



Celebrating
35 Years
Farmers funding and directing research

\$125 million+
invested in research since 1981



\$400,000
awarded in scholarships to attract the brightest minds in crop research



Prairie-wide pest monitoring and forecasting



More than
200
new varieties of wheat and barley



Diverse
research projects benefit all crops



\$36 per acre in Midge Tolerant Wheat yield and grade benefits



Powering the variety pipeline

Producer investment drives success

Keeping midge at bay

Midge Tolerant Wheat achieves five-year milestone

What's next for WGRF?

Bright future for farmer-funded research

Message from the chair

Celebrating 35 years of advancing agriculture research



In 1981, a group of farmers got together to form the Western Grains Research Foundation (WGRF). These farmers were united by a single purpose, to invest in field crop research that would benefit western Canadian farmers.

Thirty-five years later, our investment of more than \$19 million in 2015 has made us the largest producer funder of variety development and

field crop research in Canada. WGRF is a valued forum for producer organizations to collaboratively invest in crop research to maximize returns and to ensure a farmer-funded, farmer-directed research approach in Western Canada.

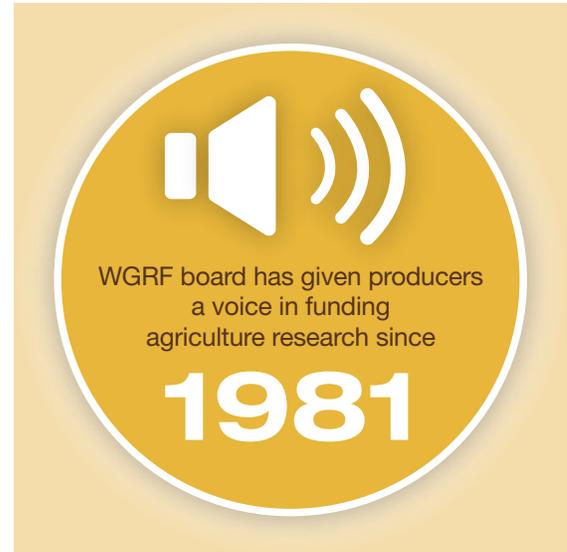
Throughout the years, more than 110 farmers have served on the WGRF board, giving western Canadian producers a strong voice in agriculture research funding decisions. These voices ensure that we undertake projects that show the most potential to benefit producers. Today, WGRF's board is made up of 18 producers, one from each member organization, who carry forth that mandate.

This magazine is a tribute to the 35th anniversary of WGRF, and celebrates the many current and past accomplishments of the organization. As you read through these pages, take note that many, if not all, of these projects and initiatives are made possible, in part, because of producer funding. As producers, we should all be very proud of these investments we've made in our industry.

A handwritten signature in black ink, appearing to read 'D Sefton'.

Dave Sefton

Board chair, WGRF
Farmer, Broadview, Saskatchewan



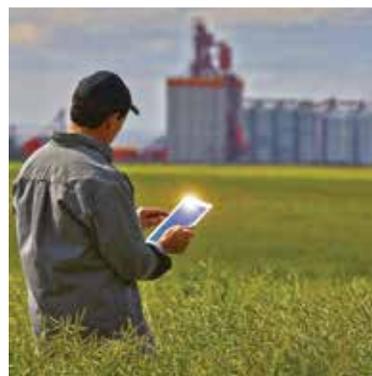
WGRF member organizations

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 Association
Western Winter Cereal Producers



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Farmers looking out for farmers

WGRF built on a solid foundation

“It was a group of farmers who got together to suggest to the government of the day that those funds should be used to fund crop research,” says Lorence Peterson, past WGRF executive director, of the beginnings of the organization.

Peterson shepherded WGRF through its middle years from 1997 to 2003. It’s an interesting vantage point from which to view WGRF’s journey, its importance to Canadian agriculture, and the unique qualities that make it one of the most enduring producer-led agencies on the Prairies.

The funds Peterson refers to, of course, are the \$9 million left in the Prairie Farm Assistance Act (PFAA), which had been established in 1939 to assist farmers suffering crop losses. They were producer dollars from the very beginning: farmers were charged 1% on all deliveries to build the fund, and payouts were rationed to half a claimant’s acres.

Overtaken by better insurance programs, the federal

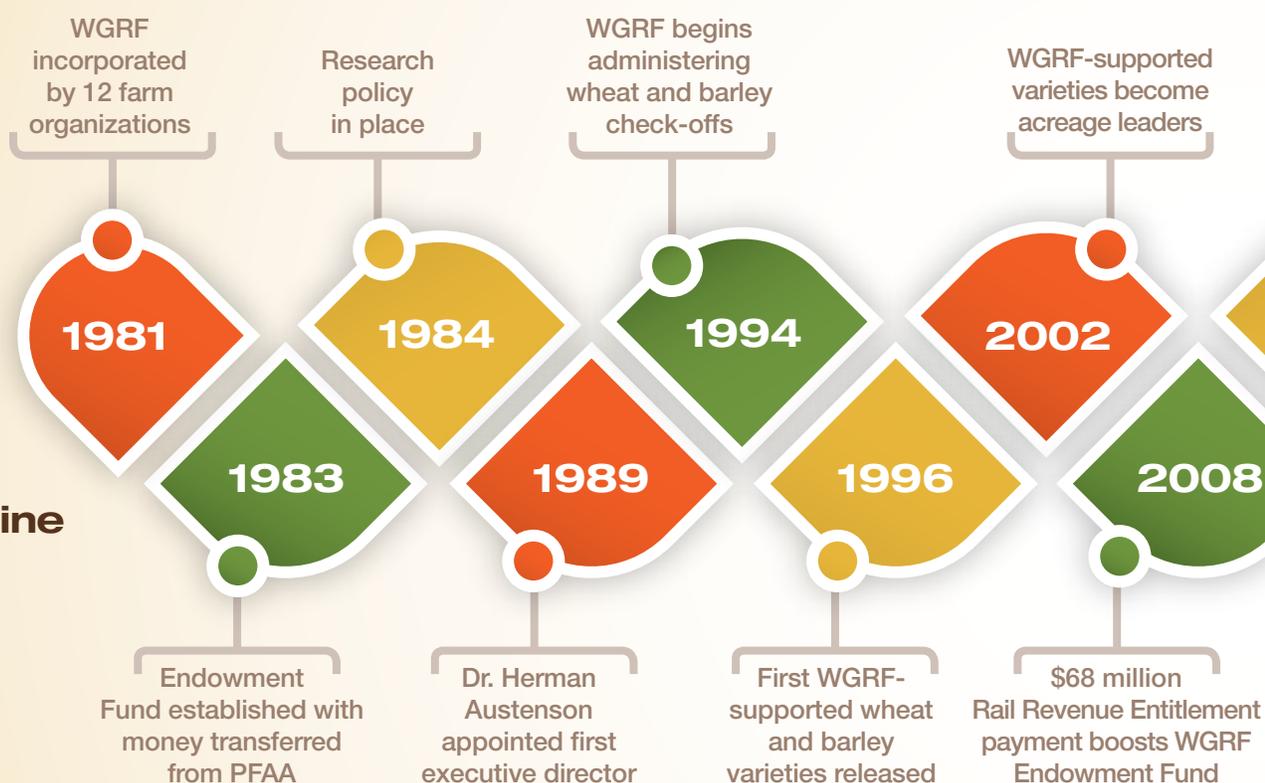
government decided to discontinue it. So, what to do with all that money?

Realizing a vision for ag research funding

Seeing an opportunity, leaders from 12 farm organizations (from pools to crop associations to policy groups) came together in 1981 to form WGRF. From the start, their vision was to establish a robust agricultural research funding organization, one that would consult farmers about what they needed, then work with research providers to fill that need.

WGRF received the PFAA funds in May of 1983 and the Endowment Fund was established. “At the time the money was turned over, interest rates were really high,” says Peterson. The board invested the money and agreed to maintain the principal by spending only the earnings on research projects.

WGRF timeline 1981 - 2016



"They understood from the start that this money would only do for a while," says Peterson. The board realized the Endowment was a temporary fix, and that a check-off was needed.

By 1984, WGRF's research policy was in place, and funding began. The Canadian Federation of Agriculture handled all the administration until Herman Austenson, head of the Crop Science Department at the University of Saskatchewan, was appointed as the first executive director in 1989. There was a time, laughs Peterson, when WGRF was pretty much contained in two drawers in Austenson's filing cabinet in his office.

In 1994, WGRF began to administer wheat and barley check-offs, directing these dollars directly to wheat and barley breeding programs, while the Endowment Fund continued to support research on all western crops.

Another revenue stream was introduced when the federal government decided to transfer the money it received from CN and CP for exceeding their revenue cap. "We were able to satisfy authorities then that WGRF was a reputable farmer organization with a research funding track record," he says.

Rail Revenue Entitlement money is usually measured in the hundreds of thousands, occasionally reaching into the millions, or sometimes nothing at all. Then in 2008, it

was \$68 million – a one-time cash injection that lifted the Endowment out of the need for maintenance costs, and allowed it to become large enough to have a significant impact on research.

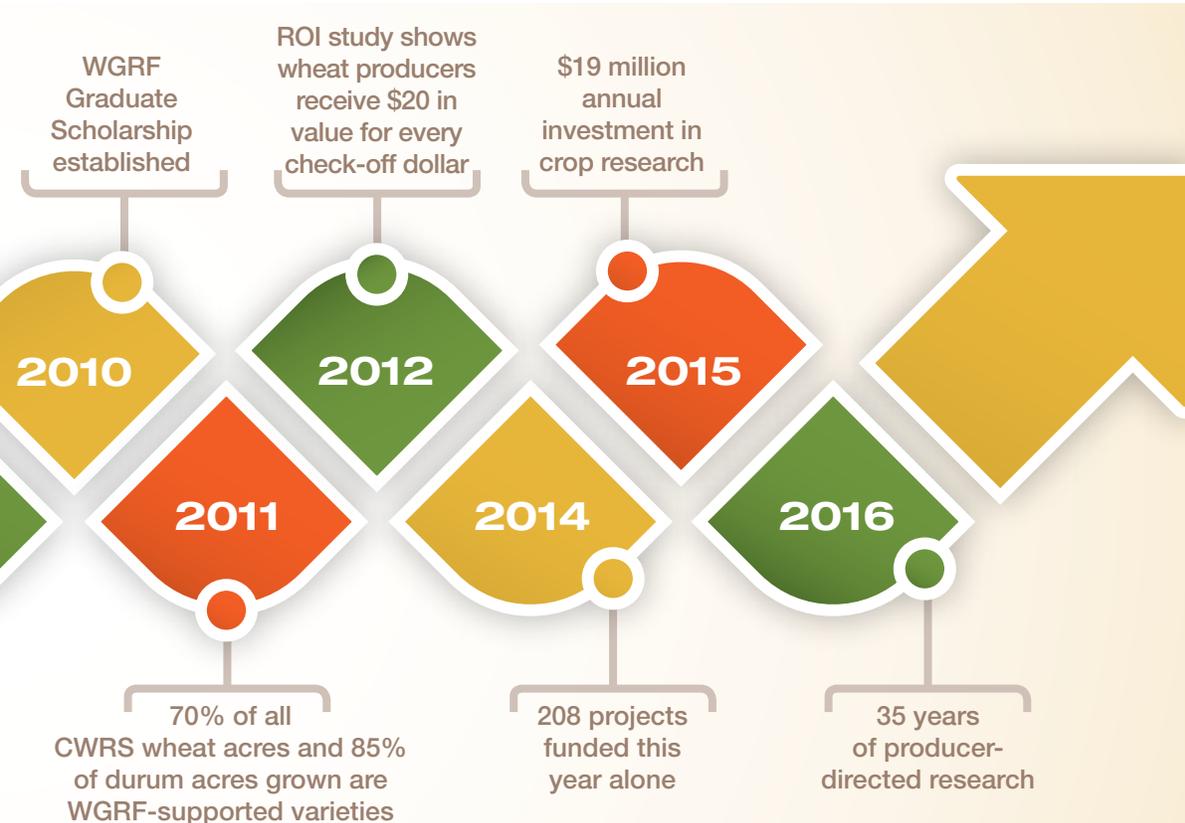
Peterson says leveraging other funds and grants has always been an important approach to help make WGRF dollars go even further.

Working together for the common good

WGRF has established graduate research scholarships, and important co-funding relationships with other funding bodies across Western Canada. Its membership structure has expanded, but producer organizations still call the shots.

The research funding numbers are staggering – over \$125 million in total invested in variety development and field crop research. But for Peterson, the lasting impression is of the people and their commitment to work together for the good of farmers.

"I wondered, when I started, how these producers would get around a table and discuss things," he says. "But everybody left their political hats at the door and asked themselves, how can we make the best use of this money to get the most benefit for farmers? The reason why it worked, and still works, is because the members continue to do that."





Associate professor Maria DeRosa and her team at Carleton University developed improved mycotoxin tests by using aptamers – synthetic pieces of DNA created in the lab.

From bench to field

Funding diverse research to benefit farmers

If you ask someone to imagine what WGRF-funded research looks like, chances are they'd picture cereal crops in field plots – and they'd be right. But if they mentioned plots of chickpeas, fields of canary seed or soybeans, a chemistry lab, a greenhouse or a growth chamber, they'd also be right.

That's because today's WGRF is about much more than cereal grains. Its members come from many agricultural organizations spanning all major western crops, including cereals, oilseeds, pulses, special crops and general farm organizations. These producers, who make WGRF funding decisions, recognize that farmers benefit from research being done right along the entire research chain – from laboratories to fields.

Bringing ideas to life

A case in point is the work completed in 2015 by Maria DeRosa, associate professor in the chemistry department at Carleton University in Ottawa. She and her team received WGRF funding to develop better, cheaper mycotoxin tests by using aptamers – synthetic pieces of DNA that are created in the lab.

“WGRF believed in the idea and gave us the time and resources to figure it out.”

~ Maria DeRosa, Carleton University

“Our goal was to have one or two cheap mycotoxin tests that can be used at elevators,” says DeRosa, adding that



existing tests rely on an imperfect sampling process that often results in false positives. “The only way to get around the sampling problem is to develop cheaper tests.”

With WGRF’s help, DeRosa and her team did just that – developing three mycotoxin test platforms, that will cost from one to ten dollars to run, and proving them in the lab.

They are now ready to move into prototype and scale-up mode. “That’s why we’re so grateful for the WGRF funding we got,” she says. “We had the nugget of a good idea but, a lot of the time, people want to know you’ve figured it out before they’ll fund you. But WGRF believed in the idea and gave us the time and resources to figure it out.”

Increasing genetic material for breeders

Closer to the farm, plant breeding is also a core focus for WGRF funding. For instance, Bunyamin Tar’an, associate professor at the University of Saskatchewan (U of S), aims to increase the amount and variety of genetic material available to chickpea breeders. “Chickpeas have a very narrow genetic background, they are all related to each other,” he says.

With so little domesticated genetic material to work with, chickpea breeders the world over are turning to wild species of chickpea in search of useful traits that can be added to

their breeding programs. “It’s a long-term project to build up the resource for breeding,” says Tar’an. “The WGRF funding is very important. It’s like a commission from farmers; if they don’t think it’s important for them, they wouldn’t fund it.”

“The WGRF funding is very important. It’s like a commission from farmers; if they don’t think it’s important for them, they wouldn’t fund it.”

~ **Bunyamin Tar’an, University of Saskatchewan**

And WGRF funding aims to answer current questions for growers, such as: what are the nutrient requirements for soybeans grown in Saskatchewan? “That’s been fairly well-documented for other pulses in Saskatchewan, but not for soy grown under our conditions,” says Jeff Schoenau, professor of soil science at the U of S.

“Our research will be used to develop more accurate fertilizer recommendations for the soybean crop itself, as well as for the crops that will be grown after it,” he says. “It’s important information if we want to maintain and, indeed, increase crop production in Western Canada in an economic and environmentally sustainable manner.”

There is only one thing all WGRF-funded projects have in common: making farming better and more profitable for farmers.



“WGRF is a major partner in various breeding programs across Western Canada. Not only in funding but in guiding programs and research at large.”

Bill Gehl
Board member, WGRF
Farmer, Regina, Saskatchewan





The WGRF Endowment Fund provides \$100,000 annually towards Graduate Scholarships at the universities of Manitoba, Alberta and Saskatchewan on a rotating basis (each university receives the endowment every three years). The institution then decides how to administer the funds. They can give one PhD student \$33,000 per year for three years, or two masters students \$25,000 per year for two years.

University of Manitoba PhD student Sean Asselin is the first WGRF scholarship recipient.

Investing in future scientists

Endowment Fund Graduate Scholarships foster industry innovation

It's said that good things come to those who wait. They also come to those who plan and invest, and that's the principle behind WGRF's Endowment Fund Graduate Scholarships, which invest in young researchers at the beginning of their careers.

“Attracting the best minds to crop research will generate improved technology and productivity for western crop producers.”

~ Dave Sefton, WGRF

“We initiated the Endowment Fund Graduate Scholarships because having access to highly trained specialists in crop research is essential for a vibrant and competitive agriculture economy,” says Dave Sefton, WGRF board chair. “Attracting the best minds to crop research will generate improved technology and productivity for western crop producers.”

Evaluating new oilseed crop potential

The first WGRF Endowment Fund Scholarship was presented in 2011 to Sean Asselin, a PhD student in Plant Breeding and Genetics at the University of Manitoba.

“Plant breeding is really where the cutting edge of genetics

research has occurred and continues to develop,” says Asselin. “The ability to work with plants allows a lot more flexibility in studying the inheritance of traits and to deploy them to our benefit.”

Asselin's research project, *Genomics of regional adaptation and domestication of Maximilian sunflower*, looked at the breeding potential of perennial

sunflower species native to Western Canada, with an eye to developing a new oilseed crop. “The diversity and flexibility present in perennials allows us the opportunity for tailoring cropping systems to the environmental limitations we face in Western Canada,” he says.

“The funding Sean received from WGRF gave him the opportunity to conduct unique and exciting research,” says Doug Cattani, faculty member with the University of Manitoba. “This support encouraged Sean to delve deeply into research that is critical for maintaining the diversity of the crops in Canada, and sustaining our agricultural industry. It also created opportunities to engage in collaborative research across North America and Europe.”

Developing disease-resistant peas

The first University of Alberta student to receive the Endowment Fund Scholarship is Jagroop Gill Kahlon, a PhD student in Plant Biosystems, Faculty of Agricultural, Life and Environmental Sciences. Her project, *Genetic engineering for disease resistance in pea; transformation, efficacy and environmental biosafety*, is focused on identifying genetically modified traits that may confer resistance to two key pea diseases: fusarium root rot complex and mycosphaeralla blight.

“My passion for agricultural crop improvement traces back to my roots,” says Kahlon. “I know the advantages that science has brought to agriculture and it has made me a strong believer in the impact of timely scientific intervention and innovative research.”

Her family's farming roots are six generations deep, and she has personally witnessed the benefits that science has brought to agriculture in her native India. Says Kahlon: “I feel evaluation of a new trait and the environmental risk assessment of genetically modified crops is indeed very important if we are to feed nine billion people by 2050.”



Jagroop Gill Kahlon inoculating pea plots for screening of potential disease-resistant lines.



HARVEST
 NAPOLEON AC MEENA
SUPERB
AC AVONLEA RADIANT
 CDC PTARMIGAN
STETTLER
TRANSCEND CDC MINDON
 LOVITT
BAILEY
CDC COPELAND PEACE
 CDC CARTER AC NORMAN
STRONGFIELD
BRIGADE
 ALVENA INFINITY
 BHISHAJ MCCLINTOCK
CDC ABOUND
 CDC LANDIS CDC AUSTENSON
SHAW
 CDC BUTEO
 CDC ABOUND CDC ALSASK
SNOWBIRD CDC EXPLUS
CDC UTMOST
 AC ANDREW
CARBERRY
 SOMERSET BURNSIDE
CDC RAPTOR
ENTERPRISE
CDC GO
AC INTREPID
 BURNSIDE CDC CLEAR
 MARCHWELL CDC MAVERICK
 AC BINSARTH
LILLIAN
MUCHMORE
 CDC WALRUS AC TAYLOR
AC SPLENDOR
SADASH
CDC MEREDITH
 KANATA AC MAJOR
UNITY
VESPER CDC HILOSE
 CDC LOPHY
 CDC COWBOY
NEWDALE
CDC VERONA
 DURAFIELD CDC OSLER
INTREPID
 CDC COALITION AC DESPERADO
CDC STANLEY
CARDALE
 CONQUER VB
 CDC KERNEN
EUROSTAR
KANE
 CDC TREY
 CDC COALITION
 AC MILLHOUSE CDC FIDAN

A hopper full of best-in-class technology.

Through Western Grains Research Foundation, producers have helped fund research and development for more than 200 varieties of wheat and barley. You most likely recognize more than a few of them, and you've probably had some success growing several of them too. Western Grains Research Foundation is a producer-funded and producer-directed organization. Working together, we produce some of the world's finest and most technologically advanced grains.



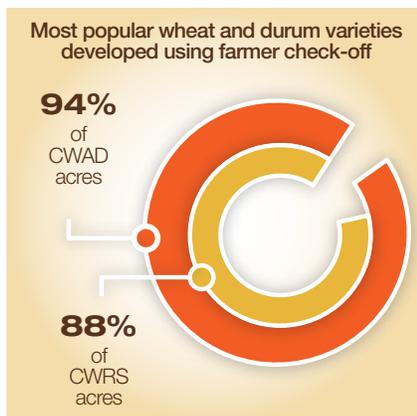
 @westerngrains
 westerngrains.com

Producer investment drives wheat and barley success

Technologically advanced grains add to a farm's bottom line

If you like the fact you have a lot of wheat and barley varieties to choose from when you plan out a cropping season, give yourself a pat on the back – you helped make it happen.

Since 1995 the WGRF has invested over \$90 million in wheat and barley variety development through partnerships with Agriculture and Agri-Food Canada (AAFC) institutions and the three prairie universities:



University of Saskatchewan, University of Manitoba, University of Alberta, and Alberta Agriculture and Forestry. The results speak for themselves with over 88% of CWRS acres, and a whopping 94% of CWAD acres, seeded to WGRF-supported varieties.

“In all, over 200 new varieties of wheat and barley have come out of WGRF-supported programs, offering greater yield gains, better pest and disease resistance, stress tolerance and higher quality characteristics...



and farmers' bottom lines have benefited,” says WGRF board chair Dave Sefton of Broadview, Saskatchewan.

Every wheat check-off dollar returns over \$20 value to producers

A return on investment study commissioned by WGRF estimated that investment in wheat varietal research

is providing producers with a very high return on their investment. This study calculates that, on average, every producer check-off dollar invested into wheat varietal research has returned \$20.40 in value to the producer.

The importance of stable long-term funding, particularly from producers, cannot be overestimated. “The WGRF is a fantastic supporter of the breeding programs here at CDC,” says Curits Pozniak, head of the Crop Development Centre’s (CDC) wheat and durum breeding program. “They provide what I think of as the foundation of funding for our breeding programs and that’s allowed us to leverage additional dollars from different levels of government as well as our industry partners.”

He adds that feedback from the industry stakeholders – including farmers and end-users of western Canadian grain – is extremely important because it ensures that plant breeders are developing varieties that address the needs of growers and processors.

Producer-led board helps set breeding priorities

“That’s the other nice thing about our relationship with the WGRF,” says Pozniak. “We meet on a yearly basis to discuss breeding targets. The WGRF board consists of producers from all across Western Canada who can provide input and guidance in terms of setting breeding priorities, so that’s an important role that WGRF plays beyond the funding.”

Approximately \$56 million is invested annually in wheat and barley variety development, with taxpayers providing 72% of the funding and producers and the private sector investing the remainder in similar amounts. WGRF is working closely with provincial wheat and barley commissions (associations) to map out a future for continuing producers’ investments.

Genomics: new frontier of wheat breeding

Genome sequencing key to increasing crop quantity and quality

There are two facts about wheat that, put together, illustrate why genomic research is critical to the continuing development of this crop.

The first is that to meet future global food demand, wheat productivity needs to increase on a global level. The second is that the wheat genome is five times larger than the human genome.

Wheat accounts for a staggering 20% of all calories consumed throughout the world today. As populations continue to grow, dependence on wheat will also grow, so we need to produce more wheat with greater nutritional value.

But, as climate change causes shifts in temperature and precipitation patterns, the ability to produce more wheat will require new varieties that can handle pest and abiotic stressors, like disease and drought. That means we need to identify genes that confer resistance to these things so they can be more easily tracked in breeding programs.

But the sheer size of the wheat genome makes finding the specific genes that confer resistance to spot blotch, for example, a Herculean task. With a properly sequenced genome, though, plant breeders can be far more specific when selecting new cultivars for development.

A man in a light blue short-sleeved button-down shirt and blue jeans stands in a field of golden wheat. He is smiling and has his hands in his pockets. The background shows a vast field of wheat under a clear sky.

“WGRF funding is absolutely critical to the success of this project. Among the research community internationally, there is more realization that there has to be translation to farmers’ fields. When [this project] was being considered for funding, one of the key considerations was producer buy-in.”

~ Curtis Pozniak,
Crop Development Centre

Access to global wheat research

That is the goal of the Canadian Triticum Advancement through Genomics (CTAG) project, which began in 2011 with WGRF as one of many funding partners. “The concept was to bring together the key wheat research institutions in Western Canada so that they’re more interconnected and information is more easily shared,” says Curtis Pozniak, CTAG project co-leader, plant breeder and associate professor at the University of Saskatchewan, Crop Development Centre (CDC).

Through CTAG, Canada is one of 20 countries that make up the International Wheat Genome Sequencing Consortium (IWGSC). Pozniak says this international component is key to CTAG’s overall success. “Being able to contribute to the IWGSC, our research team benefits by accessing the knowledge generated by all other members of the international effort.”

Part of CTAG’s initial charge was to sequence the 1A chromosome of wheat – work the team completed in 2015. “It’s very exciting,” says Pozniak. “There are a lot of useful genes residing on chromosome 1A, such as genes for gluten strength and disease resistance.”

Powerful wheat breeding tool

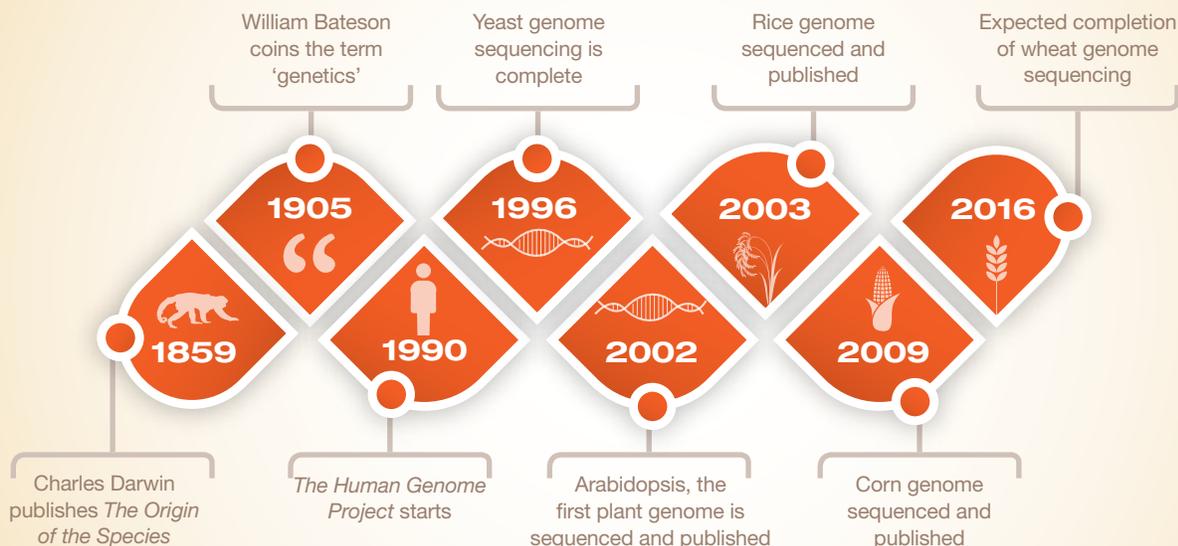
One of the tasks of CTAG2, the next phase, is sequencing the 2B chromosome. The good news is that a genome doesn’t have to be entirely sequenced to be useful. Already through CTAG and the IWGSC network, the CDC has made use of genes found on other chromosomes being tackled by researchers in other countries.

“We’re developing markers for the wheat stem saw fly and leaf rust resistance,” says Pozniak. It’s hard to emphasize the significance of this. With genetic markers, plant breeders can see much more quickly which cultivars carry the desired trait and which don’t. “Plant breeding is a long process so anything we can do to increase the efficiency of that process is good.”

“And genome sequencing is an unprecedented tool,” he says. “With it, we can see how the wheat blueprint is organized and, in combination with other technologies, like double haploidy, it can lead to more efficient selection strategies. So on its own, genome sequencing is very valuable, but when you put it in the breeding toolbox, it becomes very powerful.”



History of genomics



Prairie Pest Monitoring Network

Consortium gives farmers timely info to manage bugs

The Prairie Pest Monitoring Network, or PPMN, will turn 20 in 2016. That's a pretty significant milestone for an organization that started out simply as a means to consolidate and coordinate information about bugs.

Owen Olfert, a research scientist with Agriculture and Agri-Food Canada (AAFC) in Saskatoon and one of the founders of the PPMN explains the situation in 1996. "Entomological expertise was sort of declining and we had different groups in different areas that were sampling or monitoring insect populations, often using slightly different protocols from one another," he says.

Team committed to insect monitoring and forecasting

It wasn't easy at first. Olfert says that members of the newly formed consortium met four or five times a year to hash out insect monitoring methodologies, identify key insect pests and devise a prairie-wide system that would give farmers a better chance of identifying and managing insect-related risks.



Today, members meet just once a year to plan and prioritize. They review monitoring protocols, discuss factors that influence insect populations and densities, as

well as economic thresholds, preventative measures and control practices that can be used by growers. "It works because these are really good, really committed people," says Olfert.

Over the growing season, close to a dozen insect pests are monitored by the network and weekly updates, along with updated risk maps and in-field monitoring protocols, are posted online for growers and agronomists to use when making production decisions.

"Essentially, what we're trying to do is highlight insect-related issues for farmers, assess the risks associated with different insect pests and indicate the timeliness of in-field insect monitoring programs," says Olfert. "With the network in place, we are able to keep up with some of the new invasive alien insect species that are showing up and we are also able to monitor and forecast populations of established pests."

New blog gives farmers quicker access to info

He says the program expands a little bit every year. In 2015, for instance, a new PPMN blog was added to give producers quicker access to pest information, and a fully updated field guide, *Field Crop and Forage Pests and their Natural Enemies in Western Canada*, was published and made available online.

From the beginning, WGRF stepped up to the plate, providing financial assistance to help the PPMN get off the ground, and continuing to fund the network ever since.

And while the PPMN has many funders, both of dollars and in-kind contributions, Olfert says that funding from WGRF is particularly important. "The current round of funding from WGRF is quite critical," he says. "It's a five-year agreement. Over the years, we've had to work in two- and three-year windows, but a five-year funding agreement provides a level of stability that's so important to us because it's more and more difficult to get funding when pest populations are low. And if you're not monitoring them when they're low, how are you going to know when they're on the rise?"





“Essentially, what we’re trying to do is highlight insect-related issues for farmers, assess the risks associated with different insect pests and indicate the timeliness of in-field insect monitoring programs.”

~ Owen Olfert,
Agriculture and Agri-Food Canada

PPMN collaborators

Provincial entomologists – S. Hartley (SK), S. Meers (AB), J. Gavloski (MB)

AAFC – O. Olfert (SK), J. Otani (AB), R. Weiss (SK), N. Melnychuk (SK),
H. Carcamo (AB), K. Floate (AB), E. Svensen (SK)

Environment Canada – S. Trudel

Producers – Alberta, Saskatchewan, Manitoba, B.C. Peace

Industry agronomists – Canola Council

Expanding chickpea potential

The domestic benefits of international collaboration



If you've ever grown chickpeas, you know they can be difficult. They're terrible field competitors – highly susceptible to stressors, like disease and weather.

Breeders would love to develop better chickpea varieties, but their hands are tied by the plant's own genetic limitations. "Chickpeas have a very narrow genetic background, they are all related to each other," says Bunyamin Tar'an, associate professor at the University of Saskatchewan and a specialist in chickpea breeding and genetics.

There are useful traits in wild species of chickpea, but getting them into a breeding program is harder than it looks, says Tar'an. He explains that significant phenological differences (growth characteristics) between wild and cultivated chickpea varieties are a big stumbling block. "One of the difficulties with the wild ancestor, for example, is they require a long growing season, also short day length. Those are challenges here in Canada," he says.

It means that crossing techniques typically used in breeding programs are extremely inefficient and expensive when it

comes to chickpeas, and the main reason why few breeders have turned to wild species as a genetic resource.

Unlocking the promise of wild chickpea genetics

But the US Agency for International Development (USAID) is trying to change all that. It established a project where chickpea breeders, like Tar'an, in major chickpea-growing regions around the world can share resources and collaborate to unlock the promise of wild chickpea genetics.

The project is coordinated through the University of California (Davis) where researchers there are gathering wild chickpea species from its facility in Turkey, then systematically analyzing and cataloguing genetic material. This material is then made available to Tar'an in Canada, as well as researchers in Australia, Turkey, India and Ethiopia, who are using the wild germplasm in their own breeding programs.

All countries participating in this international effort had to come up with their own funding. For Tar'an, that money came from WGRF, the Saskatchewan Pulse Growers and the Agricultural Development Fund.

"We expect to have a collection of germplasm resource for future breeding purposes, and that will be a gem!"

~ Bunyamin Tar'an, University of Saskatchewan

He's aware that chickpea growers have high hopes for the work they are funding. "This is a bread and butter crop for them because returns can be substantial," he says. His hope is that this work will expand Canada's chickpea growing area while improving stress tolerance and yields.

"We expect to have a collection of germplasm resource for future breeding purposes, and that will be a gem!" says Tar'an of the three-year project. He also wants to develop a predictive network of genotype-phenotype associations based on this work. "We will have the toolbox, so we can use this information to do things faster and more affordably in the future."



Agronomy rules

Using advanced agronomy in the quest for higher yield

Can you imagine a bag of seed with growing instructions printed on the back to help you get the best yield out of that specific cultivar? “I can see it happening,” says Sheri Strydhorst, agronomy research scientist with Alberta Agriculture and Forestry in Barrhead.

At the mid-way point in her three-year study looking at the effects of applying advanced agronomy systems to growing wheat, feed barley and peas, Strydhorst has noticed something that seems both obvious and surprising at the same time.

Different responses to the same treatment

“After analyzing the 2014 data, it’s clear that different wheat cultivars are responding differently to the same treatments,” she says. A specific example from the research shows that, under irrigation, AC Stettler didn’t respond to the combined application of urea ammonium nitrate (UAN), plant growth regulator (PGR) and dual fungicide, while AC Harvest did. And yet both are hard red spring wheats (HRSW).

“We are managing them as if they’re all the same, but they’re not,” says Strydhorst. Her research is revealing that there are nuances among families of cultivars, such as HRSW, and that advanced agronomy systems can help farmers make the most of those nuances for higher yield and a better ROI.

So, what does she mean by advanced agronomy systems? Basically, it refers to stacking multiple agronomic practices in a field to determine where the synergies lie and where the cut off points are in the quest for higher yields.

For example, there is plenty of independent research data to show that two fungicide applications in wheat can boost yield. But what if you include a PGR in that crop and give it a supplemental treatment of liquid UAN? What about

application timings? How do various practices impact each other? Does soil zone matter? How much is too much, and where is the point of diminishing returns when it comes to input cost versus increased yield?

Optimize crop potential through advanced agronomy

Strydhorst believes that farmers already have top-of-the-line technology in the form of plant genetics, crop protection products, fertilizer, even machinery. Her focus is on how growers can optimize the potential of these things through advanced agronomy.

“This is intensive management,” she says. “We are looking at the best growth staging to apply a PGR, or the best timing and growing conditions to apply UAN. You have to get the basics right and then ask what you can tweak to build yields.”

The idea is that if growers can consistently achieve 25% higher wheat and barley yields then these crops become economically competitive choices when it comes to rotation planning.

But she cautions this is not simply a checklist of things to do to get higher yield. It’s about helping farmers farm better by knowing when to push the crop and when to cut their losses.

That different cultivars within a crop type respond differently is yet another layer of information farmers can use to their advantage. “I guess we shouldn’t have been too surprised,” says Strydhorst. “Cultivars have different disease packages or resistance levels to abiotic stress, so why would we think we could treat them all the same?”

Research is revealing that there are nuances among families of cultivars, such as HRSW, and that advanced agronomy systems can help farmers make the most of those nuances for higher yield and a better ROI.

Getting better at late-season fungicide application

Three-year study on nozzle performance aims to increase ROI for farmers



“Almost the entire probability of application success depends on the nozzle.”

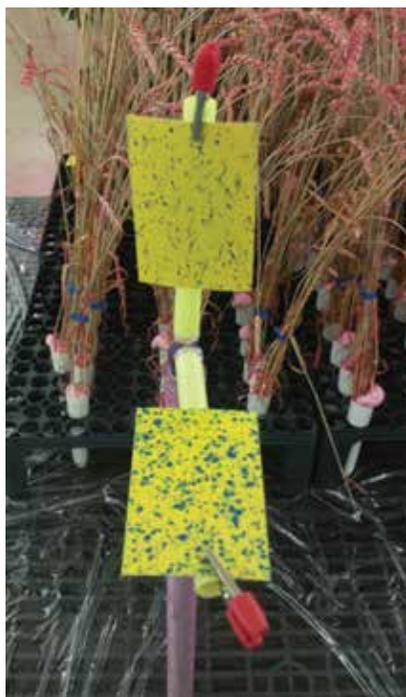
~ Tom Wolf,
Agrimetrix Research
and Training

In an effort to protect crop quality, more and more producers are opting to make a fungicide application later in the season. On paper, it's a good idea. In practice, there are challenges and, with WGRF funding, Tom Wolf aims to solve them.

A specialist in spray technology, Wolf says there are two main issues when it comes to achieving a successful spray application in a more mature crop: spray penetration and spray coverage. "The canopy can be up to four or five feet high, and disease can occur anywhere within it," says Wolf, co-owner of Agrimetrix Research and Training in Saskatoon.

And it's not about the sprayer, either. "Almost the entire probability of application success depends on the nozzle," he says. So, Wolf and his colleagues designed a three-year study to find out how to get the best nozzle performance and, by extension, a better return on fungicide investment.

Factors affecting spray penetration and coverage



Water sensitive paper used to visualize spray deposits during deposition trials demonstrates how various nozzle types and application practices impact performance.

The first order of business was to test various nozzle types and application practices in controlled lab conditions to see how adjusting various factors might affect canopy penetration and spray deposition.

"We designed the experiment to isolate particular application factors, like travel speeds, water volumes and spray pressures, nozzle type and configurations, such as leading and trailing fan positions," says Wolf.

Experiments were conducted in a track room capable of carrying a multi-nozzle boom at speeds up to 16 km/h. Broadleaf and grass crop canopies were created, and plastic drinking

straws placed vertically and horizontally into the top, middle and bottom third of each canopy to act as spray deposition targets. Straw targets were placed outside the canopies as a check.

The early results revealed some surprises. "A big belief is that spray pressure forces droplets further into the canopy," says Wolf. But the study showed high spray pressure creates droplets so fine that they have difficulty pushing through the air pressure they encounter when they leave the nozzle.

Watch speed and spray angle

Wolf also found that canopy penetration and spray deposition was not improved when nozzles were 25 cm apart compared to 50 cm apart, and that slow isn't always better. "With fusarium head blight, we found that a faster speed with the right spray angle was more effective."

Other intuitive theories were confirmed: higher water volumes tend to increase penetration into broadleaf canopies, but don't make a big difference in cereals, and backward-angled sprays are better at getting into the mid-canopy of cereal crops than forward-angled ones.

"With fusarium head blight, we found that a faster speed with the right spray angle was more effective."

~ Tom Wolf,
Agrimetrix Research and Training

The lab experiments also showed that the benefit of forward-angled sprays is pretty specific to vertical targets at the top of a cereal canopy, and that the twin-fan nozzles that produce this kind of spray work best at low boom heights.

Wolf says that even though the study is examining a multitude of application factors, the work is about more than creating a checklist of dos and don'ts. He believes it's more useful if farmers understand the principles of good canopy penetration and spray deposition, and then apply that knowledge to their specific equipment and spray practice.

"The demands on a farmer's resources are huge," he says. "I would like to keep it as simple as I reasonably can – we're going to evaluate 10 to 20 variables, but we may recommend only two or three that really count."





Midge Tolerant Wheat celebrates milestone

Producers continue to benefit from technology that keeps midge at bay

Last year marked the fifth anniversary of producers in Western Canada growing Midge Tolerant Wheat. The varieties help defend against orange wheat blossom midge, which can significantly reduce crop yield and grade.

Since their commercial launch in 2010, the industry has witnessed strong uptake of midge tolerant varieties, which were first developed by wheat breeders at Agriculture and Agri-Food Canada (AAFC) and the Crop Development Centre (CDC) with the support of funding from producers through the WGRF check-off program.

According to the Canadian Grain Commission, 18% of total western wheat acres in 2014 were midge tolerant – that’s up from 16% in 2013. In Saskatchewan, Midge Tolerant Wheat accounts for more than 36% of the province’s total wheat acres. In Alberta, producers in the

Peace River area were caught off-guard with a midge infestation in 2013. Midge tolerant varieties were shipped into the region and producers took advantage of the technology in anticipation of more midge pressure.

“Wheat producers really value this technology and are committed to maintaining its viability,” says Mike Espeseth, communications manager for WGRF and co-chair of the Midge Tolerant Wheat Stewardship Team.

“The proof is in the numbers. Nearly four million acres of Midge Tolerant Wheat were planted in 2013 and 2014 alone,” he says. “The adoption is a testament to the quality of the varieties and the benefit and convenience that they provide producers.”



Flexibility and convenience

Midge Tolerant Wheat varieties offer flexibility in crop rotations and seeding dates. Most importantly, they eliminate the need to use insecticide as a control method. Instead, midge damage is dramatically reduced with help of *Sm1*, a midge tolerant gene that is moved into wheat varieties using traditional plant breeding techniques.

“Growers told us they didn’t have to worry about their wheat,” says Ed Mazurkewich, business development consultant for AgCall, whose team interviewed producers in 2014.

“They didn’t have to scout and they didn’t have to spray. Not spraying an insecticide was pretty critical to them,” he says.



Midge Tolerant Wheat is sold as a varietal blend; 90% is made up of a midge tolerant variety and the remaining 10% is a midge susceptible variety. But that doesn’t mean producers sacrifice any agronomic benefits. Those who grow Midge Tolerant Wheat report significant yield and grade benefits – approximately \$36 per acre (based on wheat priced at \$6 bu/ac).

The varietal blends provide an “interspersed refuge system” that disrupts the midge’s ability to produce resistant offspring, preventing a build-up of the resistant midge population. Without an interspersed refuge system, midge tolerance could break down within 10 years.

There are currently 11 varieties of Midge Tolerant Wheat available in Western Canada. Durum producers will have a chance to take advantage of midge tolerant technology for the first time during the 2016 seeding season. The first midge tolerant durum wheat variety was available for sale last fall; it features the same *Sm1* gene as the other varieties. Hence, the same stewardship principles will apply.

Stewardship efforts pay off

“At the same time that we celebrate this five-year milestone, we need to keep vigilant to ensure the technology is protected for future growing seasons. To date, there is no other known source of midge tolerance. In other words, there is no Plan B if we lose the *Sm1* gene,” says Brenda Trask, communications manager for SeCan and co-chair of the Midge Tolerant Wheat Stewardship Team. The industry coalition, which includes plant breeders, government, seed growers, seed distributors and producer groups has been active educating western Canadian wheat producers on the importance of proper stewardship of the technology since before the launch of the technology.

WGRF contributes \$100,000 annually to continue wheat midge communications. Through a three-way agreement that includes producers, developers and distributors, each partner contributes financially towards protecting and communicating the importance of stewardship.

To preserve midge tolerance, producers who buy Midge Tolerant Wheat sign a Stewardship Agreement that limits the use of farm-saved seed to one generation past Certified seed, keeping the refuge at the desired level.

“Five years of diligent stewardship communications has led to a strong awareness of the practices that are critical to preserving the technology,” says Trask. “In addition to producer education, monitoring and enforcement are a key part of our committee’s mandate.”

It appears the efforts are paying off. Results of an annual audit show 96% of producers in compliance with the stewardship practices in 2014.

“By far the majority of growers said that the technology and the stewardship was really critical for them. They understand it and they are doing everything they can to protect the technology,” says Mazurkewich.

With this outlook, it looks promising that the industry will celebrate more midge tolerance milestones in the future.



“About five years ago wheat midge was a significant problem, especially with wet years making spraying a bigger issue. Due mainly to WGRF-funded variety development I seldom even think about that problem anymore.”

Doyle Wiebe
Board member, WGRF
Farmer, Langham, SK

Securing the future of agronomic research

WGRF reports highlight current capacity and strategies for the future

Agricultural researchers are the lifeblood of our industry. They do the work that provides farmers with crop varieties that grow better, yield better, grade better, and resist pests better. They also find ways to conserve soil and water, deal with climate change, and better use inputs and equipment – the list is endless.

Securing the future of our agronomic research capacity was the impetus behind *Fertile Ground: Agronomic Research Capacity in Western Canada*, an exhaustive report commissioned by WGRF that reveals the current state of research capacity in the region, and projected capacity to 2020.

Identifying and addressing research gaps

“Commissions came to us and said ‘we want WGRF to fund more agronomic research’,” says Pat Flaten, research program manager with WGRF. “People felt that research capacity was declining, but before we could increase funding, we thought we should first get a clear fix on what capacity there was in the public research system. Essentially, we wanted to know if and where the holes were so that we could make the best use of our funding.”

“Essentially, we wanted to know if and where the holes were so that we could make the best use of our funding.”

~ Pat Flaten, WGRF

The report, which was released in late 2014, surveyed public research organizations, including federal and provincial ag departments, as well as farmer-directed applied research associations, colleges and private research companies.

The results did indeed reveal that research capacity was on the decline due to loss of expertise through impending retirements, a shortage of post-graduate students lining

up to fill research spots, a lack of adequate equipment, land and buildings dedicated to research, and a lack of adequate staff and funding.

Since the *Fertile Ground* report came out, WGRF has wasted no time putting plans and strategies in place to address the deficits.

“In April 2015, we put 110 people in one room, representing producer organizations, institutions, funders, scientists and agronomists, and we talked about how crop production would change in the future and what impact that would have for agronomic research,” says Flaten. “There was lots of energy and passion in that room.” The result was *Shaping the Future*, a report that identifies specific ways to address research capacity needs.



Building a sustainable future in agronomy research

Next, we developed a process where we will look at those needs in two phases,” she says. Phase 1 will focus on Agriculture and Agri-Food Canada and the universities of Alberta, Saskatchewan and Manitoba as the primary providers of peer-reviewed agronomic research. Phase 2 will focus on infrastructure and equipment needs, as well as other research providers.





“We felt we needed to focus our attention on the most immediate need and that Phase 2 needs would naturally flow out of the Phase 1 emphasis,” says Flaten.

“We have also put together a Technical Working Group to develop a vision of the future agronomic research capacity we’ll need,” she says. “A draft strategy will be shared with boards, groups and the public during the winter of 2015-16.”

“By the spring of 2016, we plan to have a final strategy in place with the purpose of influencing agronomic research capacity over the next two years,” says Flaten.

It might sound like a lot of talk and report writing, but as the *Fertile Ground* report indicates, the challenge of rebuilding and maintaining agronomic research capacity is enormous and complex.

By breaking it down into manageable bites, and by being clear about what everyone in the industry actually needs and how to get there, Flaten believes WGRF is on the right path to building a sustainable future in agronomic research.

Both reports, *Fertile Ground* and *Shaping the Future*, are available on the WGRF website.



Download a copy of
Fertile Ground and
Shaping the Future at
westerngrains.com



The long reach of weed surveys

Findings fuel sustainable weed management strategies



“Our survey protocols have been adopted all over the world and people really see the importance and utility of this work.”

~ Hugh Beckie,
Agriculture and Agri-Food Canada

It's hard to believe there was a time when weed surveys were dismissed as weak science, but there was.

"Back in the '70s they were not really viewed as useful science," says Hugh Beckie, research scientist with Agriculture and Agri-Food Canada (AAFC) in Saskatoon. "But now, our survey protocols have been adopted all over the world and people really see the importance and utility of this work."

Beckie is well known in the western Canadian agricultural community as a weed specialist, particularly for his work with herbicide-resistant weeds. He has participated in the western Canadian weed surveys since the 1990s, working with Gord Thomas, a former AAFC research scientist and an early champion of surveys as a valuable research tool.

"Weed surveys are a key component of the whole area of weed management," says Beckie. "You really need a scientific survey over a wide area, including different crops under different crop management systems, to get a full picture of weed populations and distribution," he says. "Having that knowledge directly impacts what weed scientists can do down the line in terms of research and the development of sustainable weed management strategies."

Finding solutions for farmers

In other words, it's difficult to form useful solutions until we understand what's happening with weed populations, how they are changing, where and how they're spreading, where resistance may be developing and so on. Beckie says that the data from weed surveys often form the basis of many weed management research projects, helping scientists to identify and set priorities and work toward answers that farmers actually need.

Beckie and his colleagues conduct weed surveys on a rotating basis in Alberta, Saskatchewan and Manitoba. "Along with the weed survey comes a management questionnaire, which gives us a good idea of which integrated weed management practices are having an impact," he says.

Surveys don't need to be done every year, but they do need to be done regularly to spot the trends over time. "It's more difficult every year to conduct a survey," says Beckie, citing limited resources as one major stumbling block.

In 2014, WGRF stepped forward to help fund the Saskatchewan weed survey, which hadn't been done for 10 years, says Beckie. "To have the importance of this work recognized through funding agencies like WGRF is really gratifying," he says.



Surveys impact agronomic practices

"It's been 50 years since the surveys began, and that's a real gold mine of data that we can use to feed into sustainable practices," he says. Indeed, since he and his predecessors have been conducting surveys, he's seen western producers switch to conservation tillage, adopt more diverse cropping systems and even bump up cereal seeding rates – advice that directly or indirectly came out of survey results.

"It gives us a sense of pride that WGRF recognizes the importance of our work," says Beckie. "It validates our thinking about the importance of surveys and that we can help growers directly with the results."



"WGRF serves as a direct link between farmers and researchers to help communicate the advancements producers want to see in their fields."

Don Dewar
Board member, WGRF
Farmer, Dauphin, MB



Bright future for farmer-funded research

WGRF expands research scope and capacity

For the entire 35-year history of WGRF, three things have kept it strong. First, a single-minded focus on funding crop research to benefit western Canadian farmers; second, the capacity for many diverse farm organizations to come together in order to work for a common good; and third, the ability to build strong collaborative relationships.

So when he thinks about the next 35 years for WGRF, executive director Garth Patterson says he's very optimistic about the future of the organization because its foundations are strong.

"We have experienced a lot of growth lately – three-fold in the last five years," he says, adding that the organization invested \$19 million into breeding and field crop research in 2015. And this is expected to continue as WGRF seeks to expand its research scope and capacity through other regional and national programs.



Garth Patterson
Executive director, WGRF

WGRF investment Breeding and field crop research



Better breeding tools and germplasm

He points to the National Wheat Improvement Program (NWIP) as one great example. Announced in late 2013, NWIP includes research institutions and universities across Canada in a quest to develop new, market-competitive wheat varieties for Canadian producers.

While it's a national program, says Patterson, it is organized to respond to regional needs. "The NWIP addresses wheat growers across the country, and everyone will benefit through the development of better breeding tools and germplasm," he says.

Other collaborations with partners such as Genome Canada enable WGRF to support world-class science and leverage funds from multiple sources. The Systems Approach to Crop Sustainability (SACS) and, not to mention WGRF's



collaborative efforts to improve agronomy research capacity in Western Canada, indicate how the organization is looking at the big picture of agricultural research, while not losing sight of the regional needs of farmers.

That, says Patterson, is the future of WGRF in a nutshell. “WGRF now has over 150 million dollars in assets,” he says. “It gives us some staying power in terms of stable, long-term, multi-crop research to benefit western producers.”

“Our sole purpose is to invest in field crop research that will benefit western Canadian farmers – it’s all we do.”

~ Garth Patterson, WGRF

And producers are at the core. “We are 100% farmer directed,” he says. “Our expert technical committees provide feedback and direction to the board, so we know technically what makes sense for growers. Our sole purpose is to invest in field crop research that will benefit western Canadian farmers – it’s all we do.”

Collaboration at the core

The ability to reach out to and work with other research funders and grower groups is another key part of WGRF’s future. “Collaboration is core,” says Patterson. “It leverages funding, it helps us understand what’s important to other groups and it helps us be very efficient with our own funding.”

“Farmers can look forward to stable funding out of the Endowment Fund. We can be at the table now to fund longer-term, higher-risk research that could have enormous benefits for them.”

~ Garth Patterson, WGRF

Patterson is clearly proud of what WGRF has grown into since its humble beginnings. That it has, despite being comprised of many groups with sometimes competing interests, managed to thrive and become the largest producer-directed funder of crop research in Canada.

As he looks forward to the next 35 years, he sees even more collaboration and co-funding with other organizations. “WGRF has become a forum for farmers to fund research of common interest,” he says.

“Farmers can look forward to stable funding out of the Endowment Fund,” he says. “We can be at the table now to fund longer-term, higher-risk research that could have enormous benefits for them.”

WGRF will continue to evolve, adapt and grow, says Patterson, and farmers themselves will continue to direct that growth. “I’m very optimistic about opportunities for WGRF,” he says. “We have a lot of strengths to build upon.”



“I’m really excited about what the future holds, especially with the large investments that we’re making now. I expect Canadian grain farmers to be well positioned to prosper in a competitive global marketplace – in large part with thanks to the efforts of the WGRF.”

Kevin Auch
Board member, WGRF
Farmer, Carmangay, AB





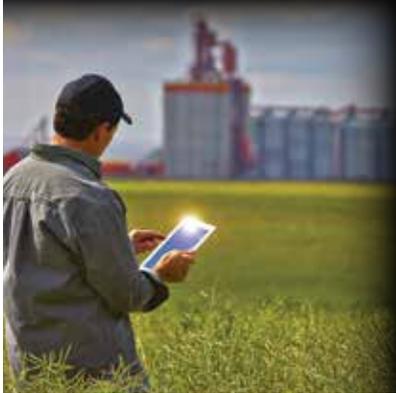
Getting innovation to farmers faster with more efficient plant breeding



Nozzle performance boosts return on fungicide investment



Weed surveys help scientists find solutions for farmers



Expanding Canada's crop diversity



Advanced agronomy systems increase ROI



100%
farmer-directed board

