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Investment of
\$13M
in 2019

CHAIR AND EXECUTIVE DIRECTOR'S MESSAGE



TERRY YOUNG
Board Chair, WGRF



GARTH PATTERSON
Executive Director, WGRF

With a new strategic plan, a refocused vision and mission, WGRF is ready to embark on the next 40 years of funding vital crop and agronomic research that benefits western Canadian grain farmers.

This annual Research Review highlights just some of the ways WGRF has invested producer dollars into research to advance crop production in Western Canada over the past year.

Vision & Mission

Vision: Profitable and sustainable western Canadian grain farmers.

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

New strategic plan

In 2019, we established a new strategic plan that reaffirmed our commitment set out in 1981 – to be a farmer-directed organization focused on crop research for Western Canada. The new plan also set forth some significant changes based on input from our valued stakeholders. This includes:

- Expansion of crop-specific funding to include barley, canaryseed, canola, chickpea, corn, fababean, flax, lentil, mustard, oats, pea, soybean, sunflower, wheat and winter cereals.
- Transformation of the WGRF Endowment Fund to a Research Fund for the purpose of sustaining crop research funding over the long term.
- Consolidation of priority funding areas to variety development and production (agronomy).
- Investment of WGRF's residual wheat and barley funds to reflect the transfer of WGRF's wheat and barley variety development responsibilities to the Wheat and Barley Commissions/Associations. WGRF plans to draw down the remaining funds with key investments into wheat and barley research over time.

Funding partners

We continue to see tremendous value in a collaborative approach to funding research. WGRF partners with producer commodity organizations and funding agencies from across Western Canada to maximize crop research investments. With more than 172 current research projects and activities, WGRF remains the largest producer funder of research in Canada.



In recent years, the agricultural community has expressed concern about the capacity for crop-related research in Western Canada. In response, the WGRF Board has made it a priority to support targeted capacity-building initiatives. In April 2019, we launched Phase 2 of this strategic initiative with a \$20 million commitment to build infrastructure and invest in tools to accelerate crop research. We are currently accepting applications and expect to make several capacity funding announcements throughout 2020. These investments are an opportunity to help WGRF deliver on its mission effectively now, and in the future.

Productive, resilient and sustainable cropping systems

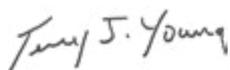
WGRF is a significant funder in the Canadian Agricultural Partnership (CAP) program. This investment is a great opportunity for WGRF to leverage producer dollars. In fact, we have committed over \$6.4 million to five agri-science research clusters. The combined value of these clusters is more than \$80 million in integrated crop agronomy, wheat, barley, organic and diverse field crops.

“Everything we do is driven by the mission of producers directing investments into crop research to benefit western Canadian grain farmers.”

Technology transfer is critical to conveying results of our research to agronomists and producers. WGRF continues to fund and explore new opportunities to enhance technology transfer tools. We are committed to ensure that research doesn't sit on the shelf, and that it gets to agronomists and farmers who can put it to use.

This magazine profiles some of the great work that is being funded with your dollars. As you read through, take note of the many advancements made possible with your support. We hope you see a return on investment in crop research on every page.

Terry Young
Board Chair, WGRF



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



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 Wheat and Barley
Growers Association

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

Agriculture and Agri-Food Canada (Class B)





Agronomy research

WGRF funds both single-crop and multi-crop agronomy research to improve the sustainability, resiliency and efficiency of crop production systems.

**Advancing
agriculture
through
research**



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Producer Impact:
Accelerating crop research to benefit farms

Building crop research capacity

WGRF funding awarded through open call

What's a research project without the people and tools to do it? In recent years, the agricultural community has noted a limited capacity for crop-related research in Western Canada. WGRF is tackling this issue through a two-phase, capacity-building initiative.

Phase 1, nearly complete, addressed human resources and successfully increased research personnel at the Universities of Alberta, Manitoba and Saskatchewan. Today, through Phase 2, WGRF is helping ensure crop researchers have the tools (e.g., infrastructure and tangible assets) to actually do the work.

Expanding researchers' toolboxes

In April 2019, WGRF announced \$20 million in funding through a competitive, open call for proposals to develop crop research infrastructure.

“The possibility of raising the bar in terms of productivity and impact that we can achieve through this call is very exciting.”

“It's meant to address equipment, buildings, lab retrofits and other types of capacity limitations for crop research,” says Garth Patterson, WGRF Executive Director. “In this way, when researchers apply for project funding down the road, we can be confident they have the appropriate capacity to carry out the research.”

He adds that \$15 million of the funding has been earmarked for projects between \$300K and \$3M while the remaining \$5 million is for smaller projects under \$300K.

“I think it is pretty unique for a farm organization to do an open call with this level of funding,” says Patterson. “It's a significant amount of farmer dollars to put forward. Through this initiative we will accelerate crop research for the benefit of crop producers in Western Canada.”

Eligible applicants include research organizations (as opposed to individual researchers). Proposals must address benefits to research disciplines in crop research (e.g., agronomy, soil science, crop protection, breeding and pre-breeding).

So far, the research community has demonstrated a high level of interest in the call for proposals, which closes at midnight on February 7, 2020. “That tells us we're hitting the mark – we know we've identified a gap out there,” says Patterson.





I think it is pretty unique for a farm organization to do an open call with this level of funding.

Intense competition

“We’ve got tremendous interest,” concurs Pat Flaten, WGRF Research Program Manager who is responsible for administering the call for proposals. “There’s going to be pretty intense competition between the applications. We suspected that would be the case, but now we’ve confirmed it.”

Flaten can say this with confidence because WGRF hosted a voluntary registration process for applicants to introduce their concepts. WGRF strongly encouraged applicants to engage directly with the organization about the nature of their application early in the process of proposal development. Both large and small institutions have responded with ideas. Once complete, applications will be judged based on merit and ranking criteria clearly outlined in the call for proposals.

Merit-based criteria

Flaten rhymes off just some of the questions that the proposal should answer. “For instance, what’s the impact to producers in Western Canada? What’s the impact to science that’ll make a difference to producers? What’s the background of the organization? Do they have a track record? What is the gap? What is the bottleneck that they can address through this purchase or development?” she says.

“Although we’re not requiring other funding to be leveraged, it’ll help to have some other organized funding associated because there are limits to how much we’ll have available,” adds Flaten. “Those are some of the major criteria that our decision makers will have to wrestle with.”

Raising the research bar

According to Flaten, decisions will be made by the WGRF Board by spring 2020. She’s enthusiastic about what’s to come. “The possibility of raising the bar in terms of productivity and impact that we can achieve through this call is very exciting,” she says.

Patterson is proud of the uniqueness of the initiative. “It’s a great opportunity for research institutions to take advantage of this. It may not be an opportunity that comes along again in the near future,” he says.

Western Canada Crop Research Capacity Funding



Can crop diversification pay?

Dialing in the true economic value of diversified cropping systems



Have you ever stared at your crop plan and wished that it didn't rely so heavily on canola? Or wheat? Or peas? Or any crop, really, that is too often called upon for guaranteed cash flow.

Agronomists have been beating the drum of crop diversity for years and, truth be told, farmers understand that tight rotations of anything leads to increased disease, weed and insect pressure over time.

But in the moment, it sure is difficult to lengthen rotations when that crop is bringing in the bucks and you've got bills to pay. It's one reason why, even as the incidence and severity of canola disease rises, many farmers still put canola on the same field every second year. They know it may bite them in the future, but the income is needed now.

That dilemma between short-term gain and long-term pain is something Danny Le Roy hopes to ease in the future. An Associate Professor in the Department of Economics at the University of Lethbridge (U of L), Le Roy is working with U of L Bio-economist Elwin Smith and University of Alberta and University of Manitoba colleagues, on a five-year, WGRF-funded research project aimed at dialing in the true economic value of diversified cropping systems.

He wants to see the numbers – exactly what are the economic trade-offs between short-rotation crop plans with limited crop options and longer-rotation plans with more diversified crop options? Because while most of us have a gut feeling that committing to crop diversification will pay off in the end, we don't really know by how much, and don't want to risk the potential cost of finding out.

"The reality is that with the spread of root rots, clubroot, blackleg and more, farmers are struggling with crop decisions," says Le Roy. "That's part of the rationale for this research. Instead of just relying on a gut feeling, is it possible to put some numbers to it?"

Smoothing the peaks and valleys

Maybe one place to start is to think about the sources of profit. You sell a crop, you get a return, and whether it's a high or low return depends on markets and the quality of what you have to sell – that's pretty straightforward. But the productivity of your land also has an impact on profit: the more productive the land, the higher the yield and grade, the higher (presumably) the return. You can't affect markets, but you can affect land productivity.

"Up to this point, land has been intensively used," says Le Roy, referring to the short rotation patterns typical of Prairie agriculture. "With canola, for example, the trade-off for it being the money maker is that canola pests reduce the productivity of that land. If you have a longer rotation, you might have a lower return, but the variability of that return may be lower."

“While most of us have a gut feeling that committing to crop diversification will pay off in the end, we don't really know by how much, and don't want to risk the potential cost of finding out.”



In other words, what you lose in terms of making a spectacular return once every few years, you gain in making smaller, but steadier, more reliable returns over time. It's kind of like the stock market – there are dips and valleys month-to-month and year-to-year, but the overall trend is upward.

To find out the profit potential of long rotations, fully diversified cropping systems, Le Roy and his colleagues are gathering data from three distinct agronomic regions in Western Canada: the black soil zone of southern Manitoba, where corn and soy crop systems are dominant; black and grey soil zone areas of Alberta and Saskatchewan where canola and cereals are ubiquitous; and the brown and dark brown soil zones of southern Alberta and Saskatchewan, where pulses reign supreme.

Both short (less diversified rotations) and longer (more diversified rotations) are included in the study, and data points will be collected by researchers and agronomists from field projects they are already working on. “All the information we need has been collected for years, but it needs to be reorganized,” says Le Roy.

THIS PROJECT FUNDED BY

WGRF +

THESE PARTNERS:

Alberta Pulse Growers Commission

Alberta Wheat Commission

Brewing and Malting Barley
Research Institute

Manitoba Pulse & Soybean Growers

Prairie Oat Growers Association

Saskatchewan Wheat
Development Commission

The framework will be a way to quantify the economic trade-offs between the profit potential of short-rotation crop plans and the long-term benefits of diversification.

The main goal is to have a solid framework that farmers can use to help make cropping decisions easier and, perhaps, more assured in terms of the risks associated with various choices.

“Margins are very thin,” says Le Roy. “It’s a very competitive industry. A small difference here or there may make the difference between making a mortgage payment and getting foreclosed, and growers need to protect that margin. So if canola doesn’t make the margin you’re used to, a tool like this will help you make some decisions – given what I’m putting in, what’s the best course of action?”

Specifically, the framework will be a way to quantify the economic trade-offs between the profit potential of short-rotation crop plans and the long-term benefits of diversification. “I don’t know at this point if the work we’re doing will lead to a commercializable spreadsheet – that would be the dream,” says Le Roy. “The point is to help real people in the real world.”

From concept to reality

“The problem motivating this study is timeless,” says Le Roy, adding that the alarm bells ringing now – increased pest severity, resistance and pressure on western Canada’s major crops – create a sense of urgency. I don’t know all the answers, but I can help frame the question,” he says.

“The importance of this research is to quantify some things that are becoming increasingly important – this is truly agronomically driven work,” he says. “I would like farmers to know there are means being developed that will help them evaluate the choices they make in the spring.”



The need for speed

Lentil breeding EVOLVES in Canada

Commodity markets can change fast. Witness the recent meteoric rise in demand for pulse products as consumer tastes change. If you're a pulse grower, you naturally want access to varieties that will help you capitalize on the opportunity and sell into this market.

The trouble is that breeding programs don't move at the same speed that markets often do. "Breeding takes a long time," says Kirstin Bett, a Professor and Pulse Crop Breeder with the Department of Plant Sciences at the University of Saskatchewan (U of S). "If I make a cross today, the farmer doesn't see it for 10 years." And that's not good enough, she adds. "We need to be able to act as fast as we can to make the breeding program respond rapidly to market demand."

To do that, says Bett, breeders need better tools that will not only help identify the quality traits consumers are looking for, but also improve the agility of breeding programs so that they can respond quickly to market demands.

"We want to provide farmers with new niche varieties of higher value."

Enhancing lentil value

Now, if you're thinking this is all about pea protein going into plant-based "meat" products, think again. Bett and veteran Pulse Breeder Bert Vandenberg are co-leads on a project called EVOLVES, or Enhancing the Value of Lentil Variation for Ecosystem Survival. It's a mouthful, but it makes sense.

EVOLVES falls under the Genome Canada umbrella and builds on an earlier project, AGILE (Application of Genomics to Innovation in the Lentil Economy), both of which received funding from WGRF. "We developed a lot of resources through that project that we are able to use here," says Bett. "AGILE was all about adaptation and EVOLVES is all about quality."

It's not just about genetic improvements, either. It's about re-thinking how lentil breeding is done, from top to bottom and developing the tools, technology, know-how and market knowledge breeders need to develop new varieties with specific quality traits the market wants. It's also about doing it all at speed so that farmers can take advantage of new opportunities immediately and not have to wait 10 years.

"We would argue the pulse research industry is in flux right now," says Bett. "We have to find alternatives and higher-value markets, and we have to transform from being a commodity supplier to being a value supplier."





Producer Impact:
Access to new and niche lentil varieties



Bett says EVOLVES stands on the shoulders of world-leading lentil research done out of the U of S for decades, particularly genome sequencing. “We have the lentil genome from end to end,” she says. Indeed, University researchers completed the sequencing in just two years and U of S breeders were the first in the world to use marker selection as a matter of routine.

Focus on quality traits

EVOLVES is a four-year project that is still in its very early stages. Bett says the team is focused on high-value, whole-food markets (that’s whole lentils and whole-lentil products, such as lentil flour), and the work runs from lab to dinner table.

For instance, researchers will be using their genetic knowledge and tools to zero in on specific quality traits, like nutritional profile, functionality (how can lentil flour be used?), and organoleptic properties – these are how people experience food through sight, taste, smell and touch.

EVOLVES researchers also have a focus on understanding consumer preferences as the means to prioritize breeding targets. “Molecular people don’t always talk to plant breeders about what they need,” explains Bett. “Plant breeders pick up the material that makes the most sense at the time. And the closer you get to the consumer, the faster the changes happen.”

“We need to be able to act as fast as we can to make the breeding program respond rapidly to market demand.”

Connecting the lentil value chain

In other words, if all parts of the chain, from breeder to consumer, are more connected and understand each other’s needs better, work can be more targeted and results – in this case, new lentil varieties fit for a specific high-value, high-demand market – can be delivered sooner. “We’ll get there faster if we have these tools and can close the gap between marker discovery and deployment in the breeding program,” says Bett.

“We want to provide farmers with new niche varieties of higher value,” she says. “We want them to not feel obliged to put a pulse crop into rotation because it’s a good thing to do, but because they make money on that crop.”



Midge Tolerant Wheat top 10

Celebrating stewardship success



Western Canadian farmers have been successfully seeding Midge Tolerant Wheat varieties for the past 10 growing seasons. That's a significant milestone for a technology that was launched with stewardship strings attached.

"Since day one, Midge Tolerant Wheat growers have had to sign a Stewardship Agreement that limits the use of farm-saved seed to one generation past Certified," says Mike Espeseth, WGRF Communications Manager and Co-Chair of the Midge Tolerant Wheat Stewardship Committee. This requirement ensures the variety's built-in refuge is maintained, which prevents the development of a resistant midge population.

"When the technology was introduced to growers in 2009, we explained that without an interspersed refuge system, midge tolerance could break down within 10 years. We've maintained this message over the past decade and are grateful to growers and industry for respecting it."

27
MILLION ACRES
OF MIDGE TOLERANT WHEAT
HAVE BEEN GROWN SINCE
ITS FIRST PLANTING IN **2009**

10 YEARS OF STEWARDSHIP SUCCESS

To mark this 10-year milestone, we've compiled a list of 10 reasons to celebrate:

1. 27 million acres grown

According to StatCan data, 27 million acres of Midge Tolerant Wheat have been grown across the Prairies since its first planting in 2009. Annually, since 2012, at least 15% of western wheat acres are midge tolerant.

\$1 BILLION
IN YIELD AND QUALITY
BENEFITS TO PRODUCERS

2. \$1 billion in benefits to growers

"Research shows that producers achieve \$36 per acre in yield and grade benefits when growing Midge Tolerant Wheat," says Todd Hyra, Western Business Manager for SeCan, one of the first companies to offer a Midge Tolerant Wheat variety to growers. "When you apply that advantage across all those acres over the past 10 years, it adds up to an estimated \$1 billion. That's a significant return to producers."



35 VARIETIES OF MIDGE TOLERANT WHEAT

IN **7** CLASSES ARE NOW AVAILABLE TO PRODUCERS



3. More outstanding varieties

Just four varieties of Midge Tolerant Wheat were available to producers 10 years ago; today, there are 35.

“There’s now just about something in every wheat class,” says Hyra. “In addition, a broad range of adaptation has happened within the genetics. It’s a very complete management package for producers. They’ve got everything they would want in a wheat variety – top yields, improved *Fusarium* ratings, short, strong straw for manageability and, on top of all of that, midge tolerance.”

4. Industry cooperation

Prior to launching Midge Tolerant Wheat to growers, industry worked together to create a strategy to collectively manage the stewardship and ensure that resistance was not broken. The result was the Midge Tolerant Wheat Stewardship Committee – a broad industry coalition representing plant breeders, government, seed growers, seed distributors and producer groups.

Midge Tolerant Wheat continues to be an effective tool because farmers and industry work together to preserve the technology.

“It was really cool how everybody came together to ensure that the stewardship program was developed. It was very much a team approach,” says Hyra. “Today, we continue to work together to ensure that this technology lasts.”

5. Front-line support

Seed retailers play a key role in sharing stewardship best practices to growers. Approximately 550 front-line retailers have completed Midge Tolerant Wheat training to ensure they understand the technology and can effectively communicate about it to growers.

Anyone who sells Midge Tolerant Wheat is also responsible for ensuring growers have signed a Stewardship Agreement. In 2016, the Midge Tolerant Wheat Stewardship Assurance Site was launched to replace the paper Agreements that were originally in place. The secure, web-based tool for use by seed distributors, seed retailers and seed growers has made the process of documenting the movement of Certified Midge Tolerant Wheat seed more efficient.

6. Nearly 100% grower compliance

Midge Tolerant Wheat growers are surveyed annually about their compliance with stewardship practices. “They are questioned in terms of understanding and respecting the technology, and results are consistently strong,” says Hyra. “In the past several years, 98% of producers have been in compliance.”

7. Reduced insecticide use

Midge Tolerant Wheat has prevented growers from having to spray to control midge. “This has resulted in several millions of litres of insecticide not purchased and not applied,” says Hyra. This not only saves growers time and input costs, but it reduces the environmental impact of an insecticide and decreases diesel fuel usage as well.

ALMOST

100%

PRODUCER COMMITMENT TO MIDGE TOLERANT WHEAT STEWARDSHIP PRACTICES FOR A DECADE



The savings also adds up in terms of a producer's time. "It frees up time to be able to spend with your family or coaching soccer or doing whatever you want to do, rather than worrying about killing bugs," says Hyra. It also eliminates the tricky task of staging spray timings for effective midge control.

8. Support for beneficial insects

Another impact of not spraying is the protection of beneficial insects. "If we're not spraying the wheat, then we're not spraying out the beneficial insects," says Tyler Wist, Field Crop Entomologist with Agriculture and Agri-Food Canada based in Saskatoon.

When beneficials are protected, they are able to do their part in helping to control the midge population. "Using Midge Tolerant Wheat helps to maintain the level of the parasitoids in the crop," says Wist. It's important to support these beneficial insects because they work by laying eggs into wheat midge larvae and eggs, eventually killing the pest. "*Macroglenes penetrans* is an example of a parasitoid that does a really good job of managing the overwintering populations of wheat midge," he says.

9. Reduced midge populations and no reported resistance

"There is no doubt that midge populations are way down across the Prairies," confirms Wist. "The fact that so much Midge Tolerant Wheat is being used is having a level of depression on the midge population. But we also have to qualify that some dry springs have contributed to a reduced midge population as well."

There have also been no reported incidences of resistant midge, which is evidence that the stewardship program is working.

10. Peace of mind

Midge Tolerant Wheat has saved producers a lot of worry over the past decade.

"It's just so convenient, right? Plant it and forget about it. You don't have to be wandering through your wheat field on the July long weekend at dusk looking for little flies," says Wist.

Hyra agrees that Midge Tolerant Wheat gives users peace of mind. "You just let the technology do its job," he says.

Stewardship works

The bottom line is that stewardship only works because of the commitment of everyone involved in the Midge Tolerant Wheat system – from the seed growers and distributors to the producers who plant it.

"Midge Tolerant Wheat continues to be an effective tool because farmers and industry work together to preserve the technology," says Espeseth.

"This trait was identified by public breeders for the good of all wheat growers in Canada. All that we ask is that as an industry we take care of it for several more decades."

"A big thanks to everyone who has done their part to protect this important technology," adds Hyra. "This trait was identified by public breeders for the good of all wheat growers in Canada. All that we ask is that as an industry we take care of it for several more decades."

AT LEAST

15%

OF WESTERN WHEAT
ACRES ANNUALLY HAVE
BEEN MIDGE TOLERANT
SINCE **2012**



A successful start for Canadian Agronomist

Website really digs into research

Translating crop research into plain language for in-field application isn't an easy task, but Bruce Barker is making it happen. His website, CanadianAgronomist.ca, has been successfully bridging the gap between the lab and farm since its launch in fall 2018.

"I'm really happy with how the first year went," says Barker of Bragg Creek, Alberta. The Professional Agrologist and agri-writer takes crop research found in peer-reviewed academic journals and makes it accessible to agronomists and farmers who can put it to practical use.

Canadian Agronomist's format is to publish Research Insights on the website on a weekly basis. Agronomists and farmers can sign up to receive email notifications of new postings. Barker also uses Twitter to promote new content.

"We really focused on targeting agronomists in our inaugural year. So far, half of the agronomists in Western Canada are subscribers. So, I'm very, very happy with that," he says. Barker reports that his email list includes 454 subscribers representing 6.78 million acres, and he's accumulated 666 followers on Twitter.

Technology transfer

"Certainly, the feedback from subscribers, researchers and agronomists has been very positive," says Barker. Sponsors are also happy with the results. The original six sponsors renewed their commitment for another year and two new sponsors signed on.

"Canadian Agronomist was established with the support of grower organizations. I wanted to keep the project free of advertising so that the research findings would remain objective," he says. "I'm very honoured that the sponsors saw the value in the project."

RESEARCH INSIGHTS

TOPICS COVERED:

Agronomy (6)
Soils and fertility (6)
Weeds (10)
Insects (4)
Disease (6)

CROPS COVERED:

Canola (10) Pulses (10)
Wheat (6) Oats (3)
Barley (4) All crops (11)

As a platinum and founding sponsor, WGRF is pleased with the impact of the resource to date.

"Western Grains Research Foundation sees the tremendous value in science communications and is a strong supporter of technology transfer," says Terry Young, WGRF Board Chair. "Canadian Agronomist is a unique website that is translating research into knowledge that agronomists and farmers can use to grow better crops."

Industry accolades

The website also received accolades from marketing communications industry peers. Canadian Agronomist took home a silver award for best website at the annual Canadian Farm Writer's Awards in September 2019. It was also a finalist in the categories of logo, website and blog at the Canadian Agri-Marketing Association's annual gala in November 2019.

So, what's Barker hoping to achieve with Canadian Agronomist in year two? "One of our targets is getting more farmers to subscribe," says Barker. "I certainly want to maintain and expand the agronomist list, but we're going to put some effort in marketing to farmers."

Visit CanadianAgronomist.ca or follow [@cdnagro](https://twitter.com/cdnagro) on Twitter for the latest Research Insights.



Drilling down on cropping systems

Study looks at best rotation by region

So here's a big question: is your cropping system giving you the best return – not just in yields, but soil health, whole-farm economics, environmental impact and long-term sustainability?

If you don't have an answer, keep your eye on Yantai Gan – he's working on it. A Research Scientist at Agriculture and Agri-Food Canada's Swift Current Research Centre, Gan is leading an enormously ambitious and multi-layered study that examines six cropping systems across seven growing regions located strategically around the Prairies. "The goal is to look at what is the best rotation in each eco-region, which one performs best over the longer-term," he says.

And "best" means far more than yield. "The question is: what system is best for yield, environmental footprint and whole-farm economics, by which we mean all input costs, the consumable and fixed costs," says Gan. "Another area we're looking at is how different systems build up the soil – over generations you can see this system does a better job than that one."

This five-year research project began in 2018 and is part of the Integrated Crop Agronomy Cluster, administered and funded by WGRF. Gan and his team have one year of data and two growing seasons under their belts and are already seeing some interesting results.

Six crop rotation systems

"The beauty of this trial is that current best practice is the check," he says. So what's that check going up against?

The six crop rotation systems in the trial include:

Conventional. A most commonly used rotation is the check.

Intensified pulse or oilseed.

Essentially, a continuous rotation of two crops – cereal-pulse or cereal-oilseed, depending on geography.

Multiple commodity, diversified.

A rotation guided by commodity markets and aimed at establishing crop diversity. One example from the study is red lentil-canola-yellow pea-durum.

Market driven.

Crop choice is determined each year using market signals. Gan and his team survey farmers to see what they think should go in. Not surprisingly, canola wins a lot. But in non-canola growing areas flax, malt barley and oats have been used for this rotation.

High risk-high reward.

This rotation incorporates new crops and basically takes some chances in the hope of high returns.

Green manure. Using intercropping strategies, this system is focused on soil health.





“The goal is to find out how cropping systems work on many levels so farmers can make better decisions.”

Producer Impact:
Confident crop rotation planning



Importantly, this study is fully phased, which means that each “year” (or phase) of a rotation appears simultaneously at each trial site in each year. For example, a rotation has four crops for the four years, and all these four crops are grown in each of the four years. Gan explains that this is done to equalize the effect of environmental conditions between years.

Seven Prairie eco-regions

The seven eco-regions reflect growing conditions across the Prairies: Beaverlodge, Lacombe and Lethbridge in Alberta; Scott, Melfort and Swift Current in Saskatchewan; and Carman in Manitoba.

The sheer amount of data this study is collecting is rather staggering. Gan is looking at plant growth traits, weed and disease impacts, harvest indices (weight of harvested grain vs. weight of above-ground biomass), yield, nutrient removal, nutrient addition and more.

Layered on top of that are the whole-farm economics, system sustainability and resilience and long-term soil health. The 2019 growing season data are still being crunched, but the 2018 results hint at things to come.

Better decision making

“All systems performed differently across the eco-sites, which we expected,” says Gan. “Some sites showed the conventional rotation is the best, while other sites

showed the more diverse system is best. In another year or two, we can be more confident about how these systems affect soil health.”

He says the goal is to find out how cropping systems work on many levels so farmers can make better decisions. “The systems approach lets us see all the interactions between crop, eco-zone, climate and management practices. If farmers can see this work and think, yeah, that system will help my productivity and soil health, they can make a decision on how to run their farm.

“The question is: what system is best for yield, environmental footprint and whole-farm economics, by which we mean all input costs, the consumable and fixed costs.”

“It’s unique – putting everything together in a system. Farmers are concerned about income, inputs, soil health – it’s difficult for a farmer to put all of that together in one study, so we are doing it for them.”



WGRF research priorities

Priority areas for single-crop and whole-farm, integrated, multi-crop research

For eligible crops, WGRF will invest in both single-crop and whole-farm, integrated, multi-crop research in the priority areas of variety development and production. Multi-crop research will address issues from an integrated crop and whole-farm perspective, with emphasis on cross-commodity benefit. Outcomes are expected to have a positive impact on producers' long-term sustainability (economic, environmental and social).



Variety development

e.g. genetics, breeding methods, pre-breeding, breeding, pest resistance development, breeding for crop quality, variety trialing



Production

e.g. cropping systems, crop nutrition, pest (insect, disease, weed) management, production management, water use efficiency, fertilizer use efficiency, adaptation to and mitigation of climate change, crop quality, storage, storage pests, economic analysis

Eligible crops:

Major crops: barley, canola, lentil, pea, wheat

Intermediate crops: canaryseed, chickpea, corn, fababean, flax, mustard, oats, soybean, sunflower, winter cereals



The impact of WGRF really adds up

SCHOLARSHIPS

\$700,000

AWARDED IN SCHOLARSHIPS TO ATTRACT THE BRIGHTEST MINDS IN CROP RESEARCH SINCE **2011**



RESEARCH

172
CURRENT RESEARCH PROJECTS & ACTIVITIES

RESEARCH CONDUCTED ON **15** CROPS

OVER **130** FARMERS HAVE SERVED ON THE WGRF BOARD

INVESTMENT AT MORE THAN **20** DIFFERENT RESEARCH INSTITUTIONS

MORE THAN **500** PROJECTS LISTED AT **WESTERNGRAINS.COM**

WGRF BOARD HAS GIVEN PRODUCERS A VOICE IN FUNDING AGRICULTURE RESEARCH SINCE **1981**



Questioning cover crops

The true value of cover crops on the Prairies

When Yvonne Lawley wrote her research proposal for a study of cover crops, she was very specific about the wording of the title: *Testing the cover crop hypothesis across Prairie Canada*.

It's the word "hypothesis" that grabs you. What could possibly be theoretical about cover crops? Farmers have been using them for decades to help build soil, reduce erosion, graze animals and more. The practice is common in Ontario and Quebec, as well as the Northern Great Plains region of the U.S. What's not to know?

Well, when it comes to the Canadian Prairies, quite a bit, says Lawley, an Assistant Professor in the Department of Plant Science at the University of Manitoba. "Our prairie environment is much more variable and more prone to extremes, compared to other areas where cover crops are regularly used," she says.

Also, she says, the thinking behind cover crops on the Prairies has shifted since the time they were considered only for green fallow. "The reasons why we might want to add cover crops are very diverse – soil health, reducing erosion, extending grazing, reducing inputs – so there is now a very diverse range of goals," says Lawley.

"And that's why I put the word 'hypothesis' in there – because farmers are hearing about cover crops everywhere, but here in this environment, we don't have a lot of data to show how they actually work." So, with funding from Western Grains Research Foundation, Lawley is leading a team of scientists and graduate students for a new five-year project that aims to find some answers.

The experiment

To generate this data, Lawley has set up a large-plot crop rotation experiment at four sites across the Prairies (Carman, Manitoba; Lethbridge, Alberta; Saskatoon and Redvers in Saskatchewan) representing a range of soil types and moisture conditions.

At each site, there are two main treatments: the first is a four-year annual crop rotation that includes cover crops, and the second is that same crop rotation without cover crops. (Third and fourth treatments will act as checks and reflect typical farming practice: a two-year short wheat-canola rotation and a four-year planting of alfalfa or alfalfa grass mix.)

“Our prairie environment is much more variable and more prone to extremes, compared to other areas where cover crops are regularly used.”

For the first two treatments, cash and cover crops were chosen to reflect regional practices, with wheat and canola at every site, plus a second cereal crop and a legume suited to each location (soybeans in Manitoba and pea in Alberta and Saskatchewan, for example). Cover crops include legumes (like clover), brassicas (such as radish) and grasses (fall rye, for example).



All sites will use direct seeding and minimum till, although the Saskatoon site includes one high-disturbance crop for comparison purposes (potatoes).

“In some ways it’s very simple – we’re comparing two rotations, one with and one without cover crops,” says Lawley. What’s not so simple is that the rotations are fully phased at each site. This means that all crops will be present in all years of the study, thereby removing weather as a factor in the results.

Lawley and her team believe this work will help to definitively show if cover crops can be reliably grown on the Prairies in the first place and, if so, what kind of impact they have on subsequent crops in terms of yield, nutrient availability, input costs, pest control and soil health. “We’re going to be doing an economic analysis and look at impact on crop production and the soil,” she says. “What’s the benefit of that living root? We’re going to try to put some numbers to that.”

The experiment also offers a golden opportunity to study the impact of cover crops on nitrogen cycling. Nitrogen needs to be available in the soil when the crops need to use it, and researchers want to know if cover crops help or hinder that process.

In addition, the study will look at the impact of cover crops on greenhouse gas emissions. “We want to know if storing nitrogen in cover crop biomass – living or dead – impacts nitrogen loss in the early spring, which is when most N₂O emissions are generated,” says Lawley.

Watch this space

“In some ways, we already know we can do this,” says Lawley, explaining that early adopters of cover crops have shown it can work on their farms. “But others are still wondering if it’s worth their time to grow cover crops, so we’re doing this work for them, and also to produce information for agronomists, who get asked questions about cover crops all the time, and need local research to refer to.”

The team has just wrapped up its second field season, so it’s an exciting time for the data crunchers. “In the first year we got baseline samples,” says Lawley.

“Lawley and her team believe this work will help to definitively show if cover crops can be reliably grown on the Prairies in the first place and, if so, what kind of impact they have on subsequent crops in terms of yield, nutrient availability, input costs, pest control and soil health.”

“We’re at the point now where grad students are coming on board to do the intensive sampling and getting all our measurements.”

And farmers don’t have to wait until 2022 to find out what Lawley and her team are learning along the way – check out #PrairieCoverCrops. “Social media is a real enabler of cover crops and soil health information for farmers,” she says. “It’s key for knowledge transfer and for researchers to know what questions farmers are asking. People with good ideas could be so isolated before social media – it’s been a game changer.”

Producer Impact:
Cover crop decisions based on local research



Tracking pests across the Prairies

Network set to launch new website

Since 1997, a dedicated team of field crop entomologists have been tracking key pests across the Prairies to help farmers better manage insect-related risks. Two decades later, the mandate of the Prairie Pest Monitoring Network (PPMN) hasn't changed, but the way they share their findings is getting an overhaul.

"We've been working with the PPMN to develop a new comprehensive website," says Mike Espeseth, WGRF Communications Manager. "The site redesign removes the restrictions of the current platform and allows for the information to be organized in a more user-friendly format."

Weekly updates from May to August

Visitors who rely on PPMN Weekly Updates, a summary of weather, crop and insect pest information throughout the growing season, will be familiar with the network's current blog platform, which launched in 2015 as a means to highlight insect issues in a timely manner.

"It will be more streamlined and powerful than the blog and feature more of a modern look," says Meghan Vankosky, PPMN Co-chair and Entomologist with Agriculture and Agri-Food Canada. The new layout better represents the quality of the information presented by the PPMN.

"With the blog, we've had to archive anything more than two years old due to space constraints. With the website, we'll have a lot more storage to post historical documents for growers," she says. "It gives us more flexibility for what we want to do and the information we want to share."

Vankosky adds that the website will also be mobile-friendly and automatically scale depending on the device it is being viewed on.

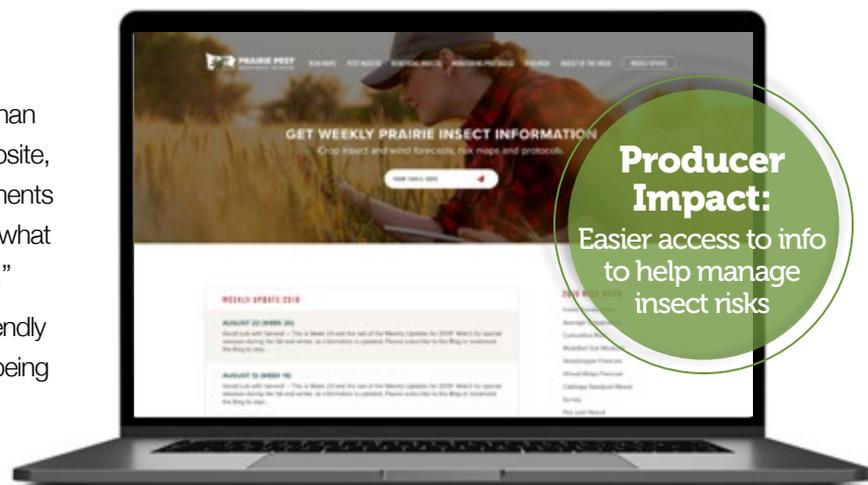
Annual risk and forecast maps

PPMN's annual risk and forecast maps are much anticipated by growers and industry each spring. "We conduct annual surveillance on key pests of field crops, including oilseeds, pulses and cereals. Then we use that data to help inform growers about regional risk to their crops," says Vankosky. This will be maintained as a key feature of the new website.

"We also use that data to develop models that explain host plant and insect phenology," says Vankosky. "Some insects are very tightly linked to plant development, so based on the stage of plant development and on climate, we can often predict quite closely when the crop is going to be at greatest risk from the insect pests."

Vankosky says current blog users will need to re-subscribe to the Weekly Updates once the transition from blog to website is complete. The website Prairiepestmonitor.ca is set to launch in spring 2020.

PPMN's new logo will be part of the website launch



Pest or beneficial insect?

Proper identification can save time and money

Are those pests or beneficial insects at work in my fields? It's a question all growers should be asking because the answer can make a big difference.

John Gavloski, Field Crop Entomologist with Manitoba Agriculture and Resource Development, received several calls last July from agronomists seeking information about clusters of silky-covered eggs spotted at the top of many cereal heads.

As he explains, the clusters were not eggs, but pupal cases of a parasitic wasp called *Cotesia*, a beneficial insect that does important work.

Parasitoids help reduce pest population

"They're actually a parasitoid of caterpillars such as armyworms, which were a problem in some cereal fields in Manitoba in 2019," says Gavloski. Parasitoids lay eggs into other insects and eventually kill them. For example, *Cotesia* wasps will lay 20 to 60 eggs into an armyworm (or other caterpillar) and inject it with a virus, which shuts down the pest's immune response. Because the eggs develop at exactly the same time, *Cotesia* larvae emerge out of the caterpillar almost simultaneously. They then rapidly form their cluster of pupae, which can easily be misidentified as a cluster of eggs.

Gavloski assures agronomist callers that the only thing *Cotesia* larvae feed on is other insects, which can help reduce the pest population. For this reason, he likens them to "insect superheroes."

Tyler Wist, Field Crop Entomologist with Agriculture and Agri-Food Canada out of Saskatoon fields a lot of calls requesting him to speak to grower groups and agronomist associations who are eager to hear about beneficials.

"They want to learn more about them – what they look like, what they can do in a field, and definitely how to protect them," he says.

Follow pest thresholds

Wist is keen to share that information but looks forward to being able to provide beneficial threshold numbers one day. "The real thing we need to figure out research-wise is how many of these beneficial insects do we need to control a population?" he says. Studies are currently underway to determine just that. In the meantime, Wist says there is a lot of benefits for growers to know pest thresholds and spray only when they are met.

"What's in it for growers is that they don't have to either hire a custom applicator or hop on their own sprayer. They don't have to use chemicals in the field, they don't have to use diesel, and they don't have to use time or wear and tear on their vehicles," says Wist.

Many resources are available at FieldHeroes.ca or by following [@FieldHeroes](https://twitter.com/FieldHeroes) on Twitter to help with proper insect identification. It's the first step to ensure that you're protecting the good guys and controlling the ones that can damage your crop.

FIELD HEROES

ATTACK!

Photo credit: J. Gavloski

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