MANITOBA Pulse Soybean GROWERS

pulse beat

Issue 91 • Fall/Winter 2020

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Please direct your comments or concerns to Sandy Robinson at 204.745.6488 or email sandy@manitobapulse.ca

In This Issue

Cover photo by Laura Schmidt, MPSG

Manitoba Pulse & Soybean Growers 2020 Board of Directors and Staff

ELECTED FARMER DIRECTORS

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On-Farm Network Technician – Ian Kirby – *ian@manitobapulse.ca*

Message from Board Chair

Calvin Penner, Chair, MPSG

BY THE TIME you receive this issue of the *Pulse Beat*, harvest and all the field activities will hopefully be finished. The travel brochures you got in the mail will have been burned in frustration and you'll have run out of excuses to put off fixing that leaky faucet.

On the plus side, I hope you all had a great harvest with good yields. What a difference a year makes, eh? Last year, it was a muddy struggle to finish harvest. There was a lot of 2019 crop harvested this spring, all over the province.

As I write this, prices are moving up. The markets are showing a renewed interest in peas. I have heard that some contracts have already been filled. There is interest from both processors and farmers. Demand and competition for the crops we grow, and the crops Manitoba Pulse & Soybean Growers (MPSG) represents is always good. All this optimism despite trade wars and tariffs.

What I don't know as I write this, is the election results of our U.S. neighbours. Will there be more trade wars or protectionism with the re-election of Donald Trump, or with a Joe Biden presidency? I suppose that the uncertainty of the American farm policy has been a wild card and it will likely continue always to be the case. If we haven't learned to live with it yet, we may have to accept an unpredictable neighbour as the continuing normal.

As a result of having to stay at home more, we will, as a neighbour told me, have to learn to read again.

Please take the time to read this issue of *Pulse Beat*. We have top-notch staff, who have been very busy on plots and field trials. We saw their work on our farm in a population trial for MPSG's On-Farm Network. I know I am looking forward to seeing the results of all the work they did this summer.

If you have a question about a production practice on your farm, let our staff know and consider an On-Farm Network trial to see how what you do compares to other farms across the province.

We want to congratulate Daryl Domitruk on his appointment as the new executive director of MPSG.

We also want to thank François Labelle for his years of service and leadership to the pulse and soybean industry. We wish him a great retirement and much success in his new ventures.

Due to the pandemic and with the cancellation of CropConnect 2021, MPSG will be hosting a virtual AGM on February 10. Planning is underway with our CropConnect commodity group partners, who will also be hosting their own virtual meetings, with the aim of providing a consistent virtual platform to all our members. Please check our website for up-to-date information. Please stay safe and healthy, both mentally and physically. There is a lot in agriculture to be thankful for.

— Calvin ■

MANITOBA Pulse Soybean GROWERS

OUR MISSION

To provide research, production knowledge and market development support to Manitoba pulse and soybean farmers.

Field Pea Scout

What is the cause of each pea root symptom?

Answers can be found on page 46

Photos: Syama Chatterton, AAFC

A

B

Message from Executive Director

Daryl Domitruk, Executive Director, MPSG

MUCH CONTINUES TO be said about the impact of the pandemic on Canadians. Not to dwell on the topic, however, I do want members to be aware Manitoba Pulse & Soybean Growers (MPSG) operations have successfully adapted to the limitations imposed by the pandemic, while following the guidance of public health authorities.

In particular, the 2020 field season came off quite smoothly. Staff schedules were brimming with crop surveillance and on-farm testing activities, while our extensive program of regional variety trials took place as planned. There were a few delays and cancellations at university and government research sites, but most projects proceeded at pace. Administrative and contract management tasks were accomplished in full and the financial pencil was kept sharp, albeit from home offices.

While practicing their profession, staff stayed safe and respectful of others and the rules. Their adaptability and dedication really showed. Once again, they've done MPSG proud.

Adaptations in how we keep in touch with our members is a longer multi-stage process. Virtually all field days were cancelled and most of the winter event calendar is blank. Even our annual general meeting is going virtual. This is tough on an organization that is defined by its connection to members. Here are a few ways in which we hope to keep in touch:

The On-Farm Network continues to work with growers across Manitoba. This one-on-one work with members in every corner of Manitoba results in two-way learning for staff and the farmer host. As the trial map suggests, there are a couple of districts we'd like to see more of.

In spring, MPSG stationed its two production specialists from home offices situated along the spine of agro-Manitoba. From these central points, one specialist heads east and the other west to survey fields, track pests and generally keep in touch with conditions. The production specialist's job has evolved to equal parts distributing and collecting knowledge from the land and the people in every district in agro-Manitoba.

This magazine remains the cornerstone of our communication with

continued on page 4

continued from page 3

members. Like all hard-copy publications, its place in the future is continually being evaluated. These days, I have to say the solid feel of a real magazine full of colour and gloss seems... well, solid.

We thought of producing an extra "Won't see you at CropConnect" issue of *Pulse Beat*. Instead, we opted to continue *The Bean Report* every month through the winter. There's a large store of crop production commentary we've collected during the season. That, along with research results and variety trial information, means we're itching to get information out through this popular, multi-media platform.

Somewhat interestingly, as a group, we've decided farmers have been saturated with webinars. As a result, we will use the medium of webinars sparingly.

OPERATIONS

Along with the board, we continue to optimize the organization's day-to-day functions. It's no secret our main source of income has declined with the decrease in soybean acres. It may be that Manitoba farmers have reached a sustainable equilibrium of acres across soybeans, dry beans and peas. Rather than the three-million-acre organization once dreamed of, we're planning for 1.5 to 2.0 million acres annually. So, from improved check-off tracking software to a streamlined phone system, we're scaling MPSG operations to our resources.

This spring saw the job of Extension Coordinator set aside and the responsibilities distributed across the remaining staff. Then, in July, with the retirement of François Labelle, the positions of Executive Director and Director of Research and Production were combined, at least for the foreseeable future. We remain flexible in our operations but determined in our mission. The need to adapt didn't start with COVID-19.

MARKET DEVELOPMENT

In a shout out to our partners at Pulse Canada, we continue to work side-by-side on pesticide regulation and market access issues. Recently, a Pulse Canada-led team of industry stakeholders made strides toward diversifying markets for Canadian pulses. The Canadian pulse team acquired insight into global demand trends for pulses in everything from flour to protein fractions to whole beans in foodservice and home cooking. No doubt, MPSG will find itself supporting research and marketing projects to capitalize on these opportunities.

Already in Manitoba, we're at the forefront of the plant protein industry with our yellow peas. This market exposed the potential for unhealthy competition among protein sources. However, the constructive attitude among pulse industry stakeholders should allay concerns that we are headed for protein wars. MPSG has consistently positioned pulses and soybeans as being at their best when combined with other protein sources to create a win-win for the farmer and consumer. In the field or on the dinner plate, sustainability and nutrition are optimal when plants and animals are present in a balanced proportion.

We look forward to playing a role in capturing as many pieces of the worldwide protein market as possible for Canadian producers.

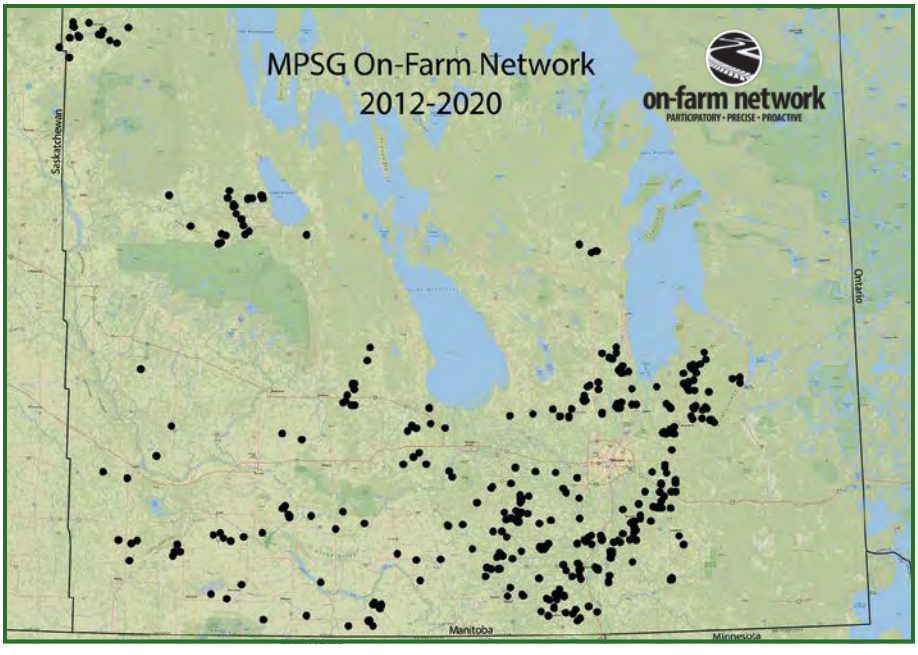
In the market for climate-friendly products until now, Canadian pulses were actually at a disadvantage. That is because nobody knew the complete life-cycle greenhouse gas footprint of pulses as they are grown in western Canada. Again, under the leadership of Pulse Canada, the calculations have been carried out by experts at University of British Columbia (UBC). Once published, the results will enable any buyer or researcher in the world to look up the numbers.

POLICY

One year ago, a strategic planning exercise led MPSG directors to conclude the organization should take modest steps to address policy issues. We continue to debate just how far down this path we should venture. MPSG staff are already engaged in policy work pertaining to topics ranging from pesticide regulations to land drainage to climate change. These are the policy areas that come with our farm production territory. A looming issue, though, is a renewed discussion of business risk management. Renewable energy, biotechnology, trade and taxation are other examples of policy issues where farmers need representation. Where are MPSG's resources best deployed? Pulse Canada, Soy Canada and Grain Growers of Canada are best suited to deal with national issues. So, at the very least, we know MPSG's focus should be within the borders of our province.

Around every corner, people, organizations and institutions are adapting to change that is accelerating more rapidly than anyone could have imagined. We are fortunate to be in an industry that carries change in its DNA. MPSG seeks to be an agent for positive change on behalf of its members. As challenging as it may be to stay in touch, we sincerely hope this issue of *Pulse Beat* helps us do just that.

— Daryl ■



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MANITOBA Pulse Soybean GROWERS

Notice of 2021
Annual General Meeting

NOTICE IS HEREBY GIVEN that a meeting of the members of Manitoba Pulse & Soybean Growers (MPSG) will be held by a **VIRTUAL** platform on

February 10, 2021 | 8:00 AM

AGM details will be posted to manitobapulse.ca and MPSG's social media channels.

The purpose of the meeting is to

1. approve the minutes of the 2020 members meeting
2. receive the financial statements of MPSG for the current fiscal year
3. appoint the auditor of MPSG
4. receive the board chair and executive director's report
5. elect directors to the MPSG Board of Directors

CALL FOR DIRECTOR NOMINATIONS

Nominations to fill three seats on MPSG's Board of Directors opens December 23 and will close on January 21, 2021.

Are you interested in becoming a director? Would you like more information?

To obtain a 2021 Board of Directors Nomination Package, please contact the MPSG office

- sandy@manitobapulse.ca

**You must be a farmer of pulse and/or soybean crops and in good standing with MPSG.*

NOMINATION COMMITTEE

- Bryce MacMillan – bryce_mac3@hotmail.com
- Frank Prince – princeagparts@hotmail.ca
- Ernie Sirski – esirski@xplornet.com

Elections will be held at the MPSG virtual annual general meeting February 10, 2021.

MPSG's Playbook of Silver Linings

Toban Dyck, Director of Communications, MPSG

THINGS HAVE CHANGED a lot since the last *Pulse Beat*. Global pandemics will do that. Initially, when this article was conceived, it was going to be about how COVID-19 has actually affected some farmers in a positive way.

Full disclosure: this was my idea, and it came from a reflection on how things have changed for me on my farm since the pandemic began. It also came from the acknowledgment that, in some cases, the changes that have been forced upon us since restrictions were implemented may not be all bad.

I have spent more time on my farm's books than I have in the past. I have spent more time on the tools than I have in the past. And, I have thoroughly enjoyed having the space of an entire farmyard at my disposal during lockdown periods. I think we can all agree on that.

The agriculture sector is undoubtedly fearful of the economic storm mustering over parts unknown that will inevitably make landfall and wreak a level of havoc that CERB and a depleted government kitty won't be able to mend.

But, the ag sector—and the pulse and soybean sectors are no exception—is also, by and large, thankful for a prosperous growing year, as well as good, and in some cases, rising commodity prices.

Once restrictions lift, I hope many of the habits I have formed over the last year remain a part of my life.

At Manitoba Pulse & Soybean Growers (MPSG), we've spent a lot of time trying to decipher how our communications to you, our farmers, need to change when in-person meetings are prohibited or, at the very least, discouraged. Part of this consideration is doing our best to decode how your needs/desires of us have changed during the pandemic.

> We want our farmers to feel supported by MPSG and proud of their membership.

It is important to MPSG that you feel supported. We specialize in research and extension, but we want you to know that if there's a file, such as trade, business risk management programs, transportation, market access—you name it—we're actively representing the interests of our farmer members, either through our own expertise or through voicing a Manitoba perspective to partner organizations, such as Keystone Ag Producers, Grain Growers of Canada, Pulse Canada or Soy Canada, to name a few.

Pulse Beat is a showcase of our activities, of the many ways in which we are aware of the issues affecting the pulse and soybean industries and of how we address them.

Galvanizing an appreciation for research is difficult to do when results could take years and headlines surrounding trade or Trump steal our attention and steer us towards reprioritizing what a commodity group like MPSG should be doing for its members. But, as Scott Chalmers from WADO said in this issue of *Pulse Beat*, 15 years ago, farmers didn't know how to grow soybeans and now they do. That's the power of research. Plus, MPSG is aware of trade and China and Trump and is doing what it can to mitigate the negative effects the related issues may have on Manitoba's farmers.

We not only want you to feel as though your check-off is an investment in your own farms, we also want you to feel proud of the membership your dollars represent.

In September, during a communications meeting, we discussed these goals of showing how we support our farmers and finding ways to build a sense of pride among our membership. The resulting ideas were fantastic. One that stood out and one that I think you will be excited about, too, is the *MPSG Working for You 2021* wall calendar.

The pictures are fantastic and inside you'll find dates to remember, such as MASC seeding deadlines, scouting information and important reminders that are easy to forget.

We hope you'll like it. We also hope you'll enjoy our *Bean Report*, which MPSG has decided to continue publishing throughout the winter months.

We hope these things will affect your farms in a positive way. ■

Actively and Effectively Helping Industry Punch Above its Weight

Jeff English, Vice President, Marketing and Communications, Pulse Canada

Pulse Canada

BEFORE AND THROUGHOUT the COVID-19 pandemic, Pulse Canada has remained focused on delivering value to our members through a strategic and coordinated approach across our team. As we look toward what will be an unpredictable 2021, directors and staff are committed to working with membership and the entire pulse value chain to eliminate risk in current priority markets for Canadian pulse and special crops while creating demand outside of traditional markets and traditional uses.

MARKET ACCESS

Our voice in Ottawa continues to help the pulse industry punch above its weight in terms of getting realistic results to known and unforeseen issues. Parliament is back in session for the fall. While both government and opposition benches are understandably focused on Canada's response to COVID-19, Pulse Canada continues to advocate on a number of issues important to our members and overall trade. We have recently seen fluctuations in India with respect to its tariff on lentils. While India continues to arbitrarily move its tariffs up and down, our organization is focused on a stable, long-term fix. The pulse industry thinks, plans and operates in months and years, not weeks, meaning transparency and predictability are key to our success. Our board and staff continue to meet with Ministers and officials in Canada and India, to come to a mutually beneficial resolution.

We know that in order to take full advantage of access gained through free-trade agreements, all parties must commit to fair implementation. Specifically, Pulse Canada is working with export-oriented commodity groups through our membership in the Canadian Agri-Food Trade Alliance (CAFTA) to ensure agriculture benefits from the Comprehensive Economic and Trade Agreement (CETA) with Europe. Three years into this agreement, agriculture has yet to realize its full potential. In addition, the European Union's recent "Farm to Fork" strategy document contains certain language that, if improperly applied, could unfairly disadvantage Canadian pulse farmers and exporters. The European Union is an important market for the current and future success of our

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Advocating Efficiently and Effectively

Erin Gowriluk, Executive Director, Grain Growers of Canada

IT WASN'T THAT long ago that Grain Growers of Canada (GGC) committed to "put more farmers in front of policymakers more often."

Well, as farmers, you know just how futile it can be to try to make plans.

It wasn't long after that when COVID-19 happened. Our plans to hold in-person meetings were no longer possible.

But, as farmers, you also know just how important it is to adapt to new situations.

And that's exactly what we at GGC did. This year we launched a variety of new digital channels and forums to communicate with our stakeholders. And the results so far have been amazing.

We carried this momentum and strategy into National Grain Week, held in November.

While all our meetings throughout Grain Week were virtual this year, little else changed. Our top focus was to ensure our members' priorities and needs remained front and centre with policymakers. Our campaign theme, Growing Back Better, focused on how the grain, pulse and oilseed sectors are well-positioned to drive our nation's economic recovery, focusing on three major points:

TRADE

Overall, we are asking the government to redirect resources towards the implementation of free-trade agreements and commit to resolving access issues in key markets around the world.

We will illustrate the need for this by driving home the importance of trade and expanded market access opportunities to our export-orientated sector. We will also stress the importance of ensuring proper implementation and enforcement of existing agreements, such as the Canada-European Union Comprehensive Economic and Trade Agreement (CETA) and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). Both have failed to remove barriers and expand growth opportunities as promised.

Finally, we will reiterate the idea that mounting market access issues can be more effectively resolved through government-supplied resources, like regionally based "SWAT teams" who can

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industry, and ensuring fairness in trade with the EU remains a priority among our team.

Of course, market access is a two-way street, and we know that Canada must always hold up our end of the bargain. That is why we continue to work with the Canola Council of Canada and Cereals Canada on the Keep It Clean initiative, which seeks to communicate best practices to growers about the importance of ensuring their crops are export-ready. Last year, we created a pilot project with the Canadian Special Crops Association (CSCA) to proactively identify product that may have been in exceedance of an export market's MRL, prior to the product being exported. Since the beginning of the program, 14 CSCA members have registered for the program and 166 samples have been submitted. The program is designed to help Canadian farmers and exporters avoid unwanted market access issues in priority markets. We will continue to work through mediums like these to protect and promote the quality of Canada's pulse crops. We know that there is an incredible global demand for Canadian pulses and want to ensure farmers can maximize value for their top-quality crops.

TRANSPORTATION

As harvest concludes and we head into winter, Pulse Canada staff is preparing to address any unforeseen transportation issues that come in the colder months. Through our leadership with the Ag Transport Coalition, we are providing weekly data into rail movement, which has shown large volumes being moved, but inconsistent fulfillment week by week. There is no guarantee with winter weather, but pulse growers can rest assured that as incidents arise, Pulse Canada will work diligently with our industry and government partners to ensure they are quickly resolved.

THE DRIVE FOR '25 BY 25'

Along with industry partners, including Manitoba Pulse & Soybean Growers, our team continues to work to find new uses and markets for 25 percent of Canadian pulse production by the year 2025.

Importantly, we have collected data from over 700 Canadian pea and lentil growers for use in an ecosystem specific life cycle assessment. The results of this project will help position Canadian pulses among the most sustainable protein sources in the world. A four-year varietal trial, in partnership with provincial members, is well underway to establishing a benchmark for Canadian pea quality, with the end goal of increasing demand for Canadian peas in processing. We anticipate these projects and others to open doors to pulses being used as ingredients in more products worldwide and to return a higher price back to the farm gate.

LOOK AHEAD TO 2021

2020 certainly underscored the importance of flexibility and resiliency as we worked on your behalf to grow the value of Canada's pulse industry. In the year ahead, we will continue to build on recent successes to deliver further value back to our grower members. It is important that results delivered align closely with the priorities of Manitoba pulse growers and the overall pulse industry. If you have a question or comment on any one of our efforts, please do not hesitate to get in touch by emailing Jeff English at *jenglish@pulsecanada.com*. ■

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work *with* customers to prevent market access concerns from becoming barriers.

INNOVATION

Secondly, we will focus on the importance of innovation to our sector. Whether it is public research into new varieties or an agile regulatory system that encourages innovation in plant breeding and crop protection products, we need government to support science over public opinion and ensure our farmers have the best tools available to maintain our competitive advantage.

SUSTAINABILITY

Thirdly, we will seek to ensure the government follows through on its commitment to recognize the important sustainability measures farmers and ranchers have undertaken in the past several decades and that we are a key partner in the fight against climate change. Of late, interactions with Environment and Climate Change Canada have certainly not acknowledged our industry's significant contributions to sustainability goals in this country, so we will be highlighting the progress we have made and continue to make.

Outside of official National Grain Week meetings, GGC will also continue to drive our agenda on two other important issues.

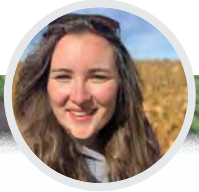
Agriculture & Agri-Food Canada (AAFC) has assured us that the Canadian Grain Act review will be initiated before the end of this calendar year. Our working group dedicated to this issue has been meeting every two weeks to refine our position and develop clear feedback for government. We look forward to advancing this feedback through the formal review process.

Finally, business risk management, or more specifically, Agri-Stability, is shaping up to be GGC members' greatest priority this fall. We have long been pushing the messaging that, when the current trigger and payment levels were set in 2012, farm incomes were rising, market access was increasing, and trade barriers were being removed. However, in recent years we have seen increased market and trade volatility, more severe climate-related events and increased cost of inputs. Agri-Stability coverage has not changed despite these significant challenges.

GGC has partnered with farm groups across the country to ask government to take immediate action to restore the payment trigger to 85% of historical reference margins, with Reference Margin Limits removed. We have been driving home the message that our industry, uniquely positioned to help fuel economic recovery and growth in our country, can only prosper with government support, partially in the form of effective BRMs. We are working on ensuring this issue is a top agenda item in policy meetings taking place in the next month. We have positive developments to report back to our members afterwards. Stay tuned.

So, like most things this year, National Grain Week looked a lot different than what we had expected.

One thing that will remain the same, though—now and always—is our commitment to advocating for our members in the most effective ways possible. That is our plan going forward and it won't change, despite whatever unpredictable circumstances arise. ■



Megan Bourns, On-Farm Network Agronomist

YIELD RESULTS ARE NOT EVERYTHING – A Story of Big Wind in Small Beans

This year, a farmer approached us about comparing his strip-till and conventional till systems in pinto beans, using an On-Farm Network trial. We set out in the spring thinking this would be a story about yield comparison between tillage treatments… and then it got really windy.

The trial was planted on May 18. By June 5, the farmer had to reseed a portion of the trial due to severe wind damage. The interesting thing? Only bean seedlings in the conventionally-tilled plots were affected. Seedlings in the strip-till plots were relatively unharmed.

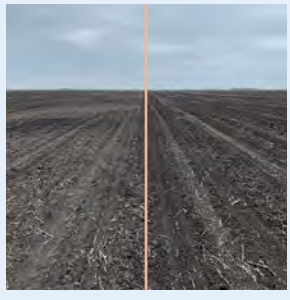
Due to the need to reseed, we were able to salvage a tillage comparison in just a small portion of the planned trial area. From the yield results we were able to obtain, there were no significant yield differences between tillage treatments. However, from a cost of production standpoint, reducing wind stress and protecting seedlings has huge economic benefits. Depending on seed and equipment costs, a reseed operation for pinto beans is in the neighbourhood of $80/ac. On top of that, seeding is now late, reducing yield potential and seed quality and increased the risk of late-season frost damage, dolling out an economic hit at the end of the season.

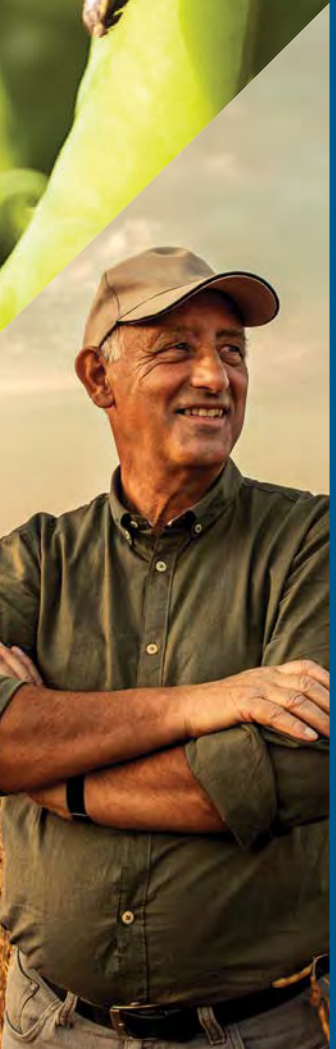
Yield isn't everything. It's a huge focus of production and management decisions, as it should be – but often there are other reasons to evaluate and modify farm practices, with valid agronomic and economic effects of their own!

Wind-damaged pinto beans in conventional till plot, early June

Pinto bean plant in strip-till plot, early June

Conventional till (left) vs. strip-till (right)





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Changing Prospects for Soybean Production in Manitoba

Ron Davidson, Executive Director, Soy Canada

THREE YEARS AGO, Manitoba farmers had registered yet another successive record soybean harvest. The preceding ten-year period was characterized by a remarkable eleven-fold expansion in volume, increasing from 215,000 acres yielding 34.7 bushels per acre, generating 202,800 tonnes in 2007 to 2,285,000 acres yielding 36.1 bushels per acre, generating 2,245,300 tonnes in 2017.

The storyline during the three years since the 2017 peak has been more diverse. By the harvest of 2020, a combination of drought, foreign and domestic political decisions, lower prices and three consecutive years of production-distorting U.S. government subsidies resulted in a pullback to 1.1 million acres yielding 38.0 bushels per acre, generating 1,174,400 tonnes. It is noteworthy nevertheless that, notwithstanding the cumulation of factors which weighed on the sector from the summer of 2017 to the harvest of 2020:

- five-year average yields continued to increase (23.9 bushels per acre from 2001 to 2005; 30.9 from 2006 to 2010; 33.3 from 2011 to 2015; and 35.7 from 2016 to 2020);
- the estimated average yield of 38.0 bushels per acre for the 2020 crop was second only to the 41.0 bushels per acre of 2016; and
- production volumes in each of 2018, 2019 and 2020 still exceeded all years prior to 2015.

Looking forward, there are a variety of factors that, both individually and cumulatively, should support a rebound in Manitoba soybean production. These include:

PRECIPITATION

Environment and Climate Change Canada data for Winnipeg indicate that, during the 81 years between 1938 and 2019, the years 2017 (327.5 millimetres) and 2018 (354.6 millimetres) were the fourth and fifth lowest single year annual precipitation levels after 266.9 millimetres in 2006, 312.4 millimetres in 1938, and 321.7 millimetres in 1961. Moreover, 2017 and 2018 recorded the lowest successive years of total precipitation (average of 341.0 millimetres) during the eight decades. In this context, there is ample reason to be optimistic that the low annual precipitation, rainfall and soil moisture conditions of recent years will not endure.

PRICE

The 2020 United States Department of Agriculture World Agricultural Supply and Demand Estimates (WASDE) is projecting a return to an improved average farm price for the current crop of US$9.80 per bushel following the depressed returns of US$8.57 in 2019, US$8.48 in 2018, US$9.33 in 2017, US$9.47 in 2016 and US$8.95 in 2015.

GLOBAL PROTEIN DEMAND

A requirement for ever greater amounts of soybean protein is being derived from: an increasing global population (from 7.8 billion currently to 9.7 billion by 2050); a continuously expanding middle class in emerging economies that is seeking increased quantities of animal protein; and a growing range of soy-based industrial products (the United Soybean Board lists more than 1,000 soy-based products that are currently on the market).

Usually accounting for two-thirds of global soybean imports, it is estimated that, since August of 2018, China has lost

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Clancey's Stats

Pulse market analysis

Brian Clancey, Senior Market Analyst and Publisher, STAT Communication

THE IMPORTANCE OF pulses in the global agricultural economy has grown significantly in the past 20 years, with massive international trade, production and consumption increases.

In the five years between 2000 and 2004, production averaged 43.57 million metric tons (MT), trade 8.02 million and inferred usage 40.24 million MT per year. During the five years ending in 2020, production averaged 62.02 million MT year, global trade 18.15 million and consumption 57.33 million MT.

There have been noticeable increases in average consumption of pulses in a wide range of forms: whole and split, prepared foods, pet foods, and after conversion into starch and protein fractions.

Fractionation has led to a proliferation of new products containing pulse flours and proteins. There is significant optimism about that sector's future growth potential as more consumers look for products they perceive as healthier, more environmentally friendly and non-GMO.

Not only for themselves. Years ago, there was a joke than one day, two dogs would meet on the street and one would ask the other, "Still eating meat?" Today, some pets are literally eating vegetarian and vegan diets, with pulses being a key nutritional important component in many formulations.

So far, the protein fraction of pulses has been the most valuable and versatile. Many companies are working on starch fractions' baking qualities to expand potential demand, while several plant breeding efforts are underway to develop peas with higher average protein levels. Peas have an advantage over other pulses for fractionation because they are readily available and generally less expensive than other pulses.

That does mean they dominate all segments of newly emerging demand in Europe, North America and other parts of the world. Beans and chickpeas have long been used to create products like noodles and sweet and savoury snacks. Historically, that type of demand has been strongest in Asia and on the Indian subcontinent, but numerous products have emerged in recent years tailored to western diets and preferences.

More significantly, targeting consumers who do not see themselves as a vegetarian. Best known are plant-based hamburgers, which try to replicate the appearance, flavour and mouth feel of beef. Supermarket freezers in

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over 100 million pigs to African Swine Fever (ASF). Now in the recovery phase, large-scale commercial facilities are replacing a portion of the pre-African Swine Fever backyard operations. This evolution of the production base will result in an even higher post-ASF per hog consumption of soybean meal.

FERTILIZER CONTAINING NITROGEN

Nitrous oxide, considered to be 300 times more potent than carbon dioxide for planet-warming, is the third most important greenhouse gas after carbon dioxide and methane. A study published in the journal Nature on October 7, 2020: (a) reports that two-thirds of nitrous oxide emissions caused by human activities are derived from the use of nitrogen fertilizers; and (b) recommends that urgent mitigation measures be implemented. Any new requirements to reduce the use of nitrogen-containing fertilizers would favour the production of nitrogen-fixing crops such as soybeans.

CLIMATE CHANGE

On August 18, 2020, three Pennsylvania State University researchers published the results of a study entitled *The response of maize, sorghum, and soybean yield to growing phase climate revealed with machine learning*. Based on an analysis of yield dependence on climate and technology between 1980 to 2016, their findings indicate that, as climate change progresses, "the best climatic conditions for rainfed maize and soybean production may shift from Iowa and Illinois to Minnesota and the Dakotas."

Particularly, since Canada is reported to be warming at twice the rate of the rest of the world, this conclusion should also be positive for soybean producers in Manitoba. It is based on a finding that, among other factors, soybean yield is impacted strongly by minimum and maximum temperatures, as well as extreme degree days during the entire growing cycle and by vapour pressure deficits during the pod filling phase. While the first two factors should benefit future soybean production in Manitoba, it is possible that the third determinant could be problematic.

According to the Pennsylvania analyses, soybeans respond strongly to *optimal minimum* temperatures of 9 to 19°C and *optimum maximum* temperatures of 23 to 29°C. Yields optimize at 494 millimetres of rainfall during the growing season. Yields are decreased by both extreme degree days and, particularly during the grain filling phase, vapour pressure deficits.

CONCLUSION

During the past two decades, Manitoba producers demonstrated a capacity to rapidly increase soybean production from only 36,700 tonnes in 2001 to a peak of 2,245,300 tonnes in 2017. Notwithstanding weather, political and market perturbations from 2017–2020, the provincial soybean sector maintained a solid foundation. It is anticipated that a series of positive considerations should lead to a rebound of production volumes in both the near and longer terms. ■

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many countries now contain plant-based fish and poultry alternatives, pursuing the same goal of being virtually indistinguishable from the real thing when eaten.

Considerable effort has been put into moving these products out of specialty outlets into mainstream supermarket and restaurant chains. Some companies have invested heavily in visually attractive packaging to catch consumers' attention while removing vegetarian or vegan references to broaden their appeal.

The COVID-19 pandemic boosted demand for these alternatives and traditional pulses. Restaurant closures forced people to eat at home, driving up retail demand for all food products. Fears of shortages were exacerbated by reports of outbreaks in meat processing facilities. Increased shopping saw products on shelves decline faster than usual, resulting in panic buying. Staple foods with long shelf lives, like canned and packaged peas, beans, lentil and chickpeas, flew out of supermarkets.

There were reports of 40% year-over-year increases in demand in March as companies across the marketing chain rushed to restock their pipelines. The 2019–20 marketing year's net result ended with much lower carryovers than initially expected, while surging prices before seeding encouraged farmers to seed more pulses than intended in January and February.

In India, problems caused by restrictions on movement within and between states combined with the migration of a significant number of labourers from cities to rural areas increased pulse consumption in net producing areas while creating supply difficulties in cities. That has contributed to the fact food price inflation is higher in cities than in rural areas. Rising domestic markets encouraged smuggling via Bangladesh and Sri Lanka, which saw exports to those countries rise above recent norms.

Finally, the Indian government decided to reduce import duties on lentils by 20 points to 10% for all countries except the United States, where duties dropped from 50% to 30%. A few days after the first round of duty reductions expired, a second-round was announced with an October 31 expiry. Expectations there will be further rounds of duty reductions until next year's rabi season lentil harvest has encouraged the speculative movement of lentils into the region. That is because transit times are too long to allow new sales to be made from most origins and shipped to arrive before import duties return to their original level.

Markets are not overly concerned because Bangladesh is expected to import more lentils and other pulses for its domestic market to overcome the impact of an unusually severe monsoon season flooding its agriculture and food supplies.

Field peas could also benefit from improved demand from Bangladesh because they remain one of the most economical pulses on the market. More importantly, peas remain competitive as a feed ingredient versus corn and protein meals. Global grain and oilseed markets have seen a modest uptrend since July, while pulses as a group have trended downward.

China is experiencing a recovery in its hog herd, fuelling increased demand for feed ingredients. As long as peas are competitively priced versus other options, demand will remain relatively healthy, helping absorb any production that is surplus to the needs of human consumption markets. The downside risk is that to the extent this trend remains in place and farmers think they can make more money on grains and oilseeds instead of pulses, they could be discouraged from expanding production outside their rotations in 2021.

Pulses face another risk. Their growing penetration of markets traditionally reserved for meat and soy protein will result in blowback from those sectors. That is already becoming apparent. Some people already assert that plant-based meat replacements and other highly processed foods based on pulses are not as healthy as people imagine. The proven health and environmental benefits of pulses, they argue, are diluted as they become more highly processed and flavours are enhanced or created with other ingredients.

One pulse trader said he loves French Canadian pea soup made from whole yellow peas but will not give up his buffalo burgers. It may be that the more significant challenge facing the industry is giving people recipes where black beans, for instance, replace meat in lasagna but use herbs and root vegetables to enhance flavour rather than sodium or other flavour enhancers. No one in the family suspects it is meat-free.

That could be a key challenge. Many importers believe demand will return to normal in 2021 and that some consumers who bought pulses in a panic in March but did not eat them will not replace them when they pass their best before date. Without knowledge about how to make good food using whole or split pulses, increasing the pace of the upward trend in pulse consumption in the home will be a challenge. ■

manitobapulse.ca

How to Help Someone Struggling with Their Mental Health

Lesley Kelly, Farmer and Co-Founder of the Do More Agriculture Foundation

IT CAN BE hard to see someone go through a hard time, and even harder when you are unsure of how to help them. We want to reach out, but worried we will say or do the wrong thing. So we tend to steer in the direction of caution and at times, not do anything.

It's a tough spot. These are hard and challenging conversations. You want to dig and ask so you can help, but at the same time, you want to respect their privacy and autonomy. The good news is there are ways to do both and also increase the likelihood of the conversation going as smoothly as possible.

Here are some tips for having a caring, respectful check-in with a friend, neighbour or loved one you are worried about:

Before the Conversation

- Decide how you will approach the conversation. The best way to broach the subject depends on the person and will help you decide whether to approach the conversation in a delicate or direct way.
- Bring up the conversation when the person is most comfortable. As long as there is no immediate danger of harming themselves or others, consider starting the conversation in a positive and relaxed setting and environment. If the conversation starts in the heat of the moment, when tensions are high and when they or yourself feel angry, it may be overwhelming for them and could hinder the likelihood of them opening up and talking about their struggles. Try and find a quiet place such as going for a drive, catching up over coffee, going fishing, or taking a walk.

Starting the Conversation

- Start the conversation by telling them that you have noticed changes (changes in behaviour, routine, their usual self) and describe these changes. Then share that you are worried about them and ask what is bothering them. Here are some suggestions:
  - I've noticed you haven't been going out lately. Is there anything you'd like to talk about?
  - You don't seem yourself lately. What's going on?
  - I've noticed you've been late coming to the farm. Is everything okay?

Keeping the Conversation Going

- The most important thing you can do after you've opened up the conversation is to listen and show understanding rather than give advice. Comments such as "what happened next" and "tell me more" can reinforce you are paying attention. Phrases such as "I'm here for you" and "you're not alone" let's them know you are supportive.
- You don't have to know or have all the answers. Let them know you are thankful that they have talked to you about what they are going through, that you understand how hard it is to talk to someone about how they are feeling and reassure them that they have taken a positive step.
- Encourage the person to get help. Proceed with this step gently. It can be hard to articulate exactly what someone needs when they are struggling. Here are some great prompts to encourage a person to get help:
  - **Ask**: What have you done in the past that has helped you manage in similar situations?
  - **Ask**: How would you like me to support you?
  - **You could say**: "When I was going through a difficult time, I tried this.... You might find it useful too."
  - **You could say**: "It might be helpful to connect with someone who can support you. I'm happy to help find the right person to talk to."
- Watch out for signs of suicidal thoughts so you can get emergency help. If they talk about taking their life, acquired the means to do so, changes in their normal routine in a way that worries you, begins to behave recklessly or gives away their

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Ag in the Classroom Revamps Programming to Meet Strong Need

Sue Clayton, Executive Director, Ag in the Classroom

AITC-M launched the Food Gratitude project in 2020 so students could thank all the people working in agriculture who help bring food to their tables.

2020 HAS BEEN a far cry from a usual year for everyone, and Agriculture in the Classroom – Manitoba (AITC-M) is no different. With their flagship in-person programming cancelled for the foreseeable future, AITC-M staff have been busy rethinking their strategies in order to create experiences for teachers and students that don't involve field trips or classroom visitors but still provide agricultural education opportunities.

For Farm & Food Awareness Week in September, AITC-M created three new resources, focusing on dairy, eggs and potatoes. The resources, launched during the same week that the Amazing Agriculture Adventure Winnipeg usually takes place, contained curriculum connections for Grades 1–5. The resources featured activities such as virtual farm tours, a naked egg experiment and a history-based potato dress-up activity.

For the Manitoba Teachers Society's annual Professional Development Day at the end of October, AITC-M had to shift gears with their annual Little Green Thumbs (LGT) workshop, which usually takes place in person over a few days. The workshop, for teachers who have LGT classroom gardens, helps teachers set up their gardens and also provides ideas and guidance for using the garden to teach various lessons in the classroom. For 2020, the workshop was virtual and contained sessions like *The One-Pot Garden – Activities and Lessons in a Time of COVID* and *The Transformative Power of Plants* with Stephen Ritz, teacher, author and founder of Green Bronx Machine in New York.

In November, AITC-M co-hosted a Digital Agriculture Career Panel, along with EMILI and the University of Manitoba's Farm & Food Discovery Centre. The panel featured presentations from four local professionals who work in the digital agriculture sector. Students were allowed to ask questions in real-time and participate in an interactive game called *Kahoot!*, as well.

AITC-M also launched the Teach Ag contest this school year to encourage teachers to share photos of students using their resources and activities. Teachers are entered in a monthly draw for a $50 Chapters gift card when they send in or tag AITC-M in a photo of their class using any of the resources.

Looking into the future, AITC-M is taking a more blended approach to agriculture learning, planning more virtual experiences for students and teachers. With the recently announced Canadian Agriculture Partnership funding, a new website, videos and more virtual and blended learning opportunities are in the works, ensuring the 2020–21 school year will be a busy one at AITC-M. ■

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belongings, they may be considering suicide. Now is the time to act and speak up. Don't be afraid to ask the person if they are feeling suicidal. If they say yes, help them contact their family, and get them to the emergency room if you can, or call the National Suicide Prevention line at 1-833-456-4566 for guidance.

If they say they don't have suicidal thoughts and you are unsure and worried, you may need to make a judgement call and take the above measures.

After the Conversation

- Check in regularly. People who are struggling often need support over the long haul. Send a text, leave a voice mail and show them there are people in their life who care.
- Support them through the process by being patient and compassionate and these other suggestions:
  - Have realistic expectations. Recovery doesn't happen overnight.
  - Lead by example. Encourage a healthy lifestyle like eating better, avoiding alcohol and drugs, exercising and leaning on others for support.
  - Encourage activity. Invite them to join you in uplifting activities like going out to a movie or having dinner at their favourite restaurant.
- Support can be shown and felt in a variety of other ways too:
  - Clean their place, truck, and equipment
  - Cooking them food
  - Running errands for them
  - Accompany them to the doctor or professional support
  - Offer them a place to stay
  - Help them with administrative tasks
  - Make them a care package
  - Offer to help them with their livestock
- Take care of yourself. Caring for someone close to you can be challenging and often can be an isolating experience. During this time, it is important to look after your own mental health and wellbeing to provide the support and care that your friend and family member need.

If you are looking for more resources or support on how to help someone who is going through a hard time, visit our list of resources at domore.ag. ■

Do More Ag was established in 2018 to promote mental health awareness, well-being, and research; as well as to empower producers to take care of their mental health through education, training, and public awareness. The foundation is also dedicated to creating a community of belonging, support and resources on mental health. Visit www.domore.ag for more information.

Roquette's Bold Move Pays Off with Pea Plant in Portage

Michelle Finley, Communications and Public Affairs Manager – Canada, Roquette

The construction site covers nearly 70 acres.

DECIDING FOUR YEARS ago to build the world's largest pea protein plant in tiny Portage la Prairie, Manitoba, was a bold and innovative move.

But for Roquette, the global leader in plant-based ingredients and a pioneer in plant proteins for food, nutrition and health markets, it was basically business as usual. The family-owned company has established itself as a business with innovation at the core of everything it does. Its willingness to take bold risks and drive to be the best, biggest and first, is what sets it apart from its competitors.

"The decision to locate the company's first greenfield project in a small Canadian city in one of the country's least populated provinces raised more than a few eyebrows in the industry," says Dominique Baumann, CEO for Roquette in Canada. "While Manitoba's clean hydroelectric power was one deciding factor, so was the province's central location in North America which is our fastest growing market."

More than 1.2 million people hours of work have been contributed to the construction project to date.

Roquette's corporate presence in Canada has gone smoothly with nearly all available positions filled by the end of 2020. The company boasts some of the best benefits and employee perks in the province and recently took home its second consecutive *Top Manitoba Employer* award.

The community of Portage la Prairie has quickly felt the positive impact of Roquette's arrival. More than 15 new Roquette employees have moved their families to town and the plant has hired many of its workers from the population already living in the area. The construction phase of the project has also brought between 500 and 1,000 construction workers to the area each day for the past few years, which has provided

10,000 truckloads of gravel were hauled in to prepare the site.

The two other deciding factors that led Roquette to invest more than CAD$600M of its own funds to construct the Portage pea protein plant in Manitoba were access to skilled labour and the ability of Manitoba and Saskatchewan growers to produce the amount of peas required to keep the plant running 24–7, 365 days a year.

Attracting the 120 skilled workers needed to run the plant and establish significant economic spin-off for hotels, restaurants and fuel providers.

Roquette's contributions to Canada's agri-food value chain are just starting and the company is eager to develop its role as the anchor tenant of the prairies' flourishing plant-based protein ecosystem.

One of the first groups of professionals hired at Roquette Canada was the agronomy and grain buying team. With three agronomists and a grain buyer on staff, Roquette's first contract season in 2020 went smoothly and response from growers was extremely positive.

"We were expecting to see about 70% of our yellow peas come from Saskatchewan growers and 30% from Manitoba, but those numbers were actually reversed," says Bruce Brolley, Senior Agronomist for Roquette in Canada. "We have no concerns about the ability of growers from across the prairies to supply the quality and quantity of yellow peas we will need in the years to come."

The Portage pea protein plant is on track to start operations by the end of 2020 and at capacity, will process 125,000 MT of conventional yellow peas annually.

Contracts for the 2021 growing season are now available and, as announced in October 2020, the offer has expanded to include organic yellow pea contracts.

Please visit GrowWithRoquette.com to watch a flyover video of the plant under construction and for information on contracting yellow peas with Roquette in 2021. ■

LALFIX PROYIELD LIQUID SOYBEAN

THE POWER OF TWO

LALFIX® PROYIELD Liquid Soybean is a game changer when it comes to soybean inoculants. By utilizing two unique strains of *Bradyrhizobium elkanii* along with proven *Delftia acidovorans*, LALFIX® PROYIELD Liquid Soybean brings soybean growers an innovative inoculant that sets the standard for performance.

The two strains of *Bradyrhizobium elkanii* deliver more N fixation through utilization of the nitrogenase enzyme. This provides dense, early nodulation dispersed over the crown and lateral roots compared to competitive inoculants.

The *Delftia acidovorans* quickly colonizes the root system, solubilizing iron in the soybean rhizosphere and stimulating root and root hair development, which helps the plant access more water and nutrients throughout the growing season.

The unique combination of these rhizobia ultimately delivers significant on-plant shoot growth, early greening and vigour to get your crop off to the best start possible.

SOYBEAN

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Your Investment at Work

MPSG's Expanding Research Portfolio

Daryl Domitruk, PhD, Executive Director, MPSG

IN THE SPRING of 2020, MPSG's portfolio of research expanded by nine projects. These projects represent a $600,000 investment by your organization.

I want to begin by explaining how we prioritize work under *Growing Market Demand*, one of our four areas of focus. Within this focus, MPSG concentrates on projects that directly impact farm gate demand or value. This usually means optimizing the qualities of the crop coming off the field. We leave food manufacturing questions to the food manufacturers, retailing questions to the retailers, etc.

A great example of our approach is the question of soybean protein levels. Inside this issue of *Pulse Beat,* Charles Grant describes the problem of protein discounts (page 38). On the facing page (39), Jim House reports on early results from his investigation of elevated levels of essential amino acids in our soybeans. Together these demonstrate the problem, but also a potential solution. It is tantalizing to dream of Manitoba soybean meal having a natural amino acid advantage in the feed market. However, to convince the feed industry, we need more data on actual animal performance. Therefore, among the latest projects, the largest is an almost $500,000 trial at the University of Manitoba (U of M) to evaluate the feeding value of our soybeans for pigs and poultry.

Soil health is a focus area the research committee felt needed a boost. To that end, there are two new projects. Ivan Oreznik's lab at the U of M continues to figure out how the frequency of soybean impacts the population of *Bradyrhizobium* and other members of the soil microbial community. An experiment led by Stephen Crittendon at AAFC–Brandon, conducted at sites across the province, looks at which indicators of soil health a grower can practically control and how important (or not) those indicators are to yield. We've co-invested with Manitoba Crop Alliance on this project.

Furthering our effort to reduce the cost of pest control, Bryan Cassone at Brandon University is developing diagnostic quick tests for root rots. Over at AAFC–Lethbridge, Manitoba-raised Charles Geddes is leading provincial surveys of herbicide-resistant weeds. See a summary of Charles' webinar on page 45.

There's nothing straightforward about the effect of crop rotation on the primary determinants of crop yield. An even less straight forward story is revealed when you look at the level of soil biology and chemistry. This *Pulse Beat* reflects on Yvonne Lawley's thoughts on the matter. And in a new project, Kristen MacMillan the MPSG Agronomist-in-Residence, embarks on a multi-year study at the U of M to figure out just how long the interval between pea crops should be.

In addition to these new projects, the Research and Production program continues to refine its on-farm testing and field surveillance activities. In fact, these will be the focus in 2021 as the provincial research funding program comes to an end, lessening the time commitment on that front. A big question coming up is how MPSG approaches funding plant breeding. For pea breeding (see DJ Bing's article on page 31), we're in discussions with our sister pulse organizations regarding pan-prairie collaboration. We may take a lesson from the wheat organizations and strive for coordinated research and funding across the major pea breeding programs. ■

Research from Concept to Profitability

Manitoba's Diversification Centres

Toban Dyck, Director of Communications, MPSG

Seeding plots this spring at Melita. Leanne Mayes and Chantal Elliott are on the seeder. WADO technician Justice Zhanda is driving.

RESEARCH HAS A VALUE THAT IS DIFFICULT TO EXPRESS TO A BROAD AUDIENCE.

"Let's go back 15 years," said Scott Chalmers, Diversification Specialist at the Westman Agricultural Diversification Organization (WADO) in Melita. "Farmers were unfamiliar with growing soybeans. They were experiencing high bushel loss on rigid headers. Inoculants and phosphorous uptake were relatively unknown issues. That has changed. In reality, our research has helped them get there."

WADO'S main site at Melita this year. There were approximately 2,000 plots that included several MPSG trials such as MCVET peas and dry beans, Kristen MacMillan's dry bean inoculant project, RR soybean variety trials, conventional soybean variety trials and intercropping projects.

There are farmers who prefer charts and graphs. There are farmers who prefer executive summaries with a key takeaway or two. And then there is yet another group skeptical of research, but whose farms grow varieties and utilize methods/products that wouldn't exist without some person's or some organization's dedication to the scientific rigours of trying, testing, repeating and analyzing.

Manitoba Agriculture's Diversification Centres are dedicated to these things.

Chalmers runs one of four such Manitoba Agriculture Crop Diversification Centres in the province. His priority is local research. His priority is local farmers. And, from what I was able to glean from our phone chat, these things are not just priorities but also passions and ones he shares with his fellow specialists.

Haider Abbas is the Diversification Specialist at the Canada-Manitoba Crop Diversification Centre (CMCDC) in Carberry. James Frey is the Diversification Specialist at the Parkland Crop Diversification Foundation (PCDF) in Roblin. Nirmal Hari is the Diversification Specialist at the Prairies East Sustainable Agriculture Initiative (PESAI) in Arborg.

WADO and all of the other Diversification Centres are strategically situated in disparate areas of Manitoba and they are focused on addressing the unique issues relevant to the farms in their respective areas, testing varieties on local soil types, testing inputs and production methods.

Each Centre has its own mandate, but they are all anchored on conducting regional research for farmers and industry and getting those results back to the farmers.

"We get the project," said Chalmers. "Then we do the project. Do the stats. Decipher the story. Learn the takeaway, and repeat if needed."

Together, the Centres have a website where each can post research results, its annual report, videos, and event listings. It serves as a place where farmers can access decision-making tools, as Chalmers pointed out, such as a grain drying cost calculator.

Chalmers is focused on ensuring the results and recommendations that come from the Diversification Centres benefit farmers and not just the industry, an especially challenging mandate when it's easy for private companies to manipulate prices when data related to their products/varieties are released.

"Production practice results, such as inoculation recommendations and rotations, fertility responses, have more impact," he said. "Farmers can personally benefit from these rather than the whole industry. I prefer that farmers have the money. Farming is a tough business."

The Centres could be better utilized, according to Chalmers. "Farmers don't know they can just call us and possibly change an important aspect of their farming operations."

"I manage the activities at the Centre—the employees—the activities—accounting and payroll," said Chalmers. "I spend time working with proposals and coordinating with the Centre's many cooperators. It's a lot of communication. I do the data analysis. The technician does the data entry, drives the equipment and writes the report. I get the results, make sure the I's are dotted and the T's are crossed, proofread them and validate the final reports."

Chalmers knows the area he serves. He's been at WADO since 2007, when it was he who was in the trenches as a technician, fixing equipment, biomassing, working with samples, seed loading and otherwise getting his hands dirty.

For a spell, after Manitoba agronomist Scott Day left the Centre, Chalmers held both the technician and specialist positions. In 2016, the province hired WADO a technician, and in 2018, the Centre hired its own.

WADO, which costs about $280,000–$330,000 per year to run, is the manifest-

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PCDF partnered with WADO for a pea intercropping trial with MPSG in 2019.

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ation of a series of funding sources and a dedicated staff team operating under the guidance of provincial mandates and a board of directors made up of local farmers, who meet once per year to discuss research, projects and operations.

WADO and the other Centres have a relatively consistent stable of trials spanning multiple commodities and multiple commodity groups. But, there are also special projects and those take more time.

"At our last board meeting, we addressed livestock-related projects, on-farm testing, and ways in which we can meet the provincial protein need. Every year, the province revises its initiatives. Long-term projects sometimes get phased out by changing provincial mandates."

"We have 30 acres of tile-drained land testing spacing on various crops," said Nirmal Hari at PESAI in Arborg, a Centre focused largely on excess moisture, including seeding rates, variety tolerance and tile drainage. "It's the second year of that study and there's been a lot of interest among farmers with heavier soils. They want to know how it's going.

PESAI also conducts a lot of variety testing and has seen an increasing interest in forage trials.

At the PCDF in Roblin, James Frey and his team also work on variety trials for a diverse selection of crops, but with an additional focus on intercropping and forage systems.

"The forage projects, in particular, are designed to address the unique characteristics of the Parkland region, which has many livestock producers," said Frey. "With WADO, we are doing one pea intercropping trial with Manitoba Pulse & Soybean Growers (MPSG)."

The CMCDC, in Carberry, falls in line with this commitment to conducting research under local conditions to benefit

PESAI has 30 acres of tile-drained land testing spacing on various crops.

local farmers. This area of Manitoba is synonymous with potatoes. According to the Centre's Specialist Haider Abbas, "Our strategic areas include sustainable irrigation, sustainable potato production, improving the environmental sustainability of intensive crop production and crop diversification."

Over the course of four growing seasons—2017 to 2020—the CMCDC collaborated with Dr. Ramona Mohr, AAFC–Brandon, on an MPSG-funded research project evaluating different residue management practices before growing soybeans. The aim of this study was to evaluate if residue management can improve soil conditions when planting soybeans earlier in May vs. soybeans planted later in May. Look for more information on the lead-up to this project in MPSG's next *Science Edition* magazine. "In this experiment, early seeding increased yield, suggesting the potential benefit of early planting, "said Abbas.

Farmers can submit proposals, as well. In some cases, according to Chalmers, there are specific agronomic questions that farmers want to see WADO address—such as, say, is one way of farming better than another. Diversification Centres are set up to accommodate or, at least, listen to such proposals.

According to Chalmers, some projects are approved just so a product, method or whatever is being proposed can be myth-busted, who was reticent to use a term we've all heard on our farms—snake oil.

"For any new proposal, we consider the cost, the economic value to the farm, the relevance, the uniqueness and the interest levels," said Chalmers. "Say it's Roquette. The province is interested in supporting its needs because of the province's current investment and its desire to further

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Peas at full maturity at CMCDC. This trial is designed to assess yield capacity and protein contents of different pea varieties in partnership with the Manitoba Crop Variety Evaluation Trials.

support its needs and the province's protein initiatives, therefore making the decision to support them much easier."

Currently, Chalmers is working at coordinating a project with the University of Alberta that tackles intercropping and soil health. "What's the design and cost?" said Chalmers. "And what are the treatments? Who's doing what?"

Chalmers recounted working with a local grower interesting in testing intercropping buckwheat, oats and faba beans using mixed row and alternate row seeding methods.

Some of these trial ideas land up being better suited for the farmer to conduct on their farm. "It can work, as long as the farmer is a good communicator and good at getting the job done when it's needed."

When Chalmers started at WADO, GPS was becoming popular and quite accessible. That was a game-changer, he recounted. And now, he's flabbergasted at the amount of data he's able to collect using drone technology. "It's unreal," he said.

"The scale of development in tech—I'm just blown away. It's unbelievable. The pace of progress is overwhelming."

Pea-oat green manure grazing trial with sheep in 2019 at PCDF.

Chalmers tries to keep up-to-date with the happenings of the ag-tech world, but his perspective on it is similar to how he manages research: "You got to find out if it's relevant or not. Embrace it or let it go."

"Soil health technology is a black box I want to tackle," he said. "It's complicated and complex. I ask myself, 'Is this going to be something I can understand and implement or is it over my head?'"

Soil health is a fraught issue, according to Chalmers. It doesn't have a proper definition and it doesn't yet have a universally agreed-upon set of metrics/technologies on which to measure it.

"What are the bugs doing below ground?" Chalmers asked, rhetorically. "Is what we're doing to the soil healthy? If not, how do we get to that point? Is no-till helping? How do we embrace the right approach?"

The answers to these questions, according to Chalmers, represent a common agricultural impasse between economics and environment. He sees climate change as something the ag world needs to take seriously, citing how southwestern Manitoba farms quite differently than it did in the '80s and how that is largely due to a shift in weather patterns.

MPSG had pea trials at WADO this summer, as well as dry bean trials, one of which was through the organization's Agronomist-in-Residence program at the University of Manitoba led by Kristen MacMillan.

"If we don't conduct research, we fall behind globally," said Chalmers. "Then, another country will take our spot and potentially beat us. Research is a way for ag in Manitoba to thrive and stay alive.

"It's exciting to think about where we're going to be in another 15 years," said Chalmers. "I'm trying to do the right thing and put humanity in a better position—it keeps me coming to work." ■

Cassandra Tkachuk, Eastern Production Specialist

LUPINS! An alternative legume crop

This year, we visited a field of lupins in Manitoba! They grow upright like faba beans and form nodules similar to those of peas. These plants also resemble the lupin wildflowers that grow along Ontario roadsides or the perennials you might plant in your flower bed. But they are definitely a unique type of legume.

A few things we learned about lupins:

- Staging goes by groups of leaflets that develop throughout the season. Most plants had one to three groups, and some had up to five by the end of the season.
- It is one of the top two N-fixing pulses, alongside faba beans.
- One of the biggest limitations to growing lupins in Manitoba is the lack of registered herbicide options. Another limitation is marketing opportunities. This particular crop was grown for an Asian seed production contract.
- Research has been conducted by Alberta Agriculture and NDSU's Carrington Research Extension Centre if you're curious to learn more.





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2020 Scouting Notes and Season Overview

Laura Schmidt, MSc, PAg, Western Production Specialist, MPSG

The Bean Report

Your source for soybean and pulse crop agronomy and research.

COOL START

We kicked off the growing season with plenty of moisture in the bank and a bit of a mess to tidy up from last year's harvest—including some standing crop. Spring had a cold, slow start delaying planting dates. Peas and faba beans didn't mind the cooler temperatures, but we ended up with a wide range of planting dates for those crops, from early May to early June. Soybean planting was, for the most part, pushed later. Combined with running into tight deadlines and a shortened growing season window, many acres designated for soybeans were swapped out for other crops like canola.

STRUGGLING THROUGH THE SOIL

Soil crusting, smearing and side-wall compaction from the wet conditions proved challenging for crop emergence. Soybean and dry bean seedlings had yellow, swollen and crooked hypocotyls from trying to grow around soil clods. A general observation was that more seedlings could grow through the crust if seeding rates were higher.

Saline areas of the field were apparent again in our saline-intolerant pulse and soybean crops. Each year we waste expensive seed, fertilizer and pesticides in these barren, marginal areas of the field. It may be time to start thinking about these saline spots as areas we need to crop independently from the rest of our pulse or soybean crop. The best thing we can do to manage these areas and stop their expansion further into the field is to have something tolerant growing and drawing salts down, and soybeans and pulses are just not the answer here.

What are better options? Soil sample to determine the scope of the problem and define the areas of the field affected. Once you have an idea of the salt values in those areas, grow something tolerant to those levels, and maybe even consider a cover crop following harvest.

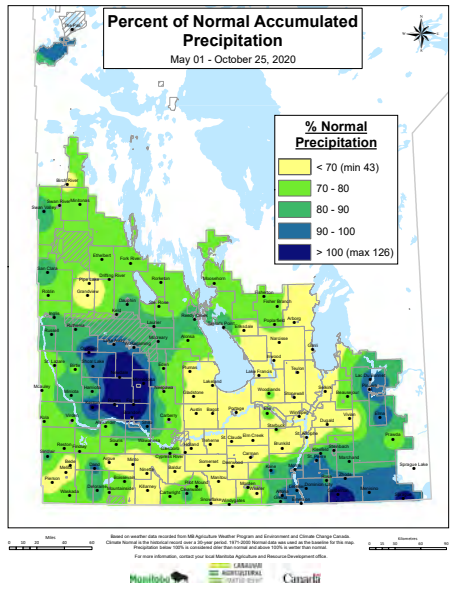
COMPETITIVE PULSE PLANT STANDS

Giving peas a strong start is the foundation of their success and while scouting this year, we saw a range of pea plant stands. Achieving a good stand (350–400,000 plants/ac) maximized yield potential, ensured good standability at harvest and offered weed suppression. Peas really aren't competitive with weeds until the canopy closes, and a higher density stand achieves that much quicker. Lower density pea plant stands were more likely to produce branches to compensate for open spaces.

Weed control was an issue in dry beans once again, and here again, I believe competitive plant stands are key to make sure we're not putting so much strain on our herbicide regime. A recently wrapped up project in Manitoba evaluated plant population, row spacing and variety effects on dry bean yield and weed suppression during wet (2015/16) and dry (2017/18) years. Watch for the results of this research in the next issue of *Pulse Beat – The Science Edition.*

EXTREMES OF MOISTURE

June brought extremes of moisture to several areas in the province. The monsoons hit mid-western and south-eastern regions of Manitoba, while desert-like conditions continued to prevail in the



Interlake. In the west, we were reminded that peas don't like wet feet or standing water and are susceptible to root rot in those conditions. Well-drained fields with coarser soil textures performed better here. Soybeans that weren't drowned out bounced back readily, displaying their ability to tolerate excess moisture once again.

Overall, more moisture in 2020 resulted in some very successful crops. Soybeans grew tall with excellent yield potential. We spotted four-bean pods in several fields — something we hadn't seen in the last couple of years. Dry beans, peas and faba beans were also very successful this year.

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Peas (L) and soybeans (R) under standing water on July 2.

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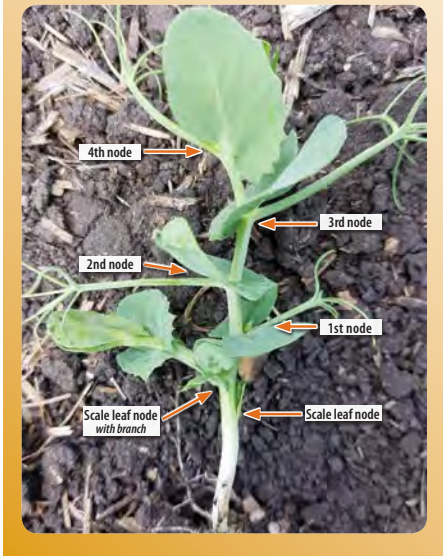
NOTES ON STAGING FIELD PEAS

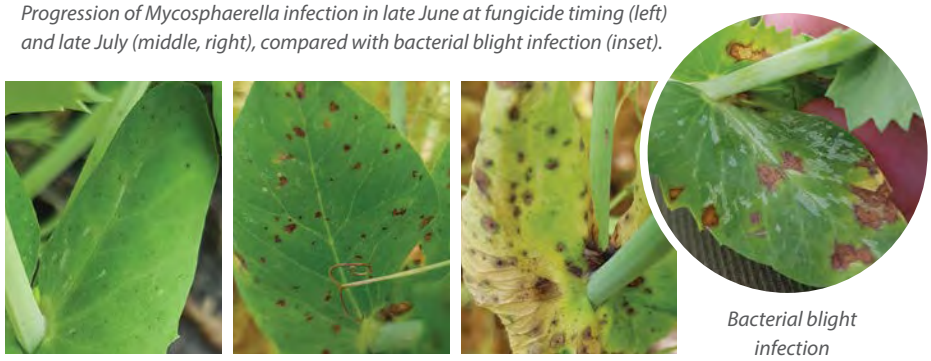
- Special attention should be given when staging field peas, as late herbicide applications can cause crop injury or delayed growth. Most herbicides may be applied up until V6, or the sixth node stage.
- Pull pea plants to count nodes since it will be easier to spot the two scale leaf nodes above or below ground. These aren't included in the total true node count and are often the point from where a branch will grow. Begin counting at the first true node, where you'll see a leaf and tendril clasping the main stem. Stop counting at the last unfurled leaf.
- If the main growing point is damaged, count the nodes on the main stem plus the nodes on the regrowth stem or branch that becomes dominant. The plant doesn't physiologically 'reset' after damage, so it's important to include both nodes' stems.



PEA FUNGICIDE PAID IN MUCH OF THE PROVINCE

While this moisture increased our yield potential, it also meant we had a year to justify fungicide applications in many fields. The decision to spray was more easily made in peas than dry beans. In peas, you could wait until you saw disease symptoms start to show up in the lower canopy to make the call, while dry bean fungicide is purely preventative, and you need to make that decision based on the forecasted conditions. For peas and dry beans, fungicides protected the yield potential that was there this year.

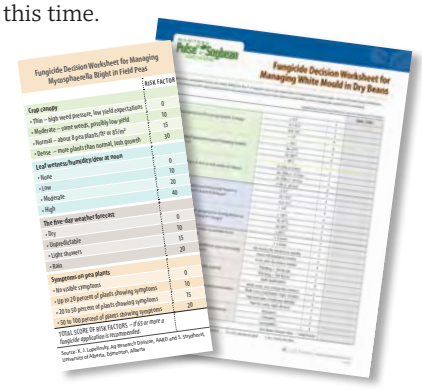
Progression of Mycosphaerella infection in late June at fungicide timing (left) and late July (middle, right), compared with bacterial blight infection (inset).



Bacterial blight infection

An unfortunate result of early-season storms was that bacterial blight showed up in pea canopies right around the time of fungicide application. Mycosphaerella (Ascochyta) blight and bacterial blight in peas look very similar as they progress. This means we need diligent scouting as peas flower, and really need to get down into the canopy to search for the purple freckles of mycosphaerella before they turn into the lesions that are often mistaken for bacterial blight.

Using this checklist may mean multiple visits to the same field to watch for disease progression and weather changes. But this is also an opportunity to assess nodulation and check for other pests, like pea aphids that like to hang out in the upper stipules and flowers around this time.



Pea aphids feeding at plant tips.

SOYBEAN FUNGICIDE

On the other hand, we ask ourselves again, is soybean fungicide really necessary? We've now been asking this question for seven years in the On-Farm Network (OFN). So far, ten sites out of 66 have had a significant yield improvement from soybean fungicide (in 2015, 2017 and 2018). We have significant results, but do they make economic sense?

If we assume an average cost of $15/ac for fungicide application and a soybean price of $10.50/bu, we'd need to see a yield increase of 1.4 bu/ac to break-even. Six sites have had significant yield increases above this, meaning of the 66 trials to-date, we've seen a positive, economic benefit to fungicide only 9% of the time. Something else to note is that three of those six sites were also soybeans the previous year, increasing the disease loads in those fields.

2020 was arguably conducive for disease development, yet not one of the seven OFN soybean fungicide trials resulted in a significant yield response. The fungal diseases we aim to control with fungicide (septoria brown spot and white mould) just have not been yield-limiting in our growing conditions to-date.

But that doesn't mean we shouldn't pay attention to soybean diseases. We've been keeping an eye out for emerging diseases through the annual soybean disease survey. This year, we identified many of the usual suspects (bacterial blight, septoria brown spot, downy mildew and northern stem canker). Interesting finds for me this year included Cercospora leaf blight, which resembles sun bronzing, and late-season Alternaria infection, which looks like premature plant ripening. Neither of these diseases are typically yield-limiting.

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Cercospora leaf blight (L) and late-season Alternaria leaf spot (R) found during the annual soybean disease survey.

DETAILS OF DESICCATION

This year, many farmers paid close attention to their desiccation decisions in peas and dry beans, as consumers and buyers have become increasingly cautious around these late-season chemical applications. This meant diligent scouting for the appropriate timing of 30% seed moisture in the least mature areas of the field—where bottom seeds rattle in pods, colour change has occurred in middle pods and the top, greenest pods have an orange peel-like texture and seeds within split evenly rather than squash when under pressure. At MPSG, we're working to create detailed fact sheets that illustrate what 30% seed moisture looks like to better support farmers in this area.

EARLY FROST

September 8 brought a hard frost across much of western Manitoba, followed by a light frost the next evening in the central and eastern regions. Many soybeans in the west were still filling pods (R6) and were susceptible to yield and quality loss as a result. As these fields were harvested, percent greens were quite high. Earlier-planted and earlier-maturing soybeans ranged from R7 to R8 and were unharmed by the frost.

Some fields were harvested in stages to separate the quality of more mature areas from those hit harder by the frost, and some were put into storage, anticipating some colour change to occur in the bin.

Soybeans at R6.5 near Pilot Mound on September 9 following a hard frost.

This served as an important reminder to match your variety selection with your maturity zone, based on the probability of when a hard, killing frost will occur.

DRY HARVEST CONDITIONS

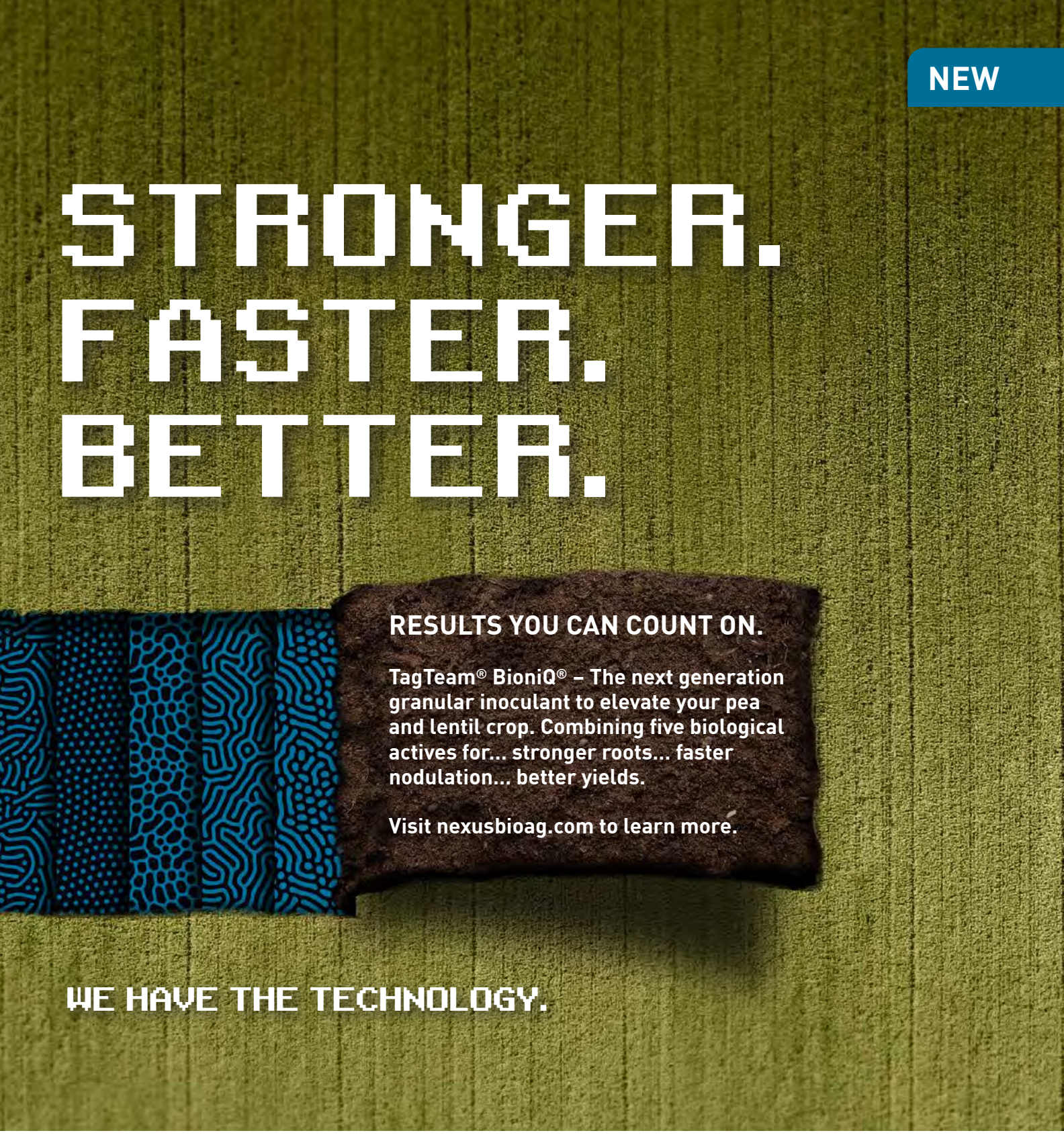
Harvest turned out to be pleasantly different from the last few years, with many farmers wrapping up in time for Thanksgiving, thanks to drier conditions. Despite the drier fall, we're sitting at better soil moisture conditions going into winter than previous years across the province. ■

Navy beans and yellow peas that are ready for desiccation. Seeds within the top, greenest pods split evenly.

L to R (top, middle, bottom pod)

THINGS MPSG'S AGRONOMY TEAM HAVE BEEN WORKING ON

- Creating videos and image libraries to help ID pests and provide solutions for production issues in the field
- Making observations in the On-Farm Network to better explain why we see the yield results we do
- Ground-truthing fungicide decision checklists
- Surveying pulse and soybean crops for diseases and insects
- Tracking down "What does 30% seed moisture look like" in our pulse crops to aid late-season herbicide application timing
- Providing agronomy and production support to farmers



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Embracing Change. . .at Home and in the Field

An update from the soybean and pulse agronomy research program

Kristen P. MacMillan, MSc, PAg, Agronomist-in-Residence, Department of Plant Science, University of Manitoba

Figure 1. A look back pre-pandemic at a busy SMART field day in Arborg, MB, on July 19, 2018, where the soybean seed depth and seeding window experiments were highlighted.

IT'S BEEN OVER a year since I last wrote in *Pulse Beat* and there is no shortage of things to catch up on. First, my husband and I proudly welcomed our first child into the world. If you can think of all the clichés of being first-time parents, we've recently been there. That includes timing naps around rides in the combine and seeder.

Now while all that fun stuff was happening at home, the momentum kept up at work. Pea agronomy research was initiated, a soybean paper was published and 2019 was our busiest research season with 20 field trials spread across six locations in Manitoba. The reality that I became a mother during our busiest field season speaks volumes to the team behind the soybean and pulse agronomy research program. I want to acknowledge Brodie Erb, Ishan Samaranayake, Nate Ort and Mike Erb, along with our summer students, for providing top-notch technical support. To borrow an analogy from one of my mentors, Don Flaten, they are truly self-propelled. Field research activities resumed during my maternity leave and I even made a few trips to the field and office with my daughter.

The 2020 growing season has also been busy as we all continue to navigate a global pandemic. New protocols are in place for us to continue working together while staying apart, and despite some reduction in capacity, research continues. The most significant change is the number of people who work on the University of Manitoba campus, with capacity restricted to 20–40% of people at any given time. My return to work this summer was greeted not by farmers and agronomists at field days (Figure 1), but rather by a pile of data and virtual meetings in my home office. Looking ahead to this winter, the primary source of information from the soybean and pulse agronomy program will be the annual report. Until then, my field crew will be busy processing samples and organizing data, and I'll be at my computer – crunching numbers and writing reports. For now, here's a reminder of our activities in soybeans, dry beans and peas.

SOYBEANS

Studies evaluating the optimum seeding window and seed depth for soybeans, and yield response to fungicide application, wrapped up in 2019 and final results are being analyzed. We once again harvested the soybean iron deficiency chlorosis (IDC) variety evaluation site and continue to evaluate the relationship between IDC and yield. In 2021, I will be looking to survey soybean fields that are prone to IDC. If you have a field of soybeans planned for 2021 that consistently expresses yellowing due to IDC, please contact me at kristen.macmillan@umanitoba.ca.

In other soybean work, we started collaborating with Dr. Charles Geddes in 2019 to test integrated weed management strategies for soybeans. The management practices being tested are variety choice, preceding crop type, residue management and seeding date. The objective is to determine if these cultural practices affect soybean's ability to compete with or withstand weed competition.

Lastly, we continue to test new soybean intercrop and relay crop systems. These include a soybean-flax intercrop, winter wheat-soybean relay crop and fall rye-soybean relay crop. We are testing different seeding rate ratios for the soybean-flax intercrop, and for the relay crop systems, we are evaluating multiple row spacings.

FIRST SOYBEAN PUBLICATION

Just before my daughter came into the world, I was working on a paper to share new insight with the scientific community on how soybeans grow in our prairie environment. During maternity leave, somehow between infrequent naps and sleepless nights, this paper was submitted, revised, accepted and published in the *Agronomy Journal*. This publication expands on a previous seeding date study that produced data to re-evaluate Manitoba's soybean seeding deadlines. It is a landmark study for western Canada, characterizing soybean yield, yield components and seed quality for modern varieties that will help researchers across North America understand and improve soybeans for the Canadian prairies. A summary of the data is presented here in a neat info-graphic (Figure 2) and the open-access journal article can be found at this link: https://doi.org/10.1002/agj2.20185.

One of the takeaways from this publication and an emerging theme in my research is the importance of environment in determining soybean yield. Soybeans are somewhat unique compared to other crops like wheat, canola and corn, which are highly responsive to management practices like fertility and spatial arrangement (in addition to environment). The "environment" refers to soil, landscape and weather conditions that interact each growing season and are proving to be more influential on soybean outcomes than many management practices,

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including variety choice, seeding date and fungicide application. That doesn't mean you shouldn't continue using best management practices, but I do think some of that focus should be shifted to environment (field) management. What aspects of each field on your farm promote or limit crop yields? Can they be improved? Are they being addressed?

PEAS

In response to the progress being made in the plant protein industry, the 2020 growing season marks the first year that we embark on dedicated pea agronomy research. In our first experiment, we are seeking to answer the following questions for farmers and agronomists:

1. Is pea yield affected by stubble type (wheat vs. canola)?
2. Does residue management (tilled or direct seed) affect pea productivity?
3. Do peas respond to starter phosphorus and does placement matter (seed placed vs. sideband vs. none)?
4. Do these management practices interact?

As pea production opportunities expand in Manitoba, no local research is available to support these agronomic decisions, which are important for maximizing pea productivity. Currently, approximately 38% of Manitoba pea acres are grown on wheat stubble and 20% on canola stubble, with crop insurance data pointing towards a yield advantage to wheat stubble (MASC 2015–2018). Meanwhile, less than half of western Canadian farmers are applying phosphorus for pea production (Stratus Ag Research 2015). And while no data is available on residue management practices, peas are tolerant to early seeding into cool soil, which presents an opportunity for reduced or rotational tillage systems.

While this is the first experiment focusing specifically on peas, we continue to evaluate new pea intercrop and relay crop systems. These include pea-canola, pea-flax and pea-oat intercrops as well as fall rye-pea and winter wheat-pea relay crops.

DRY BEANS

The dry bean nitrogen fertility experiment where we evaluated the response of Windbreaker pinto beans and T9905 navy beans to five rates of N fertilizer (0, 35, 70, 105 and 140 lbs/ac) ended in 2019. I'm currently analyzing and summarizing the data for release this winter. In the first two years of the study, it was clear that beans were able to produce respectable yields without the addition of N fertilizer, but the economics were unclear. This finding and the observation of nodulation has fuelled my quest to better understand our N strategy and N fixation capacity of dry beans. During winter extension meetings in 2019, I connected with two companies that had new inoculant offerings for western Canada. We put these to the test in 2019 and 2020 at Carman and Melita. Stay tuned for these brand-new results this winter. Some farmers have also tested N management practices through MPSG's On-Farm Network.

We are also closer to understanding the impact of preceding crop type and residue management on dry bean productivity. We just harvested the final crop of pinto beans in that experiment at Carman and Portage.

The annual report from the Soybean and Pulse Agronomy Lab will be available this winter and include results and updates from these experiments.

Stay tuned! ■

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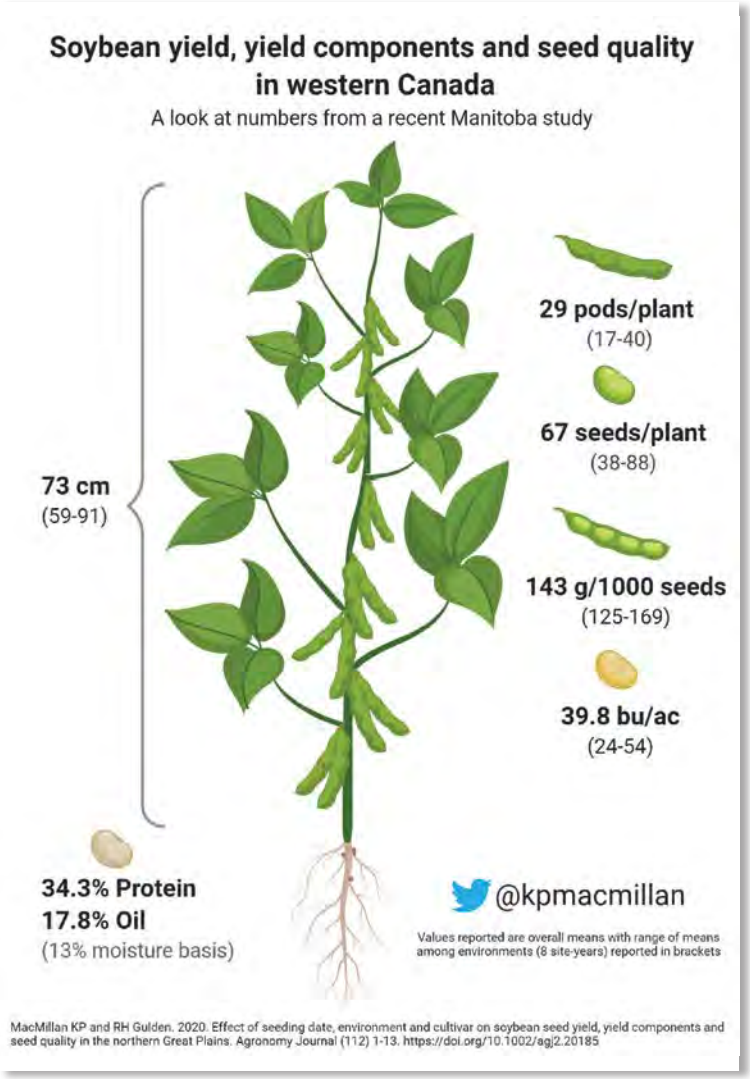
Manitoba Agricultural Services Corporation (MASC). 2010-2015. *Crop rotation and yield information.* MASC [Online]. Available: https://www.masc.mb.ca/masc.nsf/mmpp_crop_rotations.html

Stratus Ag Research. 2015. *Canadian Fertilizer Use Survey*. Stratus Ag Research [Online].

Figure 2. Soybean yield, yield components and seed quality from a recently published Manitoba study evaluating soybean seeding dates at Arborg, Carman and Portage la Prairie, MB (2015–2017).



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Field Pea Breeding at Agriculture and Agri-Food Canada

Dengjin Bing, PhD, Lacombe Research and Development Centre, Agriculture and Agri-Food Canada

FIELD PEA (Pisum *sativum*) is the most widely grown pulse crop in Canada, and Canada is the leading producer and exporter of field peas in the world. Breeding for improved field pea varieties for Canadian pulse growers is an integrated part of the Agriculture and Agri-Food Canada (AAFC) cereals and pulse research strategy. In this article, I will describe the major breeding activities and their status. In particular, I will present the relevant information on pea varieties the AAFC field pea breeding program has developed to assist producers in choosing appropriate varieties for production.

The breeding program has developed varieties of six market classes, including yellow, green, maple, marrowfat, red (also known as orange) and forage (Figure 1). Since early 2000, 30 varieties have been released to Canadian and U.S. markets from the program (Table 1). These varieties include 20 yellow, four green, two maple, two marrowfat, one red and one forage pea. Producers interested in a particular type can contact the licensee(s) of that variety.

The primary breeding objectives for all market classes are high yield, good harvestability (good standability and low pod-shattering), resistance or tolerance to major field pea diseases, including powdery mildew, mycophaerella blight and fusarium wilt, and good seed quality.

This breeding has resulted in gradual but steady yield improvements in all market classes. However, in general, the higher yield is positively associated with later maturity (Figure 2) and taller plant height (Figure 3). To capitalize on the maximum yield advantage, producers may choose taller varieties with appropriate maturity in their production regions.

Good lodging resistance (aka standability) is an important characteristic of a superior field pea variety since it facilitates harvest and reduces dockage of harvested grains (Figure 4). No clear relationship between yield and lodging

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Figure 1. Market classes of field pea varieties developed by the AAFC field pea breeding program. A – Yellow B – Green C and D – Maple E – Marrowfat F – Red

Table 1. Field pea varieties developed at Agriculture and Agri-Food Canada since 2003.

Variety	Market Class	Year of Release	Licensee
Miser	Yellow	2003	SeCan Association, ON
Canstar	Yellow	2005	Canseed Canada Ltd., AB
Reward	Yellow	2005	Canterra Seeds Ltd., MB
Agassiz	Yellow	2006	Canterra Seeds Ltd., MB
Thunderbird	Yellow	2006	Canterra Seeds Ltd., MB
Mendel	Green	2008	FP Genetics, SK
Hugo	Yellow	2008	FP Genetics, SK
Stella	Forage	2009	FP Genetics, SK
Argus	Yellow	2009	SeCan Association, ON
Earlystar	Yellow	2011	Canterra Seeds Ltd., MB
AAC Peace River	Yellow	2012	Hadland Seed Farm Ltd., BC
AAC Barrhead	Yellow	2013	Canseed Canada Ltd., AB
AAC Lacombe	Yellow	2013	SeedNet Inc., AB
AAC Ardill	Yellow	2013	Wagon Wheel Seed Corporation, SK
AAC Radius	Green	2014	Columbia Seed Co. Ltd., AB
AAC Royce	Green	2014	Columbia Seed Co. Ltd., AB
AAC Liscard	Maple	2014	Wagon Wheel Seed Corporation, SK
AAC Carver	Yellow	2014	Canterra Seeds Ltd., MB
AAC Comfort	Green	2016	Canterra Seeds Ltd., MB
AAC Oriole	Red	2016	Wayfinder Farms, SK
AAC Chrome	Yellow	2017	FP Genetics, SK
AAC Asher	Yellow	2018	Legume Logic, ND, USA
AAC Delhi	Yellow	2018	SeedNet Inc., AB
AAC Lorlie	Maple	2019	Wagon Wheel Seed Corporation, SK
AAC Olive	Marrowfat	2019	Columbia Seed Co. Ltd., AB
AAC Bingo	Marrowfat	2019	D Five Holdings, SK
AAC Profit	Yellow	2019	Legume Logic, ND, USA
AAC Aberdeen	Yellow	2019	Alliance Seeds, MB
P0937-4006	Yellow	2020	FP Genetics, Legume Logic and Great Northern Ag
P0938-4055	Yellow	2020	Canterra Seeds Ltd., MB

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Figure 2. Relationship between yield and maturity of AAFC yellow pea varieties.

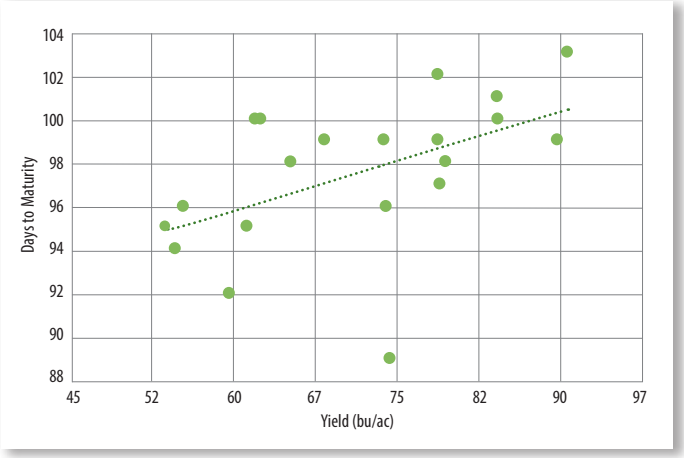
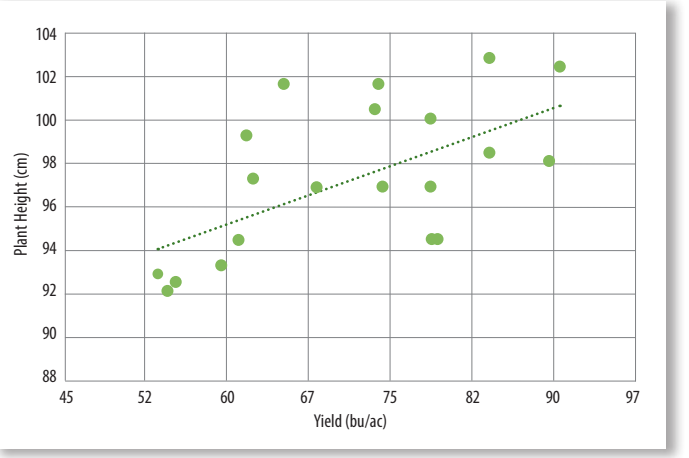


Figure 3. Relationship between yield and plant height of AAFC yellow pea varieties.



has been found in the AAFC varieties. This may be related to the fact that these varieties have been selected for improved standability. The majority of varieties have a pre-harvest lodging score of 2.4 to 4.8 on a 1–9 scale, and there is little difference among the varieties.

Seed size is also a significant factor to consider when choosing an appropriate variety to grow. Small seed size can reduce the seed cost at planting, but a large seed size of good quality can have a market premium. The seed size of the AAFC pea varieties varies greatly depending on the market classes. For the marrowfat varieties, the thousand seed weight (TSW) is greater than 340 g. For the yellow pea varieties, the TSW ranges from 190–288 g and in general, high-yielding varieties have a TSW around 220–250 g. However, it should be noted that the seed size is variety-specific, and environmental conditions significantly influence it.

All of the AAFC field pea varieties are resistant to powdery mildew and moderately tolerant to mycophaerella blight and fusarium wilt for disease resistance. In production regions with prevalent mycophaerella blight and fusarium wilt, appropriate disease management should be expected.

In addition to the aforementioned breeding objectives, this program has been breeding for improved protein content for several years. In recent years, the program has increased its efforts to develop varieties with improved resistance or tolerance to root rot. However, these are very challenging breeding objectives and have yet to result in commercial varieties. ■

Acknowledgement

The AAFC field pea breeding program has been strongly supported by Alberta, Saskatchewan, and Manitoba's pulse producers. The current breeding activities are funded through the Canadian Agriculture Partnership-Pulse Cluster program. This strong support has been essential for the program's success in the past and in coming years, and is greatly appreciated.

Figure 4. Selection for varieties with good lodging resistance.

Findings from the On-Farm Network

Do higher soybean seeding rates pay?

Megan Bourns, MSc, On-Farm Network Agronomist, MPSG

SOYBEANS ARE AN attractive addition to diversify crop rotations in Manitoba as a nitrogen-fixing, low input crop. Seems ideal for your bottom line, right? However, there is one large limiting factor to the low input cost, and that is the cost of seed. Relative to most other crops grown in Manitoba, soybean seed cost is quite high. With that in mind, efficient use of seed inputs is critical for protecting positive economic outcomes at the end of the season.

The On-Farm Network (OFN), MPSG's in-house research program, has been investigating soybean seeding rates since 2012. Over seven years, a total of 75 soybean seeding rate trials were conducted, comparing seeding rates ranging from 125,000 to 239,000 seeds/ac (Figure 1). Each trial compared two or three seeding rates. Although various combinations of seeding rates have been used across the 75 trials, the main question remains consistent: "Can I lower my seeding rate while maintaining my yield?" Generally speaking, the answer seems to be yes.

Out of the total 75 trials, only 16 (or 21%) had a significant yield difference between seeding rates (Figure 2). Of these 16 trials, the higher seeding rates significantly out-yielded the lower seeding rates at 15 site-years, as expected. One

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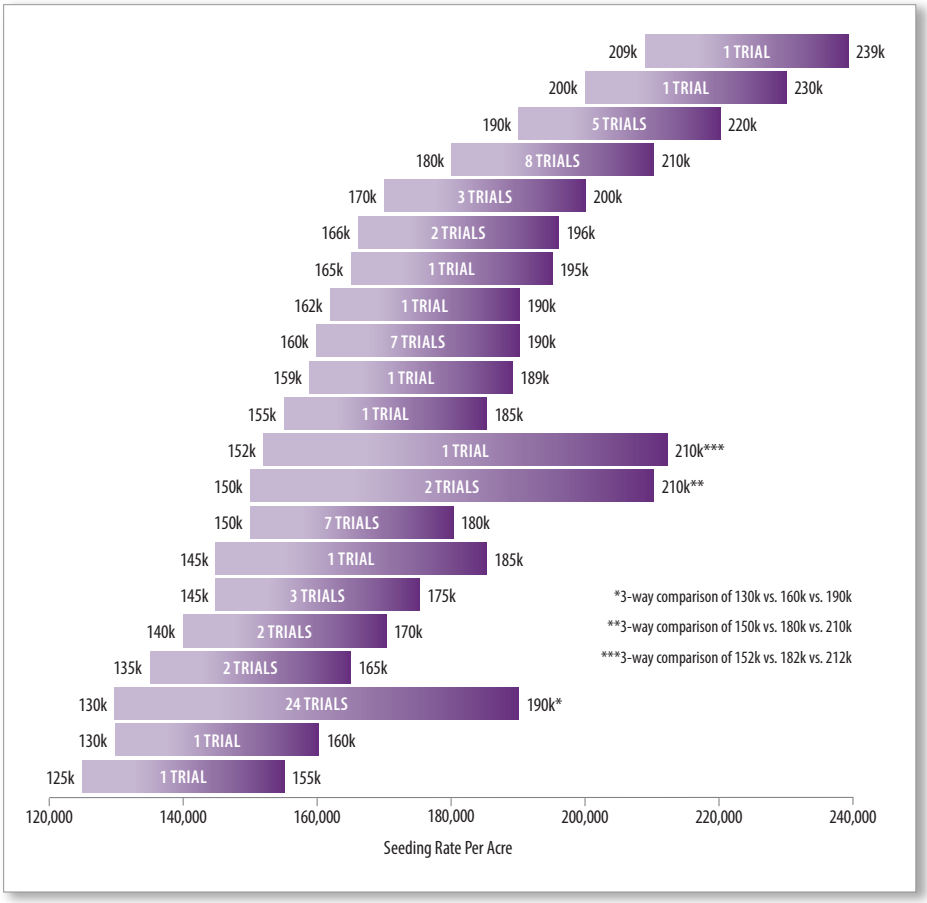
Current guidelines recommend targeting a stand of 140,000 to 160,000 live plants/ac. To achieve that target plant stand, seeding rates should account for expected seed survivability, which is usually 75–80% for soybeans, but can differ with seed lot, seeding conditions, etc. For example, assuming a seed survivability rate of 75% and targeting plant stand of 140,000 live plants/ac, a seeding rate of 190,000 seeds/ac would be required.

Figure 1. OFN seeding rate comparisons from 2012 to 2019 and the number of trials for each comparison.



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site in 2012 had the opposite result, but that site had less than 45% emergence in the spring due to poor seed quality. The positive trend with greater seeding rates might make it seem as though reducing rates is not such a great idea after all. However, we need to break down the results further to look at the economics.

The paired bars in Figure 3 show the yield results for the 16 trials with significant yield differences between seeding rate treatments. Below the bars, the bu/ac value is the yield difference between the high and low seeding rate for each trial. Along with that yield difference is the soybean price required to offset the additional seed cost of the higher seeding rate at planting, based on the yield increase at harvest. These break-even prices range from $3.85/bu, an obvious economically favourable yield response, to $23.75/bu, an out-of-the-question soybean price in today's market. Examining the sites in Figure 2, only a handful of higher seeding rates resulted in yield increases great enough to cover the additional seed cost per acre, assuming realistic soybean prices. If we assume prices are below $10.00/bu, about 8% of the trials had enough of a yield increase with a higher seeding rate to pay for the increased seed cost in the spring (Figure 2). If we are optimistic that prices will continue to be closer to $11/bu in the future, then about 14% of the sites show a positive economic return from increased seeding rate. Whether we are

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Figure 2. Proportion of 75 seeding rate trials with significant yield and economic responses at soybean prices <$10/bu (A) and <$11/bu (B)

Economic response determined using the soybean seed and seed treatment cost of $66.50/unit from Manitoba Agriculture's 2020 *Cost of Production Guidelines*.

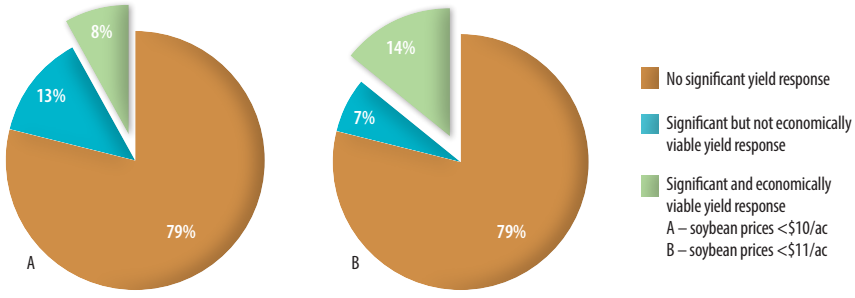
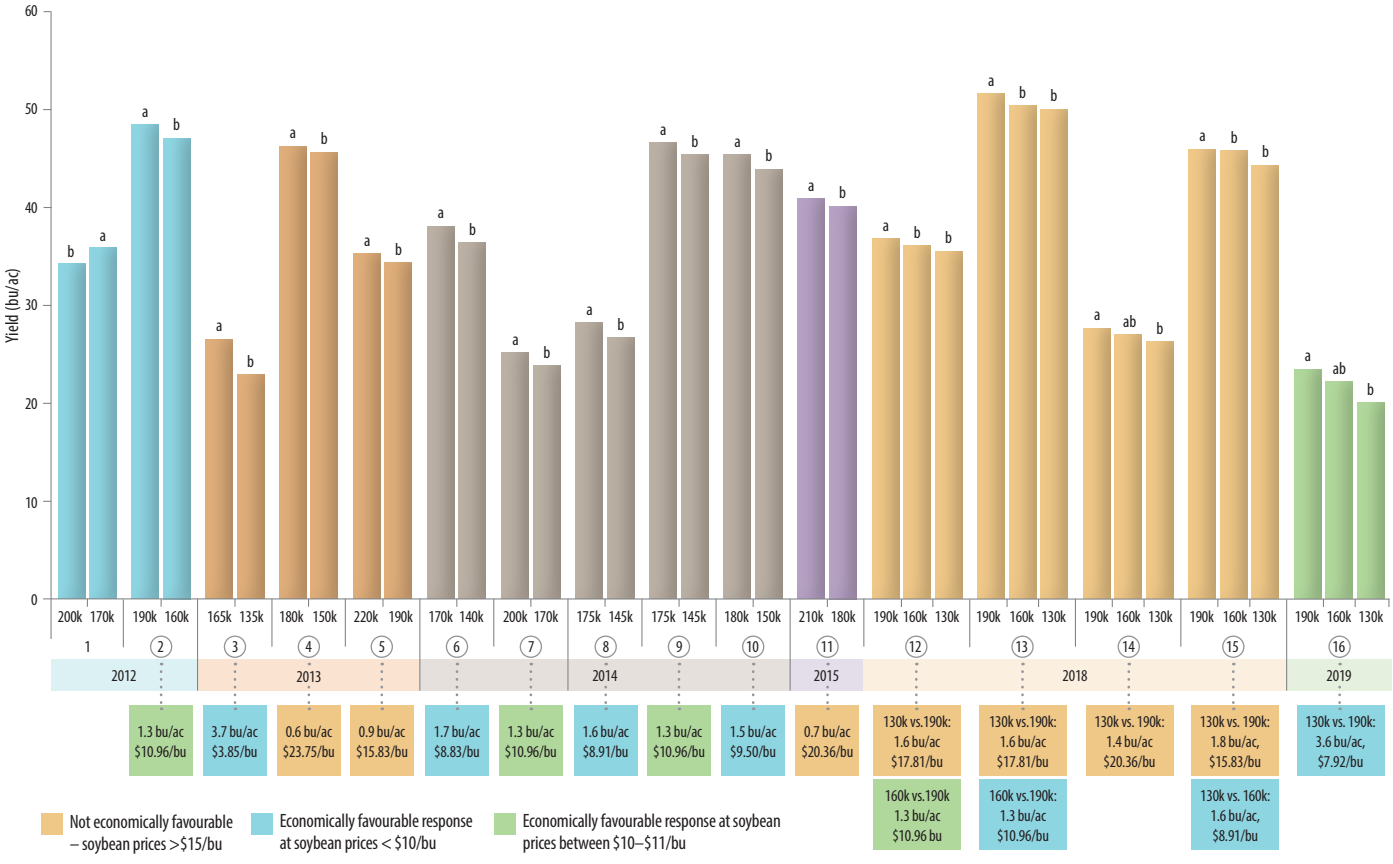
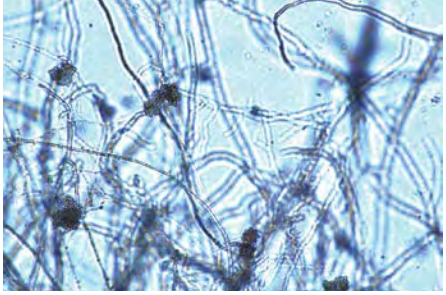


Figure 3. Trials with significant yield differences between seeding rates from 2012 to 2019. Values below the paired bars show the yield difference between seeding rates (bu/ac), followed by the soybean price ($/bu) required to break even at the higher seeding rate with the respective yield increase.



Within each trial, different letters above bars indicate statistically significant differences between seeding rates.



Aphanomyces Root Rot

Dr. Syama Chatterton, Plant Pathologist, Lethbridge Research Centre, Agriculture and Agri-Food Canada

Figure 1. Zoospores in clusters are released and can swim short distances in wet soil to find a host root.

APHANOMYCES ROOT ROT is historically the most destructive disease of peas. Although reported in Manitoba for the first time in 1997 and into the early 2000s, it has recently made a resurgence and was reported in Saskatchewan for the first time in 2012 and Alberta in 2013. Since that time, prairie-wide surveys have revealed that it is widespread across all pea- and lentil-growing regions of the prairies. Wet and warm soil conditions favour the disease, and thus the wet growing seasons of the early-mid 2010s likely caused the widespread explosion of the disease.

CAUSAL AGENT

Aphanomyces root rot is caused by *Aphanomyces euteiches*. This micro-organism belongs to a group called oomycetes or water-moulds because, unlike fungi, there is a portion of its life cycle that is dependent on water. Zoospores, microscopic swimming cells (Figure 1), are released from resting spores (oospores, Figure 2) under high soil-moisture conditions when a host crop is present. The zoospores can swim through free water in soil pores to find and attach to a host root. The zoospores then germinate to produce mycelia (thread-like strands) that infect host roots and quickly spread throughout the root system. When root nutrients have been used up, or environmental conditions become inhospitable, the pathogen initiates sexual reproduction to produce thick-walled oospores. Oospores survive in soil and plant debris in a dormant state for many

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optimistic, pessimistic or somewhere in between regarding soybean prices, 8–14% isn't a very high success rate of favourable economic outcomes. Does this mean we can all reduce our seeding rates next spring? If so, how low can we go? Unfortunately, there isn't likely to be a one-size-fits-all answer.

Seeding rate trials are ongoing in the OFN, and as the dataset continues to expand, so too will our analysis into the factors affecting yield outcomes for different seeding rates. A very important piece of the seeding rate puzzle is seed survivability—how much of what we put in the ground actually grows into a yield-producing plant? How can we optimize seed survivability? Is this the key to lowering seeding rates even further? How low is too low?

These are the types of questions we seek to answer in the OFN and we need your participation to make it happen! If you are interested in investigating different seeding rates on your farm, contact the OFN (204-751-0439 or megan@manitobapulse.ca). Stay tuned for the spring edition of *Pulse Beat*, where we will dive further into the seeding rate trial results, including those from the 2020 growing season, and discuss seed survivability, the factors affecting it and its influence on yield response. ■

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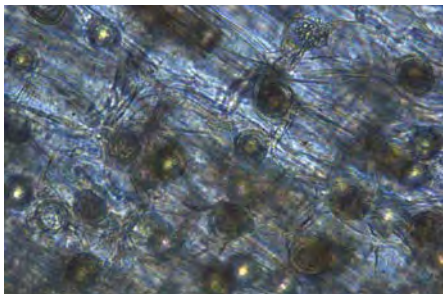

Figure 2. Oospores, in a pea root, have very thick cell walls that make them resistant to breakdown.

years and can withstand freezing and dry conditions. Thus, *A. euteiches* overwinters exclusively as oospores. Oospore germination and infection can occur at any time over the growing season, as long as soil moisture is adequate. Although zoospores are the propagules of *A. euteiches* that directly infect the host, their quantity is dependent on the number of viable oospores within the soil. Therefore, oospores are considered the primary drivers of disease and quantification of oospores in the soil will facilitate disease prediction.

SYMPTOMS AND HOST RANGE

Roots infected by *A. euteiches* appear honey-brown in colour, with symptoms appearing on lateral roots very quickly after initial infection (Figure 3). However, it is difficult to catch the disease at this stage, as infection spreads through the roots quickly. The root cortical (or outer) tissue becomes soft and dark brown in colour as the disease progresses, and infection moves into the main taproot and epicotyl (portion between the seed and green stem), which becomes pinched, honey-coloured and soft (Figure 4). This is the stage where Aphanomyces root rot is the most recognizable and can be distinguished from other root rot pathogens. However, this stage is also short-lived, and in later stages, when infected plants are pulled from the soil, the cortex becomes easily sloughed off and remains behind in the soil. Oospores are produced in these outer infected tissues. In later stages, the epicotyl and taproot also become dark or blackened, usually due to infection by other organisms, such as *Fusarium* and *Pythium*

Figure 3. Lateral roots appear honey-brown in early stages of Aphanomyces infection.

Figure 4. Later stages of infection when Aphanomyces has moved into the tap root and epicotyl causing pinching, browning and softening of the tissue, and loss of root mass.

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Figure 5. Advanced symptoms where tap root is blackened by secondary pathogens, and root cortex has decayed away.

Figure 6. Extensive yellowing of pea shoots due to early-season Aphanomyces infection.

species (Figure 5). When an infection is severe, shoots become wilted, chlorotic and stunted, with leaves of infected plants progressively yellowing from the bottom of the shoot upward (Figure 6). Shoots are particularly affected if infection occurs early in the season. Because the root system becomes decayed, nodule production is also affected, which further exacerbates symptoms, as plants will not be able to fix nitrogen needed for growth. As a result of both root infection and nodule loss, infected plants produce fewer pods, a reduced number of seeds per pod, or may even die before pod development. The degree of yield loss is largely dependent on the environment. Very wet conditions in spring (approximately 4–6 weeks after seeding), followed by dry conditions, often result in the most significant yield losses, as plants will have a diminished root system that cannot deal with drought stress.

In low to moderately infested fields, the disease is first evident as yellow patches in low-lying areas of the field, or in areas where water accumulates, like water tracks or seepage areas (Figure 7). It is important to note these test areas, as the pathogen can quickly spread across the whole field during periods of flooding or water-saturation of the field. An inoculum density of 100 oospores/g soil is the threshold needed to cause moderate to severe root rot. Oospore levels can increase quickly in these infested patches. A field with a low inoculum level, or a few small patches, can produce sufficient inoculum to destroy a subsequent pea crop, particularly if wet conditions persist in favouring infection. In highly infested fields, the pathogen tends to be distributed fairly uniformly across the field, and the entire field can show yellowing. However, areas prone to water collection will be worse.

Figure 7. Signs of early infestation in a field include yellowing patches often observed along water tracks or in low-lying areas.

Aphanomyces has a host range confined to the legume family. In inoculation tests, *A. euteiches* could infect peas, alfalfa, snap beans, dry beans, red clover, lentils, vetches and many different weed species. Faba beans, chickpeas and soybeans may show little to no infection but is dependent on variety. There is evidence that some non-legume plants, such as spinach, oats and red-root pigweed, can be infected by *A. euteiches* and this can potentially be exploited to reduce oospore levels in soil. There is also some degree of host-specialization of different isolates of the pathogen. Isolates from peas can infect other legumes, including alfalfa and lentils, but most isolates from beans and red clover do not infect peas. Furthermore, races of the pathogen have been described for alfalfa, but not for peas. For alfalfa, there are two distinct races of *A. euteiches* with different varieties of alfalfa displaying resistance to race 1 or 2.

DISEASE MANAGEMENT AND RESEARCH

Aphanomyces root rot remains very difficult to manage because the oospores are long-lived and soil-borne. Intego Solo (a.i. ethaboxam) is the only product currently registered for early-season suppression of Aphanomyces root rot but does not provide full-season control. The most effective way to reduce losses caused by this disease is to avoid planting peas or lentils in moderate to highly infested fields. Many labs in the prairies offer soil testing services for the presence/absence of *A. euteiches* based on DNA screening of root or soil samples, but to date, do not provide information on infestation level. If a field tests positive for Aphanomyces, crop rotation away from peas or lentils for 6–8 years or longer is required to reduce oospore levels below the threshold. Legume species such as soybeans, chickpeas, fenugreek, lupins and some faba bean varieties are resistant and can be good options to replace peas. In contrast, lentils, alfalfa and vetches are susceptible to the disease and would contribute to increasing oospore levels in the soil. There are currently no cultivars of pea with resistance to Aphanomyces root rot.

Aphanomyces root rot is a relatively new disease to the prairies, so research into managing this disease on the prairies also started relatively recently. Research at the University of Saskatchewan is underway to develop cultivars with partial resistance to the disease. There are several research projects aimed at agronomic practices that may mitigate impacts of Aphanomyces root rot, which include evaluation of various seed treatments, soil amendments (e.g. liming), crop rotation and use of Brassica, rye and oat cover crops or intercrops. Significant research effort into developing a quantitative test for measuring oospore levels in the soil and predicting disease risk is also ongoing. ■

Protein Discounts for Manitoba-Grown Soybeans

Charles Grant, PhD, PAg – Senior Instructor, Department of Agribusiness and Agricultural Economics, Faculty of Agricultural and Food Sciences, University of Manitoba

SOYBEANS GROWN IN Manitoba generally show protein levels in the 37% to 38% range. This is below the 40% protein level required by soybean processors producing 47.5% protein soybean meal for animal feed.

Processors provide protein guarantees for their soymeal products and pay claims to buyers if those guaranteed protein contents are not met. To best meet those guarantees, it would be ideal if processors could procure a steady supply of 40% protein soybeans. The challenge is that soybeans vary in protein content by region and by year, and those soybeans with lower than 40% protein require blending with higher protein soybeans to achieve a processed 47.5% soybean meal.

Blending is not a particularly sophisticated process. It is a matter of estimating the blend that can give the percent target protein level in the soybean meal, doing the mix and checking the result.

Difficulties in blending can often be a result of logistical limitations like non-availability of rail cars for deliveries of soybeans and weight restrictions on roads in the springtime that limit deliveries of the raw product. These limitations can make it difficult to access the required range of soybeans in terms of protein level and to consequently maintain consistent quality of soybean meal across seasons.

Manitoba-grown soybeans are typically blended with higher protein soybeans procured from somewhere else, say Ontario or Quebec, where soybeans are generally at or above a 40% protein level. Blending unfortunately, can introduce inefficiency in processing and inconsistency in product quality. This inefficiency costs money, so that is why lower protein soybeans face discounted prices.

Protein level guarantees in soybean meal have been reduced over time from 48.5% to 47.5%, and now at times to 46.5%. These reduced guarantees are a result of generally declining protein levels in soybeans across North America. The push for higher yields in soybeans seems to have caused a reduction in protein levels. However, this yield-protein offset is not fully understood.

The desire of feed companies buying soybean meal from soybean crushers is that the product quality be consistent in terms of protein level (47.5%), fat (0.5%), fibre (3.5%) and moisture (12%). Consistent quality allows feed companies to assure deliverable guarantees to their customers and to use consistent milling specifications in their feeds. A reason for the decline in protein guarantee from 48.5% to 47.5% to 46.5% is that it makes it easier for the soybean crushers to maintain a consistent protein guarantee to the feed mills year in and year out.

There are several discounts commonly applied to soybeans by soybean buyers. These include test weight, moisture, foreign material, damage and splits. Protein has, to date, not been a discount item for soybeans that has been explicitly stated, but rather an unnamed part of the basis off the Chicago Mercantile Exchange futures price. Protein discounts have typically been set relative to the protein levels of soybeans that are available in the marketplace at a given time. This pricing with a market-availability protein reference is due to the variability in soybean protein levels across regions and protein variability from year-to-year.

The lower protein levels in Manitoba-grown soybeans have processors discounting them below soybeans grown in Ontario or Quebec. Manitoba soybeans generally run 10 to 20 cents per bushel lower for 1.5 to 2 percent protein levels below the Ontario or Quebec standard for the crop year. This price discount is in the range of 1 to 2 percent off the 40% protein soybean price.

With continuing soybean production on the eastern prairies, the industry has the incentive to raise protein levels. Ontario and Quebec have been growing soybeans for some time and have had the time to hone their soybean skills—both production and marketing.

While the protein levels in soybeans affect the cost of soybean meal in Manitoba, the protein level in soybeans is not necessarily the only major factor. A major factor for soybean meal buyers in Manitoba is the CAD/USD exchange rate. A one-cent change in the CAD/USD exchange rate has a $5 per tonne effect on the price of soybean meal.

Increased volatility in the soybean meal futures market has made soybean meal providers shy about providing forward contracts that are very far into the future. Many soybean meal buyers in Manitoba would like to book their soybean meal price a year ahead but those forward contracts are not offered anymore.

If seeded acres of soybeans are projected in Manitoba to be 2 million acres and the yield is projected to be 40 bushels per acre, then the province is working with 80 million bushels of soybeans. If the price differential between 38% protein soybeans and 40% protein soybeans is 20 cents per bushel, then the direct value of closing that 2% protein gap can be valued at $16 million per year to the producers. The present value of $16 million per year in perpetuity using an 8% discount rate is $200 million.

An additional value for the province of closing the soybean protein gap is that consistent 40% protein soybeans would allow a local soybean processing plant to produce consistent 47.5% protein soybean meal, making it a viable business for providing soybean meal to the provincial animal industry. ■

Overcoming Low Protein Discounts on Manitoba Soybeans

Development of rapid tools to predict the protein quality of Manitoba soybeans

Da Shi and Dr. James House, Department of Food and Human Nutritional Sciences, Faculty of Agricultural and Food Sciences, University of Manitoba

SOYBEANS CONTAIN SIGNIFICANT amounts of protein (40–50%), lipids (20–30%) and carbohydrates (26–30%), and they represent an important source of nutrients for livestock and humans alike. Soybean production occurs globally but is dominated by Brazil and the United States. Canada currently represents just 2% of global production.

The soy sector in Canada has evolved over the past two decades. In 2000, soybean production in Canada was estimated to be 2.7 million metric tonnes, with the bulk of production (85%) occurring in Ontario (with no production in western Canada). Fast forward 20 years and Canadian soybean production now exceeds 6.1 million metric tonnes, with Manitoba accounting for 19% of total production. However, production in 2020 was down from the historic highs of 2017 (2.25 million metric tonnes).

This changing soybean landscape has led to the availability of new varieties suited to Manitoba production. Unfortunately, these varieties have resulted in lower crude protein values. Several factors influence protein and amino acids profiles, including variety, environment and the interaction between the two.

A comprehensive review authored by researchers from major government and academic research settings in the United States (Assefa et al. 2019) detailed the genetic, environmental and management factors contributing to soybean composition. The authors benchmarked several factors influencing soybean protein composition as production moved north, including planting date and maturity group (genetics). Under the same growing conditions, different varieties of soybeans contain different protein and amino acids concentrations. Conditions like temperature, water availability and sunlight affect protein content.

Understanding this interplay between genetics, environment and management is highly beneficial to the soy sector in Manitoba. One current focus is on identifying soybean varieties that will produce high protein levels in Manitoba.

Right now, the lower protein levels we are seeing in northern soybean crops present a barrier to further development of the Manitoba soybean sector. This is because protein content plays an important role in determining both the price and value of the crop. In 2017, soybeans that presented 33% protein (on a 13% moisture basis) received a $6-per-tonne discount from one major buyer. Even more serious, soybeans with 32.4% protein or lower may have received discounts approaching $9-per-tonne.

The traditional focus on protein content of soybeans relates to the importance of the meal as a livestock feed ingredient. However, feed formulation strategies have evolved away from a primary focus on crude protein content to a focus on digestible amino acid content. Amino acids are the building blocks of proteins. And animals, including humans, require a dietary source of available essential amino acids.

Essential amino acids (EAA) cannot be synthesized by the body at a rate satisfactory with its demand and must be provided in the diet. Diets with high crude protein content but limiting or deficient in one or more EAA cannot support growth and production targets and lead to excess nitrogen release in the manure.

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Laura Schmidt, Western Production Specialist

FIELD PEA FUNGICIDE

Make Sure You're Spraying for the Right Disease

Mycosphaerella (ascochyta) blight is the most prevalent foliar disease of peas in Manitoba and the main target of foliar fungicide application. We recommend scouting for this disease near flowering from mid-June to late July by looking for lower canopy symptoms.

MYCOSPHAERELLA BLIGHT

- Early lesions appear as small purple-brown freckles or as large circular, ringed lesions
- First infection will occur in the lower canopy on the bottom-most leaves and move up the plant

Unfortunately, this year mycosphaerella blight's doppelgänger, **bacterial blight**, was commonly found in the lower and mid-canopy of pea fields. Widespread bacterial blight presence in 2020 can be attributed to severe wind, rain and hail storms throughout the province early in the season. This environmental damage created openings for bacterial blight to colonize.

Fungicide will not control bacterial blight, so accurate disease identification is key.

BACTERIAL BLIGHT

- Lesions are broken by leaf veins, resulting in an angular appearance
- Initial lesions have a water-soaked appearance
- Most often, occurs in the mid or upper canopy that was exposed during storms

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A more accurate reflection of soybean quality is the concentration of primary limiting EAA in livestock feeds, namely lysine, cysteine, threonine, methionine and tryptophan. The sum of these amino acids is the critical amino acid value (CAAV) used by the soy sector in the northern U.S. These are generally the limiting amino acids in swine and poultry feeds, formulated from cereal grains (corn, wheat) and soybean meal. A higher CAA content would improve the feeding value of Manitoba soybeans and allow feed formulators more flexibility in formulating rations.

In order to identify soybean varieties capable of yielding high contents of the CAA, research in our laboratory has been focused on the development of high capacity, accurate and non-destructive methods for the rapid assessment of protein and amino acid content in Manitoba soybeans to support varietal selection and breeding efforts. In collaboration with the Manitoba Pulse & Soybean Growers, we have secured samples from the regional variety trials conducted in 2018 (2700 samples) and 2019 (2000 samples). We are using a process called Near Infrared Reflectance (NIR) spectroscopy to determine the amino acid composition and the CAA of soybeans varieties available in Manitoba.

Figure 1 depicts the variability in crude protein content of soybeans from 2018 and 2019. The average (minimum; maximum) values of crude protein (%) for the 2018 and 2019 cropping years were 35.79 (25.37; 46.75) and 35.55 (28.06; 47.07), respectively. These data show that there is considerable variability in protein content, and understanding the factors influencing this variability will be important in guiding soybean development and selection for Manitoba conditions.

While low protein values (<33%) are present within these cropping years, the data in Figure 2 highlights the importance of considering the CAAV in addition to protein content to understand the true feeding values of the soybean meal for livestock feeding in particular. There is a negative relationship between the CAAV and the total protein content for Manitoba-grown soybeans, similar to observations that have been made in the northern U.S. As such, the true feeding value of Manitoba-grown soybeans may be underestimated if the focus is kept solely on the crude protein content.

Figure 1. Distribution of crude protein (%) of Manitoba soybeans from 2018 and 2019.

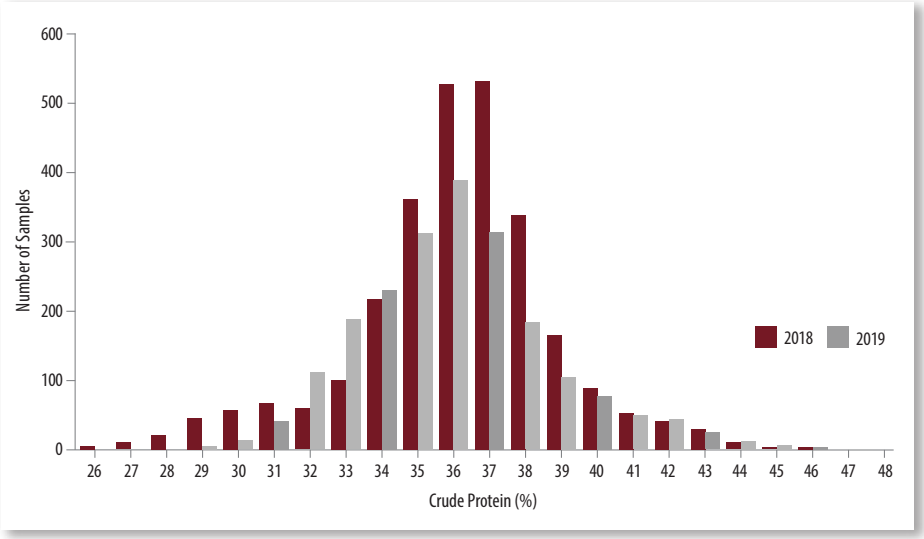
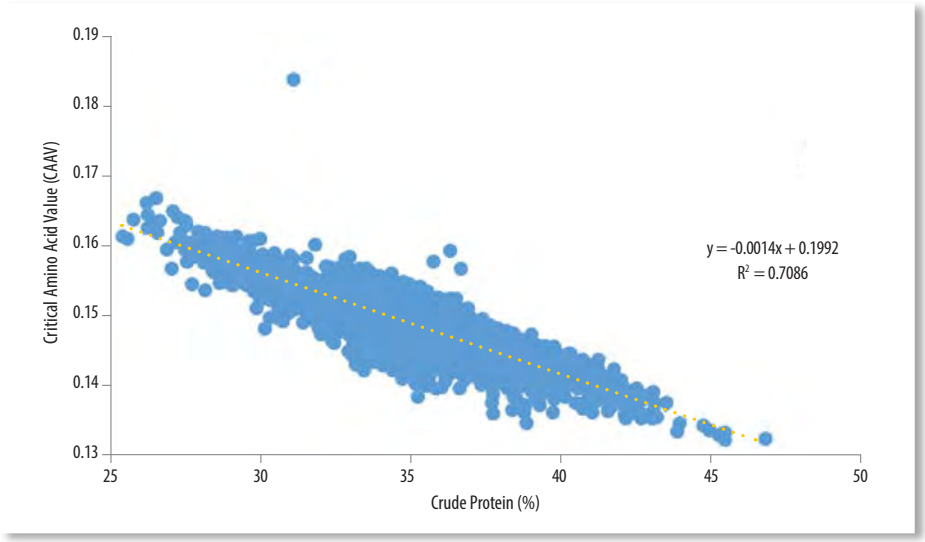


Figure 2. Relationship between critical amino acid values (calculated by sum of lysine, threonine, tryptophan, methionine, cysteine content divided by crude protein %) and crude protein (%) in Manitoba soybeans in 2018.



This assessment of soybean varieties best suited to meet market demands is important for the soybean sector to continue to advance in Manitoba. Our continuing research will lead to the development of new tools to predict the quality of the protein contained in locally-sourced soybeans. The development of rapid assessment methods, including the use of NIR, will provide the sector with tools needed to determine the true nutritional value, with respect to protein nutrition, for soybeans grown in northern regions, including Manitoba. ■

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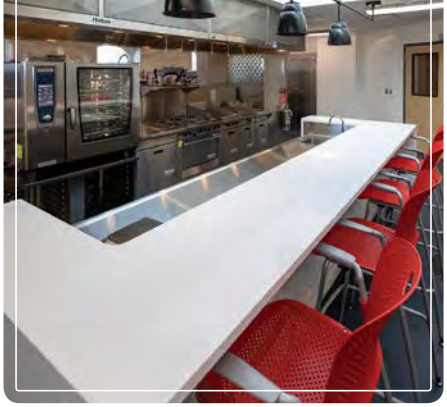

Introducing the Prairie Plant Protein Project

Laina Hughes, Communications Officer, Red River College

PRAIRIE RESEARCH KITCHEN
TECHNOLOGY ACCESS CENTRE

HERE IN MANITOBA, agri-food innovation is in our roots. The keystone province is the place to dream up and work on food innovation and development, thanks to our abundance of agriculture and culinary science professionals. From food engineering, food processing, food science, culinary science to nutrition research, our food researchers and research institutes fertilize the grounds for expanding food innovation. Red River College's Prairie Research Kitchen is a new applied research facility that supports food application and development by focusing on the role of culinary arts to make great food innovations that start in our test kitchens.

The Prairie Research Kitchen is currently collaborating with the University of Manitoba's Department of Food and Human Nutritional Sciences, as well as the Food Development Centre (FDC)—in partnership with funding from the Manitoba Pulse & Soybean Growers (MPSG) and Canadian Agricultural Partnerships (CAP)—to build new, innovative ingredients and products using prairie plant protein sources like dry beans, soybeans and hemp in the project *Development of value-added food platform technologies using plant-based protein sources including bean, soy and hemp.* In this project, equalling nearly $90,000, researchers are extracting and coagulating plant proteins to form curds, which then can be used in a plethora of interesting, novel food applications.

"Manitoba has so much expertise in the food R&D area," says Heather Hill, Research Manager at the Prairie Research Kitchen. "The project itself is a way to network between research organizations and to come to a greater endpoint in food and protein development."

The Canadian prairies are the perfect place to launch developments in plant proteins. Our farmers grow many protein-rich crops like black beans, navy beans, soybeans, hemp and fava beans. Once these nutritious crops grow and mature, Manitoba's food research and development specialists take over—turning these crops into novel

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food products that are not only tasty, but nutritious.

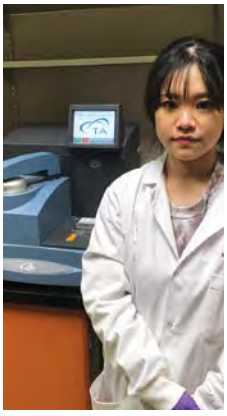
"Beyond R&D, Manitoba is a good place to grow plant protein products," says Hill. "Manitoba regionally produces high-quality protein products. By using our R&D facilities here, we can capitalize on using them in food products."

Food Science researchers at the University of Manitoba (U of M) have the ability to characterize plant proteins for their quality traits in order to understand which are best suited for novel food applications. Dr. Filiz Koksel and her team use technology called *Differential Scanning Calorimetry* to characterize proteins and their behaviours and tell which varieties might be better suited for forming protein curds.

From here, the food engineers and food technologists at the FDC can work with the select varieties of prairie plants to extract their proteins using large-scale food processing equipment. Their background in food science and food engineering enables them to understand how processing parameters can be changed to best extract the proteins to maintain their functionality for further food processing.

Research chefs at the Prairie Research Kitchen then work collaboratively with food scientists to turn these extracted proteins into tofu-like protein curds and use them in a number of recipes and food applications.

"We have a co-op student who's helping to support activities on this project while learning more and more about protein extraction," says Hill.



Siwen Luo, U of M PhD candidate in food science, characterizes bean proteins using differential scanning calorimetry to determine their best end-use functionality.

RRC culinary arts student Drew Derbowka gets creative baking with faba bean tofu.

"They get to build on their skills from culinary school while working on protein production. The U of M has also hired a student to focus on the more analytical work on types of proteins."

The protein curds can be used much in the same way as traditional tofu. However, chefs also bring the ingredients to life to highlight texture and flavours of the ingredients based on new and upcoming food trends, like non-dairy cheese, vegan nuggets or even brownies.

"For us at the Prairie Research Kitchen, we can tap into the creativity and expertise that chefs bring, in terms of creating new food products and using foods in novel and trendy ways—we pride ourselves on that here," says Hill. "We complement the more scientific and engineering approach of the FDC in terms of ingredients. They're really good at protein extraction and we don't want to replicate that here. We have the culinary perspective and can complement the research element in projects like this, and other projects over the long term."

Nutrition scientists have the ability to truly understand how new proteins can benefit our bodies. Blending plant proteins provide a combination of a number of amino acids that can be tailored to create a complete protein. Dr. Jim House and his team can evaluate the level of digestibility of these new proteins to make sure consumers are getting the nutrition that they need.

"With the overall emphasis on plant proteins right now, this project helps to build a baseline understanding of how we could differently position tofu-style products for more diverse uses of plant proteins, beyond just a block of tofu," says Hill. "We're definitely interested in changing the definition of tofu. I see big potential—I see these protein trends becoming mainstream."

This project was made possible through the support from MPSG and CAP. ■

Collaborating Together While Being Apart

A behind-the-scenes look at interdisciplinary soybean crop-rotation research during the 2020 pandemic

Dr. Yvonne Lawley, Assistant Professor of Agronomy and Cropping Systems, University of Manitoba

Dr. Yvonne Lawley leads a group of collaborative researchers looking at the frequency of soybeans in Manitoba crop rotations at the University of Manitoba.

CROP ROTATION STUDIES require a long-term commitment to research. The COVID-19 pandemic in 2020 was a new test for our commitment to long-term research at the University of Manitoba (U of M). Our study looking at the frequency of soybeans in Manitoba crop rotations was initiated in 2014 and has become a field laboratory for interdisciplinary research. With a team of graduate students and postdoctoral fellows relying on this experiment, we had to find creative ways to keep the study going within the health protocols established to keep staff and students safe. At the best of times, collaboration takes good communication and that was never more true than for the summer of 2020 when we had to work and collaborate together while being apart.

Our rotation study compares four different crop sequences: 1. continuous soybeans 2. soybeans grown every second year with canola, 3. soybeans grown every second year with corn, and 4. soybeans grown once every four years in rotation with wheat, canola and corn. Every year, technicians Codi Hennan and Stephanie Dheilly plant, manage and harvest these crops and take key measurements like yield, plant establishment, crop residue biomass and weather data that are the foundation of the experiment. This year, they coordinated these activities over the phone from separate vehicles instead of face-to-face, met up in the field with their dedicated personal sampling equipment, and practiced social distancing while collecting samples in the field. Daily observations that technicians were able to make about progress of the field trials located at the U of M Carman research farm and Richardson's Kelburn Farm were communicated to the rest of our team through online meetings, emails and text messages. This allowed collaborators to

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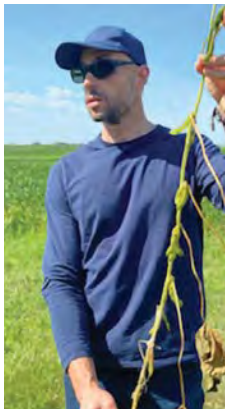
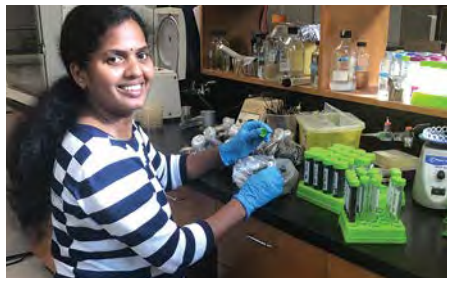


Postdoctoral fellow Dr. Ahmed Abdelmagid has been tracking pathogens in the soybean crop rotation study since 2017.

Graduate student Ambihai Shayanthan is studying the microbiome of the soybean rhizosphere.



Graduate student Chathuri Weerasekera measures the impact of crop rotation treatments on soil active carbon after returning to the lab in August of 2020.

make targeted trips on their own out to the field to collect samples for each of their objectives within the larger project.

PATHOLOGY

With a high frequency of soybeans in rotation, pathology is an important focus in the rotation study. Dr. Fouad Daayf and postdoctoral fellow Dr. Ahmed Abdelmagid have been following the development of pathogens in our rotation study since 2017. Root rots continued to be the most prevalent and damaging disease in the study, especially *Fusarium* spp. In 2019, when three of the four rotations had soybeans present, they found the highest severity of root rot occurred in the continuous soybean treatment followed by the canola-soybean, and lastly, the corn-soybean treatment at both the Carman and Kelburn locations. The continuous soybean treatment in this study has been running for seven years and it has not been disappointing our pathology team. They identified and published the two first reports for *Fusarium cerealis* causing root rot in soybeans and Northern Stem Canker caused by *Diaporthe caulivora* on soybeans in western Canada in the journal *Plant Disease*. A cautionary tale for soybean growers across Manitoba.

SOIL MICROBIOME

Soil populations of *Bradyrhizobia* bacteria that fix nitrogen when nodulated within soybean roots have been an important focus in the rotation study for Dr. Ivan Oresnik and his new PhD student Ambihai Shayanthan. Their current project builds on the completed MSc thesis of Patricia Ordonez, who followed the change in *Bradyrhizobia* populations within a growing season and between seasons. Patricia confirmed that *Bradyrhizobia* can persist in Manitoba soils from year to year. Ambihai will take this project to the next step by studying rotation effects on the biome of microbes surrounding the soybean root in the rhizosphere. She is very interested in understanding which soil microbes are enriched by the presence of soybean plants and those positively correlated with increased productivity and plant health.

SOIL HEALTH

We know that crop rotation can improve both plant and soil health. Graduate student Chathuri Weerasekara is working with Dr. Lawley and Dr. Oresnik to measure the impact of the frequency of soybeans in rotation on new measures of soil health. Soybeans are a low-residue crop that don't return as much carbon to the soil as cereal crops like wheat or corn. This experiment allows us to track carbon inputs from crop residues over time and to follow resulting changes in soil carbon. Chathuri is looking at both the traditional stable pools of soil carbon as well as a new method called active carbon that focuses on the carbon pool that can easily feed and be decomposed by soil microbes. Chathuri has also been following the concentration of soil enzymes released by microbes as an index of microbial activity for processes involving the cycling of carbon, nitrogen and phosphorus in the soil. After analyzing archived samples from 2017 and 2019 (four and six years into the study, respectively), Chathuri has not found any differences between rotation treatments in total or active carbon pools at both the Carman and Kelburn sites. However, soil enzyme activity has consistently been lowest in the continuous soybean treatments at both sites. All of the interdisciplinary layers in this rotation study connect with the soil microbial community—both good and bad. These layers are going to help us to integrate the possible outcomes that farmers can expect as soybeans continue to be an important crop in Manitoba rotations.

Focusing on the agronomic fundamentals for our rotation study in 2020 has set us up for an important year in 2021, where all treatments align to grow soybeans and we have a test crop year where we are planning to make many important measurements. Each member of the team will have the best opportunity to compare treatments in the coming soybean test crop year after maturing over the past eight years. Postdoctoral fellow, Dr. Navneet Brar, will also join our team in 2021 to take an in-depth look at soybean performance and integrate the impact of our crop-rotation treatments on mycorrhizal colonization, nodulation and biological nitrogen fixation.

Like many, we were tested by the conditions of the 2020 pandemic. Being able to work outside helped many of us to feel a sense of normalcy at a time when accessing indoor lab spaces has been much more limiting. Following health guidelines and keeping to the fundamentals throughout each step of the 2020 growing season made even simple tasks more complicated time and time again. This forced us to find efficiencies and focus on the essentials. The sense of community that comes with collaborating together while being apart has helped us to make it through this crazy year and we are looking forward to a future where life—and our research—can return to normal. ■

Managing Herbicide-Resistant Weeds

This past July, MPSG hosted a webinar featuring Dr. Charles Geddes, Research Scientist at Agriculture and Agri-Food Canada in Lethbridge. This webinar covered Dr. Geddes' Manitoba-based research on volunteer canola management in soybeans and updates from his current research on how to mitigate and manage herbicide-resistant weeds in western Canada.

If you missed the webinar or you're looking to verify a few facts, check out the key points below or find the recorded video at manitobapulse.ca.

VOLUNTEER CANOLA MANAGEMENT IN SOYBEANS

Volunteer canola is the number one weed in soybeans in Manitoba. It has become a pest due to seed lot contamination, canola harvest loss (source of 4000–6000 seeds/m^2), seedbank persistence (can last >3 years), short crop rotations, limited herbicide options and seed return from unmanaged volunteers.

Four different studies were conducted by Dr. Geddes and Dr. Rob Gulden at the University of Manitoba, testing different practices that might reduce volunteer canola populations in soybean crops and protect soybean yield.

STUDY 1 — Soil disturbance (timing and implement) after canola harvest to reduce volunteer canola persistence in the seedbank and reduce its population in subsequent crops

Tested early fall (September) vs. late fall (October) vs. spring (May) tillage and light (tine harrow) vs. heavy (tandem disc) disturbance.

- Early fall tillage lowered volunteer canola populations by half compared to other timings. It offered the best seedling recruitment ahead of winterkill. Spring tillage promoted volunteer canola emergence 3–4x more than other timings and would require control before planting.
- Low and high disturbance resulted in similar volunteer canola populations.

STUDY 2 — Management within the soybean crop (row spacing, plant population, inter-row tillage, soil N) to reduce volunteer canola and increase the competitive ability of soybeans

Tested 7.5" vs. 15" vs. 30" rows, 160,000 pl/ac (recommended) vs. 240,000 pl/ac (1.5x the recommended rate), with vs. without inter-row tillage and residual soil nitrogen (N) level vs. N applied (20 lbs N/ac) in separate trials.

- Row spacing did not influence soybean yield or the volunteer canola population.
- Soybeans seeded at the higher rate competed against volunteer canola and yielded well, but the canola population was not reduced.
- Inter-row tillage improved soybean yield (especially when the canola population was high) but did not reduce canola seed production because it also grew within seed-row.

Volunteer canola in a soybean crop.

Photo: Charles Geddes

- Soybean yields were unaffected by different N levels, but higher N resulted in more volunteer canola seed production.
- Each of these techniques used alone did not reduce volunteer canola seed

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production. However, integrating multiple practices may offer better results.

STUDY 3 — Inter-seeded cereal mulch for early-season competition against volunteer canola

Tested spring wheat mulch vs. fall rye mulch (both spring-seeded) vs. no mulch, 15" vs. 30" rows and two different herbicide regimes — group 1 to manage grassy weeds but let mulches remain living vs. standard post-emergence application of glyphosate to terminate the mulch.

- Soybean yields did not differ between the terminated mulch and those grown without mulch. The living mulch reduced soybean yield, but also reduced volunteer canola seed production by 1/4 to 1/3 — something that may show promise in combination with other practices.

STUDY 4 — Digging deeper into the effects of limited vs. abundant N on volunteer canola in a soybean crop

Tested 0, 20, 40, 80 and 160 lbs N/ac and four different varieties of volunteer canola in soybeans vs. soybeans without volunteer canola.

- With volunteer canola present in the crop, volunteer canola seed production increased and soybean yield declined in response to increasing soil N levels. Without volunteer canola present, soybean yield remained stable with increasing N.
- These results confirm that the soil N level drives the competitive balance between N-fixing soybeans and non-leguminous weeds.

Living wheat mulch between soybean rows.

Photo: Charles Geddes

For more information on this research check out *Pulse Beat – The Science Edition,* Issue 2.

MITIGATING HERBICIDE-RESISTANT WEEDS IN SOYBEANS

Canada currently ranks third worldwide for the most herbicide resistant (HR) weed species. The number of HR weed species has risen relatively quickly and is expected to continue increasing. Dr. Geddes' current research is focused on increasing crop competitiveness and reducing selection pressure for resistance across western Canada.

One area of interest is glyphosate-resistant (GR) kochia. Weed surveys have shown GR kochia in Manitoba increased from 1% (2013) to 59% (2018) of the total kochia population in Manitoba, and from 5% (2012) to 50% (2017) in Alberta. Resistance to dicamba was also confirmed in 18% of the Alberta kochia population.

Four projects are ongoing across western Canada (including Manitoba sites hosted by Kristen MacMillan and Dr. Gulden), looking at several combinations of integrated weed management (IWM) practices to increase soybean competitiveness against weeds. IWM practices like variety selection, planting date, crop sequence, tillage system, row spacing, plant density and cover cropping, under both weedy vs. weed-free conditions.

A promising preliminary finding from one project is that high-yielding varieties under-weed free conditions also produced high yields under weedy conditions. This means breeders selecting varieties for high yield can know that they are also selecting varieties that are highly competitive against weeds. For the rest of the projects, it's still too early to tell. Stay tuned. ■

Over 300 independent, on-farm trial project details and results available at manitobapulse.ca

Field Pea Scout ANSWERS

Photos: Syama Chatterton, AAFC

A – Aphanomyces root rot

This honey-brown colour and reduced lateral root growth is caused by *Aphanomyces euteiches.* Aphanomyces is difficult to control, persists in the soil for many years and can infect plants at any point during the growing season. Hosts include peas, lentils, dry beans, alfalfa, vetches, clovers and several weed species. Root rot declines and yields increase with a longer break period away from peas. A six- to eight-year break is recommended if Aphanomyces is present. Research is ongoing to develop a soil test for measuring oospore levels, to identify pea varieties with partial resistance and to identify best management practices.

B – Fusarium root rot

These blackened taproots are an indicator of Fusarium root rot, which can be caused by a range of different species found in the prairies. Pea roots infected by Fusarium can maintain their lateral root structure compared to those infected by Aphanomyces. However, plants infected by Aphanomyces can also be infected by Fusarium. It is the most common root rot of pulse crops in western Canada and has a wide host range. Research on cross-pathogenicity of Fusarium has confirmed that 11 different species, including the head blight-causing *F. graminearum*, can commonly infect peas, soybeans and cereals.

Manitoba Pulse and Soybean Buyer List – November 2020

COMPANY	EDIBLE BEANS	FABA BEANS	LENTILS	PEAS	SOYBEANS	PHONE	LOCATION	CGC REGULATED
Alliance Pulse Processors Inc. dba AGT Foods Canada	✓	✓	✓	✓	✓	306-525-4490	Regina, SK	✓
• AGT Foods St. Joseph	✓		✓	✓	✓	204-737-2625	St. Joseph, MB	✓
All Commodities (AC) Trading Ltd.			✓	✓		204-339-8001	Winnipeg, MB	✓
Avena Foods Ltd. dba Best Booking Pulses Inc			✓	✓		204-857-4451	Portage la Prairie, MB	✓
Belle Pulses Ltd.		✓		✓		306-423-5202	Bellevue, SK	✓
Besco Grain Ltd.		✓		✓		204-745-3662	Carman, MB	✓
Brett-Young Seeds				✓	✓	204-261-7932	Winnipeg, MB	
BroadGrain Commodities Inc.	✓	✓	✓	✓	✓	416-504-0070	Toronto, ON	✓
C.B. Constantini Ltd.				✓		604-669-1212	Vancouver, BC	✓
Cargill Ltd.					✓	204-947-6219	Winnipeg, MB	✓
Columbia Grain Inc. (CGI) (Walhalla Bean Co.)	✓					701-549-3721	Walhalla, ND	✓
Delmar Commodities Ltd.	✓		✓	✓	✓	204-331-3696	Winkler, MB	✓
ETG Commodities	✓	✓	✓	✓	✓	416-900-4148	Mississauga, ON	✓
G3 Canada Limited				✓		204-983-0239	Winnipeg, MB	✓
Gavilon Grain LLC					✓	816-584-2210	Omaha, NB	✓
Global Food and Ingredients Inc.		✓	✓	✓		416-840-8590	Toronto, ON	✓
Global Grain Canada Ltd.	✓					204-829-3641	Plum Coulee, MB	
Hensall District Co-op	✓			✓		204-295-3938	Winnipeg, MB	✓
Horizon Agro Inc.					✓	204-746-2026	Morris, MB	
Kalshea Commodities Inc.			✓	✓		204-272-3773	Winnipeg, MB	✓
Knight Seeds			✓	✓		204-764-2450	Hamiota, MB	
Linear Grain Inc.	✓	✓		✓	✓	204-745-6747	Carman, MB	✓
Louis Dreyfus Company Canada ULC				✓	✓	403-205-3322	Calgary, AB	✓
Marina Commodities Inc.			✓	✓		204-937-2300	Roblin, MB	✓
Masterfeeds		✓		✓		403-327-2555	Lethbridge, AB	
McDougall Acres Ltd.	✓	✓	✓	✓	✓	306-693-3649	Moose Jaw, SK	
Monsanto					✓	–	Winnipeg, MB	
Natural Proteins Inc.					✓	204-355-5040	Blumenort, MB	
Nu-Vision Commodities	✓			✓	✓	204-758-3401	St. Jean Baptiste, MB	
Parrheim Foods				✓		306-931-1655	Saskatoon, SK	✓
Parrish & Heimbecker Ltd.				✓	✓	204-987-4320	Winnipeg, MB	✓
Paterson Grain	✓			✓	✓	204-956-2090	Winnipeg, MB	✓
• FeedMax Corp.				✓		204-523-0682	Killarney, MB	✓
Pipeline Foods, ULC				✓	✓	204-594-8750	Winnipeg, MB	✓
Prairie Fava Ltd.		✓				204-721-4715	Glenboro, MB	
Providence Grain Group			✓	✓	✓	780-997-0211	Fort Saskatchewan, AB	✓
PS International, LLC DBA Seaboard Special Crops		✓	✓	✓		306-565-3934	Regina, SK	✓
Richardson International Ltd.				✓		204-934-5627	Winnipeg, MB	✓
• Richardson Pioneer Limited				✓	✓	204-934-5627	Winnipeg, MB	✓
• Tri Lake Agri Limited				✓		204-523-5380	Killarney, MB	✓
Roquette Canada Ltd.				✓		204-428-3722	Portage la Prairie, MB	✓
Rudy Agro Ltd.	✓		✓	✓		306-867-8667	Outlook, SK	✓
Scoular Canada Ltd.	✓	✓	✓	✓		403-720-9050	Calgary, AB	✓
Seed-Ex Inc.				✓	✓	204-737-2000	Letellier, MB	✓
Semences Prograin Inc.					✓	450-469-5744	Saint-Césaire, QC	
Shafer Commodities Inc.	✓	✓	✓	✓	✓	204-822-6275	Morden, MB	✓
Simpson Seeds Inc.			✓			306-693-2132	Moose Jaw, SK	✓
Southland Pulse Inc.			✓	✓		306-634-8008	Estevan, SK	✓
The Andersons Inc.			✓	✓		419-891-6464	Maumee, OH	✓
Vandaele Seeds Ltd.		✓		✓		204-665-2384	Medora, MB	✓
Vanderveen Commodity Services Ltd.				✓	✓	204-745-6444	Carman, MB	✓
Viterra Inc.	✓		✓	✓	✓	Contact your local Viterra sales representative		✓
Western Harvest Bean ULC	✓					204-515-7331	Winnipeg, MB	
Wilbur Ellis Company of Canada Ltd.	✓		✓	✓		204-867-8163	Minnedosa, MB	✓
XPT Grain Inc.	✓			✓		306-525-0205	Regina, SK	✓

The Canada Grain Act requires some elevators and grain dealers to have a Canadian Grain Commission (CGC) license and post security to cover their liabilities (what they owe) to farmers. Grain dealers and operators of primary, terminal and process elevators in western Canada are licensed by the CGC. Seed cleaning plants, which do not purchase grain, and feed mills do not have to be licensed.

It is the responsibility of farmers to satisfy themselves that any company they deal with is financially sound. Questions regarding licensing and security should be directed to the CGC at 800-853-6705 or 204-983-2770.

MPSG's pulse crop buyers list contains the names of companies that have registered with MPSG and are actively purchasing pulse and soybean crops in Manitoba. The word *registered* does not imply endorsement. The complete list is available on our website manitobapulse.ca.

Recipe Corner

Black Bean Mini Burgers

Servings: 8–10 | Prep time: 45 minutes | Cook time: 15 minutes | Total time: 60 minutes

Ingredients

8 ounces mushrooms
1 small carrot
1 ½ cups broccoli florets
¼ cup red onion
2 whole garlic cloves
2 tbsp canola oil
1 tsp smoked paprika
1 tsp chili powder
¾ tsp salt
¼ tsp ground black pepper
1 (15-ounce) can **black beans**, drained and rinsed
½ cup walnut pieces
2 cups packed spinach leaves
¼ cup fresh chopped herbs, chives or parsley
½ cup panko breadcrumbs
2 large eggs
1 tbsp tomato paste

Method

1. Preheat oven to 400°F and line two baking sheets with parchment paper.
2. Wash, peel and trim the mushrooms, carrot, garlic, broccoli and onion. Toss with the 2 tbsp of canola oil and place in food processor and pulse until a small coarse texture has been achieved. Spread the vegetable mixture on one of the lined baking sheets and bake for 15–20 minutes. Remove from oven, stir mixture and set aside.
3. Drain and rinse the black beans, spread evenly on the second baking sheet. Bake both the sheet of beans and the sheet of vegetables for 15 minutes or until the black beans begin to split. Remove from oven and let cool. *This process will remove excess moisture while increasing the flavour.*
4. While the beans and vegetables roast, place the walnuts, spinach and fresh herbs in a food processor. Pulse until they are coarsely chopped.
5. Add the beans and the spices, pulse 5 to 10 times until the beans look crumbly.
6. Add the roasted vegetables, panko breadcrumbs, eggs and the tomato paste. Pulse until everything is combined, keeping some texture.
7. Season with salt and pepper
8. Divide into 16 equal portions and form into 1/2-inch thick patties.
9. Heat skillet over medium-low heat, add oil and put in approximately 8 patties. Cook until heated through, firm and browned on both sides.

Serve with small buns and favourite condiments.

Recipe featured on Great Tastes of Manitoba – www.greattastesmb.ca

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