Western Grains Research Foundation

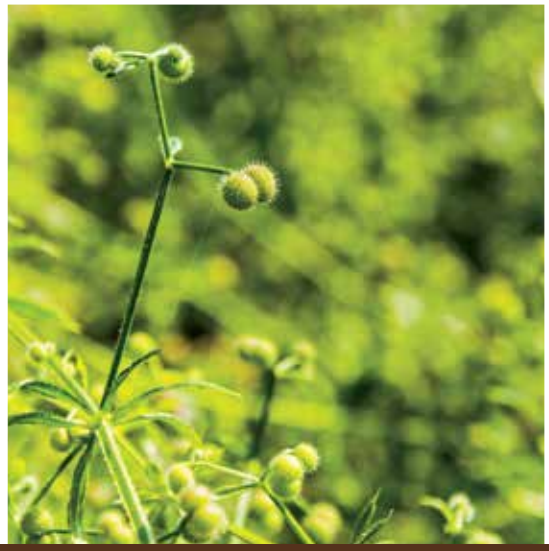
RESEARCH REVIEW

What's inside

$31.7 million
wheat and barley research

2016 2017 2018 2019 2020

$130 million+
invested in research since 1981



Message from the chair

Thanks for your commitment to funding research

As we embark on a new year, we reflect on an amazing 2016. It was a busy and exciting time for the Western Grains Research Foundation (WGRF) – we celebrated our 35th anniversary and surpassed a total investment of $130 million into agricultural research.

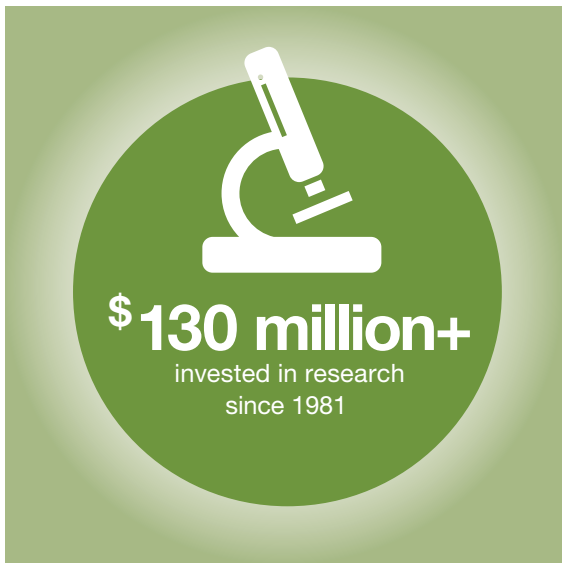
These milestones are significant accomplishments for an independent, charitable foundation. Do you know the secret to our success? Farmers like you. WGRF is producer-funded and producer-led. Our tremendous achievements are not possible without the commitment of producers across Western Canada who believe that funding research will lead to improving the way we farm.

We are proud of what makes our organization unique – our focus on funding research, our western Canadian membership base, and our multi-crop funding scope. WGRF is recognized as a significant funder of crop research throughout the industry – from researchers and governments to producer organizations and funding partners. We are also valued for our expertise and project management capacity.

This publication is a way for WGRF to highlight how we have invested your research dollars to advance western Canadian agriculture. As you read about these initiatives, pat yourself on the back and take pride that your contribution has helped make each advancement possible.

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
Western Winter Cereal Producers
Agriculture and Agri-Food Canada (Class B)

Contents

Wanted: scientists for agronomic research

Initiative tackles gaps in research capacity

"What research do we need in the future?" That's a question that Pat Flaten, research program manager with WGRF, is working hard to answer in order to support progress for western Canadian farmers.

Her efforts address the findings of a WGRF-commissioned report (*Fertile Ground: Agronomic Research Capacity in Western Canada)* that revealed two major gaps in the industry's current public research system – people and facilities.

Approach supports ag progress

Flaten is working alongside a Technical Working Group of representatives from across the industry in an approach to determine essential agronomy research needs and the scientists needed to make it happen. They are well underway with the first phase, which is focused on tackling the 'people' challenge. Namely, too many vacant and soon-to-be-vacant (through retirement) research positions, and not enough support for technical research staff.

"Over the last winter, we talked to our membership a lot as to where the needs are and what additional positions would be beneficial to the entire system," says Flaten.

It was determined the place to start was with the Universities of Alberta, Saskatchewan and Manitoba, and Agriculture and Agri-Food Canada (AAFC). "We decided to focus on the three post-secondary institutions and AAFC because that's where many of the gaps were and where significant agronomic foundational work is done," she explains.

Facilitating ag research positions

Flaten is clear – WGRF is not proposing to backfill research positions for any of these institutions, rather, enhance what exists. The idea is to help with some funds where appropriate, but also facilitate and encourage agronomic research positions. "We're at the stage now with the three universities where we're talking about what would be appropriate and where our shared responsibilities are. We are not proposing to go it alone; rather, we want to help these institutions develop the tools to build and support research capacity where we share an interest."

She is greatly encouraged that AAFC has begun to fill vacant positions already, some in desperately needed areas of research. "They've hired three entomologists recently, two in Saskatoon and one in Lethbridge," says Flaten. "And they intend to fill several others. But the best part is that a lot of these new scientists are already submitting research proposals." It bodes well for the future of agronomy.

And while she's encouraged by these developments, Flaten says WGRF recognizes it's just a start – small steps on a journey.

"We understand that these things do take time, there are lots of steps ahead of us, lots of work to do to find common ground to move forward," says Flaten. "I think our role is to continue to encourage stability and growth. Part of that will be developing capacity and part of it is supporting and identifying research that needs to be done."

Return on innovation

Cost-benefit study shows Midge Tolerant Wheat investment paying off

Midge Tolerant Wheat growers know the technology that protects their crop yield and grade from the pesky orange blossom midge offers a great return on investment, but a new study puts an actual number to it.

The net benefits of the Midge Tolerant Wheat innovation are approximately $455.8 million according to Ference and Company consultants. Agriculture and Agri-Food Canada's (AAFC) Innovation Programs Directorate (IPD) hired the Vancouver-based program evaluation and research consulting firm to measure the return on investment of the technology. The study puts the development cost of the innovation at $16.3 million, which includes ongoing investment over the next three years.

Plant breeders began developing Midge Tolerant Wheat in 1996, the first varieties were planted commercially in 2010 and work is ongoing today. AAFC is the largest funder of this research, committing $10 million. Other contributors include Western Grains Research Foundation (WGRF), SeCan, Alberta Crop Industry Development Fund (ACIDF), and the Saskatchewan Agriculture Development Fund (ADF). WGRF also contributes $100,000 annually to stewardship communication initiatives that help raise awareness to preserve and protect the innovation.

Since its launch, western Canadian farmers have embraced the technology and industry has responded with the development of several more varieties to meet the various agronomic needs. To date, there are nearly 20 Midge Tolerant Wheat varieties to choose from and growers have seeded about 2 million acres annually since 2013, which equates to about 17% of the total wheat acreage in Western Canada.

Technology offers annual savings of at least $40 million

In order to calculate the cost-benefit analysis, Ference consulted with stakeholders and examined research reports, including two studies led by AAFC. Research scientist Ian Wise, now retired, conducted a detailed investigation of midge damage at the Cereal Research Centre at the University of Manitoba. Results showed that the financial losses incurred due to midge averaged $62.1 million annually between 2004 and 2010. In a separate study, Michael Jackman, a commercialization officer with AAFC, estimated the annual economic losses caused by midge totaled approximately $40 million. (It's important to note that both studies take into account all western wheat acres – not just those with midge infestations.)

$456 million
= net benefits of Midge Tolerant Wheat

Taking a closer look at fields directly affected by midge, the numbers look somewhat different. Industry representatives suggest that growers who seed Midge Tolerant Wheat receive a net savings of $20 to $70 per acre. For the purposes of the cost-benefit analysis, Ference used a conservative assumption of $20 per acre. The analysis also assumes that midge tolerant wheat acres will remain at the current level of 2 million acres over the next 15 years. Based on these numbers, the annual savings resulting from Midge Tolerant Wheat is $40 million per year.

Ference notes that the net benefits (1997 net present value) of approximately $455.8 million, result in a benefit cost-ratio of about 37:1. When this cost-benefit analysis is factored in with the other advantages the technology provides, such as eliminating the need for spraying, Midge Tolerant Wheat is truly an innovation that pays.

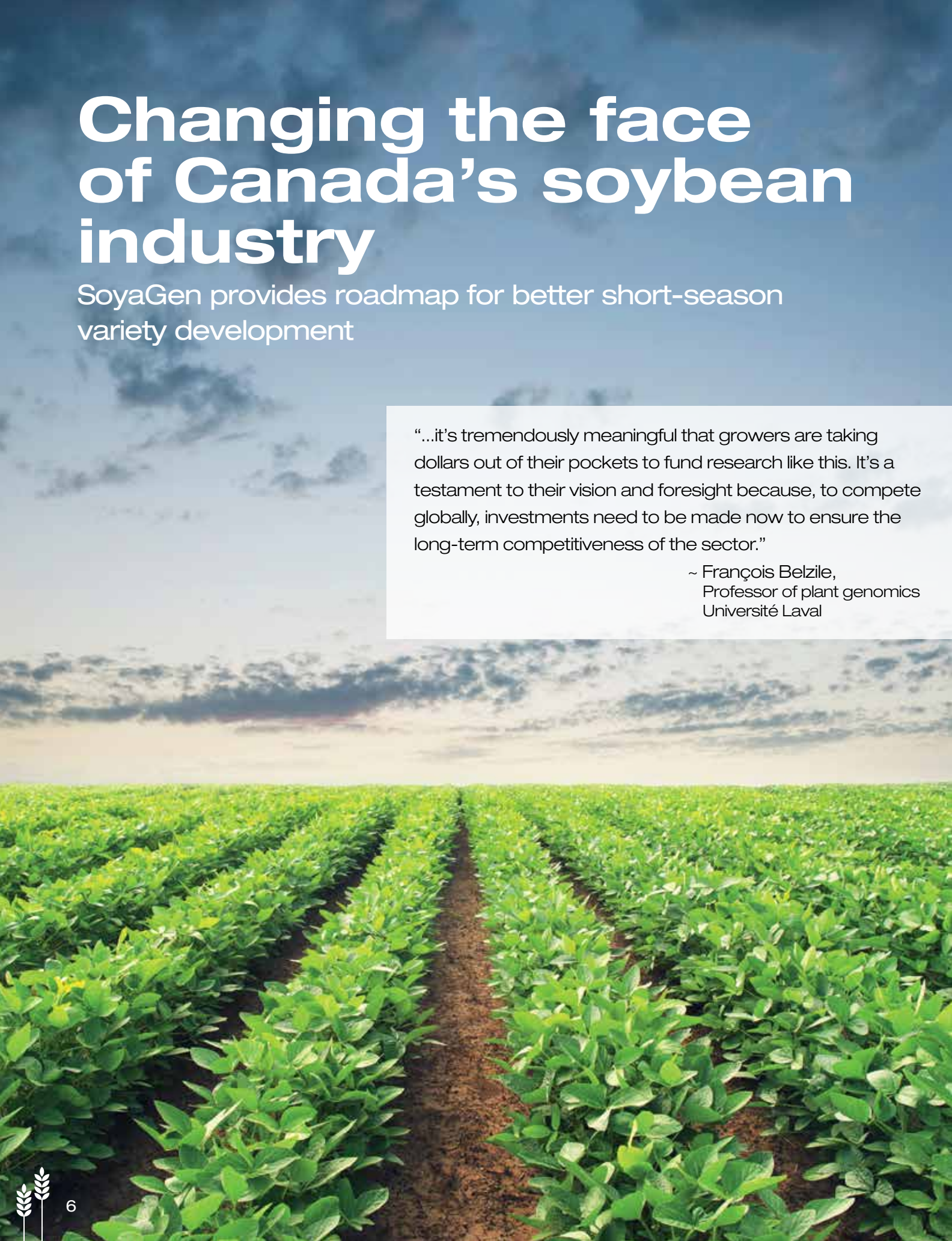
To read the complete report by Ference & Company Consulting Ltd., visit: http://www.agr.gc.ca/resources/prod/CMS/Internet/CCB-DGCC/1469446881725_2_succes_innovation-eng.pdf

Changing the face of Canada's soybean industry

SoyaGen provides roadmap for better short-season variety development

"...it's tremendously meaningful that growers are taking dollars out of their pockets to fund research like this. It's a testament to their vision and foresight because, to compete globally, investments need to be made now to ensure the long-term competitiveness of the sector."

~ François Belzile,
Professor of plant genomics
Université Laval



François Belzile imagines a lot more soybean acres in Canada, particularly in Western Canada.

"The agricultural land in the West is so huge," says Belzile, professor of plant genomics at Université Laval in Québec City. "Even if only a fraction of the land within the main grain growing areas could grow soy, it would be a huge expansion for the crop."

It's not as far-fetched as it sounds. Belzile and his colleague, Richard Bélanger, are leading a project called SoyaGen, which aims to decipher the entire genetic code of short-season soybeans. Their goal is to identify genetic markers that influence maturity, disease resistance and yield in order to provide plant breeders with a better road map so they can develop new, improved varieties quicker.

SoyaGen is part of the $5 million investment that WGRF has made to three applied genomics projects under the Genome Canada umbrella (the other two focus on lentil and wheat). It's crucial, long-term, large-scale applied research that will drive Canada's agricultural sector forward and help it stay competitive.

Developing soybeans for shorter growing seasons

Belzile says SoyaGen has three main areas of focus. First: identify the genes that control crop maturity so that soybeans can be produced in the shorter growing seasons of the West. And it's not just about finding the genes and markers, he says. "We want to know how the different genes that control maturity act as you move westward, so we can tell the breeders what will work best when they develop new varieties."

The second focus is on disease resistance, specifically phytophthora root rot, soybean cyst nematode and sclerotinia stem rot – three diseases that have increased in importance as soybean acres have expanded. "I think this is where farmers will see the first benefits of the research," says Belzile. "We're lucky in soy because we do have the resistance genes, but we don't know which one to deploy in the field."

It comes down to the incredible diversity of fungal pathogens, where one disease can express itself through many races or strains, so knowing which gene confers resistance to, say phytophthora, isn't enough. You have to know which strain of the disease you're dealing with in a region, then breeders can develop varieties carrying resistance genes that are effective against that strain.

"We're sequencing the complete genome of these fungal strains so we know this gene is unique to this strain," says Belzile. This information will be critical for breeders developing resistant varieties, but it's also going to be critical for growers choosing seed. "About one year from now, we're hoping to have a diagnostic kit, where farmers can send in a soil sample and know what race of the disease they're dealing with," he says. "Then they will know what they need to look for when they buy seed."

Ensuring successful adoption and returns for western farmers

The third focus is something you might not expect from an applied genomics project: grower adaptation. "Soybean has to make economic and agronomic sense for growers," says Belzile.

Effective crop diversification to high-value crops is one thing. Who wouldn't want a profitable crop that adds N to the soil, fits perfectly into a grain-canola rotation, grows well and has ready markets? It sounds great, but if you don't know how to grow it, where those markets are, and if you need specialized equipment, or whether the grain delivery and transportation system can handle it, then what?

"If we're going to add something else to the rotation that isn't processed here, it all has to be considered," says Belzile. From infrastructure to policy to agronomic know-how – SoyaGen is looking at what mechanisms need to be in place to ensure successful adoption and returns for western farmers.

And that's important because Canada's current soy industry generates annual revenue of $2.5 billion. It's our third most important field crop – and that's before the kind of western expansion SoyaGen is aiming for.

Belzile started this work in 2013. "Back then, we never hoped to have this much knowledge," he says. "We used to struggle to get hundreds of markers and now we can get tens of thousands of them. We are able to do things that are ahead of the curve in many ways. So to us, it's tremendously meaningful that growers are taking dollars out of their pockets to fund research like this. It's a testament to their vision and foresight because, to compete globally, investments need to be made now to ensure the long-term competitiveness of the sector."

Check-off changes ahead

Commitment to variety development continues

Right now, cereal growers across the Prairies see two check-off deductions whenever they sell wheat and barley – one going to their provincial wheat or barley organization and the other going to the Western Canadian Deduction (WCD), also known as the Western Wheat and Barley Check-off.

That's about to change.

The WCD was established in 2012 as a five-year transitional measure to ensure that check-off funds collected through the Canadian Wheat Board (CWB), to provide core funding for variety and market development, would not disappear when the single-desk selling marketing system came to an end. The idea was to allow some time for the provinces to set up their own farmer-led wheat and barley commissions, and get some processes and systems in place so that they could take over check-off collection and administration.

And it worked. For the last (nearly) five years, the WCD has ensured stable funding for the Canadian Malting Barley Technical Centre (CMBTC), the Canadian International Grains Institute (Cigi) and WGRF, each of which received a portion of the overall check-off to fund research into new varieties, new markets and improved production methods for western farmers.

Commissions assume check-off collection

In the meantime, Alberta, Manitoba and Saskatchewan have successfully established their own wheat and barley commissions and associations and, on August 1, 2017, the WCD will expire as planned, as these commissions take on the responsibility of check-off collection and administration.

So what now? The dissolution of the WCD doesn't mean that farmers will pay any more or less in check-offs. It simply means that the two check-offs they were paying will now show up as one combined deduction and the leadership on how those monies are spent will come from the provinces.

For example, barley growers in Saskatchewan are now paying $0.50/T to SaskBarley and $0.56/T to WCD. After August 1, they'll pay $1.06 to SaskBarley, which will administer the funds.

WGRF ensures smooth transition

Does this mean that it's every province for itself now? Absolutely not. All provincial commissions and associations recognize the importance and long-term benefit of a western Canadian approach to research and variety development. Indeed, a study commissioned by WGRF calculated that every producer check-off dollar invested in varietal research returned $20.40 in value for wheat and $7.56 for barley. All parties want to see that kind of ROI continue and intend to work together to see that it does.

WGRF has been working closely with these organizations over the past few years to ensure a smooth transition on August 1. WGRF will continue to work with them to ensure that core research and funding agreements remain in place under the new check-off system.

On the surface, this check-off change is not going to look much different to growers who will continue to see returns in the form of new varieties of wheat and barley and market development initiatives.

On **August 1, 2017,** the WCD check-off will transition to the following organizations:

Alberta Wheat Commission

Alberta Barley

Saskatchewan Wheat Development Commission (SaskWheat)

Saskatchewan Barley Development Commission (SaskBarley)

Manitoba Wheat and Barley Growers Association

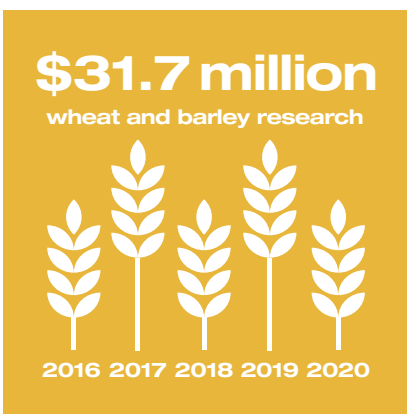
BC Peace River Grain Industry Development Council

Research projects progress

Core funding remains in place

As the Western Canadian Deduction (WCD) transitions from WGRF to provincial commissions, many may be wondering what will happen to some of the long-term research projects that began life under the old funding model.

It's a natural question given that WGRF's investment of check-off funds over the last 20 years has been rooted in the idea that region-wide, producer-based funding in public wheat and barley breeding programs is critical to grower success. Indeed, since producer investments began over twenty years ago, public research institutions have developed over 200 new wheat and barley varieties for western Canadian farmers – a return only possible through broad-based funding.



WGRF made five major funding announcements in 2016. These investments in wheat and barley research total $31.7 million and effectively draw down the remaining WCD funds to zero by the year 2020 when these agreements expire.

Perhaps more importantly for growers is that these investments ensure that the work of wheat and barley breeding programs at AAFC, the U of A, the U of S and the U of M will continue uninterrupted to the year 2020.

It also signals the cooperation growers can continue to expect as provincial grower associations and commissions take over the WCD check-off. The fact that all parties recognize the importance of long-term, stable, region-wide funding bodes well for the future of wheat and barley in Western Canada.

Uninterrupted investment

Here's a recap of the five-year investments announced in 2016.

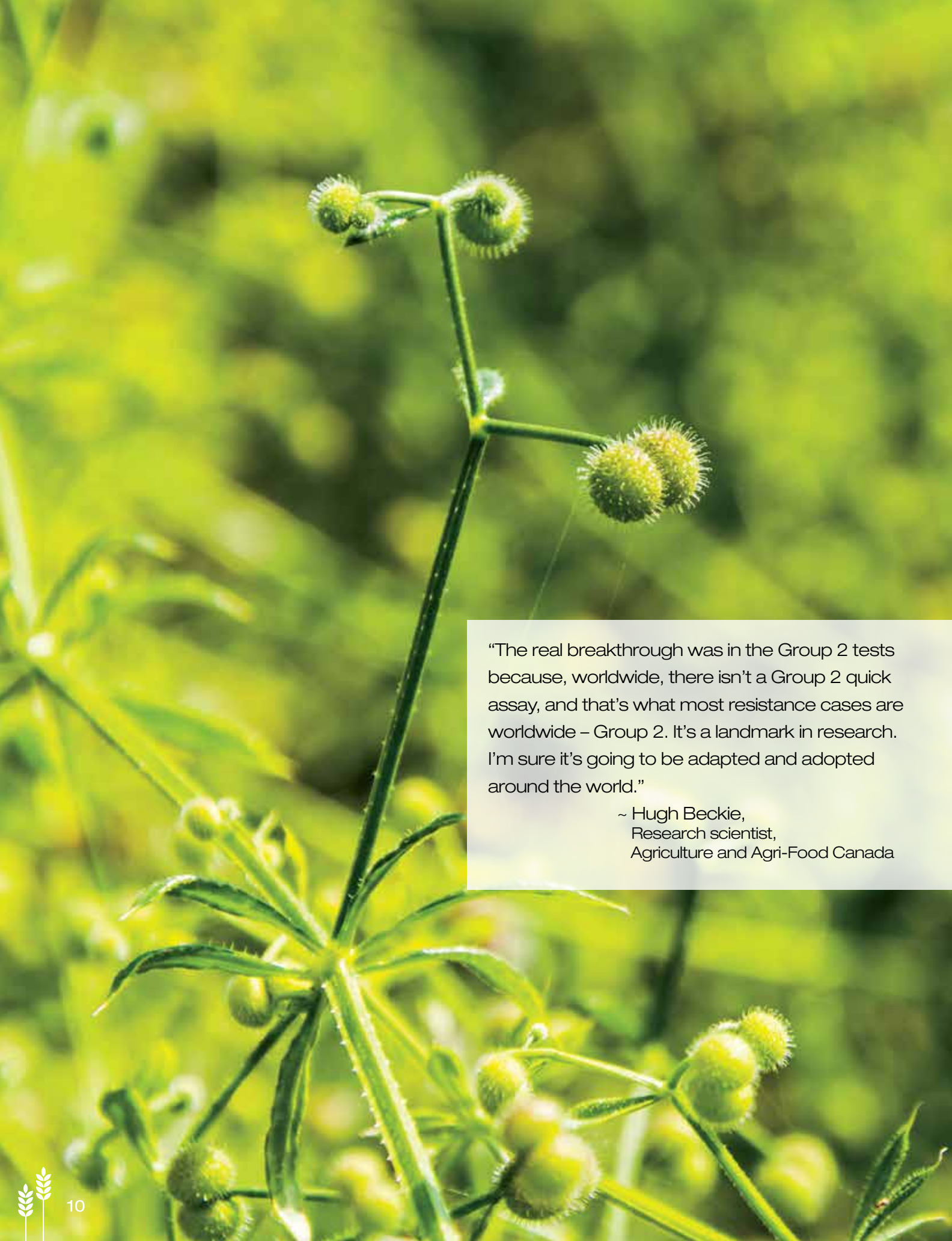
Agriculture and Agri-Food Canada (AAFC) WGRF invested $20 million into wheat breeding and $1.4 million into barley breeding programs at AAFC research centres in Alberta, Saskatchewan and Manitoba over the next five years. This is the largest-ever industry investment into research at AAFC.

University of Manitoba (U of M) An investment of $1.9 million was made to the winter wheat breeding program and FHB nursery. The breeding program is looking for improved disease resistance, yield and cold-hardiness in CWGP and CWRW, while the FHB nursery will continue the important work of screening new spring and winter wheat lines for disease tolerance.

University of Saskatchewan (U of S) WGRF invested $5.2 million in wheat breeding programs at the Crop Development Centre (CDC), extending its 20-year relationship with the facility for another five years. The renewed funding will expand the research program to include the use of molecular tools to improve breeding efficiency.

Also, in cooperation with Alberta Barley, SaskBarley and the Manitoba Wheat and Barley Growers Association, an investment of $2.4 million was made to the CDC's barley variety development programs.

University of Alberta (U of A) WGRF has contributed to the U of A's wheat breeding program since 2005. This new investment of $800,000 will help researchers develop new varieties of CWRS, CPS-R and CWGP for the Parkland zone.



"The real breakthrough was in the Group 2 tests because, worldwide, there isn't a Group 2 quick assay, and that's what most resistance cases are worldwide – Group 2. It's a landmark in research. I'm sure it's going to be adapted and adopted around the world."

~ Hugh Beckie,
Research scientist,
Agriculture and Agri-Food Canada

Faster, cheaper herbicide resistance testing

WGRF funds study with breakthrough results

If you've ever sat on pins and needles waiting for Crop Protection Lab (CPL) results, Hugh Beckie understands your pain. He explains it can take months for producers to find out if a weed sample they submitted has tested positive for herbicide resistance – that's a long time to wait before being able to make an informed management decision.

A research scientist with Agriculture and Agri-Food Canada (AAFC), Beckie says this happens because the CPL only does soil-less tests, such as Group 1 FOP and DIM – two of the three chemical families that make up the Group 1 class of herbicides. Any Group 2 or Group 1 DEN test (the third Group 1 category) had to be done at AAFC in Saskatoon.

And those tests take longer because AAFC has to grow out suspect seeds in greenhouses then spray the resulting plants to get results. Add to that the sheer volume of samples sent in for testing (over 400 in 2015) and you can see how bottlenecks can occur.

Farmers to benefit from quicker testing

As herbicide resistance spreads and becomes more complex, those bottlenecks will only get worse. So with funding from WGRF, SaskPulse and Saskatchewan's Agriculture Development Fund (ADF), Beckie, along with Jeff Schoenau and Anna Szmigielski at the University of Saskatchewan, set out to see if they could develop testing methods that would help speed things up a bit.

Taking their cue from the rapid assays the CPL uses to detect Group 1 FOP and DIM resistance in wild oats and green foxtail, Beckie, Szmigielski and Schoenau set out to find new and similarly fast test protocols for Group 1 DEN and the Group 2 classes on key grass and broadleaf weeds (wild oats, green foxtail, cleavers and wild mustard).

"Developing the DEN test was fairly straightforward because we were able to adapt it from FOP and DIM tests," says Beckie.

The Group 2 tests were a different kettle of fish. The soil-less testing methods used to successfully develop Group 1 rapid bioassays didn't work for the Group 2 classes, so the team turned to a protocol called the soil pouch assay. "It's still soil, but much less than we'd use in the greenhouse work," says Beckie. "It's quite a departure from the past in terms of resistance testing."

In a nutshell, a mere 50 grams of soil, moistened and spiked with a Group 2 active, is put in a small bag. Suspected weed seeds (in this case, cleavers and wild mustard) are planted 2 mm deep and the bags hang upright on a frame allowing the seedlings to grow as they would in a field. After a few days, the plants are taken out, the soil washed away and roots examined. Root length inhibition – whether or not the roots develop and lengthen in the spiked soil – is an accurate indicator of herbicide resistance or susceptibility.

Researchers discovered world's first Group 2 quick assay

By the end of the study, the team had successfully developed a rapid assay for Group 2 resistance in wild mustard and cleavers. "It's a mixed blessing," says Beckie. "This test is likely adaptable to other broadleaf weeds, but we didn't get it to work well on wild oats, so we'll keep working on that."

Even so, he says the Group 2 rapid assay is a game changer. "The Group 1 assay is really an extension of existing tests," he says. "The real breakthrough was in the Group 2 tests because, worldwide, there isn't a Group 2 quick assay, and that's what most resistance cases are worldwide – Group 2. It's a landmark in research. I'm sure it's going to be adapted and adopted around the world."

The new rapid assays are in use now. "There will be a more rapid turnaround time from when farmers submit a sample to when they get a result, and that's the most important benefit," says Beckie. "The cost should also come down."

Photo courtesy of Hot Shoe Studio

The big business of craft malting

Nuffield scholar gains global insights

"Farmers need to be excited about craft beer," says Matt Hamill. "It uses three to seven times more barley per beer than macro beer."

It's knowing that kind of statistic and seeing that kind of potential for Canadian barley growers, and wanting to capitalize on it, that won Hamill the first WGRF-funded Nuffield Canada scholarship.

In 2014, Hamill and his brother, Joe, founded Red Shed Malting, a specialty malt company located on the family farm near Penhold, Alberta.

Actually, it's a full family affair. Hamill Farms is a 2,100-acre, fourth generation family farm, established in 1929 by Matt's great-grandfather. Matt's father, John, grows the barley his sons turn into malt, his mother, Susie, handles bookkeeping and administration, Joe's wife, Daelyn, looks after barley and malt analysis, while Matt and Joe get creative in the malthouse steeping and kilning up small batches of local, traceable, specialty malts for Alberta's exploding craft brewing industry. Oh yes – and they all farm, too.

Potential to transform Canada's barley industry

Hamill applied for the $20,000 Nuffield Canada scholarship in May 2016, seeing it as a chance to learn more about craft malting in countries where it is more

established, then bring that knowledge back to Western Canada and help grow the industry here.

"Craft malting is in its infancy here," he says. "I thought it might appeal to Nuffield as it has the potential to transform the barley industry – to develop new barley varieties and new markets for farmers."

> **"I want to find out what's similar in our systems, what's different, the benchmarks we can use, best practices we can bring back to improve our industry."**

And it's not just the malting – Hamill is interested in looking at the entire value chain, from field to glass, in Australia, New Zealand and the US. "I will talk to farmers and craft malsters, brewers and distillers and consumers – everyone along the value chain," he says. "I want to find out what's similar in our systems, what's different, the benchmarks we can use, best practices we can bring back to improve our industry."

It all sounds pretty fun because it's beer and spirits. But make no mistake, this is seriously big business. Craft brewing and distilling in Western Canada has taken off in recent years – in Alberta alone, the number of licensed craft breweries quadrupled between 2013 and 2016, with new ones coming on line almost monthly. And the lifeblood of this industry lays in a handful of quality ingredients, specialty malted grains among them.

And yet, Canada's malt barley industry is sometimes slow to respond. "It's still really hard to get new malt varieties into the system," says Hamill, adding that it can take about 10 years for a new malting variety to make it through the Canadian Malt Technical Standards. "One of the things we're excited about is that we can make that process quicker."

Giving back to the local value chain

Already, Hamill works closely with Alberta Barley, a number local craft brewers and distillers and, closing the circle, with instructors and students at Olds College's Brewmaster and Brewery Operations Management program to work on ways the entire system can work together to create better infrastructure and opportunities for farmers.

He's also taking lessons from other farm sectors. A big part of Red Shed's pitch is that their product is local, traceable and sustainable – qualities that consumers care a lot about. "We need to deliver a consistent message back to the consumer and make them comfortable with the product we make, that it's safe," says Hamill. Because it's in its infancy, the craft malting business has an opportunity, he says, to shape and define its story to consumers.

He's exited to learn more on his travels. "I want to bring everything I learn back and put it into the value chain here," says Hamill. "I'm hugely grateful to WGRF and Nuffield for this funding, and I do plan on giving value back. They say for every dollar put into barley research we get seven dollars back. Maybe I can make that higher."

Fostering leadership capacity in Canadian agriculture

WGRF is a proud sponsor of Nuffield Canada's Agricultural Scholarships. The scholarships are awarded annually to individuals with a passion for agriculture and a desire to expand their knowledge through a multi-week program of international study. The experience results in personal and professional benefit, while adding leadership capacity to Canadian agriculture.

On the front lines of FHB resistance

Long-term research keeps ahead of disease

One simple truth about crop disease is that it constantly adapts. Whatever we (or indeed, Mother Nature) can throw at it, disease will eventually find a way to survive. It's why we sometimes see an effective fungicide slowly lose its power, or a resistant variety become susceptible over time.

It means that the "war" is never over, and staying one step ahead of disease requires a commitment to long-term, ongoing, broad-spectrum research. On the genetic front, that means constantly looking for and identifying breeding material that offers disease resistance so that new commercial varieties can produce the quality and yields farmers want.

In the case of fusarium head blight (FHB), this work is being done at the FHB screening nursery at the University of Manitoba's research farm at Carman. Here, tens of thousands of potential breeding lines are intentionally infected with the disease and only the resistant go on to further development in plant breeding labs across Western Canada.

"It's incredibly labour intensive," says Anita Brûlé-Babel of the screening process. The U of M professor established the FHB nursery in 2001 and has managed it ever since.

Coordinated nursery provides efficient disease screening

"It's much more efficient to do disease screening in a nursery like this, rather than have each breeder set up their own screening program," she says. "And it's much better to do it in an environment conducive to FHB because if you don't have a good nursery with good infection, you don't get reliable information."

The nursery serves public spring and winter wheat breeding programs across the West with three areas of focus: gathering fusarium susceptibility data for variety registration; conducting replicated trials for research purposes (this is the gene mapping work for breeders); but the main part of the nursery, Brûlé-Babel says, is dedicated to screening breeding lines for FHB.

"This is early generation material and each breeder has a quota as to the number of lines they put into the nursery," she says. "They want to know what the reaction is to fusarium, we send them the data and they can decide what lines they want to keep in their programs and what lines to get rid of."

Now, "gathering data" sounds simple enough but in 2016, Brûlé-Babel and her team tested 25,000 individual lines in the FHB nursery. They are grown in single-row, one-metre long plots, and for every 75 plots there is a block of five check varieties with known resistance levels (resistant, moderately resistant, intermediate, moderately susceptible, susceptible). "We make sure we're evaluating against known standards," she says.

"We grow the disease inoculum in the lab, measure the concentration of spores and use a backpack sprayer to inoculate plots," says Brûlé-Babel. "We spray at flower and again three days later."

Ideal conditions for supporting Canada's wheat industry

To ensure conditions are perfect for disease development, the plots are mist irrigated – 10 minutes per hour for 12 hours – shortly after they're treated. Plants are checked 18 to 21 days after inoculation and rated for disease incidence and severity, plus the team does DON and FDK analysis.

"Without the consistent WGRF funding, this nursery wouldn't exist."

The work is constant – 25,000 lines and three seeding dates means plot rows are all heading and flowering at different times.

And the work is only increasing with more plots being added almost every year – a significant indicator as to how important the FHB nursery is to Canada's wheat industry and why WGRF continues to fund the project. "They were the first funders of the coordinated nursery in 2001," says Brûlé-Babel. "Without the consistent WGRF funding, this nursery wouldn't exist."

Turbulent times

Studying the effects of air turbulence on spray applications

"There are few pieces of farm equipment with more variables affecting performance than a sprayer." A multitude of factors can influence how successfully product gets from the spray tank to the plant surface – everything from the nozzle to driving speed to boom height to ambient wind conditions…it's a long list.

But have you ever thought about air turbulence *caused* by the sprayer? Hubert Landry has.

Landry, a research scientist with PAMI in Humboldt, Saskatchewan, with assistance from Tom Wolf of Agrimetrix Research and Training in Saskatoon, is looking at how travel speed and sprayer configuration can impact air turbulence around sprayer nozzles and how, in turn, that turbulence might affect spray deposition.

First step? Quantify airflow and air turbulence. "Sprayers are getting larger and longer and faster, so we have to look at the airflow patterns to see how they could affect spray deposition. Does air turbulence matter? We don't know yet, but it should be quantified so that we can find out," says Landry who received WGRF funding to help determine the answer.

Do air currents interfere with spray deposition?

Clearly, any solid body moving through space will cause air turbulence in its wake. But think about a sprayer with its boxy tractor body, spray tank, long skinny boom, bulky little nozzles, big fat tires – every one of those components displaces air differently. Add travel speed to the mix and you get even greater potential for air currents and eddies powerful enough to interfere with spray deposition.

Landry and his team conducted field trials using a Spra-Coupe 4640, where three ultrasonic anemometers (wind speed measurement tools) were placed at key positions around the sprayer – one in front and two behind, with the ability to move the rear anemometers to different positions to gather a more complete picture of air turbulence at specific locations along the boom itself, as well as a short distance behind it.

A weather station was set up in the field to measure ambient wind speed and direction. “As much as possible, we wanted to keep wind out as one of the variables,” says Landry.

Air turbulence is measured as TKE, or turbulence kinetic energy, which indicates the intensity of air movement, and measurements were taken at two travel speeds: two and eight metres per second (7.2 km/h and 28.8 km/h).

Air flow differs depending on the component

A total of 45 trials were carried out and, crunching the data, Landry has already spotted some trends. “We observed that, fairly consistently, the area behind the rear tire had a higher TKE, it was more erratic,” he says. “And the higher the velocity, the more turbulence there was.”

Indeed, compared to TKE behind other parts of the boom and sprayer, the space behind the tire is a veritable tornado. Computer modeling also suggests that the bigger the tire, the bigger the TKE, which has implications for larger machines.

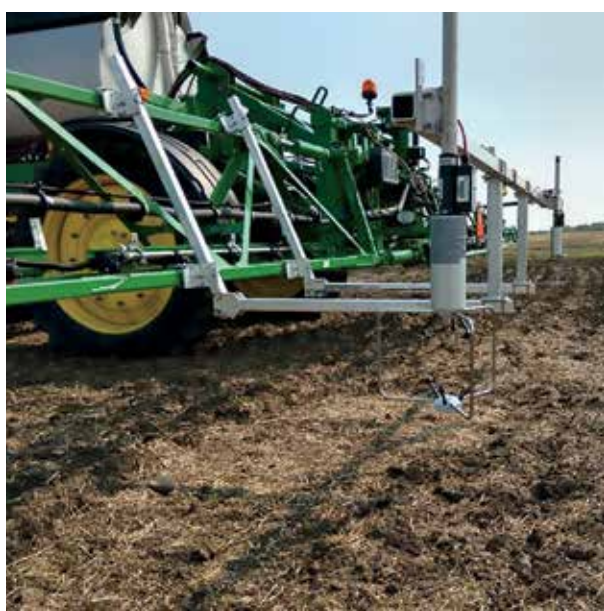
But it wasn’t just the tires. “We think the machine itself, its geometry and size, has an impact on air flow,” says Landry. Further experiments with a new 120-foot boom John Deere should yield good data about how air turbulence differs behind components of a big machine, plus how the sheer size of that machine impacts air movement all around it.

Now that airflow and turbulence have been quantified, the next phase of the study will look at how air turbulence plus speed affect spray deposition.

“At this point in the research, we can see three possible outcomes,” says Landry. “First, we may find that air turbulence doesn’t matter at all to spray deposition. Second, farmers may need to watch speed more closely – there may be a combination of ambient conditions and speed that will affect deposition. And third, there may be a need to design sprayers differently in terms of the geometry of the boom.”

Work is underway now to determine which of these three outcomes will win out. Landry says to look for results in 2017.

Producer benefit:
Sprayer-applied agricultural inputs represent a high operational cost. Developing the knowledge required to understand the impact of high-speed sprayer operations has the potential to maximize the efficacy of those inputs, reduce cost and increase profitability.



Looking into the future

WGRF in transition

"With change comes opportunity." It's a fitting adage for the Western Grains Research Foundation (WGRF) as it embarks on changes that will bring new possibilities to western Canadian farmers.

"Over the next four years, WGRF will be transitioning out of funding crop-specific research in established crops to funding of multi-crop research for established crops," explains Garth Patterson, executive director. "We're excited about this new direction and the doors it will open for agriculture in Western Canada."

"Over the next four years, WGRF will be transitioning out of funding crop-specific research in established crops to funding of multi-crop research for established crops."

~ Garth Patterson, WGRF

Patterson cites WGRF's 35 years of experience, its diverse producer-directed board, and Canadian scope as reasons that the organization is well positioned to fund and lead research on whole farm, integrated multi-crop issues. This could include research in crop production systems, pest monitoring and management, nutrient management, crop adaptation to climate change, soil health, genomic tools, grain storage and human resource capacity.

"We will continue funding crop-specific research in emerging crops, including variety development, production and post production," says Patterson. "We will also be enhancing our support for extension and technology transfer of research results to agronomists and producers."

From a financial perspective, WGRF has the capacity within its Endowment Fund to sustain annual funding of $6 million for the next decade.

Beyond 2020

Another significant change for 2017 is the end of the Western Canadian Deduction (WCD) on July 31st. After that date, wheat and barley commissions and associations will assume responsibility for the consolidation of the WCD into their respective check-offs.

Garth Patterson
Executive director, WGRF

During this transition period, WGRF has provided stability for the publically funded wheat and barley breeding programs by extending core program funding to 2020. This investment totals $31.7 million and several projects in partnership with Agriculture and Agri-Food Canada, the University of Alberta, the University of Saskatchewan's Crop Development Centre and the University of Manitoba.

What about beyond 2020? "We plan to remain involved in funding wheat and barley variety development through the use of royalty funds," confirms Patterson.

WGRF looks to the future on behalf of western Canadian farmers. This pro-active, forward-looking approach helps to keep everyone one step ahead and ready to take advantage of opportunities on the agricultural horizon.

What makes WGRF unique?

- Independent, charitable foundation, directed by producers
- Largest producer funder of crop research in Canada
- Focus on funding research, a western Canadian membership base and multi-crop funding scope
- Recognized as a significant funder of crop research by researchers, governments, producer organizations and industry
- Acknowledged for expertise and project management capacity

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.

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@westerngrains
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Western Grains Research Foundation

$1.6 million
soybean yield and disease resistance research

15 years
funding FHB research

$456 million
= net benefits of Midge Tolerant Wheat