MANITOBA PULSE & SOYBEAN GROWERS

pulse beat

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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 – 2018 Board of Directors and Staff

Manitoba Pulse & Soybean Growers 2018 Committees and Representatives

MPSG COMMITTEES – *The first named is chair*

Executive – J. Preun, C. Penner, E. Sirski, B. MacMillan, F. Labelle

Governance/HR – F. Prince, B. MacMillan, F. Labelle

Finance/Audit – M. Rattai, M. Denys-Roulette, F. Labelle

Resolutions and Nominations – B. MacMillan, H. Jefferies, B. Phillips

Communications/Member Relations/Market Development – E. Sirski, R. Vaags, C. Penner, B. MacMillan, F. Labelle, T. Dyck, H. Jefferies, B. Phillips, D. Domitruk, S. Robinson, L. Schmidt

Research – F. Prince, B. Martens, M. Rattai, C. Penner, H. Jefferies, B. Phillips, R. Vaags, F. Labelle, D. Domitruk, L. Stevenson, G. Bartley, C. Tkachuk, L. Schmidt, I. Kirby, W. Voogt, S. Robinson, industry advisors

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MPSG REPRESENTATIVES

Canadian Grain Commission Pulse Sub-Committee – F. Labelle

Grain Growers of Canada – B. Martens, M. Rattai (alt)

Keystone Agricultural Producers – C. Penner, F. Labelle, R. Vaags, M. Rattai
- **General Council** – F. Labelle
- **Pulse/Oilseed Sub-Committee** – M. Rattai, F. Labelle (alt)
- **Commodity Group** – R. Vaags, C. Penner
- **Safety Group** – R. Vaags

Pulse Canada – R. Vaags, B. Martens (alt), H. Jefferies (alt)
- **Sustainability** – F. Prince

Soy Canada – E. Sirski

MCVET – D. Domitruk, D. Lange

PGDC/PRCPSC – B. Martens, D. Domitruk, D. Lange

Western Canadian Pulse Growers Association
- **WGRF** – C. Loessin (SPG)
- **CGC Western Grain Standards Committee** – E. Sirski (exp. 2018) *This is a four-year term that rotates between APG, SPG and MPSG.*

Amalgamation – F. Prince, F. Labelle, J. Preun, R. Vaags (alt)

Message from Board Chair

John Preun, Chair

I JOINED THE Manitoba Pulse & Soybean Growers (MPSG) board because I had a few questions. I was concerned about the dollars being taken off my soybean sales. I was concerned about whether or not I was receiving value for my check-off. This is why I joined MPSG.

It did not take long for me to see that MPSG is doing a great job in matching your investment dollars while delivering value back to your farms. I am 100 percent confident of this and I am a strong advocate for the association and the good work it is doing. But it can improve and I believe it will do just that.

I would like to take this opportunity to say hello. It's a genuine honour to represent you as chair of the Manitoba Pulse & Soybean Growers. I will do my best to serve your interests and I will work hard to improve the pulse and soybean sector in Manitoba. MPSG is a strong, vibrant organization and I want to encourage all of you to utilize its services, from the On-Farm Network to our huge research database stored on our website. And don't forget to download the MPSG Bean App.

I farm with my kids, my brother, Hubert and my nieces and nephews in the Selkirk area. We implement MPSG research on our farm. I hope all of Manitoba's pulse and soybean farmers take advantage of the great things going on here. There's so much important stuff happening. Your investment dollars are being put to good use. We're definitely making sure of that. Our farmers always need to benefit.

I would also like to thank outgoing Chair Jason Voth for his dedication to MPSG and the farmers it represents. I'm inheriting a great organization and a fantastic board. It wouldn't be this way without strong leadership. Thanks, Jason!

MPSG continues to figure out how it can best work with other farm organizations to deliver more value to Manitoba farmers. I think this is possible. I'm not a stranger to collaboration. I collaborate with other farms in my area to get more buying and selling power. It works on our farm and I could see it working for the five organizations, too, but it's a long, ongoing process.

We heard a lot of great feedback during the regional meetings and at our AGM. Some of you are for it. And I talked to some farmers who don't support it, as it stands. Many people had questions. We want to make sure we answer your questions and respond to your concerns. It has become clear we have a lot of work to do.

There are ways MPSG can work together with the other organizations at the table during these collaboration talks. We talk about how to properly fund research that doesn't affect just one crop. We talk about how we can make administration more efficient, and we've explored the idea that we may be able to leverage your investment dollars better if we'd negotiate with a larger pot.

What will this all look like five, 10, 15 years from now? That's difficult to say. We hope we're laying the groundwork for great things. We see voids in terms of research and work that relates to the whole farm and we see ways we can improve.

Whatever the case and whatever the outcome of these talks, I can assure you that this process is being led by us farmers. That is a priority to everyone at the table.

ROQUETTE

We are anxiously awaiting the completion of the Roquette pea processing plant, and we are looking forward to working with them on developing a pea program in Manitoba that benefits our farmers. I grew peas on my farm in 2016 and had great success. I welcome the opportunity to reintroduce

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Dry Bean Scout

Which two diseases are these dry bean pods infected by?

Photo: Debra McLaren, AAFC

A

Photo: Cassandra Tkachuk, MPSG

B

Answers can be found on page 50

Do you have a production question related to pulse or soybean crops? Maybe you're looking for an opinion or advice? Write to us!

Email cassandra@manitobapulse.ca or laryssa@manitobapulse.ca

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them in my rotation, once Roquette establishes their program.

MPSG's research program is something you should be proud of. The research committee is working hard to foresee the challenges farmers will face now and in the future. Significant work is being done on variety development as well as the issue of low protein in soybeans.

MPSG has a strong research and production staff. As a farmer, you can be confident they are doing their best to make your farm as sustainable and profitable as possible.

We talk a lot about where soybean acres will go in Manitoba and it's tough to say. When those August rains don't come, we sometimes think that acres will drop. But, we're not seeing too much of that. I think farmers are still getting comfortable growing soybeans and more and more areas are deciding to plant them. It will be interesting to watch the trend.

We're hoping to see enthusiasm build around planting peas. We'd love to see those acres go up under a strong local program. Dry bean acres are not to be forgotten, though. We're seeing stability in those acres. Manitoba dry bean growers are among the best. They know what they're doing. It's impressive, given our unpredictable growing conditions.

We're seeing lots of optimism around faba beans. Those acres are growing as more and more end-use markets are being established. There's lots of potential for this high-protein pulse crop.

MPSG is honoured to have a good relationship with the province of Manitoba. We're happy to consider Agriculture Minister Ralph Eichler a friend.

I wish you all a great growing season. Stay safe out there.

– John ■

Message from Executive Director

François Labelle, Executive Director

WHAT IS NORMAL?

We know what isn't normal: agriculture. Every year is very different. The weather is unpredictable, crop production issues are never the same, year in and year out, and then we have to worry about things like markets access, transportation, market disruptions, protectionism and any other curve balls? What does this mean to those involved in the agriculture sector? It means challenges, but more importantly it means opportunities.

WEATHER

It's a real wild card this year, and I hope it's looking more favourable now than it was when I wrote this article. In late April early May, the air was cool and soils were pretty chilly, as well. It was also dry and windy with not much in the forecast for precipitation. Are we at the end of a wet cycle? We have had ample rain for the past number of years, resulting in great crops and some bumpers at that.

Was 2017 a turning off of the tap and a move towards a dry cycle, or just a less predictable one? If so, how will that change cropping decisions? Many of us will remember when moisture was a limiting factor.

RAIL UPDATE

Transportation is still an issue for farmers because of two main factors: poor rail service and the snail's pace of legislation to modernize our Transportation Act.

On the rail service: it's important to note that CN admitted they made a mistake in their forecasting. They let people and equipment go and could not react in time to the large volumes that needed to move. They made changes and it appears they are making efforts to improve. Not as encouraging, though, is the fact that CP used a 125-year-old excuse that winter was a major factor to blame for poor service. Can we not expect by now that the system can plan for winter – it comes every year?

Looking forward it will be interesting to see what happens to our rail service. If crude oil prices move up, will more resources be put to that sector? How will that affect grain movement?

Without any doubt, we need to keep supporting the Ag Transportation Collation to monitor movement in the rail sector.

Federal Minister of Agriculture Lawrence MacAulay (L) and Manitoba Minister of Agriculture Ralph Eichler (R)

BILL C-49

The good news is that Bill C-49, the Transportation Modernization Act, received royal assent. It has been a frustrating and long process to get to this point. But its passage is a giant step in the right direction for Canadian farmers. Also worth noting is that as part of this Bill, soybeans will now be included under the Maximum Revenue Entitlement (MRE). We'll keep a close eye on this file as it rolls out.

MARKET DISRUPTIONS

We're usually looking for the weather market, hoping to reap the benefits of poor weather affecting regions other than our own.

Well, this past while it's market disruptions that are causing anxiety and potential gains.

India – the saga affecting yellow peas and mainly red lentils continues. India has banned all imports of yellow peas, which has put a big question mark on seeding intentions. Stats Can numbers do not seem to take this into account, either, which is a whole other story. At one point, fairly large reductions in acres were predicted, but as time goes by it appears to be changing. Acres of peas and lentils may not drop as much as predicted.

On the flip side, peas are moving into China for feed. They are looking for protein for feed and we know peas fit well into the feed market. It's positive that there is a market for peas in this direction, as long as the prices remain attractive to growers.

The main focus on India for the next few months will be on the monsoons. Will they be average? If so, we may see pea movement remain slow into the market, but if they are poor, we could expect policies to change.

China – the trade war with the USA is continuing to escalate. China appears to be focusing on U.S. soybeans, with trade essentially stopped. They are looking to import soybeans from other countries – Brazil, Argentina and Canada. All of our beans may not amount to much, but we still can ship in that direction.

Some interesting things are happening. U.S. soybeans are going to Argentina to feed their crushers. Meanwhile, Argentinian beans are going to China? What other trade patterns will change due to this? U.S. soybeans still need to go somewhere and traders will be looking for any and all opportunities. It's a trade war, but the net effect is trade disruption.

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Notice to Members

In accordance with MPSG bylaws, any active member who wishes to bring forward a resolution to the annual general meeting (AGM) must provide notice to the board of directors by December 1 of the year prior to the AGM.

Resolutions to be presented at the February 13, 2019 AGM must be received by December 1, 2018.

Please forward to Sandy Robinson at **sandy@manitobapulse.ca** on or before that date.

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LOW PROTEIN CONTENT IN SOYBEANS

This pot has been simmering for a few years. The subject has been discussed at research meetings, meetings of feed manufactures and around many board tables across North America, but it has not been at the forefront in farm circles. Well, in 2017, for some reason and there are many theories, the overall protein of beans in North American was lower. Looking in our backyard, some have said it was the dryness – but it was not dry all over North America. So, what is causing this?

It will take time to answer that question. And it will take time to turn around this trend. The industry needs to work as a team to make it happen. We need the breeders, life science companies, seed companies, grain buyers and farmers to all work together to improve, so we do not end up with discounts or difficulties sending product into some markets.

COLLABORATION

The five groups, who all work out of the same office in Carman, have signed a new MOU.

This past winter we have had some encouraging comments and some not as supportive comments about collaboration or amalgamation. We are still exploring ways and means to give a better service and improve farm profits into the future.

It's been said before and it's important to say again: these five groups work closely together in many aspects. The groups talk all the time – daily, weekly and more. We are using common IT service providers and using common equipment. Why? It's the best, most economical option. We recently decided to go ahead with a new computer server for the groups. The best option was putting all our needs together and investing in a higher-end unit that, if we were purchasing it on our own, wouldn't have been fiscally feasible. So, instead of having three or four units, we have one top-end unit. All the data will remain separate; just one server.

There are numerous association-related operational tasks that could work more efficiently under this model.

We have more work to do and we will continue to ask for input from you, the farmers.

STAFF

Looks like a busy summer for our staff: on-farm research, production, agronomy and surveillance work. Make sure to sign-up for *The Bean Report* and the new *Pea Report,* subscribe to our news list, follow us on social media and visit manitobapulse.ca for the latest information and resources.

Have a great growing season. And don't forget to work safe!

– François ■

Meet our On-Farm Technician

Ian Kirby

Manitoba Pulse & Soybean Growers is honoured to announce the hiring of On-Farm Technician Ian Kirby.

Ian joins the team after 14 years working with Manitoba Agriculture where he held various roles, including producer extension, business development and field technical positions, all while incorporating his skills in GIS and database management.

Ian lives in St. Malo where he is active in the community, volunteering with the local wildlife association. He is passionate about his hunting and fishing hobbies, particularly introducing youth and less experienced hunters and anglers to the wonderful outdoor opportunities Manitoba has to offer.

Look forward to meeting and getting to know Ian while he is establishing and monitoring the trials in our On-Farm Network.

Say Hello to Our Summer Interns

Katie Meggison

Katie comes from a fourth-generation grain and beef cattle farm near Goodlands, Manitoba. She is currently pursuing a Bachelor of Science degree majoring in agronomy and working toward a minor in soil science at the University of Manitoba. Katie has been actively involved in 4-H, as part of the U of M Future Leaders Club, music and team sports, and will serve as the Faculty of Agriculture and Students' Organization (FASO) agronomy representative for the upcoming school year. Working at MPSG appealed to Katie due to her interest in learning from, working for and providing value to farmers.

Morgan McCormick

Morgan is from and actively involved in her family's mixed grain and cattle farm near Oakville, Manitoba. She is nearing completion of a Bachelor of Science degree majoring in agribusiness at the University of Manitoba. Morgan served on FASO as charity representative and vice-stick internal. In these positions, she helped plan major events such as the annual bed push charity event and aggie grad. Her other interests include team sports and travelling. Morgan sees her employment with MPSG as a unique opportunity to build relationships within the industry and to strengthen her background in soybean and edible bean production before returning to the family farm.

MPSG welcomes Katie and Morgan to the team.


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MPSG Renews Commitment to Collaborate, Deliver More Value to Farmers

MANITOBA PULSE & Soybean Growers (MPSG), along with the four other grower organizations involved in ongoing collaboration talks, have signed a second Memorandum of Understanding (MOU), with a renewed and focused commitment to delivering more value to Manitoba farmers through working together.

Manitoba Corn Growers Association (MCGA), MPSG, Manitoba Flax Growers Association (MFGA), National Sunflower Association of Canada (NSAC) and the Manitoba Wheat and Barley Association (MWBGA) signed the MOU May 1, 2018.

"We heard from some farmers, but we want to hear from more of you," said NSAC President Mark McDonald, referring to the feedback heard during the regional meetings that took place late 2017 and the comments made during each group's Annual General Meeting in February. "There were some concerns – which was to be expected – some praise and a lot of questions. We've got more work to do, but one thing is clear. We think it's important to continue this process, developing a powerful and specific mandate for delivering more value to Manitoba's farmers."

The steering committee comprised of farmer-director representatives from each group as well as the executive directors or general managers of each association, will use the feedback it has received from farmers to amend the proposal released in 2017 with the aim of once again hosting regional feedback meetings along the way.

It is the mandate of the steering committee to identify and explore opportunities that will benefit the various memberships, such as how working together could increase research and agronomy services for farmers, as well as enhance capacity to leverage grower investment dollars. The group is similarly committed to entertaining other collaborative options, including models that don't include legal amalgamation.

"We share a common goal to represent the best interests of our members," reads the new MOU. "Our intention is to develop a future working relationship that is efficient, effective and advantageous to the farmers we represent. Our vision for the duration of this MOU is to further develop a plan for increased collaboration among like-minded grower groups."

The original MOU was signed in May of 2017, the culmination of three years of informal talks surrounding the idea of working together to increase efficiencies.

Four of the five involved groups currently share office space in Carman, Manitoba. While MFGA does not have a physical space in the Carman facility, the association is being administered by MPSG. ■

Manitoba farmers who grow the crops represented in this MOU are encouraged to get involved and have their voices heard by reaching out to one of the participating commodity groups or by contacting process facilitator Rob Hannam at **rob@mbcrops.ca**.

For additional information, visit **mbcrops.ca**.

THANK YOU

2018 Diploma Scholarship Recipient

Benjamin Esau

My family immigrated to Winkler, Manitoba in 2004. Growing up in a little village having nothing to do with farming, I never imagined that I would be interested and possibly working in agriculture. My interest in agriculture began after I unloaded grain trucks at a receiving station three years ago. My boss told me how much potential there was in the industry and urged me to get my agriculture diploma. That same year I enrolled in the diploma program. My passion for and knowledge in agriculture has increased tremendously over this short time and I look forward to continuing to learn.

I would like to say a big thank-you to Manitoba Pulse & Soybean Growers for awarding me with the $1,000 diploma scholarship. I have completed the diploma and have been blessed with a full-time job as an agronomist. I look forward to working with many farmers and helping them make the best choices for their farms.

Pulse Canada

Pulses: a Canadian Solution to a Global Challenge

FEEDING A GROWING population in a sustainable way is a global challenge. Public discussions on how to produce more food with fewer environmental resources tend to focus on opposite ends of the supply chain: production and consumption. At the production level, growers work to optimize their farming systems by reducing fertilizer and fuel use. This is not only better for the environment, it also makes good economic sense. Meanwhile, among consumers, there is growing focus on making dietary choices that are perceived to be healthier and "greener." Yet a discussion of food system improvement that's solely focused on producers or consumers overlooks other opportunities in the supply chain.

Food manufacturers can improve environmental sustainability through their ingredient sourcing and food formulations. Pulse Canada has commissioned two research projects which explore how food companies can drive improvements at both the production and consumption ends of the food supply chain by putting the emphasis on the ingredients within their products.

The first project, conducted by the Saskatchewan Research Council (SRC), analyzed the effect of different cropping systems on the carbon footprint of Canadian wheat, with a focus on the impact of growing pulses in a rotation with wheat. Using data from 26 western Canadian studies, SRC's work revealed that peas and lentils reduce the carbon footprint of a following wheat crop by increasing yields and reducing nitrogen requirements of the system overall. The effects were most significant when a pulse-wheat rotation was compared to a wheat-wheat rotation. The study showed that wheat grown after peas or lentils produces 13 percent less greenhouse gases per tonne than wheat grown in monoculture, if the fertility of the wheat was the same between the two rotations.

The second project, led by researchers from ETH-Zurich and published in April in the journal *Nutrients*, used this carbon footprint data to provide examples for how traditionally cereal-based foods such as bread, pasta and breakfast cereal can be improved from a nutritional and environmental standpoint through ingredient sourcing and reformulation. The study showed that by using wheat sourced from optimized production systems and by reformulating to include whole yellow pea flour, a food manufacturer can dramatically improve the nutrition and reduce the carbon footprint of these foods.

For instance, the researchers looked at pasta manufactured with wheat flour sourced from Canadian wheat grown in a rotation with pulses. This pasta was also reformulated to include 30 percent whole yellow pea flour. Compared to pasta formulated with 100 percent wheat flour sourced from a monoculture rotation (which is common practice in Italy and North Africa), the carbon footprint of this "new and improved" pasta is 22 percent lower and the Nutrient Balance Score (an aggregated measure of nutritional quality) is increased by 19 percent. These features could then be marketed to consumers who are looking to improve their nutrition and reduce their own carbon footprints.

Of course, carbon emissions are just one measure of environmental sustainability when it comes to food production. The next step of Pulse Canada's work will be to factor in other metrics of sustainability, such as water use and land use efficiency, and to expand this research to apply to plant-animal protein combinations like yogurts with pea ingredients, or ground meat products that include lentils.

Nonetheless, this research provides an excellent case study for the food industry and for policymakers

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Celebrating Canadian Grain Week in Ottawa

Jeff Nielsen, President, Grain Growers of Canada

IN APRIL, I was pleased to join Grain Growers of Canada (GGC) members in Ottawa as we hosted the inaugural National Grain Week. Focused on federal advocacy, we spent a busy three days engaging with decision makers on many levels and from many departments talking about the policy issues that matter to today's grain farmers.

Our theme for Grain Week was *Innovating to $75 Billion in Agri-food Exports* and we made sure to incorporate that idea into all messaging. The current federal government has placed a strong focus on innovation and we all know that agriculture fits perfectly into the innovation sphere. The announcement earlier this year that the protein industries supercluster would receive funding is great news for the pulse industry and the fact that the proposal was selected among non-ag applications is a clear indication of the real growth potential of agriculture as a whole.

I am sure I speak for all my colleagues when I say that I left Ottawa exhausted. Divided into three teams, we held 37 government meetings with MPs, Senators and staff from the Prime Minister's Office, the Office of the Leader of the Opposition, Agriculture and Agri-Food Canada (AAFC), Transport Canada, Environment and Climate Change Canada, Natural Resources Canada, the Pest Management Regulatory Agency, Employment and Social Development Canada and Finance Canada. As a result, we were able to have substantive discussions on a wide variety of topics all around the future prosperity of grain farming in Canada.

From the perspective of pulses, we had the opportunity to discuss the India tariff and fumigation issues with elected officials as well as the Market Access Secretariat at AAFC. These discussions were enlightening and it was encouraging to learn more about the behind-the-scenes work that is being done to resolve our trade barriers. We have strong allies in government who understand how crucial it is to keep markets open. While no one can promise a speedy resolution it was particularly interesting to hear how the MAS ranks trade issues and just how many hundreds are being monitored or addressed at any one time.

The quick passage of an amended Bill C-49 was a top priority as well and GGC has long advocated for the inclusion of soybeans in the Maximum Revenue Entitlement. There is no definite timeline for passage in the House of Commons but we are urging government ensure that the bill is in place by August 1.

On the more social side, GGC hosted a well-attended parliamentary reception. We welcomed about 100 guests including MPs, staff and industry. Agriculture Minister Lawrence MacAulay delivered well-received remarks and I am always pleased to see how well the Minister engages with his critics from the Conservative Party and the NDP. The success of agriculture is a non-partisan issue and we will need all parties to work together to achieve our potential.

On the horizon GGC is focussed on seeing the Comprehensive and Progressive Agreement for Trans-Pacific Partnership ratified in Parliament as soon as possible. We have stressed that it is crucial that Canada is part of the first wave of signatories and I think the government is getting the message. I hope that my next update to you will celebrate ratification.

I wish all of you the best for a safe and productive *Plant 2018* and thank you for your hard work to ensure a strong Canadian grain industry. ■

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at the global level. As global food requirements grow, governments are looking more intensely at ways to reduce the environmental impact of the current food production system. An increasing number of food companies are making public commitments to reduce greenhouse gas emissions throughout their supply chains. This research provides food companies with a cost-effective strategy for meeting corporate sustainability goals by reformulating foods with ingredients sourced from optimized farming systems with lower carbon footprints.

This strategy also provides Canadian agriculture with a unique marketing advantage. Canada has an opportunity to position itself as part of a solution to the question of how to feed nine billion people sustainably. Adoption of new technology and sustainable production practices show that Canadian farmers can produce food in an efficient, sustainable manner. Canadian-grown ingredients like pulses can help food companies address their corporate sustainability goals and meet growing consumer demand for more nutritious food products. ■

Expanding Opportunities for Canadian Soybeans

Ron Davidson, Executive Director, Soy Canada

THE CANADIAN SOYBEAN sector is off to another strong year in 2018. Growers will plant over 6.5 million acres of soybeans across the country, with almost 40 percent – or 2.5 million acres – seeded on the prairies. For the first time ever, Statistics Canada is reporting on new soy acres in Alberta where new technology is allowing soybeans to adapt to growing conditions further west. Our ongoing strategic goal is to increase soybean acreage to 10 million acres by 2027 and it is our vision that of this target, six million acres will be seeded in Manitoba, Saskatchewan and Alberta.

Recent market access developments and research innovations are fuelling this growth. After much debate and stakeholder feedback in Parliament, during committee meetings and in ministers' offices, the federal government has accepted several of the Senate-proposed grain transportation amendments to Bill C-49 the Transportation Modernization Act. Chief among these proposals is the addition of soybeans to the list of Schedule II crops regulated by the Maximum Revenue Entitlement (MRE) in the Canadian Transportation Act – a provision that governs the maximum revenue per tonne-mile that railways are permitted to charge exporters of western grains. If approved by Parliament, soybean exporters and by extension farmers, will no longer be vulnerable to unpredictable rate hikes.

Soy Canada has undertaken a range of independent and joint efforts to secure this amendment and ensure soybeans, as the fastest growing principal field crop, are not discriminated against in the transport of western grains on the prairies. In addition to engaging each member of the Senate Committee on Transport and Communications, Soy Canada held meetings and discussions with Senate sponsors of Bill C-49, the leader of the opposition in the Senate and senior policy staff in ministers' offices. These efforts undertaken with support from the Grain Growers of Canada and exporters contributed substantially to the government's adoption to add soybeans to the MRE. This amendment, coupled with the federal government's intention to also adopt other industry-recommended grain transportation amendments that were endorsed by the Senate including improvements

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Soybean Probable Yields: A Question of Buffering (IPI) vs. Responsiveness (IC)

MASC'S AGRIINSURANCE PROGRAM assigns every insured producer an individualized Probable Yield (PY). PY is calculated for each crop by incorporating a producer's own yield history into one of two PY determination methodologies. The two PY determination methodologies are the Individual Coverage (IC) method and the Individual Productivity Index (IPI) method.

Both methods are broadly similar. They both use a 10-year data period with a two-year lag, and both have similar five-year accelerated yield experience phase-in systems. However, they differ significantly in regards to buffering caps, soil zone recognition and how hail losses are addressed.

Most Manitoba crops use the IPI methodology, as do most of the crops under the purview of the Manitoba Pulse & Soybean Growers (MPSG). MPSG crops that use the IPI methodology are dry edible beans (navy, pinto, kidney, cranberry, black, small red and other), field peas and lentils. Faba beans and soybeans are the only MPSG crops that use the IC methodology.

Generally speaking, the IC crops are either high value crops, limited acreage crops or crops for which commodity groups have specifically requested using the IC method. Occasionally, the methodology applied when a crop was first insured continues to be carried forward, even though the alternative may be a better choice as acreage grown changes (e.g. use of IC for soybeans and use of IPI on lentils).

Soybeans use the IC methodology, which makes the soybean individual PY very sensitive to year-to-year variation, as compared to what PY would be with the buffering of an IPI methodology.

Wide swings in individual PY that occur in IC crops often bring smiles to producers when bumper crop yields occur and their PYs rapidly increase, but can also bring frowns to producers when their IC crop has significant yield losses and that unbuffered low annual yield (or zero yield) is included in their ten-year average and their PYs rapidly decline.

Similarly, this is exacerbated when producers see their IPI crop wiped out. But in this case, PY is impacted less than the IC crop because the annual yield used for the individual's PY calculation is buffered to 70 percent, and in the case of hail losses, having the hail loss potentially ignored completely.

Perhaps a quick refresher on IPI and IC and their related advantages and disadvantages is in order.

INDIVIDUAL PRODUCTIVITY INDEX (IPI) METHODOLOGY (E.G. PINTO BEANS)

An IPI is determined by comparing a producer's yield to those of other producers growing the same crop in the same soil zone and same risk area. The yield comparison determines an annual productivity index, which is averaged over the 10-year period, resulting in an IPI for the current crop year.

If a crop is grown for less than five years, there is a phase-in calculation that uses the individual's yield in combination with the area average

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to the new long-haul interswitching mechanism and the Canadian Transportation Agency investigative powers, are welcomed changes by the soybean value chain and ones that signal the importance of agriculture to the Canadian economy.

Improved grain transportation legislation will significantly enhance our industry's ability to stay flexible and capitalize on an array of changes to the international trade of grains and oilseeds, including China. China's pending 25 percent import tariff on U.S. soybeans has generated considerable speculation into how trade patterns will be impacted and related consequences for soybean exporting nations. Canada, as a comparatively small supplier of both GM and non-GM soybeans to the Chinese marketplace, does have an opportunity to heighten market share and incrementally fill any potential new demand resulting from higher import cost U.S. soybeans. Improved export infrastructure, regulation and discussions of a Canada-China trade agreement are critical to realizing this export potential and grow our export capacity.

The Chinese tariff threat on U.S. soybeans does not, however, translate into clear and certain benefits for Canadian soybean exports and must be weighed against dynamic changes to U.S. soy exports patterns. U.S. soybean exporters seeking to diversity markets in response to Chinese tariffs may seek out established or developing Canadian soybean export markets. At home, Canada could also endure an influx of American soybeans. Both cases may indirectly force Canadian exporters to defend international sales and adapt to emerging trade uncertainty and unpredictability.

Market access improvements, new plant breeding innovations and cluster research efforts underpin the growth of the soybean sector and continue to demonstrate why Canadians farmers are continually turning to soybeans as a reliable and profitable crop to include in their rotation. To learn more, visit us at www.soycanada.ca or contact us at info@soycanada.ca. ■

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to accelerate individualization of the PY. For each year the individual has production data, the average of the individual's annual productivity index is giving a weighting of 20 percent in each year of production data, to a maximum of 100 percent, with non-production years being assigned an annual index of 1.0 in the calculation. If a person has not grown the crop at all in the 10-year period, their starting IPI is 1.0. The producer's IPI is then multiplied by the 10-year average for the soil zone, resulting in the producer's PY for that year.

Advantages of IPI methodology:

- provides accurate yield coverage with buffering
- buffering – the impact of year-to-year variability is stabilized by:
  - comparing individual yields to average yields, and
  - limiting the fluctuation of the annual index, which cannot drop below 70 percent or rise above 130 percent of the previous year's IPI
  - reflects relative management capability by using soil productivity adjusted comparisons
- ignores yield losses that may be covered by other sources (hail, wildlife and third-party sources (e.g. spray drift))

Disadvantages of IPI methodology:

- requires larger crop acres so good annual indices can be determined
- buffering means responsiveness is slower

INDIVIDUAL COVERAGE (IC) METHODOLOGY (E.G. SOYBEANS):

An IC is determined as the simple average of a producer's yield over the previous 10-year period, regardless of the soil type where the crop was grown. If a crop is grown for less than five years, there is a phase-in calculation that uses the individual's yield in combination with the area average.

The difference between the producer's yield and average yield is calculated for each growing year, and these differences are averaged to estimate a relative productivity difference. This relative productivity difference is given a weight of 20 percent for each year of experience, up to 100 percent. For each of the 10 years in the IC calculation, the annual assigned yields are then calculated

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Example of Accelerated Individual Coverage

Year	Area Average Yield (bu/ac)	Individual Yield/ac	Yield Difference	Assigned Yield (bu/ac)
1991	80.3		n/a	85.6
1992	19.6		n/a	25.0
1993	19.3		n/a	24.7
1994	92.2	100.0	7.8	100.0
1995	82.2	95.0	12.8	95.0
1996	86.8	90.0	3.2	90.0
1997	84.9	88.0	3.1	88.0
1998	99.3		n/a	104.6
1999	94.2		n/a	99.6
2000	78.6		n/a	84.0
Average yield difference (bu/ac)			6.7	79.6
Yield factor (20% for every verified yield)			80%	Individual
Yield portion to apply (bu/ac)			5.4	Probable yield

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using either actual individual yields (if available) or the actual insurance area average yield, adjusted by the producer's relative productivity difference.

Advantages of IC methodology:

- doesn't require large acres of crop to work properly
- very responsive – provides accurate yield coverage without buffering
- third-party losses can be ignored (e.g. spray drift), provided that MASC appraises the loss and the third party provides compensation for the loss

Disadvantages of IC methodology:

- very responsive – no buffering after major losses
- doesn't ignore losses caused by hail or wildlife

ALTERNATIVE PY METHODS?

MASC has occasionally looked at alternative individual PY methodologies. In the early 2000s, MASC investigated a potential third method of PY individualization. In essence, it was the current IC methodology with the additional component of ignoring hail losses. The upside of the 'Individual Coverage Hail' (ICH) methodology was that spot-losses for hail were ignored in the IC calculation for individuals with hail losses.

However, there was a downside to the ICH methodology. For actuarial and regulatory reasons, any increases in the PYs of individuals who experienced hail losses have to be offset by reduced PYs for other producers with no hail claims (so that the overall average provincial PY for that year remained true).

In a completely random situation, it was determined that individuals with ten years of experience had IC and IPI calculations with roughly the same PY. The alternative ICH methodology, however, would always result in a lower PY, due to the offsetting yield adjustment in the ICH calculation of producers with no hail claims.

To date, MASC has never implemented any alternative individual PY method, generally taking the program design philosophical position that for any crop, a producer either wants buffering (IPI) or responsiveness (IC). Furthermore, providing other alternative PY options would move away from a desired ongoing corporate goal of standardizing and simplifying programs.

MASC has also emphasized that no matter whether IPI or IC is used, it is actuarially important that one methodology remain in place as much as possible with no or minimal flip-flopping.

So should soybeans continue to be an IC crop? Given it is now grown on adequate acreage for IPI calculation purposes, and some soybean producers are now wanting hail losses to be ignored, MPSG has asked MASC to investigate this concept further over the coming year.

If you have any thoughts on this issue, please direct them to MPSG to pass along to MASC for consideration. Additionally, details of the IPI and IC calculations have only been briefly described in this article. For further explanation, please contact your local MASC insurance agent. ■

Clancey's Stats

China's field pea import demand in 2018

Brian Clancey, Senior Market Analyst and Publisher, STAT Communications

CHINA'S FIELD PEA import demand will grow dramatically this year because of expansion of the country's fractionation capacity and unexpected buying by the country's livestock feed sector.

Speakers at this year's China International Pulse and Seeds Conference suggest growing trade tension with the United States along with a steep reduction in demand by India are key factors helping drive demand.

An estimated 300,000 metric tons (MT) of peas have already been bought by compound feed manufacturers. This contributed to a 25 percent increase in China's field pea imports in January and February at 256,000 MT.

As is the case in other countries, feed mills operate on least-cost formulations. That means that they will only be bought when they are cheaper than other ingredients.

It is important to note that Pulse Canada is working to make China's feed sector aware of the nutritional advantages of incorporating peas in their rations. That does not change the fact that peas only work for feed manufacturers when prices are competitive with other ingredients. But, it puts peas on the map.

The competitiveness of peas was helped by India's decision to eliminate the duty exemption for the peas last November. That saw the duty jump from zero to 50 percent effective November 8, 2017. Export trading levels for No. 2 Canada whole yellow peas dropped U.S. $60 per MT within a week of the decision. They recovered over half the loss by January, but have slipped back to a nominal $230 MT on a track Vancouver basis.

However, yellow pea markets are facing a new uncertainty because of India's decision to place the commodity on its restricted import list until the end of June. This will limit total imports between April 1 and June 30 to 100,000 MT. This has increased fears that demand from India could be near zero well into 2019.

China is threatening to impose a 25 percent import duty on U.S. origin corn and soybeans. In the meantime, it has imposed a 178.6 percent anti-dumping duty on U.S. sorghum, which is mainly bought as a feed ingredient.

Many analysts think import duties on soybeans will not result in lower than average trading levels for soybeans and meal. Instead, they will boost demand for product from Argentina, Canada and other suppliers. As prices for those origins increase, European demand for U.S. soybeans should rise; while crushers in Argentina and other net exporting countries may need to buy whole soybeans from the United States to cover their needs.

Changes in trade flows will ensure all countries cover their needs, though costs could be higher. By the same

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token, uncertainty over demand prospects could affect the thinking of farmers in the United States and other countries.

One problem is that media coverage of the impact Chinese import duties will have on U.S. agriculture suggest there will be a fundamental drop in demand instead of a change in who buys from whom. That could make some farmers reduce land in the crop, which has the potential to add price support.

This combination of events has the potential to raise the maximum price that feed manufacturers in China can pay for peas, which could reduce stocks in Canada and elsewhere to manageable levels.

At current values, China's vermicelli manufacturers are also increasing the proportion of peas used in their recipes. When prices are high relative to other sources of starch, many companies reduce the proportion of pea starch in their recipes to keep product costs under control.

This is a large part of the reason China's pea imports from Canada collapsed from just over 967,000 MT during the 2013–14 marketing year to around 795,000 MT the following season and just under 770,000 MT in 2015–16.

Apart from price-based changes in the proportion of pea starch used by noodle makers and shifts in consumer taste preferences, vermicelli markets appears to be mature, with overall growth likely to follow population trends.

Some companies that started in the vermicelli business have expanded into what the Chinese refer to as deep processing. This is the production of protein, starch and fibre fractions, as well as specialized starch or protein mixes.

China will materially expand its pea fractionation capacity this year. In May, one company will finish construction of a project, which will expand its pea processing capacity from 80,000 to 200,000 MT per year. Further increases in capacity are expected this year, with more companies emphasizing the quality of the products produced.

One market targeted for growth by China's fractionation industry is pea protein powder. This sector is seen as having excellent export growth potential because pea protein can be guaranteed to be non-GMO and contains fewer allergic compounds than soy protein.

Isoflavone has numerous proven health benefits, but can trigger food allergies in some people and interfere with some cancer treatments. Soy protein supplements have been associated with bloating, cramping, other stomach problems, constipation and changes in stool quality. In infants, soy-based formula can result in serious diarrhea. For affected people, pea protein is a viable alternative because isoflavone levels are 97 percent lower than in soy protein. ■

www.manitobapulse.ca

Watch GREAT Tastes OF MANITOBA

The Half-Cup Challenge
November 24, 2018

Manitoba Chef to Share His Passion for Pulses on Television

MANITOBA PULSE & Soybean Growers (MPSG) is pleased to announce that Winnipeg Chef Gordon Bailey will be representing the association on the television show Great Tastes of Manitoba, a program promoting the use of local products in everyday recipes.

Gordon was born and raised on the prairies and started his cooking career in Manitoba, but his thirst for adventure set him on a journey to the East Coast of Canada, where he stayed for 17 years. However, after missing his home province and the bounty of food that Manitoba has to offer, he returned three years ago and is currently a chef instructor at Red River College. One thing is for sure, he has a wealth of culinary experience and a passion for pulses!

"The versatility and health benefits that pulses offer make them a go-to for a lot of my menu options," says Gordon. "Not only are they easy to cook but the possibilities are endless whether you're looking to pair them with your favourite protein or let them be the star of the show."

Gordon has worked with MPSG in the past and looks forward to demonstrating and increasing the awareness of pulses in Great Tastes of Manitoba. "This year, on the show I want to make people who might not cook with pulses see them in a different light, and for those who know them well I hope to inspire their recipes to a whole new level. ■

AgVocacy Forum and Commodity Classic in Anaheim

Advocating for agriculture

Toban Dyck, Director of Communications, MPSG

AARON PUTZE IS the director of communications for the Iowa Soybean Association (ISA).

"If you were to stop a farmer in Iowa on the road and ask him or her what my association does, nine times out of 10 that person will have no idea," said Aaron.

Aaron does what I do. Only, he has the challenge of communicating to 40,000 farmers. Five minutes into our chat, after we both felt comfortable enough to be candid with each other, we started to get into it.

I found Aaron sitting on a couch on the second floor of the Anaheim Convention Center, where the Commodity Classic, the largest farmer-led ag conference and tradeshow in the U.S., was taking place at the end of February. He was busy. Very busy. We spent time together between ISA resolution meetings, AGMs, district meeting, delegate events and his required tradeshow booth shifts.

He likes American football. He wrote a book on the topic. Aaron smiles a lot and has a bottomless reserve of energy. If I would have challenged him mid-sentence to a sprint down the corridor, he would have been out of the hacks before I could say, "just kidding."

Aaron wanted to know what Manitoba Pulse & Soybean Growers (MPSG) does to reach its members. And I certainly wanted to know what ISA gets up to, as well.

ISA sends newsletters and press releases out to its members. It also helps administer the Iowa Food & Family Project, an initiative the purpose of which is to help "Iowans become better acquainted with the dedicated farmers who grow their food through activities throughout the year including the Iowa State Fair, farmers markets, farm tours and more. The goal of this outreach is to help consumers become more knowledgeable and trusting in agricultural processes."

MPSG and ISA, it turns out, aren't so different. We both anchor our member communications heavily on extension, production resources and as much person-to-person contact with our farmers as possible.

But, we also talked about China, U.S. President Donald Trump and low protein in soybeans, a trend that has left most, if not all, of North America perplexed. We vowed to keep in touch.

I was in Anaheim to take in an event called the AgVocacy Forum, hosted by Bayer. The company invited a group of agricultural writers from across the U.S., Canada and perhaps even further afield, to hear what others are doing to advocate on behalf of the ag industry to both people in it and the average consumer.

We heard from authors, farmers engaged in sustainable ag practices and politicians. It took place over the two days prior to the Commodity Classic. I stuck around for both.

I learned that many U.S. farmers practice zero-till as a way of preserving moisture, preventing erosion and fostering soil health.

Similarly, it soon became clear that cover cropping is also a popular practice among U.S. farmers. I know it's beginning to get traction here in Manitoba, but south of the border it seems to have near unanimous support. Lots of the ag-related literature in the U.S. right now touches at least somewhat on cover cropping and zero-till.

It's these great practices that the public needs to know about agriculture, we heard at the forum. It's these stories – stories of farmers doing the right things – that need to make front-page, mainstream news.

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GMOs and the need to correct the public's perception of them also came up. And often. Everyone in the room was on the correct side of this one.

A tomato farmer from California also spoke at the forum. He said it's frustrating when the consumer wants a tomato that stays red for a week on the shelf, but doesn't want it bleached. You can't have it both ways, he said. His point was that consumers don't know enough.

Us writers need to let them know. And in some cases, it's us commodity groups that have to help carry that mantle, much like the ISA's Farm & Family campaign.

I met fellow writers, joined the American Agricultural Editors Association and shared appetizers with Kurt Lawton, the guy behind the *Corn and Soybean Digest*, a magazine that spans more than 13 states and has a readership in the hundreds of thousands. This meeting of writers and editors inserted MPSG and MPSG's magazine *Pulse Beat* into a larger network of excellent communicators, all of whom share a passion for agriculture.

Sonny Perdue, U.S. Secretary of Agriculture addresses the attendees

I purchased two suits in preparation for this trip. My wife, Jamie, had been pushing me to do so for a long time prior.

"You should really get a suit or two," she said. "You don't want to meet people looking schleppy."

Hours after the forum officially concluded, the Classic was scheduled to kick-off with an opening banquet/mixer.

Before I was wheels-down in Anaheim, I made the conscious decision to extract the most value out of this trip as possible. And, as out of character as it was for a writer to make such a robotic and utilitarian commitment, I saw it through. So much so, that the instant I returned home and plunked my tired carcass on the couch, I was struck with a virus that rendered me useless for a few days.

I made the decision to attend every event, every meeting and take-up every opportunity to chat with farmers. And I did that.

On opening night, wearing a brand new suit, I walked into a large banquet room knowing not a single person. I was already tired.

I grabbed some appetizers and joined a group of farmers, who happened to be delegates from the Minnesota Corn Growers Association. In this pod, I learned about just how political these commodity groups are in the U.S.

They were asking me questions about my farm. I said it's old and considered a heritage farm in Canada.

"What does that mean?" one of them asked.

"It means I get a plaque and road sign – no exemptions or anything like that," I said, with an audible chuckle.

One of the delegates immediately left the conversation to go find their executive director. They wanted him to hear my comment about tax exemptions for heritage farms and entertain the idea of bringing it up at their resolutions meeting as a potential benefit to lobby the government for.

They decided that this year wouldn't be a good year to bring it up, what with the renewable fuel standard (RFS) up in the air.

I met with members and staff of the North Dakota Soybean Association, South Dakota Soybean Association, United Soybean Board, American Soybean Association, Grain Farmers of Ontario and many, many more.

I even met up with some farmer representatives from Manitoba, some of whom got roped into joining me at a Disney store where I was commissioned to bring home a Cinderella dress for my niece.

I spoke with a lot of people about MPSG and the great things we do. I was a strong champion for our research, our website and our On-Farm Network.

I returned to Canada knowing that low protein in soybeans is a problem North America will have to face together. And that each one of these groups struggles with getting their research, their news, their information in the hands of farmers.

This is why AgVocacy is not only about chatting with the public. It's also about chatting amongst ourselves.

On the plane ride home – still in networking mode – I ended up giving my only copy of *Corn and Soybean Digest* to a couple of dry bean farmers from Manitoba, who had questions about cover cropping, which was the magazine's cover story. They also had agronomy-related questions for MPSG. I handed them a few business cards and urged them to visit our website.

Aaron Putze has since emailed me expressing interest in visiting the soybean fields of Manitoba. I think he very well might. ■

Prairie Fava's Hailey Jefferies

Pulse marketer, entrepreneur and new MPSG board member

Toban Dyck, Director of Communications, MPSG

THIS STORY BEGINS with a car accident and gets more interesting from there. Arlene Dickinson from *Dragon's Den* is involved, and at some point the movie *Silence of the Lambs* is mentioned in reference to fava beans.

This is the story of new Manitoba Pulse & Soybean Growers (MPSG) board member Hailey Jefferies and her company Prairie Fava. But it's also about the places enthusiasm, serendipity and entrepreneurial gumption will take you.

"When my father-in-law saw our business cards, he said, 'You spelled faba wrong,'" said Hailey. "Fava bean is a bean known by many names, depending on where you are from and how you're using it (broad bean, horse bean, tic bean and probably more). Farmers know it as faba and the food/ingredient market knows the pulse as fava. As a consumer-focused company, we decided to use fava."

Hailey and her husband, Cale Jefferies, live in Brandon, and run Prairie Fava, a small company that is poised to explode. Prairie Fava has set course for becoming the go-to place for farmers interested in growing what is this top-notch pulse crop.

The company runs in close connection to Jefferies Seeds near Glenboro, and is anchored by the connections and strong agronomic know-how of the Jefferies's fifth-generation family farm. "We couldn't be doing all of this without Jefferies Seeds and the family farm," said Hailey.

Hailey is bright, energetic and focused. Her and I met at the Prairie Fava headquarters west of Glenboro.

"Cale and I met in Brandon," said Hailey. "He was playing for the Brandon Wheat Kings and was billeted at my high school. We started dating. I moved to Toronto to attend business school. We did the long distance thing for a while."

After a three-year stint with the hockey club, Cale moved to Guelph to be closer to Hailey as well as pursue an ag economics degree.

Hailey graduated, and began working in sales for pharmaceutical company Alcon Canada, where she stayed for two years before her life veered in a different direction.

The year was 2015, and Cale had also recently graduated. "Hey, this would be a good time for us to move back and join the family business," Hailey remembers him saying.

"Oh, great. What the heck am I going to do in rural Manitoba? I moved home in 2015. Then my mom got sick and we were looking for alternative protein sources for her. So, one of the big things was working on her diet. How are we going to get her better nutrition?"

Hailey was on the lookout for an alternative, high-protein diet. And Cale was already selling fava bean seed in the area for livestock feed. "Cale took a group of farmers on a crop tour that summer. The farmers in the area said, "You guys should try to find a market for these beans. We'd grow more then."

Hailey was working part-time at the chamber of commerce in Brandon when Cale suggested she use her sales expertise to explore and create markets for this bean.

"We're pretty entrepreneurial spirited and I'm a risk taker. I said, 'All right, done.' I walked into the chamber of commerce and said, 'I'm starting a fava bean food company,' and that was it."

Hailey confesses she did not know much about fava beans when she

jumped into this new life of marketing them. She spent much of 2015 researching the bean, talking to food companies, processors, key industry organizations and continuing to chat with growers.

Prairie Fava's intention is to find and/or build a strong network of end-use markets for fava beans, giving the company the ability to offer competitive contracts to its farmers.

"The Food Development Centre (FDC) was one of our first contacts in 2016. I didn't even know it was the International Year of the Pulse. Heck. I didn't even really know what a pulse was," said Hailey.

She took two bags of beans to their office in Portage la Prairie, where she got into a car accident. The beans were everywhere. Emergency crews asked if she needed anything. She told them that there was still a chance she could make her meeting at the FDC, but she'd need some help.

So, the firefighters in their full garb rummaged through the car collecting spilled fava beans into a bag for her to bring to the meeting.

"I rolled up to the FDC in a cop car carrying a bag of fava beans. They immediately asked if I was okay."

That meeting started everything for Prairie Fava.

After that fateful day and instrumental meeting, it became clear to Hailey she'd need to find a way to

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process the beans. The food ingredient market would require this, she learned.

"Why don't we make the ingredient ourselves?" Hailey recalled asking. "I went to a Pulse Canada meeting in Saskatchewan and ended up sitting with a gentleman who worked for a multinational packaged goods company. He saw potential in our favas and connected us to his research and development team. And then I met a guy at the conference reception whose company now mills our product. The stars aligned."

Prairie Fava quickly realized that they couldn't mill the entire fava bean. The miller didn't like the hull and neither did some of their potential end-use clients.

They bought a dehuller from Germany. The machine uses emery stones to dehull and split the bean. Prairie Fava broke the first batch of expensive millstones, due to a settings error that could have cost them $15,000, but thanks to the providential grace of the manufacturer, replacing them was not nearly so financially devastating.

"I'm a perfectionist," said Hailey. "I'm fortunate that Cale, his brother and his father are processing wizards and didn't balk at the challenge of figuring out this complicated machine so we could get the results we needed."

They've got it dialled-in now. And they have been busy sending out samples, visiting potential customers and otherwise working hard on behalf of the industry.

"We're kind of at an interesting point right now. We have our splits. We sell whole beans. We sell flour. We sell raw and precooked fava bean flour. We sell flakes and roasted fava beans, as well. There is a lot going on. And there is lots of opportunity. It can be a challenge to stay focused and make sure we are doing everything we take on to the best of our ability."

Transactions with end-use markets can take years, according to Hailey, who confessed that she's learned a lot about patience. Despite the seemingly long process of getting such products to market, Hailey has remained a steadfast optimist.

Prairie Fava was recently accepted into the Calgary-based accelerator called District Ventures. Founded by Arlene Dickenson from the hit TV series *Dragon's Den*, District Ventures is the first accelerator of its kind in Canada. They have a mission to help entrepreneurs succeed. Their sole purpose is to help turn successful companies into globally respected brands.

"We ended up applying for the accelerator program in the summer of 2017 and we were accepted into the Cohort 4 program, which concluded at the end of November with a final pitch day. Cale and I presented our business to key investors, buyers and influencers. It was pretty cool (and very nerve racking) to also be pitching to Arlene. We have now been accepted into Cohort 5, and received an equity investment from District Ventures Capital, Arlene's venture capital fund for food and beverage companies.

"District Ventures' expertise is in consumer-packaged goods, which is something we are excited to be exploring in addition to continuing to grow our ingredient business," said Hailey.

Hailey was going to sign the paperwork for that partnership at 4 p.m. on the day we spoke.

Today, Prairie Fava sends their beans to Saskatchewan for roasting (which, apparently, is big in the snack world right now), but splits them at their Manitoba facility.

Prairie Fava has also started to export. They attended their first international tradeshow called Foodex and are currently in the process of sending a shipment of fava splits to a customer in Japan, where the event took place.

"We are also working with companies in China and Korea that are very interested in fava flour," said Hailey. "Some companies are interested in buying it to further process into a fava protein and some are interested in marketing fava as a high protein source in their food products, such as cookies."

They have also had a lot of interest in their fava flakes. Some food companies like adding the pulse flakes as a meat additive, either in a mixture or as a breading. The flakes are also a popular, less dusty flour alternative.

"Dog food, too," she said. "Testing has now started with a dog food company and so far the company is having great success with the flakes. So, we're hoping to start getting traction in the pet food market segment."

With all of these various markets, Prairie Fava is in the testing phase. And the prospects look promising. The company is set for exponential growth.

They are working with an established food ingredient distributor, which is now promoting the use of fava beans to companies across the country. "They tell us what they need and we supply it."

Hailey has spent a lot of time trying to figure out why the fava bean hasn't taken off in the consumer market. It's exceptionally high in protein and it doesn't have a powerful bean flavour, when milled.

She mentioned that while most people don't know much about fava, a few know the bean from a reference in *Silence of the Lambs*. Anthony Hopkins's

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character, Hannibal Lecter mentions eating fava beans with "a nice chianti."

One of the challenges facing the fava bean market is variety related. "Some farmers have struggled to find the right variety for their unique growing conditions," said Hailey.

Hailey is excited that she has been working closely with DL Seeds on a fava bean variety of their own called DL Rico. It is non-tannin, low vicine and low convince, which is an ideal combination of traits for the human consumption market.

Also, according to studies Hailey has familiarized herself with, the traits present in the DL Rico variety of fava bean will not trigger favism, a rare condition affecting a small percentage of the population – most of whom have Mediterranean origins – with symptoms similar to that of a mild allergic reaction.

DL Rico will be the first fava bean variety of its kind in North America. Prairie Fava hopes this will help the bean become more popular in the global marketplace.

Similar to their partnership with District, Prairie Fava signed the licensing agreement for this new variety the day we spoke.

"The variety is also being multiplied in Chile right now," said Hailey. "And the Jefferies and Craig Riddell from Riddell Seeds are going to be planting breeder seed this year. Craig has been a great resource. He is a wealth of knowledge on fava beans. We are in the process of learning all about ramping up production and how we can work with farmers to get them excited about growing it. It's all quite exhilarating!"

Prairie Fava is striving to activate a steady, reliable network of end-use markets so they can start offering farmers grower contracts and realize their dream of becoming the hub of fava bean activity on the Prairies.

"We want to add value to a great, Canadian prairie crop and see it in the products we eat. It's good for the farmers, good for the environment, good for the consumer. We want to be a successful example about of what the fava bean is capable of."

Hailey joined the MPSG board of directors at the association's AGM in February, seeing the importance of gaining commodity group experience while also offering her expertise in sales and marketing.

She's looking forward to bringing a different perspective to the table.

Hailey Jefferies is not the farmer on the tractor. But she is passionate about pulses and has a strong desire to do whatever she can to grow the pulse and soybean industry from the farm level.

"I have a lot of passion for health and sustainability, and I love exploring ways we could do things better," said Hailey. "I think it's the right time to get involved. I'm excited and honoured to be a part of MPSG's exciting future." ■

The Next Era of MPSG Research

Daryl Domitruk, PhD, PAg, Director of Research and Production, MPSG

WITH THE SUNSET of governments' five-year *Growing Forward* 2 (GF2) programs, MPSG has taken stock of its previous research investments and set priorities for participating in the new Canadian Agricultural Partnership (CAP). While government programs do not define MPSG's research aspirations, they are counted on to stretch producer dollars and enlist the services of federal government researchers.

Since 2012, *Pulse Beat* has reported on GF2-funded projects, representing about $8.5 million in producer investment. Additionally, a read of the inaugural editions of *Pulse Beat – The Science Edition* shows the tremendous range of issues tackled during this time through studies in agronomy, genetics, plant physiology and human nutrition. All GF2 projects have concluded. Their legacy will emerge time and again in MPSG extension activities, further research and as the underpinnings of sustained profit from pulse and soybean production.

The dawn of CAP does not represent a shift in government direction nor in available funds for research. However, CAP does kick off a new round of potential projects and partnerships. For this reason, it was important for MPSG to match its members needs to a framework for future research. This framework simply helps MPSG carve out projects and partnerships most relevant to Manitoba producers. The following table summarizes the research objectives at the heart of the framework.

The first round of CAP project applications were submitted to federal and provincial programs early in 2018. At the time of writing, responses from governments were pending. Nevertheless, MPSG issued a green light to select new projects so they could proceed for the 2018 field season. As well, in 2016 and 2017, MPSG undertook sole funding of several projects which continue in 2018. Both new projects and those in progress are summarized in the adjoining table. A short description of the new projects in the context of their objective appears below.

OBJECTIVE: IMPROVE CROP YIELD AND MARKET QUALITY

Often the largest basket of research activity, projects in this category aim to improve net return without adding to the cost-of-production. Improved crop varieties, crop rotation comparisons, seeding rates and timing along with crop fertility experiments are common focuses of projects.

For example, soybeans face occasional challenges from iron deficiency chlorosis and lower protein content. Agronomic studies by the University of Manitoba Agronomist-in-Residence and variety evaluations by MPSG have been initiated to better understand these problems. Further, an economist has been contracted to investigate the protein discount applied to Manitoba soybeans. Meanwhile, to better explain the interplay of soybean with other crops, MPSG has extended research on crop rotations at University of Manitoba (U of M). Land rolling is a go-to practice for many soybean growers. MPSG has enlisted the U of M and Prairie Agricultural Machinery Institute to determine if there are conditions under which the costs of rolling may not be justified. This study will also look at the potential for inadvertent damage to soil through rolling-induced erosion.

OBJECTIVE: REDUCE PEST CONTROL COSTS

Crop pests (weeds, insects and diseases) literally take a bite out of farm income. This fact has moved MPSG to focus on reducing some of the costs. True enough. Crop input pipelines continue to develop tools such as varieties with stacked traits and crop protection chemicals with a blended range of active ingredients. As effective an ally against pests as these products often are, they also propel rising input costs – too often with returns that are nebulous. What's more, it is widely accepted that the appearance of resistant pests indicates these tools carry the risk of becoming blunted by overuse. One response to these circumstances has been renewed interest in cultural practices the incorporation of which can make pest management systems more robust. Although, the fact that these practices haven't caught on with the majority of producers suggests practical challenges still persist.

Part of MPSG's response is to encourage public research programs to develop pest-resistant crops and methods of early and accurate detection, particularly of soil-borne pests.

The combination of soil-borne pathogens known to cause "root rot" are among the most damaging, especially to pea crops. Under the leadership of Agriculture and Agri-Food Canada's Brandon Research Centre, federal labs in Morden and Lethbridge, along with provincial researchers from Alberta, have teamed to develop tools to definitively detect species of *Fusarium* and a particularly virulent fungus called *Aphanomyces euteiches*. Surveys show a range of Fusarium species exist in many Manitoba soils while *A. euteiches*

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is present in over one-half of dry pea fields. Researchers will also look for genes in the pea plant that render the crop resistant to these pathogens that could, someday, move control costs down.

Wireworm is another root-killing soil-borne pest that's proven difficult to profile and control. Brandon University is building its ag research program partly by using advanced DNA methods to catalogue wireworm and confirm its impact on soybean at various crop stages. By knowing how to assess damage researchers can seek cost-effective controls.

On the weeds side, volunteer herbicide-tolerant canola can plague soybeans. Rather than stacking more weed control products, U of M researchers are assessing "CombCut" equipment to sever the tops of volunteers above the soybean canopy. This should reduce the weed seedbank return and allow more sunlight to penetrate the crop. The same U of M group is examining the use of camera-guided inter-row cultivation of narrow-row edible beans to remove weeds.

OBJECTIVE: GROW MARKET DEMAND

This objective will continue to be the target of research in nutrition and food processing. MPSG's desire is to support rather than lead work in this area. Funding from partners will often be a pre-condition.

To these ends, MPSG has teamed with Pulse Canada's efforts to diversify markets for pulses. MPSG will take its research cues from this market diversification exercise. While at present there are no approved projects in this category, a few are in the proposal stage and Pulse Canada's market work promises to bring more ideas forward.

OBJECTIVE: IMPROVE SOIL QUALITY

Soybean and pulse crops are in harmony with nature through symbiotic nitrogen fixation. At the same time, as a group, pulse and soybean crops contribute the least amount of soil-protecting crop residue. Low-residue crops contribute to an effective crop rotation even though they can leave soil exposed to degrading forces.

Maintaining a robust and resilient soil is the biggest win-win for farmers and society. Despite advances, we're still seeking ways where pulse and soybean crops can help achieve this goal in all areas of the province. A renewed emphasis on this objective is warranted. ■

2018 Funding Approved for Research

RESEARCHER	PROJECT	START	END	MPSG FUNDING	TOTAL VALUE
	CROP YIELD AND MARKET QUALITY				
AAFC – Hou	Evaluation and Selection of Azuki beans for Adaptation and Production in Manitoba	2017	2019	$108,000	$108,000
MPSG – *On-Farm Network*	Soybean Response to Potassium Fertilizer	2017	2018	$39,000	$39,000
MPSG – *On-Farm Network*	Soybean Response to Seeding Rate	2012	2020	$19,100	$19,100
MPSG – *On-Farm Network*	Evaluation of Single vs. Double vs No Inoculation Strategies for Soybean	2017	2019	$19,100	$19,100
AAFC – Mohr	Management Practices to Optimize Establishment and Early-Season Growth of Soybean	2017	2019	$144,022	$144,022
U of M – Flaten	Soybean Response to Potassium Fertility and Fertilizer in Manitoba	2017	2018	$85,226	$170,453
U of M – Lawley	Cover Crop Strategies for Dry Bean and Soybean Crops in Manitoba	2017	2019	$195,444	$195,444
U of M – Lawley	Predicting Soybean Phenology in Manitoba	2017	2019	$96,400	$192,800
U of M – Oresnik	Frequency of Soybean Rotation and Persistence of Rhizobia in Manitoba Soils	2017	2018	$68,700	$68,700
AAFC – Mohr	Sustainable Soybean Cropping Systems for Western Manitoba	2017	2021	$98,325	$196,651
U of M – Stasolla	Enhancing Water Stress Tolerance in Soybean Through Phytoglobin Manipulations	2016	2018	$123,000	$173,000
LU – Belzile	SoyaGen: Improving Yield and Disease Resistance in Short-Season Soybean	2015	2018	$160,000	$375,000
MPSG – MCVET	Evaluating Yield, Disease Resistance and Protein in Pulse and Soybean Varieties	1990s	ongoing	cost recovery	cost recovery
U of M – MacMillan	Soybean Seeding Windows	2017	2019	In 2016, MPSG committed **$400,000** per year for five years to support applied research at the University of Manitoba. Under this program an Agronomist-in-Residence conducts research, extension and student training. Projects are reviewed annually to ensure they align with farmer priorities.	
U of M – MacMillan	Evaluating the Effect of Simulated Hail Damage on Soybeans	2015	2018		
U of M – MacMillan	Soybean Seeding Depth Assessment	2017	2019		
U of M – MacMillan	Soybean Iron Chlorosis – Variety Screening	2017	ongoing		
U of M – MacMillan	Effect of Preceding Crop and Residue Management on Dry Bean	2017	2018		
U of M – MacMillan	Optimizing Nitrogen Rate for Dry Bean Production	2017	2019		
U of M – MacMillan	Novel Pulse Cropping Systems	2017	ongoing	$32,392	$57,843
U of M – Lawley	**Optimizing the Frequency of Soybean in Manitoba Crop Rotations**	**2018**	**2022**	**$212,462**	**$424,925**
PAMI	**Assessment of Pre- and Post-Emergent Rolling in Non-Stony Fields**	**2018**	**2019**	**$113,040**	**$113,040**
C.W. Grant & Co.	**An Economic Investigation of the Quality Discount for Manitoba Soybeans**	**2018**	**2018**	**$24,600**	**$24,600**

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RESEARCHER	PROJECT	START	END	MPSG FUNDING	TOTAL VALUE
	REDUCE THE COST OF PEST CONTROL				
U of M – Gulden	Rotational Effects and Optimized Plant Spatial Arrangement for Wheat Production in Manitoba	2017	2020	$82,800	$349,140
U of M – Costamagna	Determining the Role of Crop and Non-Crop Habitats to Provide Sustainable Aphid Suppression in Soybean	2017	2019	$107,838	$215,677
U of M – Tenuta	Manitoba Survey and Molecular Quantification of Soybean Cyst Nematode	2017	2018	$121,612	$243,225
MPSG – *On-Farm Network*	Soybean Response to Fungicide and Insecticide Seed Treatment	2017	2019	$19,100	$19,100
MPSG – *On-Farm Network*	Field Pea Response to Foliar Fungicide	2017	2019	$4,800	$4,800
MPSG – *On-Farm Network*	Dry Bean Response to Foliar Fungicide	2017	2019	$4,800	$4,800
U of M – Daayf	Frequency of Soybean Rotations: Exploring Root Rot and Foliar Pathogens	2017	2018	$106,000	$106,000
BU – Cassone	The Most Comprehensive Survey of Foliar Diseases in Manitoba Soybean	2016	2018	$112,509	$112,509
U of M – Gulden	Optimizing Plant Spatial Arrangement and Weed Management for Field Bean Production	2015	2019	$236,325	$236,325
AAFC – McLaren	**Management of Root Rot in Pea in Manitoba**	**2018**	**2020**	**$150,000**	**$150,000**
BU – Cassone	**Improved Integrative Pest Management of Wireworm in Manitoba**	**2018**	**2020**	**$78,545**	**$157,090**
U of M – Entz	**Novel Mechanical Weed Control Tools for Integrated Weed Management in Narrow-Row Field Beans.**	**2018**	**2019**	**$115,000**	**$115,000**
U of M – Entz	**Control of Late-Season Herbicide Escapes and Volunteer Canola by Selective Cutting Using the CombCut**	**2018**	**2019**	**$27,140**	**$54,280**
MPSG – *On-Farm Network*	**Soybean Response to Foliar Fungicide**	**2018**	**2020**	**$15,900**	**$15,900**
	IMPROVE SOIL QUALITY				
U of M – Lobb	**Assessment of the Agronomic and Environmental Impacts of Land Rolling in Soybean Production in Manitoba**	**2018**	**2019**	**$85,560**	**$85,560**
	GROW MARKET DEMAND – *Projects Under Development*				
Total Project Funding Commitments				**$3,001,092**	**$4,538,142**

New Projects in Bold

AAFC – Agriculture and Agri-Food Canada
BU – Brandon University
LU – Laval University
MCVET – Manitoba Crop Variety Evaluation Trials
MPSG – Manitoba Pulse & Soybean Growers
PAMI – Prairie Agriculture Machinery Institute
U of M – University of Manitoba

Make the Most of Your MPSG Investment

DID YOU KNOW that as a Manitoba Pulse & Soybean Grower member in good standing, you are able to claim a Scientific Research & Experimental Development (SR&ED) tax credit on your personal or corporate tax return to reduce your income taxes payable?

Every year, MPSG invests the funds it receives from farmers (check-off) in a variety of research projects. These types of expenditures are eligible for the SR&ED tax credit and MPSG members in good standing can claim this credit on their income tax.

BUT WHAT ARE FARMERS ABLE TO CLAIM?

MPSG, following the guide put out by the Canadian Revenue Agency, determines what percentage of the research dollars invested qualifies under the program. A number as a percentage of the check-off dollars paid is published on our website. You can use this number or have your accountant use the number to lower your income tax payable. In 2017, the SR&ED tax credit is 48.42%.

EXAMPLE FOR CALCULATION OF TAX CREDITS

In 2017, John Doe paid $2,500 in check-off to MPSG.

- If John Doe's **farm is incorporated** and he files a corporate tax return, his additional investment tax credit is calculated as follows:

  $2,500 x 48.42% x 80%* x 35% = $338.94
  the corporate income tax payable is reduced by this amount.

- If John Doe runs a **sole proprietorship** and the farm income is on his personal tax return, his additional investment tax credit is calculated as follows:

  $2,500 x 48.42% x 80%* x 15% = $145.26
  the personal income tax payable is reduced by this amount.

  If there is no tax payable that year, the amount can be carried forward and used in a year when taxes are due.

*The Canada Revenue Agency only allows 80% of eligible expenditures related to SR&ED to be claimed.

Water Limitations in Pulse and Soybean Crops

Laura Schmidt, Extension Coordinator, MPSG

ANNUAL CROP WATER use is low at the beginning of the growing season and increases as the crop progresses through the vegetative growth stages. It peaks during reproductive development and gradually declines at maturity.

Soybeans require significantly more water than wheat, canola and pulse crops, taking up 400–500 mm (16–20 inches) over the entire growing season (Table 1). The actual amount will vary with maturity group, planting date and environmental conditions. For most of agro-Manitoba, the normal accumulated precipitation during the growing season is between 300–350 mm (12–14 inches). This means we often rely on moisture held in the soil from the previous year to support our soybean crops. Our other pulse crops like peas and dry beans require less water overall, as they are cool-season legumes (Table 1).

Table 1. Approximate daily water use and total growing season water use (mm) for soybeans, peas and dry beans. Values are based on optimum soil moisture conditions. Water use can vary depending on variety, plant density and environmental conditions.

Crop Stage	Soybeans[1]	Peas[2]	Dry Beans[3]
Germination and seedling	1.3–2.5	0.5–2	0.5–1.5
Vegetative growth	2.5–5	2–5	1.5–4.5
Flowering to pod fill	5–7.6	5–6	4.5–7
Maturation	1.3–5	3–5	3–5
Total seasonal water use	400–500 mm	300–370 mm	300–375 mm

GERMINATION

Pulse and soybean crops are susceptible to water limitations during germination. Soybean seeds need to imbibe half of their weight in water for germination and seedling elongation. Peas and dry beans also need to have sufficient water for germination and root development during the early stages of growth.

Inadequate soil water in these early growth stages may result in reduced plant populations, which can reduce final seed yield. Soybean and dry bean plants will try to compensate under low density conditions once sufficient moisture is available. Plants will produce more branches, leaf area and pods per plant. However, in soybeans, these compensatory mechanisms are not always enough to combat severely reduced plant stands and yield reductions may still occur.

Emergence may also be uneven, due to delayed emergence. Whole seeds in dry soil will eventually germinate and emerge once adequate moisture is present, filling in stand densities. Soybean maturity is largely determined by photoperiod, meaning these late-emerging plants will be ready for harvest at the same time as early-emerging plants. However, these later-emerging plants will have less growing time, accumulating less biomass and producing less seed yield.

VEGETATIVE GROWTH

During the vegetative growth stages, short-term, moderate water deficits generally do not influence yield.[1] Compensatory growth will occur following precipitation. Interestingly, one study evaluated the response of soybeans to water stress induced at different developmental stages and found plants subjected to water stress during the V4 stage showed an increased tolerance to water shortages in later stages.[4]

Typically, soybean root distribution is concentrated in the top 16 inches (40 cm) of soil, with over half of the root mass growing in the top eight inches (20 cm). Peas also obtain the majority of their seasonal water from the top 14 inches (35 cm) of soil, with an effective water extraction depth of 2.3 feet (70 cm).

Roots in this upper soil profile grow slowly under water limitations. Plants tend to compensate by partitioning photosynthates to the roots, enabling them to grow more rapidly into the lower soil profile. This results in a reduction or cessation in shoot growth, allowing roots to penetrate further into the soil in search of moisture. Under normal field conditions in Iowa, soybeans have been measured to grow as deep as 4.9 to 6.5 feet (1.5–2 m). Growth rates return to normal once soil water levels return to normal.

Above ground, symptoms of heat stress may be visible. Growth may be reduced, the distance between internodes shortens and leaves may be shed to conserve moisture. Soybeans also turn their leaves to reflect solar energy, reducing heat as well as reducing photosynthesis. Reduced photosynthesis allows plant stomates to remain closed and reduces water loss through respiration.

CRITICAL TIMING

Critical timing for water uptake by pulse and soybean crops occurs during flowering and pod fill (R1–R6). Water deficits during these reproductive development stages will reduce yield. While water demand of soybeans is

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highest at flower initiation (R1), water limitations during pod initiation (R3) and filling (R5–R6) are more critical to yield. In one study, each millimetre of rain between flowering and pod emergence caused a yield increase 0.06 bu/ac. During grain filling, each millimetre of rain resulted in a yield increase of 0.19 bu/ac.[4]

During these reproductive development stages, water deficits can result in flower abortion, leading to a reduction in pod number and yield. Water-stressed plants also often mature earlier, shortening the grain-filling period, resulting in reduced seed weight and seeds per pod. In August, during pod formation and seed fill, soybeans and peas will take up approximately 6–8 mm (1/4–1/3 inch) of water per day.

Prolonged water limitations in pulse and soybean crops also reduces activity in the root nodules, reducing nitrogen fixation. Water deficits result in limited water and oxygen supply to the root nodules, as well as a build up of the nitrogen compounds synthesized during nitrogen fixation (ureides) in the stem tissue. The ureide accumulation in the stem tissue signals back to the nodules, reducing nitrogen fixation. The subsequent decline in nitrogen supply leads to further yield reductions. Some evidence has reported that soybean plants that produce larger nodules are less susceptible to reductions in nitrogen fixation under water stress.[4]

Water deficits induced during reproductive development may result in a higher protein content in soybean seeds, according to some studies.[4] However, water limitations during this time significantly reduce soybean yield. Lower seed number and weight means fewer sinks for protein within the plant, leading to a higher protein content in the grain.

MANAGEMENT

Management practices that leave high amounts of residue on the soil surface and improve soil structure can increase water infiltration rate. Adopting production practices that reduce soil compaction can also benefit yield when drought conditions occur, through improved root penetration and nodule function.

Adequate plant nutrition can further combat the deleterious effects of water stress. Potassium, phosphorus and calcium have direct beneficial effects on plant metabolism under water limitations and improve plant recovery following water deficits. ■

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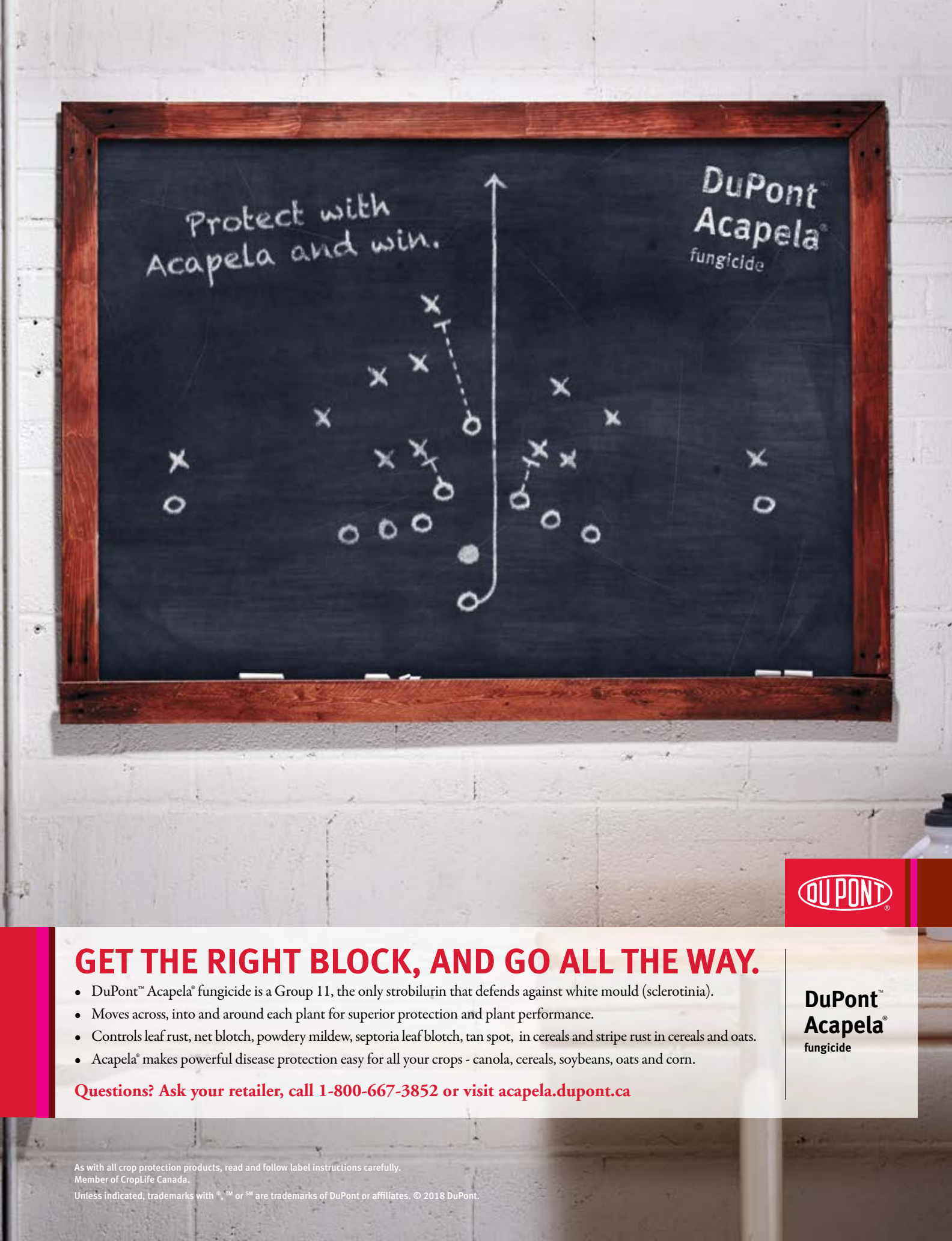

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Faba Bean Agronomy

Cassandra Tkachuk, MSc, PAg, Production Specialist – East, MPSG

The Bean Report

FABA BEANS (VICIA FABA), also known as fava or broad beans, have tremendous potential in Manitoba due to their rotational benefits and adaptation to cool, moist growing conditions. In 2017, Manitoba saw approximately 7800 acres of faba beans scattered throughout the province (MASC). Limited acres are largely due to marketing constraints within the export marketplace. But there is also relatively limited experience and knowledge of faba bean production in Manitoba. Whether you have secured a marketing strategy as an experienced faba producer, or you are interested in trying them for the first time, this article will provide (a refresher on) the basics in faba bean agronomy.

DESCRIPTION

Faba beans produce tall, upright plants (three to five feet in height) that develop large pods along the square, main stem. They are annual, cool-season legumes with high biological nitrogen fixation (BNF) capability. These plants prefer moist growing conditions and have a greater tolerance to flooding than other pulse crops. For maximum yield potential, faba beans require at least 10 inches of water per season. High seed protein and energy content makes them suitable for human or animal consumption, depending on the type that is grown.

FIELD SELECTION

For faba bean production, select fields with:

- medium to heavy textured soils with good water holding capacity
- soil test soluble salt levels less than 1.0 mmho/cm[1]
- cereal stubble
- adequate phosphorus and potassium levels, low nitrogen – see *Fertility* section for more information.
- no carryover of residual herbicides (see *Guide to Field Crop Protection*)

VARIETY SELECTION

In order of importance, the major considerations for faba bean variety selection should be the target market, seed size and maturity. Faba bean varieties fall into two categories:

1. **Tannin varieties** – coloured flowers or white flowers with a black spot, tan seed coats, seeds are often larger, grown for human consumption markets due to desirable cooking quality
2. **Low or near zero tannin varieties** – white flowers, greyish-white seed coats, grown mainly for the livestock feed industry

Due to cross-pollination that can occur between tannin and low tannin varieties, ensure at least 500 metres between types. Large-seeded tannin types have better cooking quality and are more desirable in export markets, such as Egypt, the United Arab Emirates, Morocco and Ethiopia. In 2017, the most common varieties grown in Manitoba were Snowbird (smaller-seeded) and Tabasco (larger-seeded), which are both low tannin varieties. The five- and 10-year yield averages for the province are 2379 and 2127 lbs/ac, respectively (MASC). Refer to the MPSG *Pulse and Soybean Variety Guide* or *Seed Manitoba* for faba bean variety data, such as days to maturity, thousand kernel weight and yield.

PLANT ESTABLISHMENT

Row Spacing and Equipment

As faba beans grow upright and do not branch out, narrower rows will provide faster canopy closure, better weed competition and moisture conservation. However, this needs to be validated by research in western Canada.

Planters or air seeders can be used for faba bean planting, although air seeders pose a greater risk of plugging, damage to the seed and uneven seed depth. Due to the irregular shape and large seed size, plugging can occur at various points in an air seeder—the metering system, distribution system, blockage sensors and soil openers. Plant slowly (less than five mph) to avoid plugging issues. According to a survey conducted by the Prairie Agricultural Machinery Institute (PAMI) across Saskatchewan in 2017, soil openers were the most common source of plugging. Openers

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▼ *Faba bean plants at the flowering stage (Source: Manitoba Agriculture). Inset: Square stem with clasping leaf.*

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with straight-through geometry and no obstructions or change in direction reduced the probability of plugging. Follow equipment manufacturer recommendations and consider a "practice run" to ensure there are no flow issues. Also refer to the PAMI report for an extensive list of solutions to seed plugging.[2]

Date, Depth and Rate

Faba beans should be planted as early as possible in Manitoba for maximum yield potential. Also to ensure they reach maturity in 105 to 110 days. Soil temperature should be at least 3°C for successful germination. Aim to plant during the last week in April to the first week in May and avoid planting later than mid-May. Hypogeal germination keeps faba bean seedlings safe from frost after emergence, as the growing point remains below ground. The recommended seed depth range for faba beans is 2 to 3 ½ inches, ensuring adequate seed to soil moisture contact for successful germination.

The recommended target population for faba beans is 40–45 live plants/m^2 (161,000–182,000 plants/ac). Research by Dr. Steve Shirtliffe in Saskatchewan is currently wrapping up to validate the optimal plant population. For an accurate seeding rate, calculate the thousand kernel weight (TKW), % germination and estimate expected seed survival for each seed lot. Seed survival may be reduced by seed handling and dry field conditions. Seed size and weight can also vary widely. According to the same PAMI survey and Manitoba variety evaluation trials, seed weight can range from 335 to 789 g/1000 seeds, which results in a wide seeding rate range.[2] Also consider seed cost, expected grain price and yield for the most economical seeding rate.

FERTILITY

Faba beans should be inoculated with *Rhizobium leguminosarum* bacteria to promote BNF. This inoculant species is the same for peas and lentils; however, check the label to ensure the strain is registered for faba beans specifically. Faba bean plants can fix approximately 90% of their N-requirement and can leave behind an N-credit for subsequent crops.[3] This means fabas are a nice fit in crop rotations and a good cover crop option. Although starter N fertilizer is not necessary, ensure soil test N levels are low enough to accommodate nodulation (<50 lbs N/ac). The first root nodules will appear about two to three weeks after emergence and peak N_2-fixation extends from full flower to late podding.

Faba beans are efficient at extracting phosphorus. For long-term management, ensure nutrient inputs balance grain removal throughout a rotation. See Table 1 for average nutrient removal rates of faba beans. According to research conducted at the University of Saskatchewan (U of S), up to 40 lbs P/ac can be seed-placed safely with faba beans (10–15% seed-bed utilization).[4] Research on faba bean nutrient uptake and nitrogen fixation is ongoing at the U of S in Dr. Jeff Schoenau's lab, so stay tuned for more results.

Table 1. Average faba bean nutrient removal rates.

Nutrient	Removal	
	lbs/bu	lbs/ac*
Nitrogen (N)	3.0	150
Phosphorus (P_2O_5)	1.2	60
Potassium (K_2O)	0.9	45
Sulphur (S)	0.1	5

*Based on a 50 bu/ac (3000 lbs/ac) faba bean crop.

Faba bean tannin seed (left) and low-tannin seed (right). Source: Mark Olson, Alberta Agriculture and Forestry.

WEED CONTROL

Early-season weed control is important for faba beans, as they are relatively poor competitors. Reduced emergence under dry conditions, for example, can further reduce competitive ability of the crop.

Research is needed in western Canada to determine the critical weed-free period of faba beans.

Tips on Weed Control in Faba Beans

- Use pre-plant herbicides to improve early-season competition and avoid the need for broadleaf weed control in-crop.
- Aim to control perennial weeds in the fall.
- Avoid late application of herbicides to prevent crop injury. Follow application timing directions on the label.
- Consult the *Guide to Field Crop Protection,* product labels and chemical reps for information on the best herbicide options, risk of herbicide carryover and pre-harvest intervals (PHI).

DISEASES

The main disease pests of faba beans are chocolate spot (*Botrytis cinerea* or *B. fabae*), also known as grey mould, and *Ascochyta fabae*. *B. cinerea* is also a pest of chickpeas, sunflowers, buckwheat and alfalfa. Producers should be wary of using crop rotation to control this disease if these crops are also included in a rotation. Most pulse crops are associated with a type of ascochyta blight (faba beans, peas, lentils, chickpeas); however, *A. fabae* is specific to faba beans and crop rotation can successfully be used to prevent this disease.[5] Both diseases are seed- and stubble-borne, so purchasing disease-free seed is another method of control. The benefit of leaving infected residue on the soil surface (e.g. prevention of soil erosion) would outweigh the benefits of burying infected crop residue.

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Like soybeans and other pulse crops, faba beans are susceptible to the root rot complex, including *Fusarium spp.*, *Pythium spp.* and *Rhizoctonia solani*. According to a 2009 survey conducted by Dr. Robert Conner at AAFC, all three root diseases were present in faba bean crops, but *Fusarium avenaceum* was the most common.[6] No crops were severely affected by *F. avenaceum* at the time, but inoculum can persist in crop residue for several years, especially with a wide range of host crops such as field peas. In the same study, fungicide seed treatment improved seedling emergence and yield.

Below is a list of foliar diseases to scout for in faba beans:

- chocolate spot (*Botrytis fabae* or *B. cinerea*)
- ascochyta blight (*Ascochyta fabae*)
- anthracnose
- bean yellow mosaic virus (BYMV)
- white mould (*Sclerotinia sclerotiorum*)
- alternaria leaf spot
- rust
- powdery mildew

All except for BYMV are fungal pathogens. However, ensure that foliar fungicides are registered for control of the disease in question, and that it would be economical to apply the product. Not all diseases listed here will occur at economical levels in Manitoba. Note that higher incidence of these diseases can be expected under irrigation.

INSECTS

Insect pests to watch for in Manitoba-grown faba beans include cutworms, lygus bugs, pea aphids, bertha armyworms and grasshoppers. Pea leaf weevil is also a pest of faba beans, but its presence has not been confirmed in Manitoba. Blister beetles are of concern if faba beans are grown for livestock feed, due to the toxin cantharidin. Scout for severed plant tissue caused by cutworms early in the season. Note that insecticide seed treatments do not provide protection against cutworms and faba seedlings can re-grow from the growing point at the seed after they are damaged. Scout for lygus bugs starting in mid-June. Lygus bugs pierce the pod and cause damage to the seed coat, appearing as a brown spot on the seed. This direct damage to the seed can cause downgrading. As lygus bugs and bertha armyworms are also pests of canola, be vigilant of pest pressure if these two crops are close in rotation. Less is known about the extent of aphid damage to fabas in Manitoba, but damage will appear as brown spotting on the undersides of leaves. Grasshopper and bertha armyworm forecasts are also available from Manitoba Agriculture each season.

▼ *Chocolate spot (left) and Ascochyta blight (right) on faba bean plants. Source: Pulse Australia.*

HARVEST

High volumes of plant biomass typically make faba bean harvest a challenge. This crop can be direct harvested or swathed then combined. However, swaths can be difficult to pick up and do not dry out if they are rained on. On the flip side, pod shatter losses can occur if the crop is left standing to completely mature. Due to this, desiccation is recommended to help speed up maturity. If desiccating, refer to PHIs and maximum residue levels (MRLs) to prevent market restrictions (keepingitclean.ca). Faba beans should be direct harvested at 18–20% moisture to reduce seed damage, then aerated. Seed is considered dry enough for storage at 16% moisture. A flex header is not crucial for direct harvesting due to high pod clearance. Also keep an eye on harvest loss. With a seed weight of 450 g/1000 seeds, approximately 1 ½ seeds/ft^2 equate to 1 bu/ac of yield loss. ■

Acknowledgements

Information in this article was adapted from presentations and resources developed by Sherrilyn Phelps at Saskatchewan Pulse Growers and Chris Holzapfel at the Indian Head Agricultural Research Foundation. Manitoba Pulse & Soybean Growers gratefully acknowledges the contribution of these partners.

MPSG FUNDING COMMITMENT

To date, MPSG has funded three projects focused on faba beans in recent years, representing $111,031.

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Getting Peas in the Bin

Laryssa Stevenson, MSc, PAg, Production Specialist – West, MPSG

The Pea Report

"LOWER YOUR EXPECTATIONS" was a comment from a farmer this winter who was asked about how to best harvest field peas. Getting a pea crop off can be slow and challenging, even for experienced growers. But improved genetics, the right equipment options and careful timing can make all the difference.

DEALING WITH LODGING

Both straight-cutting and windrowing are viable options for harvesting peas, which lodge with increasing severity under wetter conditions and taller crop canopy height. Varieties of most common market classes (e.g. yellow) are semi-leafless, meaning the leaflets have been replaced by tendrils. These tendrils knit together, improving standability. Newer yellow pea varieties, such as CDC Amarillo, Spectrum, Canary and Athabasca, AAC Ardill and Lacombe and Abarth also have improved lodging resistance over older varieties like Agassiz and CDC Meadow. Use of a foliar fungicide and recommended seeding rates may also decrease lodging.

If direct harvesting, flex headers are typically used to run as close to the ground as possible. Rigid headers can also successfully be used and may be preferred if stones are prevalent in the field. Even if no stones are present, land rolling is a must to reduce earth tag when straight-cutting. Vine lifters and pick up reels aid in harvesting lodged crops by lifting the canopy up over the cutting bar. Vine lifters have been found to reduce harvest losses from 5% to 1.5% of crop yield, decrease plugging and allow for faster harvest speeds.[1] Lifters spaced at 9–12 inch intervals were found to work best.

Swathers can be used if the crop has begun to lodge earlier during the dry-down phase. Swathing also facilitates a pick-up header and avoids the risk of picking up stones or earth. Swaths can be quite billowy immediately after swathing and susceptible to wind damage, so harvest should be timed as quickly as possible after dry-down.

TIMING YOUR OPERATIONS

Most yellow peas are determinate, but staging maturity of peas for swathing or desiccating can be a bit tricky. The plant flowers and ripens from the bottom up and there will often be green material at the top of the plant when the majority of the plant is ripening. This means looking across the field from the road could be misleading. Getting into the crop canopy and opening up pods is necessary. After doing some ground truthing, using a drone is a good way of checking the evenness of maturity across the field, especially when you know there are depressions or sandy ridges with contrasting moisture levels that will affect maturity.

Peas are ready to desiccate or swath when the crop reaches R7 – when most pods (75–80%) are yellow/golden brown, seeds in the bottom pods become detached and rattle in the pod and overall seed moisture is <30% (Figure 1).[2] Harvest can commence in 3–10 days post-desiccant application, depending on the product, heat and moisture conditions and crop stage. Several active ingredients are registered as pre-harvest aids and desiccants for field pea including carfentrazone (Aim, CleanStart), diquat, glyphosate, saflufenacil (Heat LQ/Heat WG) and flumioxazine (Valtera). Some of these actives may restrict export to key markets. Before selecting a product, visit keepingitclean.ca for up-to-date maximum residue limits and consult your grain buyer.

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▼ *Figure 1. Appearance of oldest pod at R3, R4, R5 and R6. At R7 (not pictured), most pods are brown and dry with yellow seeds that rattle in lower pods. "Dry" seeds will not dent with fingernail pressure.[2]*

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▲ *Figure 2. At R8, seed is dry (<20%) and ready to harvest.*

Harvest peas when overall seed moisture is <20% (Figure 2). Combining in the humid parts of the day, morning and evening, can reduce shatter loss, but tougher plant material may not feed as well. Matching the pick-up header or reel speed to ground speed will also reduce shatter.

MAINTAINING SEED QUALITY

Your harvest operations and weather during harvest can affect seed quality which is important for marketing peas. A few grading factors to keep in mind this harvest are:

- **Cracked seed coats and splits** – These occur when seed is too dry and/or cylinder or rotor speeds are too high. Harvesting at 18–20% seed moisture and slowing cylinder speed with drier grain can reduce seed damage. Run combine and grain cart augers at low speeds and at full capacity.
- **Shrivelled seed** – Seed appears dimpled and shrunken, due to plant senescence while seed was immature. Carefully timed swathing or desiccation will avoid this issue.
- **Bleaching** – A grading factor only in green peas, bleaching is caused by excessive moisture (rainfall or humidity) at crop maturity, causing a yellow colour on the cotyledons. Desiccation and prompt harvest can reduce the risk of bleaching.
- **Earth tag** – A greater issue in peas than in other crops due to the nature of harvest and the texture of the seed coat (which retains dirt). If you are finding earth tag on the seed, check for soil sticking to the flighting on your combine augers. Reduce earth tag by minimizing green or dewy plant material passing through the combine and if necessary, lift the cutting bar.
- **Pink peas** – Hail can damage pods and allow the bacteria *Erwinia rhapontici* to enter and stain peas pink.
- **Spoilage** – As the peas enter the bin, measure the grain temperature and moisture. If the initial temperature and moisture are within the "no spoilage" zone of Figure 3, grain can be safely stored for up to five months.[3] A general recommendation is to use aeration fans to cool and dry the crop to at least 16% moisture and 15°C. ■

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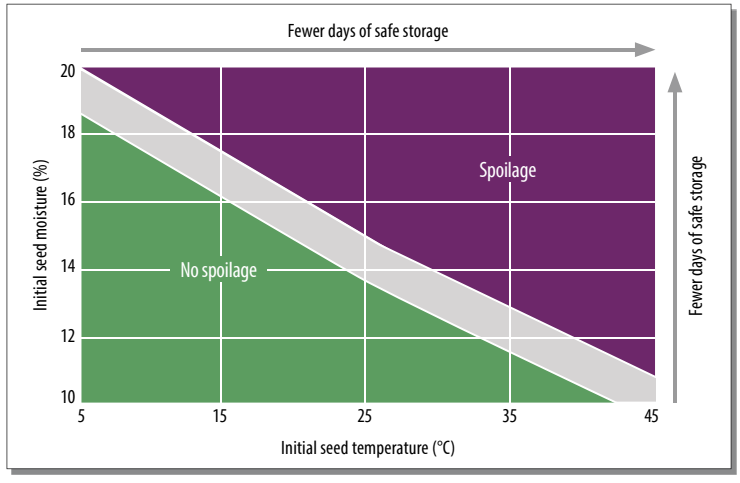
▼ *Figure 3. Canadian Grain Commission safe storage chart for peas. Spoilage occurs when initial temperature ranges from 5°C to 42°C, with respective moisture from 19% to 10%.[3]*



Yield Impact of Yellow Soybeans and Management Strategies

Kristen P. MacMillan, MSc, PAg, Research Agronomist, University of Manitoba

Figure 1. Over 80 varieties are rated for iron deficiency chlorosis (IDC) annually at an IDC prone site near Winnipeg.

THE YELLOWING OVER of soybean fields, caused by iron deficiency chlorosis, during June in Manitoba is a mystery that continues to be investigated. It hits close to home for me – over half the soil tests on our farm come back at a "high" risk for IDC. We choose varieties carefully and continue to grow great soybeans, but a look into the literature describing this unique soil-plant interaction offers more insight into how we could manage it in the future.

UNDERSTANDING THE SOIL-PLANT-WATER INTERACTION

To manage a problem, you must first understand the system. Iron deficiency chlorosis (IDC) is a challenge unique to high pH soils (often called calcareous due to the presence of calcium carbonates), which is why we don't hear about it from all soybean growing regions. Manitoba soils are calcareous by nature; calcium carbonates in our soil are derived from the weathering of limestone parent material, particularly in the Interlake and Red River Valley. In wet soil, carbon dioxide builds up and reacts with these carbonates, leading to bicarbonate which impedes iron uptake in soybeans. Despite iron being abundant in most of our soils, soybeans need to convert it to an available form for uptake by acidifying the area around their roots. Bicarbonate neutralizes that acidification process, reducing the availability of iron, leading to IDC. In addition to wet, calcareous soils, high nitrate levels are also thought to be involved with bicarbonate presence in the soil and salinity and is another soil factor that contributes to IDC. Good news though – the ability of soybean to acidify their root zone and take up iron differs among cultivars, which is why variety selection is the best management tool for IDC prone environments.

HOW ARE VARIETIES EVALUATED FOR IDC AND HOW MUCH DOES IT IMPACT YIELD?

The susceptibility of soybean varieties to IDC is tested annually at an IDC prone site near Winnipeg (Figure 1). Each variety is grown in single rows over three replicates and a visual rating from 1 to 5 is assigned based on its reaction, with 1 being tolerant and 5 being highly susceptible. This information is then used to choose varieties when growing soybeans in fields prone to IDC. The IDC test site was taken to yield in 2017 for the first time in order to demonstrate the effect of IDC rating on yield. In Figure 2, soybean yield decrease in response to IDC rating is shown through regression using the 2017 data. The results may surprise you. Based on last year's trial, soybean yield was reduced by 20 bu/ac with each 1-unit increase in IDC rating at V5/R1. For example, varieties with an IDC rating of 1.7 produced an average soybean yield of 43 bu/ac compared to 23 bu/ac for soybean varieties with an IDC rating of 2.7, in an IDC prone environment. These results may represent the extremity of yield impact due to IDC as symptoms in 2017 persisted for several weeks; in other years, chlorosis comes and goes within a week and may have less of an impact on yield. However, these results are in line with previous data from North Dakota, where Goos (1998–2000) reported 9–19 bu/ac yield decrease per chlorosis unit at V5–6. So if you were skeptical of variety

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Figure 2. Soybean yield decrease with increasing IDC rating as collected from the 2017 IDC trial.

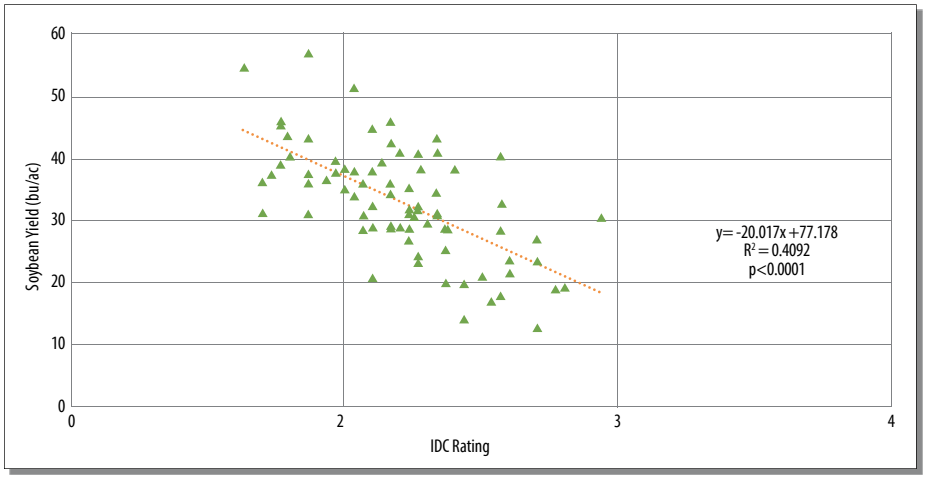

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Figure 3. The pattern of IDC in a field varies by soil and topography. In nearly level fields of the Red River Valley and Interlake, carbonates are often widespread in the soil (pictured left is a field planted to tolerant and susceptible variety). While areas where topography and salinity are at play, IDC may occur in only certain parts of the field, often low areas and headlands (pictured right). In other cases, the pattern may be unpredictable from year to year, making site specific management an even greater challenge.

selection as a management tool for iron chlorosis, I hope this convinces you otherwise.

BUT WHAT IF WE ARE DEALING WITH IDC PRONE AREAS, NOT ENTIRE FIELDS?

This past winter, I spoke of this topic to farmer audiences in Brandon and Clandeboye – and I surveyed the groups on their experiences with iron chlorosis. The majority indicated that IDC occurs every year, and that when IDC occurs, 10–25% of their acres are affected.

The reason I asked these questions is because Helms et al. (2010) found that in North Dakota and South Dakota, varieties suited for IDC affected areas did not maximize yield in non-IDC parts of the field, although in Kansas they did. In other words, varieties can perform differently depending on the environment, but also potentially by site within environment or field. To optimize yield across the whole field, we could be planting multiple varieties or planting the overall best variety. But what varieties and where? Does this yield drag with IDC score exist in Manitoba? What is the overall best variety? The answers are not readily available.

MOVING TOWARDS SITE-SPECIFIC MANAGEMENT OF IDC

Currently, soil test values for calcium carbonates and soluble salts are used as predictors to evaluate field risk for IDC; this index was developed by AgVise and was able to predict IDC occurrence 73–81% of the time. The best management strategy begins with soil testing, using this index to assess field risk, and then choosing varieties based on field risk in order to prevent the yield loss previously discussed. Another approach is using those soil layers for site-specific management – however, temporal and spatial variability in the occurrence of IDC across years and within fields remains a challenge. This is likely due to the interaction of soil factors with moisture and the heterogeneity of soil properties at a fine scale. Mapping the occurrence of IDC when it's actually happening, and letting the plants tell the story, is something I encourage you to start doing – it may provide the foundation for future site-specific management.

To move forward and address some of these questions, future work in Manitoba aims to evaluate soybean yield performance on both IDC and non-IDC sites within the same field, potentially expand to multiple fields and attempt to characterize where IDC occurs in fields by building on previous literature. Stay tuned as more clues are unveiled. ■

DATES TO REMEMBER 2018

- **SMART Day**
  July 17 WADO | *Melita, MB*
  July 19 PESAI | *Arborg, MB*
- **Crops-a-Palooza**
  July 25 | *Portage la Prairie, MB*
- **Great Tastes of Manitoba**
  November 24 | *CTV Winnipeg*

Intercropping After Harvest

Managing the potential of intercrops

Dr. Joy Agnew, PEng, Prairie Agricultural Machinery Institute

▲ *Separating intercrops on-farm before storing.*

INTEREST IN THE practice of planting two different crops on the same land, or intercropping, is growing exponentially. Despite more complications during seeding, separation and storage producers are looking at intercropping to improve soil health, ease crop harvesting and to diversify risk. In my own province of Saskatchewan, producers expect to seed around 30,000 acres of intercrops this year, which is modest, but demand for more information is evident. Intercropping workshops fill up quickly and I field an average of one inquiry a week on this topic.

Intercropping makes sense for pulse growers. During harvest, these crops have a tendency to lay flat when grown as a monocrop. Not only does this pose yield challenges, but you also face the risk of picking up rocks and damaging your machinery. In combination with other crops like canola or flax, the oilseed crops form a stand for peas, soybeans, lentils and chickpeas to grow.

The Prairie Agricultural Machinery Institute (PAMI) conducts research and development for agricultural technology. There is a lot of science yet to discover on the topic of intercropping, but we can also draw implications from our past research in grain processing and storage and apply it to this emerging technique.

SEPARATION AND CLEANING

The difference in the size of the seeds drives the ease with which grains are separated and cleaned. One can use a variety of technologies:

- **Gravity tables** use a tilted, vibrating table to separate grains based on seed size and weight. The capacity is 400 to 1,400 bu/hr.
- Offering efficiencies of up to 13,000 bu/hr are **rotary grain cleaners**, which also rely on difference of seed size.
- **Air separators** or aspirators operate on different densities of seeds with a capacity between gravity tables and rotary grain cleaners.
- **Flat sieves and screens** offer varying capacity and also rely on differences in seed size but may also use air streams to remove impurities.
- Other technologies include the centrifuge-like **spiral separators, indent cylinder machines and colour/seed property separators**.

With the hundreds of combinations of grains available through intercropping, separation becomes as much an art as it is a science and there is no definitive optimal technology. Beyond seed size, shape and density, one must consider different variables in their choices including dockage level and seed-mix ratio in making technology choices. In most circumstances, combining technologies may be appropriate. It's also important to note that these cleaning technologies were designed primarily to remove dockage from a single grain and not for separating two (or more) different grains. Increased efficiencies in separation may become available with specially designed equipment, but the need for these technologies needs to be established first.

STORAGE

Producers typically only store intercrops together until they have an opportunity to separate them – a matter of weeks to a few months. This timeframe poses little risk to quality, but, over longer periods, spoilage can result from

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temperature fluctuations and moisture migration.

The impacts of moisture and temperature can be managed by blowing some air through the grain. Aeration, or cooling of grain, requires an airflow rate of about 0.1–0.2 cfm/bu. Moisture can be removed from grain using natural air drying with an airflow rate of 1–2 cfm/bu.

Managing aeration and natural air drying with mixed grains involves careful attention to the airflow rate and uniformity of airflow. This requires an understanding of how air conditions will affect grain conditions and can be tricky because of seed segregation – typically larger kernels roll to the outside of the bin while the smaller ones stay in the middle. Layers and areas of concentration may result in poor uniformity of airflow. In some areas, you get increased resistance and in others you get preferential airflow. Where you have pockets of grain with a significantly different level of humidity compared to the surrounding grain, issues may arise due to the formation of hot spots.

To detect the potential for spoilage and to know when to begin aeration or natural air drying, one can again turn to technology:

- **Cable-mounted temperature and moisture sensors** (e.g. OPI and Bin-Sense®) may be connected to fan control systems, but note that moisture sensors based on equilibrium moisture content (EMC) may not be effective for intercrops.
- **Bin EMC forecasts** (i.e. BINcast®) use weather advisories to inform a producer's choices about when to run fans, but also rely on EMC equations that are not valid for intercrops.
- With **aeration controller systems**, fans run only when cooling will be achieved or maintained and are based only on temperature differential between air and grain.

As intercropping science emerges, there are important questions and problems to resolve. Although we have significant data on the safe storage of monocrops, there are hundreds of possible combinations for intercrops where the assumptions do not necessarily apply. As a result, the impact of airflow resistance changes and particle size segregation on storage risk is unknown. We also have yet to study the impacts of moisture equilibration and the effects of air conditions on grain quality.

In 2018, PAMI is undertaking an evaluation of intercropping knowledge and research with a machinery-based focus. Alongside a literature review, we will be assessing the feasibility and practicality of using existing equipment for seeding, harvesting, separating and handling intercrops. We would also like to learn from intercropping early adopters. If you have experience with intercropping seeding, harvesting, processing and storage, PAMI would appreciate hearing from you.

306-682-5033 or jagnew@pami.ca ■

IMPORTANT INFORMATION FOR PULSE GROWERS

WHAT ARE THE CROP PROTECTION PRODUCTS TO PAY ATTENTION TO THIS SEASON?

For pulse crop production in Western Canada, products that may pose market risks include diquat (Reglone®), glyphosate (Roundup®), saflufenacil (Heat®), glufosinate (MPower® Good Harvest®), flumioxazin (Valtera™), carfentrazone (Aim®, CleanStart®), benzovindiflupyr (Solatenol®, Elatus™), and chlorpyrifos (Lorsban™ and other trade names).

WHAT ARE THE RISKS OF USING THESE PRODUCTS?

Late-season applications of fungicides, insecticides, or desiccants may result in residue levels found in the seed. Growers must take appropriate risk mitigation steps to ensure product residue remains below maximum residue limits (MRLs) set by regulatory agencies.

Pre-harvest application of glyphosate is of interest for two reasons:

1. Glyphosate use in general and specifically pre-harvest use is under increased scrutiny by segments of the general public.
2. Applying glyphosate when seed moisture content is 30% or above can result in residue levels greater than the maximum allowable limit.

WHAT DEVELOPMENTS HAVE THERE BEEN ON THESE ISSUES SINCE LAST YEAR?

The Canadian pulse industry is working hard to eliminate market access risks. For the crop protection products referenced in this document, growers are advised to be aware of international regulations in order to make the best crop management decisions.

WHAT CAN YOU DO TO MITIGATE RISK?

Ensure product residues remain at trace levels or levels well below accepted maximums by following these steps:

1. DO NOT EXCEED THE PRODUCT'S LABELLED RATE

Application guidelines for individual pesticides are set to allow growers to properly use the product. Guidelines assume that the labelled rate is not exceeded. Exceeding the labelled rate increases the risk of surpassing recognized MRLs and this can have serious consequences in terms of international acceptance of the crop.

2. TIME THE APPLICATION ACCORDING TO THE LABEL

Labels are very specific in terms of crop staging. Follow label instructions and apply crop protection products only at the recommended crop stage.

3. CONSULT WITH YOUR EXPORTER/PROCESSOR ABOUT WHICH CROP PROTECTION PRODUCTS ARE ACCEPTABLE IN INTERNATIONAL MARKETS

Exporters/processors have a good sense of which markets may be sensitive to specific products, and may ask farmers what was used in their crop for more information.

4. CONSULT THE CHART ON THE FOLLOWING PAGE INDICATING MARKET CONSIDERATIONS AND STATUSES FOR SPECIFIC PRODUCTS, OR VISIT WWW.KEEPINGITCLEAN.CA

ALBERTA PULSE GROWERS
SASKATCHEWAN pulse Growers
MANITOBA Pulse Soybean GROWERS

MARKET CONSIDERATIONS FOR USE OF PULSE CROP PROTECTION PRODUCTS – MARCH 2018 UPDATE

CROP PROTECTION PRODUCTS	PEAS	LENTILS	CHICKPEAS	DRY BEANS	FABA BEANS	COMMENTS
A. Desiccant/Harvest Management Tools						
Glyphosate* (e.g. Roundup)	✓	✓	!	!	!	Consult with your exporter/processor before using this product for certain crops/destinations. Maximum residue limits are established in key markets, however, MRLs are set at low levels for dry beans in the EU, and all pulse crops in South Korea except for lentils.
Diquat (e.g. Reglone)	!	!	!	!	!	Consult with your exporter/processor on pulse crops destined for the US. Maximum residue limits are established in key markets but are set at low levels in the US.
Saflufenacil (e.g. Heat)	✓	✓**	✓	✓	NR	Maximum residue limits have been established for all major export markets. This product is not registered for pre-harvest use on green lentils.
Glufosinate (e.g. MPower Good Harvest)	NR	!	NR	NR	NR	Consult with your exporter/processor before using this product. Maximum residue limits are established in the EU and Japan, but not in the US or at CODEX.
Carfentrazone (e.g. Cleanstart, Aim)	!	NR	!	!	!	Consult with your exporter/processor before using this product. Maximum residue limits are established in the EU, US and Japan, but not at CODEX.
Flumioxazin (e.g. Valtera)	!	!	!	!	!	Consult with your exporter/processor before using this product for certain crops/destinations. Maximum residue limits are established in key markets, however, MRLs are set at low levels in the EU.
B. Other Crop Protection Products						
Chlorpyrifos Insecticide (e.g. Lorsban, other trade names)	NR	✓/!	NR	NR	NR	If applied according to label rates early in the crop year at vegetative stage or during flowering, there is no need for caution. In cases of later-season application during pod development or seed fill to maturity (e.g. for late-season grasshopper control), consult with your exporter/processor.
Benzovindiflupyr Fungicide (e.g. Elatus, Solatenol)	✓	✓/✋	✓/✋	✓	✓/✋	For dry beans and peas, maximum residue limits have been established for all major export markets. For chickpeas, lentils, and faba beans, CODEX MRLs have not been established. If applied according to label rates and only early in the crop year (e.g. single application at 0-20% flowering,) there are no export marketing issues. For chickpeas, lentils, and faba beans, do not apply later than the 20% flowering stage.

✓ No marketing issues.

! Know your market. There is at least one market where MRLs are not established. Consult with your exporter/processor.

✓/! No marketing issues association with early application. If late application during pod development or seed fill to maturity (e.g. for late season grasshopper control), consult with your exporter/processor.

✋ Do not use after 20% flowering.

NR Not registered. Only use registered product.

*Pre-harvest application of glyphosate is of interest for two reasons: 1. Glyphosate use in general and specifically pre-harvest use is under increased scrutiny by segments of the general public concerned with several components of modern agricultural systems. 2. Unlike many products applied in fall, applying glyphosate when seed moisture content is 30% or above can result in residues greater than the maximum allowable limit.

**This product is not registered for pre-harvest use on green lentils.

Are Foliar Fungicide Applications Necessary in Dry Beans to Control White Mould in a Dry Year?

on-farm network
PARTICIPATORY • PRECISE • PROACTIVE

Greg Bartley, On-Farm Specialist, MPSG

THE DECISION TO spray foliar fungicide weighed heavily on some dry bean farmers in 2017. Below average rainfall and dry conditions leading up to flowering made the risk of a white mould disease outbreak low, yet the thought of the potential damage that a white mould outbreak could incur with the next timely rainfall was hard to ignore. Coming into the 2018 growing season, the dry conditions are still present and a repeat of the 2017 growing conditions are imminent. If these dry conditions repeat, understanding the risk factors that influence white mould in dry beans will better aid in the decision of whether to spray a foliar fungicide in dry beans.

There are three factors that must be present and interact for a disease to develop. Those three factors are: a susceptible host, a virulent pathogen and favourable environmental conditions. If one of these factors is missing, the disease will not occur. The two factors that are almost always present are a susceptible host (dry bean) and a virulent pathogen (*Sclerotinia sclerotiorum*). The factor that has the greatest influence on white mould infection for dry beans in Manitoba is a favourable environment and how the plant canopy influences the microclimate in each field.

The infection process of white mould (Sclerotinia) in dry beans begins when sclerotia germinates to produce small, mushroom-like structures called apothecia. Warm (15 to 25°C), wet soil about ten days before flowering favours the development of apothecia. Once mature, millions of spores are released from the apothecia. The spores require an external energy source for further development and colonize fallen flower petals. Secondary infection of healthy plant tissues then occurs within 2–3 days. Once a blossom is infected, the mycelium remains viable for more than a month. This is why the timing of fungicide applications is crucial for prevention of white mould outbreaks. Ensuring proper coverage of flower blossoms helps prevent this disease from developing further and infecting healthy plant tissue.

A dense canopy during flowering may provide an ideal microclimate for

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white mould development, along with cool maximum daily temperatures (less than 28°C) and lots of moisture from rainfall or high relative humidity. A thick plant canopy will provide a buffer from air temperature, often maintaining the ideal moisture and temperatures for disease development, despite external conditions. The microclimate below the canopy is influenced by the architecture of the plant and its branching arrangement. Aeration below the plant canopy may be improved by planting more upright genotypes with higher or elevated branches and planting to facilitate more space between plants, either by reducing plant populations or by increasing row widths. Nitrogen fertilizer plays a role by resulting in leafier, bushier plants with more biomass, ultimately creating a denser canopy with reduced aeration.

Manitoba Pulse & Soybean Growers have conducted dry bean fungicide trials since 2013. From 2013 to 2016, a single site near Carman hosted a foliar fungicide product comparison trial in pinto beans. In 2016 and 2017, an additional eight On-Farm Network field trials were established in pinto and navy bean fields across central Manitoba, reaching from Glenboro to Altona. A single application of fungicide targeted the R2 growth stage (early pin bean) for all trials. Recommended fungicide rates and water volumes were used. Out of the five years of dry bean fungicide trials, there was a significant yield response to foliar fungicide only two out of the five years (2013 and 2015). Comparing the environmental conditions between the 2013 to 2017 growing seasons, we can reflect on the annual variation in response to foliar fungicide applied to dry beans.

Figure 1. Mycelial growth and stem bleaching caused by white mould.

Rainfall is the most variable environmental factor that influences white mould in Manitoba. During flowering, sustained leaf wetness below the canopy is a crucial factor for the disease to develop. The rainfall that coincides with dry bean flowering and foliar fungicide application has the most influence on white mould development. July is when dry beans begin to flower, and most foliar fungicide applications are applied. Comparing July rainfall from 2013 to 2017, there were two years where the rainfall was considerably below normal, 2014 and 2017 (Table 1). In these years, we did not see a response to foliar fungicide. In 2013, 2015 and 2016, rainfall was either slightly above or below normal. We observed a significant response to foliar fungicide in 2013 and 2015, but not in 2016.

Table 1. Growing season rainfall (mm) summary from 2013 to 2017 – Carman, MB.

	May	June	July	August	Accumulated
2013	129	55	50	67	302
2014	31	117	28	122	298
2015	99	75	109	47	331
2016	108	95	79	58	340
2017	25	64	23	23	136
Normal	70	96	79	75	139

Based on the accumulated rainfall, we anticipated a response to foliar fungicide in 2016. One possible explanation for not seeing a foliar fungicide response in 2016 was the timing of fungicide application. Frequent rainfalls in July made it difficult to apply foliar fungicide by ground at the optimal timing of R2 (early pin bean) due to wet conditions. In addition to the late timing, a thicker crop canopy could have limited fungicide coverage in the lower canopy. Most fungicide applications did reduce the white mould incidence and severity compared to the untreated control at Carman in 2016, but there was still white mould present in all fungicide treatments. The overall high level of disease pressure likely warranted a second fungicide application to effectively control the disease.

If dry weather conditions continue to repeat themselves in the 2018 growing season, a fungicide application in dry beans may not be warranted.

This work is continuing to better aid farmers with their decisions on foliar fungicide applications in dry beans. Important considerations when assessing your white mould risk are included in the *Fungicide Decision Worksheet* found at www.manitobapulse.ca/production/production-resources. To help you assess your field's risk, the latest weather conditions and weekly summaries for regions in Manitoba may be found here: www.gov.mb.ca/agriculture/weather/weather-conditions-and-reports.html. Incidence of white mould in dry bean varieties evaluated in the MCVET variety trials may be found in MPSG's *Pulse and Soybean Variety Guide*. ■

MPSG FUNDING COMMITMENT

MPSG has conducted eight on-farm trials evaluating foliar fungicide use in dry beans and one four-year project comparing fungicide products, representing a research commitment of $70,000.

Narrow-Row vs. Wide-Row Dry Bean Production

Applied research and demonstration project

Project lead: Jeff Ewen, PAg, Saskatchewan Agriculture

IN SASKATCHEWAN, WIDE-ROW production of dry beans has created a barrier for most growers due to the need for specialized equipment. A narrow-row (solid-seeded) production system would allow for easier adoption of dry beans, as growers can use conventional farming equipment. Solid seeding may also allow for further expansion of dry beans onto dryland acres, with adequate rainfall, as another pulse crop option. This applied research and demonstration project, funded by Saskatchewan Pulse Growers (SPG), was established to compare narrow-row dry bean production (solid seeding) with wide-row production (row cropping) in a field-scale experiment.

METHODS

This project was carried out in 2017 by the Outlook Irrigation Crop Diversification Centre in Saskatchewan. An 80-acre centre pivot was split in half for a side-by-side comparison of a traditional wide-row production system on 22-inch rows, using a vacuum planter, compared to the solid seeded, narrow-row system, using an air seeder on 10-inch rows.

Seeding of CDC Blackstrap black beans occurred on May 29 with both systems. The wide-row system was seeded with a John Deere MaxEmerge™ vacuum planter, targeting 115,000 plants/ac or a 56 lb/ac seeding rate. The narrow-row seeding operation used a Bourgault 3320 Paralink™ hoe drill and Bourgault 6700™ seed tank, with auger metering targeting 125,000 plants/ac or a 61.4 lb/ac seeding rate.

Seeding of the narrow rows took place at 3.8 mph, at a seeding depth of one inch, into warm, moist soil. Air seeder fans on the seed row were set high enough to avoid plugging, but as low as possible to reduce seed damage. Warm, moist soil at seeding resulted in quick emergence within seven days. Plant counts were taken three weeks after seeding.

Undercutting of the wide-row section was done at the buckskin stage (R9), with a Pickett One Step. The narrow-row section was divided in half to compare swathing to straight-cutting. At R9, Reglone® was applied to the half to be straight-cut, while the other half was swathed. A Pickett Twin Master™ bean combine was used to harvest the wide rows and the swathed portion of the narrow rows. The remaining standing area of the narrow-row portion of the field was direct harvested with a Case IH 8230 rotary combine, using a MacDon FD75 FlexDraper® header.

Throughout the growing season beans were irrigated 11 separate times, for a total of 7.5 inches. A total of 3.78 inches of natural precipitation accumulated through the growing season.

RESULTS

The wide-row area averaged 142,600 plants/ac or 20 percent higher than the target. The planter seeding rate was set based on manufacturer manual settings, which resulted in a higher seeding rate than expected.

The narrow-row area averaged 98,000 plants/ac or 22 percent lower than targeted. It is believed that more seed damage occurred through the air seeder than was observed at the time of seeding.

Permit® pre-plant, Viper® ADV, and Basagran® provided exceptional weed control in this demonstration. Climatic conditions in 2017 also made for a lower disease presence.

The wide-row area of the field matured approximately five days faster than the narrow-row, likely the result of the higher plant populations.

Harvest management with undercutting the wide-row section and swathing a portion of the narrow-row side resulted in minimal seed damage and minimal harvest losses.

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▼ *Narrow-Row*

▼ *Wide-Row*

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No modifications were made to the combine or header for the direct harvest of the desiccated half of the field. The combine was set to factory default settings for black beans, with the concave set wide open, rotor speed on low, and fan speed set high. The straight-cut header was tilted forward to allow for the lowest possible cutting. The reel speed was slow and reel tines were tilted back enough to allow for the knife to be cleared and the material to be pulled onto the canvas.

The majority of loss occurred on the cutter bar of the header. It was found that areas with less plant material resulted in increased loss, due to poor feeding. In areas with more plant material, a constant feed resulted in decreased losses. The rotary combine was effective in separating seed, but the use of augers throughout the combine resulted in some seed damage. The most damage of the seed was observed during the auguring from the hopper to the truck.

YIELDS

Target dry bean yields in Saskatchewan under irrigation are 3,000 lb/ac, with an average of 2,500 lb/ac. In this project the wide-row system resulted in the highest yield at 3,735 lb/ac. The sample had minimal damage. The narrow-row swathed portion of the field resulted in the second highest yield at 3,516 lb/ac, while the straight-cut harvest portion yielded 3,226 lb/ac. The swathed sample also had minimal damage, while the narrow-row straight-cut harvest sample had increased damaged and increased dockage.

All seed moisture levels were lower than ideal, due to the hot and dry conditions surrounding harvest. It was determined that the severity of seed damage and dockage was due to the differences between the combines. The Pickett Twin Master performance was superior on threshing, cleaning, and handling.

The variability in the yield between the wide rows undercut, and narrow rows swathed was a direct reflection of the plant population. The wide-row portion of the field had over 20% more plants than targeted while the narrow-row portion had 22% less plants than targeted. It was observed that the narrow-row portion of the field compensated for the lower plant population by producing larger plants with more branches. The slight yield advantage of the swathed, over the straight-harvested, narrow-row portions was observed to be due to seed loss in the straight-cut harvesting system.

ECONOMIC IMPLICATIONS

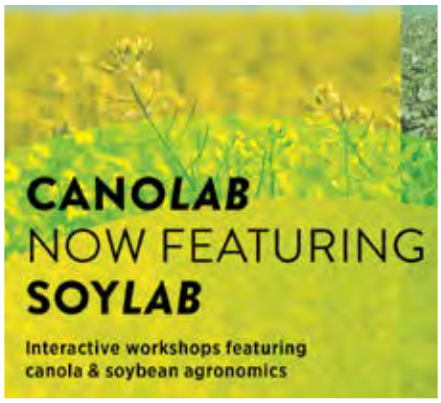
The wide-row system produced the highest gross returns based on the highest yields (Table 1). However, when expenses are taken into account, the higher cost of row cropping resulted in net returns that are only slightly higher than the narrow-row production system that was swathed. Row cropping costs an additional $70/ac compared to swathed production, using conventional seeding. The extra cost with row cropping comes from the higher cost of custom seeding and harvest equipment, as well as tillage and undercutting. Straight-cutting had the lowest net returns of all.

RECOMMENDATIONS

The narrow-row system proved to be economical, and with some correction to achieve target plant population, there is potential to meet or exceed returns of the wide-row production system. Both systems were very successful in producing high yields and high quality black beans. There is potential for growing dry beans under narrow-row systems to use existing equipment and to reduce the intensity of field management with row cropping. ■

Table 1. Returns based on yield and expenses as related to production method (narrow-row straight-cut, narrow-row swathed and wide- row).

	Narrow-Row		Wide-Row
Income	**Straight-Cut**	**Swathed**	**Undercut**
Yield (lb/ac)	3226	3515	3753
Price ($/lb)	$ 0.33	$ 0.33	$ 0.33
Gross ($/ac)	**$ 1,065**	**$ 1,160**	**$ 1,238**
Expenses/Equipment Costs			
Discing			$ 17.26
Harrowing	$ 5.40	$ 5.40	$ 5.40
Burnoff	$ 1.95	$ 1.95	$ 1.95
Seed and fertilizer (air seeder)	$ 14.49	$ 14.49	
Fertilizer			$ 14.49
Cultivating			$ 8.61
Seeding (Planter)			$ 19.00
Rolling	$ 6.77	$ 6.77	
Inter-row cultivating and hilling			$ 24.00
Herbicide	$ 1.95	$ 1.95	$ 1.95
Fungicide	$ 1.95	$ 1.95	$ 1.95
Desiccating	$ 1.95		
Swathing or undercutting		$ 5.94	$ 20.00
Combining	$ 21.93	$ 34.00	$ 34.00
Irrigation	$ 39.31	$ 39.31	$ 39.31
Input Costs			
Edge™	$ 22.48	$ 22.48	$ 22.48
Glyphosate/Permit®	$ 20.80	$ 20.80	$ 20.80
Seed	$ 61.40	$ 61.40	$ 56.00
Nitrogen/Phosphorus/Potassium	$ 36.80	$ 36.80	$ 36.80
Viper®	$ 16.75	$ 16.75	$ 16.75
Contegra®	$ 28.80	$ 28.80	$ 28.80
Reglone®	$ 13.90		
Water/Power	$ 70.00	$ 70.00	$ 70.00
TOTAL per acre	**$366.63**	**$368.79**	**$439.55**
Net Returns ($/ac)	**$697.95**	**$791.33**	**$ 798.94**



Manitoba Pulse & Soybean Growers joined the Manitoba Canola Growers Association for an interactive, two-day event in Brandon and Dauphin on March 14–15. SOY*LAB* joined canola sessions to bring farmers and agronomists hands-on information about soybean management. Eight sessions and more than 16 extension and research experts covered a wide range of topics. Stand establishment was a focus for both crops and was paired with weed and disease management topics, focusing on Phytophthora root rot and white mould. Aphids and beneficial insects were explored in more detail. Inoculation and nodulation topics brought in researchers studying nitrogen and rhizobia dynamics. A dynamic station filled with great information, the inoculation and nodulation session highlights are provided below.

SOY*LAB* – Inoculation and Nodulation

Laura Schmidt, Extension Coordinator, MPSG

INOCULATION

Nitrogen in soybeans is mainly supplied by a symbiotic relationship with the nitrogen-fixing bacteria, *Bradyrhizobium japonicum*, living within the soybean nodules. These N-fixing *B. japonicum* strains are not native to Manitoba and inoculation is used to introduce the bacteria into the soil. Native species of *Bradyrhizobium* exist in the soil but are incapable of forming nodules on soybeans.

During SOY*LAB*, Patricia Ordonez discussed the preliminary results of her ongoing, MPSG-funded study with Dr. Ivan Oresnik, looking at the persistence of *B. japonicum* in Manitoba soils and the influence of crop rotation on rhizobial and microbial populations. The frequency of soybean in the rotation can build up populations of rhizobia capable of nodulating soybeans. Her results indicate these rhizobia overwinter in Manitoba and soybeans following canola had lower *B. japonicum* populations than soybeans following wheat or corn.

In fields with little to no history of soybean, double inoculation with two inoculant formations or placement techniques is recommended to ensure adequate rhizobia is present in the soil to facilitate nodulation. Once soybeans have been established in the crop rotation, the amount of inoculant required may be reduced. To help determine the best inoculant strategies for your field, consult MPSG's *Soybean Fertility Fact Sheet*.

STARTER N

One question was repeated at this station throughout SoyLAB: Would there be a yield or protein response to low rates of nitrogen early in the season? Dr. Navneet Brar investigated the effects of starter nitrogen (0–75 lbs/ac) on soybeans in her study with Dr. Yvonne Lawley. The thinking behind this project was with our cool, wet soils in Manitoba and the long time between seeding and when nitrogen fixation begins, that there might be a response to starter N. Ureide N analysis was used to assess the nitrogen contribution from biological N fixation.

Where higher N fertilizer rates were applied at planting, N fixation was reduced and the number of nodules at R1 and R5.5 decreased. However, there was no response in soybean yield nor protein with nitrogen applications.[1] For well nodulated soybeans, it appears nitrogen fertilizer isn't necessary.

ASSESSING NODULATION

How many nodules should a soybean have to maximize yield?

Regardless of the inoculant strategy used or field history, nodulation should be assessed on every field, every year. The ideal stage to check for adequate nodulation is at R1 to ensure the crop will have sufficient capacity to supply itself N during critical growth stages (R4–R5) to maximize yield.

Use a shovel to gently uproot soybean roots – nodules can be ripped off it the plants are not carefully pulled out from the ground. Cut the nodules open to determine if the rhizobia are actively fixing nitrogen. If the inside of the nodules are pinkish-red, then biological N fixation is taking place. Leghemoglobin in the nodules, similar to hemoglobin in blood, is produced by the rhizobia during N-fixation and turns colour when exposed to oxygen. Results from a recent MPSG study evaluating various inoculant products, rates, formulations and combinations found that at least ten nodules per plant at R4 was required to reach 90% of maximum yield (Figure 1).[2]

What to do in the event of a nodulation failure was answered by John Heard from Manitoba Agriculture,

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taking a closer look at some of his work on rescue nitrogen applications.

At the advanced growth stage of R4, it would be too late to conduct a rescue nitrogen application should you suspect a nodulation failure. At R4 to R5, N fixation and N requirements for soybean have reached a maximum, accumulating 4.5 lbs N/ac each day (Figure 2).[3] A rescue application of nitrogen fertilizer should be made at R2–R3 and the fertilizer should be directed below the canopy, minimizing leaf burn which can reduce yield.[4] Either a broadcast granular or liquid nitrogen fertilizer can be used as long as care is taken to minimize leaf coverage and application is made when rainfall is imminent, which is necessary to move the nitrogen into the root zone. ■

Figure 1. Relationship between number of nodules per soybean plant and relative yield.

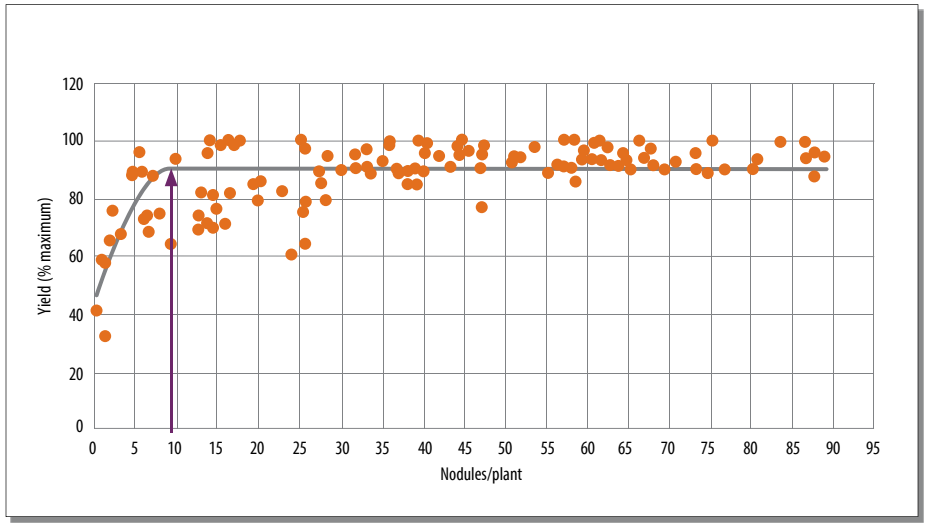
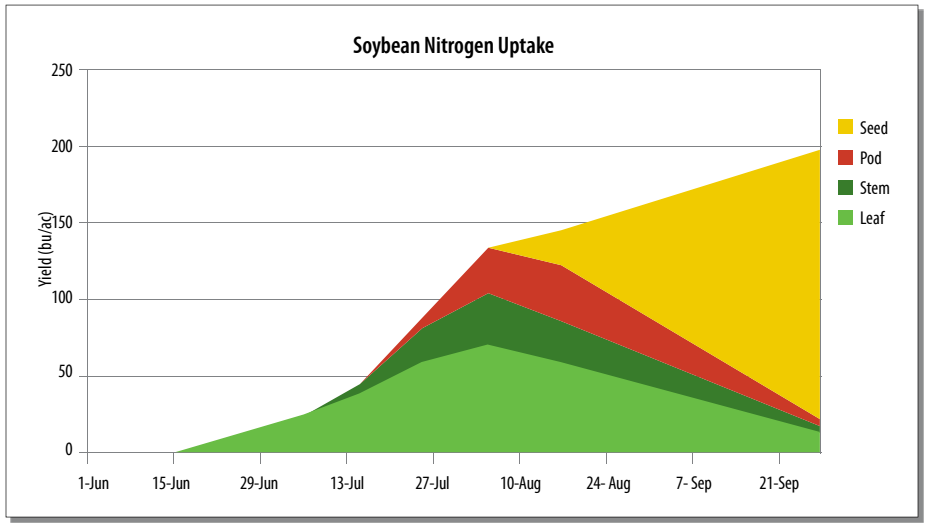


Figure 2. Nitrogen accumulation by soybean.



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MPSG FUNDING COMMITMENT

MPSG has funded three studies looking further in-depth at inoculation and *Bradyrhizobium japonicum* in fields, representing $91,363. Forty-six replicated On-Farm Network trials over five years have further investigated inoculant use in soybean and results are available at www.manitobapulse.ca.

Decisions About Soybean Residue Management

Dr. Yvonne Lawley, Department of Plant Science, University of Manitoba

WITH THE INCREASE in harvested acres of soybean in Manitoba, decisions were made about how to manage soybean residue for over 2 million acres in Manitoba in 2017. For many, these decisions were simple. For others, there are questions about what approach to take with this low-residue crop. The black snow visible along highways across southern Manitoba during this past open winter reminded many of us how important these decisions are. Results from a recent four-year on-farm study focused on soybean residue management may provide decision makers with new information about crop performance following contrasting approaches to manage soybean residue after harvest.

Let's rewind to the fall of 2013 when the soybean residue management project was just getting started. Deep tillage with double-discs and cultivators was commonly used in conventional tillage systems across Manitoba to bury and incorporate soybean residue. Vertical tillage tools were still relatively new, but rapidly gaining in popularity.

Soybeans are considered to be a low-residue crop and stems are cut very close to the ground at harvest. However, some of the farmers that I have talked with described soybean as tough and impenetrable to water – or hydrophobic – so that water would not move into the soil or dry underneath the residue in the spring. Further to the problem, soybean residue was prone to catching and balling up in some seeding equipment.

Later in the study, during the fall of 2016, conversations I had with farmers about decision making for soybean residue management after harvest have had nothing to do with the residue itself, but rather the deep ruts left after trafficking wet soils during soybean harvest.

As a researcher, I have been learning that any project involving residue and tillage is tough. We decided to take an on-farm approach for this project so that we could compare the ability of a range of tillage tools to manage soybean residue. Four tillage treatments were compared: 1) a deep-till cultivator or double disc – representing the standard practice in conventional till systems when the project started, 2) no tillage or direct seeding, 3) vertical tillage low disturbance (discs set on 0° angle so that residue is somewhat incorporated but mostly left of soil surface), and 4) vertical tillage high disturbance (discs set on a 6° angle so that residue is incorporated with little residue left on soil surface) – which has become a more common practice during the time frame of the project.

We wanted to evaluate the impact of these residue management treatments on spring seedbed conditions (temperature, moisture) and on the stand and yield of subsequent crops. In the last year of the experiment, with the formation of MPSG's On-Farm Network, we simplified our approach to compare a farmer's standard tillage method for soybean residue compared to direct seeding into soybean residue.

On-farm experiments were an essential choice for this project due to the large size of tillage equipment and the operating speeds required to optimize equipment performance. Field-length plots were used and each treatment was randomized and replicated three or four times in the field, as space would allow. The farmer's own cultivation equipment was used for the standard tillage treatments

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and the vertical tillage equipment was provided by neighbours or local equipment dealers if it was not available on the farm. Experiments were established in the fall after soybean harvest, from 2013–2016, in five fields on farms near Boissevain, Winkler, Homewood, Linden and New Bothwell. The soil types for these five fields ranged from loam to clay. You will find reports summarizing the site history, management, and results of each experiment on the On-Farm Network page of the MPSG website. Test crops were planted the following spring in each experiment. The test crop selected depended on the farmers' rotation and ranged from wheat to corn and soybeans. Test crops were managed based on standard practices for each farm. All plots within each experiment received identical management across all residue management treatments in the test-crop year.

HOW MUCH SOYBEAN RESIDUE WAS THERE?

First, ground cover by soybean residue was quantified in the fall following tillage treatments (Figure 1). Fall ground cover by soybean residue was reduced in the residue management treatments involving tillage compared to direct seeding (Table 1). As expected, greater reductions in soybean residue ground cover occurred in the disc and vertical till high disturbance treatments.

Across the five experiments in the study, soybean residue in the direct seeded treatment – where there was no residue management after harvest – ranged from an average of 40 to 88% in the fall. In two of the studies, ground cover was quantified in both fall and in the following spring (Table 1). Ground cover by soybean residue was lowered by 31% and 57% from fall to spring, in these two studies. This gives us a better estimate of how much soybean residue is broken down between harvest and spring planting in Manitoba, even when soybean residue is left on the soil surface.

▼ *Figure 1. Ground cover by soybean residue after harvest with and without fall tillage.*

Fall Tillage
Average Residue Cover: 21%

No Tillage (Direct Seeding)
Average Residue Cover: 71%

SEEDING CONDITIONS NEXT SPRING

The impact of soybean residue management on soil conditions at seeding the next year was of great interest in this project. During the emergence period of the test crops, soil moisture and temperature at a 5 cm (2 inch) depth was compared. This depth represents soil conditions around an average seeding depth. No significant differences in soil temperature or moisture were observed between soybean residue management treatments during test-crop emergence for any of the experiments. When walking in the field in the spring, it was often hard to visually distinguish between soybean residue management treatments (Figure 2). Given the low amounts of soybean residue in the spring, the similarity between residue management treatments was not very surprising.

Table 1. Soil covered by soybean residue in fall and spring for four tillage treatments.

	Boissevain		Winkler	
	Fall 2014 (%)	Spring 2015 (%)	Fall 2014 (%)	Spring 2015 (%)
Disc or cultivator	23.9	17.5	10.2	8.6
Vertical tillage – high disturbance	17.8	18.5	12.7	15.4
Vertical tillage – low disturbance	56.2	45.2	26.1	14.3
No tillage (direct seeding)	80.4	55.0	42.4	18.8

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TEST-CROP PLANT STANDS AND YIELDS

Despite the different tillage tools used, there were few differences in test-crop performance between the soybean residue management treatments compared in this project. No statistical differences in test-crop stand were measured in four out of five experiments for both early and final stand counts. There were also no statistical differences in test-crop yields between soybean residue management treatments for four of the five experiments. These are a few simple sentences summarizing a lot of on-farm research effort!

What happened at the sites where there were differences? Spring conditions during emergence of the 2016 corn test crop at Homewood were challenging. Corn was planted on April 30, 2016 and two weeks of very dry conditions followed, resulting in uneven corn emergence within all treatments in the experiment. Final corn-plant stands in the no-till treatment were 3,000 plants/ac lower than the conventional and vertical tillage conservative treatments.

Soybean test-crop yield was three bushels higher for the fall tillage treatment relative to the no-till treatment at Linden in 2017. There were no differences in plant stand or soil temperature and moisture during emergence to explain this difference. Although unexpected, soil moisture at 30 cm was slightly higher in the conventional tillage treatment in July during flowering and early pod fill. It is hard to explain why soil moisture would be higher in the standard tillage treatment, but it would account for the higher soybean yield.

Table 2. Test-crop yield (bu/ac) for five on-farm trials comparing soybean residue management treatments.

	Test-Crop Yield (bu/ac)				
Location	Boissevain 2015	Winkler 2015	Homewood 2016	Linden 2017	New Bothwell 2017
Test Crop	Wheat	Corn	Corn	Soybean	Wheat
Disc or cultivator	69.1	132.6	177.0	29.1	83.3
Vertical tillage – high disturbance	66.9	133.1	–	–	–
Vertical tillage – low disturbance	69.3	134.0	169.8	–	–
No tillage (direct seeding)	68.0	131.7	167.8	26.2	85.1
P-value	0.2963	0.7818	0.0717	0.0124	0.3548
CV	6.5	2.91	4.92	7.88	1.87
Significance	No	No	No	Yes	No

WHAT WAS LEARNED?

There were remarkably few differences between soybean residue management treatments in this four-year study using a number of different measures. Once the test crop was planted, it was often hard to distinguish treatments within the field.

Decisions about residue management are always farm, field and equipment specific, but the results of this on-farm study should provide food for thought about our current thinking and practices for soybean residue management in conventional tillage systems in Manitoba. Some of the concerns about direct seeding into soybean residue that were not addressed in this project, such as ruts after harvest and the seeding equipment or openers for planting into soybean residue would be good topics for future research projects. The financial and time costs for residue management as well as the risks of losing soil to wind erosion after soybeans are good reasons to test your own ideas about how to best manage soybean residue on your farm. ■

▼ *Figure 2. Soybean residue management treatments (1) Vertical till – high disturbance, (2) Vertical till – low disturbance, (3) Conventional till – deep tillage cultivator, (4) No tillage – direct seeded.*

2017 Soybean Foliar Disease Survey

Holly Derksen, Manitoba Agriculture and Dr. Bryan Cassone, Brandon University

THE ANNUAL SOYBEAN disease survey provides important information on disease issues faced by growers across Manitoba. Sixty-seven soybean fields distributed across the province were surveyed in 2017. Areas with higher soybean production were targeted, but almost all areas growing soybeans were represented in the survey. Both foliar and root diseases were included and the following article outlines the foliar diseases detected across the province and the implications of these results. For more information on the root diseases surveyed, readers are encouraged to refer to the 2018 spring edition of *Pulse Beat* for the article *2017 Survey of Soybean Root Rot in Manitoba*.

Disease assessments were made in the field focusing on common diseases like septoria brown spot, bacterial blight and downy mildew as well as less common diseases like white mould, pod/stem blight, anthracnose and frogeye leaf spot. Most foliar diseases in soybean are able to infect throughout the growing season, so fields were surveyed early in July (at the onset of flowering) and later in August (during pod fill). Two survey timings allowed for an accurate depiction of diseases showing up early and late in the growing season. Some foliar stem diseases, like white mould, pod/stem blight and anthracnose only show up later in the season in most years. It is important to note that the disease ratings presented here were only based on visual assessment and were not individually verified through laboratory analysis.

Not surprisingly, bacterial blight and septoria brown spot were found in the majority of fields surveyed (Table 1). These two foliar diseases are very common, but are rarely present at levels which cause economic concern in the form of yield loss. Both of these diseases, along with downy mildew, were assessed for both incidence (the proportion of surveyed plants showing infection) and severity (the level of disease based on proportion of the canopy infected). At the later survey timing, bacterial blight, septoria brown spot and downy mildew had average severities of 1.9, 1.8 and 1.8, respectively. Severity levels this low are not expected to cause yield loss (disease severity levels are explained in Table 2). It is important to note that,

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▼ *Figure 1. Septoria brown spot (top) and bacterial blight (bottom) are two common foliar diseases present in Manitoba soybean fields, though rarely found at levels that would result in yield loss.*

Photos: Dennis Lange, Manitoba Agriculture

Table 1. Results of the 2017 soybean disease survey for bacterial blight, septoria brown spot, and downy mildew.

	Bacterial Blight		Septoria Brown Spot		Downy Mildew	
Region	**Early**	**Late**	**Early**	**Late**	**Early**	**Late**
Central (23 fields)						
% Prevalence[1]	61%	87%	87%	100%	9%	65%
% Incidence[2] in infected fields	36%	71%	54%	57%	16%	41%
Average severity[3] in infected fields	1.3	2.1	1.4	1.9	3.0	1.6
Eastern/Interlake (20 fields)						
% Prevalence	45%	45%	100%	95%	30%	59%
% Incidence in infected fields	27%	29%	88%	64%	17%	50%
Average severity in infected fields	1.6	2.3	1.6	1.9	1.3	2.3
Northwest (5 fields)						
% Prevalence	100%	100%	100%	100%	0%	20%
% Incidence in infected fields	8%	7%	13%	9%	0%	4%
Average severity in infected fields	1.3	1.9	1.5	2.1	0.0	1.5
Southwest (17 fields)						
% Prevalence	71%	100%	94%	94%	29%	53%
% Incidence in infected fields	36%	63%	34%	41%	8%	17%
Average severity in infected fields	1.5	1.5	1.4	1.4	1.4	1.3
Manitoba (65 fields)						
% Prevalence	62%	78%	94%	97%	20%	57%
% Incidence in infected fields	31%	54%	59%	52%	14%	38%
Average severity in infected fields	1.4	1.9	1.5	1.8	1.6	1.8

[1]Prevalence – % fields having infection with the region of province [2]Incidence – average % of plants showing infection within infected fields [3]Severity – average severity of plants showing infection within infected fields (scale 0–5)

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while the provincial average severities remained low, there was variation between fields. For example, one field surveyed was visually assessed to have bacterial blight present on all plants surveyed with an average severity of 3.9 and septoria brown spot present on more than 90% of plants with an average severity of 3.3. In cases like this, verification of the causal agent of the symptoms is important if management practices are to be employed. Practices such as crop rotation and tillage can be used to manage both bacterial blight and septoria brown spot, but the use of fungicides (while rarely economical in Manitoba) would only be effective against septoria brown spot.

Table 2. Scale used to rate severity of bacterial blight, septoria brown spot, and downy mildew on individual plants.

Rating	Visual Assessment
0	No disease present
1	Trace amount of symptoms
2	Symptoms present in one part of canopy
3	Symptoms present throughout canopy, but symptoms are not severe
4	Severe symptoms present in mid-upper portions of canopy
5	Severe symptoms present in mid-upper portions of canopy with defoliation

Table 3. Results of the 2017 soybean disease survey for white mould, pod/stem blight, anthracnose, and frogeye leaf spot.

	White Mould		Pod/Stem Blight		Anthracnose		Frogeye Leaf Spot	
Region	Early	Late	Early	Late	Early	Late	Early	Late
Central (23 fields)								
% Prevalence[1]	0%	30%	0%	26%	0%	0%	0%	22%
% Incidence[2] in infected fields	0%	2%	0%	4%	0%	0%	0%	5%
Eastern/Interlake (22 fields)								
% Prevalence	0%	27%	0%	27%	0%	5%	0%	5%
% Incidence in infected fields	0%	11%	0%	4%	0%	2%	0%	8%
Northwest (5 fields)								
% Prevalence	0%	20%	0%	0%	0%	0%	0%	0%
% Incidence in infected fields	0%	6%	0%	0%	0%	0%	0%	0%
Southwest (17 fields)								
% Prevalence	6%	18%	6%	0%	0%	6%	0%	29%
% Incidence in infected fields	10%	5%	24%	0%	0%	8%	0%	10%
Manitoba (67 fields)								
% Prevalence	2%	25%	2%	18%	0%	3%	0%	16%
% Incidence in infected fields	10%	6%	24%	4%	0%	5%	0%	8%

[1]Prevalence – % fields having infection with the region of province
[2]Incidence – average % of plants showing infection within infected fields

Less common diseases detected as part of this survey include white mould, phomopsis pod/stem blight, anthracnose, and frogeye leaf spot (Table 3). Most of these diseases are considered of minor importance to soybean production in Manitoba due to their relatively lower prevalence in comparison with the diseases listed in Table 1. However, white mould is an important soybean disease issue in other soybean-producing areas of North America and has the potential to be a yield-limiting issue in Manitoba. In fields with thick canopies, high moisture, and/or high humidity, this disease can cause economic losses. In most years, fungicide use is not necessary for management of this disease in soybeans (unlike other crops like canola or dry beans), but individual fields should be assessed during flowering to determine the microclimatic conditions, and therefore, risk of infection.

In addition to making disease assessments, samples were collected for molecular analysis as part of a project through Brandon University. Using a novel diagnostic approach previously described in the 2017 spring edition of *Pulse Beat* for the article *An Innovative Technology for Early Detection of Foliar Diseases in Manitoba*, disease-causing microorganisms (pathogens) are identified in symptomatic leaves. Not only does this validate the visual diagnoses, it also detects pathogens that may be new to the region and not yet on the radar of agronomists. This approach largely confirmed the seasonal and regional distributions of the disease survey (Table 4). In addition, pathogens causing bacteria pustule,

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▼ *Figure 2. Typical symptoms of white mould include white mycelial growth (left) within the canopy resulting in prematurely senescent plants (right).*

Photos: Holly Derksen and Dennis Lange, Manitoba Agriculture

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leaf spot and leaf blight were detected, along with several viruses. This included Alfalfa mosaic virus (AMV), which had not been previously reported to infect soybean in the province. AMV can cause plant stunting, leaf distortion, mottling and reduced pod numbers. While most of these diseases are not considered economically important, high incidence of bacteria pustule has been shown to cause significant yield losses on susceptible varieties in other soybean growing regions of North America.

The results of these surveys paint an important picture of soybean production in Manitoba. Agronomists can use this information when assessing prevalent diseases and their impact on the crop. This survey also provides important information for researchers, breeders and funding agencies. As soybean production continues to expand in Manitoba and western Canada, the continuation of pest surveys such as this will cast light on issues that may accompany expanding acres and tight rotations. This survey is in its infancy, but as more years of data are collected, trends and regional differences will begin to emerge and guide agronomy research and extension in the future. ■

The Manitoba soybean disease survey is a coordinated effort by Manitoba Agriculture, Manitoba Pulse & Soybean Growers, Agriculture and Agri-Food Canada, Brandon University and the University of Manitoba.

▼ *Figure 3. Diseases detected through molecular analysis at Brandon University include Alfalfa Mosaic Virus (AMV) (left) and bacterial pustule (right).*

Photos: Gustavo Diaz Cruz, Brandon University

Table 4. Foliar pathogens identified by molecular analyses of symptomatic leaves. The regions and surveys where pathogens are present (+) and absent (–) are displayed.

			Central		Eastern/ Interlake		Northwest		Southwest	
Type	Pathogen	Disease	Early	Late	Early	Late	Early	Late	Early	Late
Fungi	*Alternaria* spp.	Leaf spot	+	+	+	+	+	+	+	+
	Cercospora kikuchii	Leaf blight	–	+	–	+	–	–	–	+
	Cercospora sojina	Frogeye	+	+	+	+	–	–	–	+
	Colletotrichum spp.	Anthracnose	+	+	+	+	–	–	–	+
	Drechslera spp.	Leaf spot	–	+	+	+	–	–	–	+
	Peronospora manshurica	Downy mildew	+	+	+	+	+	+	+	+
	Septoria glycines	Brown spot	+	+	+	+	+	+	+	+
Bacteria	*Pseudomonas syringae*	Bacterial blight	+	+	+	+	+	+	+	+
	Xanthomonas spp.	Bacterial pustule	–	+	–	–	–	–	–	–
Virus	Tobacco necrosis virus	Necrotic spots	–	+	+	+	–	–	+	+
	Alfalfa mosaic virus	Alfalfa mosaic	+	+	+	+	–	–	+	+
	Bean yellow mosaic virus	Viral infection	–	–	–	–	–	–	–	+

Dry Bean Scout ANSWERS

Photo: Debra McLaren, AAFC

A – Anthracnose (*Colletotrichum lindemuthianum*)

Anthracnose appears on dry bean pods as rusty brown specks that later develop into circular lesions. These lesions have a pale brown centre and raised, dark brown margin. It may also appear as brown to purplish red lesions along veins on lower leaf surfaces, the petiole and stem. This fungal pathogen survives in crop residue and seed, favouring warm, wet conditions. Anthracnose can have a severe impact on yield and seed quality in susceptible cultivars. Many races of anthracnose have been identified and resistance genes are available in some cultivars. Methods of control include crop rotation, disease-free seed, resistant cultivars and foliar fungicide.

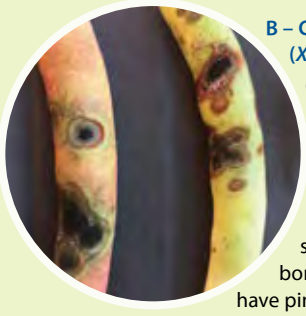

Photo: Cassandra Tkachuk, MPSG

B – Common bacterial blight (*Xanthomonas campestris*)

Common bacterial blight (CBB) symptoms on dry bean pods may at first resemble anthracnose. However, CBB symptoms on the pod begin as small, water-soaked spots that enlarge and become surrounded by a reddish-brown border. Seeds infected with CBB will have pinpoint lesions on the seed coat. This disease is seed-borne and favours wet, windy conditions. It may also spread via equipment. The best methods of CBB control include crop rotation, disease-free seed and equipment sanitation, if used in infected fields. Foliar fungicides will not control this disease. Refer to the MPSG *Pulse and Soybean Variety Guide* or *Seed Manitoba* for CBB severity and incidence ratings of dry bean cultivars.

Manitoba Pulse & Soybean Buyer List – May 2018

COMPANY	EDIBLE BEANS	FABA BEANS	LENTILS	PEAS	SOYBEANS	PHONE	LOCATION	CGC REGULATED
Agri-Tel Grain Ltd.				✓	✓	204-268-1415	Beausejour, MB	✓
AGT Foods	✓		✓	✓	✓	306-525-4490	Regina, SK	✓
• SaskCan Pulse Trading – Parent Division	✓		✓	✓	✓	204-737-2625	St. Joseph, MB	✓
All Commodities			✓	✓		204-339-8001	Winnipeg, MB	✓
B.P. & Sons Grain and Storage Inc.					✓	204-822-4815	Morden, MB	✓
Belle Pulses Ltd.				✓		306-423-5202	Bellevue, SK	✓
Besco Grain Ltd.	✓	✓	✓	✓	✓	204-745-3662	Carman, MB	✓
Best Cooking Pulses Inc.			✓	✓		204-857-4451	Portage la Prairie, MB	✓
Brett-Young Seeds				✓	✓	204-261-7932	Winnipeg, MB	
BroadGrain Commodities Inc.	✓	✓	✓	✓	✓	416-504-0070	Toronto, ON	✓
C.B. Constantini				✓		604-669-1212	Vancouver, BC	✓
Canadian Grain Inc.	✓	✓	✓	✓	✓	905-257-6200	Oakville, ON	✓
Cargill Ltd.				✓	✓	204-947-6219	Winnipeg, MB	✓
Delmar Commodities				✓	✓	204-331-3696	Winkler, MB	✓
Farmer Direct Co-operative Ltd.	✓	✓	✓	✓		306-352-2444	Regina, SK	
Fill-More Seeds Inc.			✓	✓		306-722-3353	Filmore, SK	✓
G3 Canada Limited				✓		204-983-0239	Winnipeg, MB	✓
Gavilon Grain LLC					✓	816-584-2210	Omaha, NB	✓
Global Grain Canada	✓					204-829-3641	Plum Coulee, MB	✓
Hensall District Co-op	✓					204-295-3938	Winnipeg, MB	✓
Horizon Agro					✓	204-746-2026	Morris, MB	
ILTA Grain Inc.	✓	✓	✓	✓	✓	604-597-5060	Surrey, BC	✓
J.K. Milling Canada Ltd.				✓		306-586-6111	Regina, SK	✓
Knight Seeds			✓	✓		204-764-2450	Hamiota, MB	
Kalshea Commodities Inc.				✓		204-272-3773	Winnipeg, MB	✓
Lansing Olam Canada Commodities ULC					✓	877-747-7599	Chatum, ON	✓
Linear Grain	✓			✓	✓	204-745-6747	Carman, MB	✓
Louis Dreyfus Company Canada ULC					✓	403-205-3322	Calgary, AB	✓
Masterfeeds				✓		403-327-2555	Lethbridge, AB	
Marina Commodities Inc.			✓	✓		204-937-2300	Roblin, MB	✓
Maviga NA., Inc.		✓	✓	✓		306-721-8900	Regina, SK	✓
Monsanto					✓	–	Winnipeg, MB	
Natural Proteins					✓	204-355-5040	Blumenort, MB	✓
North American Food Ingredients					✓	204-272-5510	Winnipeg, MB	✓
Nutri-Pea Ltd.				✓		204-239-5995	Portage la Prairie, MB	
Nu-Vision Commodities	✓					204-758-3401	St. Jean Baptiste, MB	
Parrish & Heimbecker Ltd.					✓	204-987-4320	Winnipeg, MB	✓
Paterson Grain				✓	✓	204-956-2090	Winnipeg, MB	✓
• FeedMax Corp.				✓		204-523-0682	Killarney, MB	✓
Providence Grain Group	✓	✓	✓	✓	✓	780-997-0211	Fort Saskatchewan, AB	✓
Pipeline Foods, ULC				✓		204-997-2480	Winnipeg, MB	✓
Quarry Seed					✓	204-467-8877	Stonewall, MB	
Richardson International				✓		204-934-5627	Winnipeg, MB	✓
• Richardson Pioneer Ltd.				✓	✓	204-934-5627	Winnipeg, MB	✓
• Tri Lake Agri				✓		204-523-5380	Killarney, MB	✓
S.S. Johnson Seeds	✓			✓		204-376-5228	Arborg, MB	✓
Scoular Canada Ltd.	✓	✓	✓	✓	✓	403-720-9050	Calgary, AB	✓
Seaboard Overseas		✓	✓	✓		306-565-3934	Regina, SK	
Seed-Ex Inc.					✓	204-737-2000	Letellier, MB	✓
Shafer Commodities					✓	204-822-6275	Morden, MB	✓
Simpson Seeds			✓			306-693-2132	Moose Jaw, SK	✓
Southland Pulse			✓	✓		306-634-8008	Estevan, SK	✓
Sunrich LLC					✓	507-446-5642	Hope, MN	
Thompsons Limited	✓		✓	✓		519-676-5411	Blenheim, ON	✓
Vanderveen Commodity Services					✓	204-745-6444	Carman, MB	✓
Viterra Inc.	✓	✓	✓	✓	✓	Contact your local Viterra sales representative		✓
Walhalla Bean Co. (Canada Ltd.)	✓					701-549-3721	Walhalla, ND	✓
• Winkler Receiving	✓					204-325-0767	Winkler, MB	✓
Wilbur Ellis	✓		✓	✓		204-867-8163	Minnedosa, MB	✓
Zeghers Seeds Inc.			✓	✓		204-526-2145	Holland, MB	✓

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 that do not purchase grain and feed mills do not have to be licensed. The pulse and soybean crop buyers listing includes only companies that are licensed and secured by the CGC (or exempted by regulation), and who are registered to submit check-off to MPSG. It is the responsibility of the farmer to ensure the company they are dealing with is reliable. Questions regarding licensing and security should be directed to the CGC at 1-800-853-6705 or 204-983-2770. To be included on MPSG's pulse and soybean crop buyers list, contact the MPSG office at 204-745-6488 for the buyers registration package.

Recipe Corner

Spicy Roasted Chickpeas

1 15 oz. can of chickpeas (garbanzo beans)

1 tbsp olive oil

1/2 tsp sea salt

2 tsp of spice mixture (a curry, Morrocan, or Mexican spice mixture work well)

Directions

Make sure the chickpeas are completely dry after draining and rinsing them. Otherwise they'll end up chewy and soggy.

1. Preheat oven to 400°F.
2. Drain and rinse chickpeas in a colander. Pat dry.
3. Toss chickpeas in a medium sized bowl with olive oil, sea salt, and spices.
4. Arrange chickpeas on a baking sheet in a single layer.
5. Bake for approximately 30 minutes or until crispy. While baking, shake pan or stir chickpeas to avoid burning.
6. Transfer to a serving bowl.
7. If desired, sprinkle and toss with more spices.

Broccoli and Cheddar White Bean Spread

Servings: 6

1 1/2 cups (375 mL) broccoli florets

1 can (540 mL) cannellini beans or white kidney beans, drained and rinsed

1 cup (250 mL) shredded old cheddar cheese

1 clove garlic, minced

3 tbsp (45 mL) olive oil

3 tbsp (45 mL) lemon juice

1/4 tsp (1 mL) salt

1/4 tsp (1 mL) pepper

9 cups (2.1 L) vegetable crudités, (baby carrots, celery, sweet pepper)

3 whole grain Greek-style pitas, cut in wedges

Directions

In saucepan of boiling salted water, cover and cook broccoli until tender-crisp, about 2 minutes. Drain and chill in cold water; drain well. Transfer to food processor.

Add beans, cheddar cheese, garlic, oil, lemon juice, salt and pepper; purée until smooth.

To take along, divide dip, vegetables and pitas among resealable containers.

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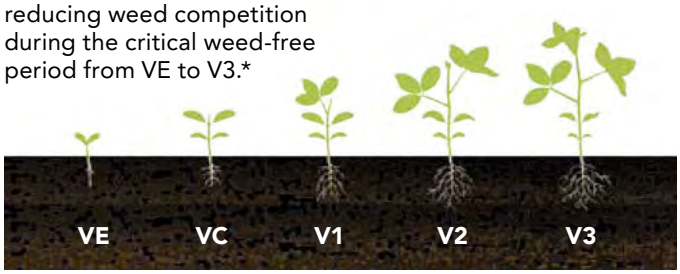

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PRE-SEED HERBICIDE	Pre-seed application of Roundup XTEND VaporGrip	In-crop application of XTENDIMAX VaporGrip
	Valtera™ • Multiple Mode of Action defense strategy • Improved control of kochia, cleavers, mustard, pigweeds and suppression of volunteer canola • Longer residual control	**Glyphosate + Valtera™** *– or –* **Fierce™** *(for grasses)* *ADD* **BlackHawk™** *(for exceptionally dirty fields)*
PRODUCT USE MATRIX	Pre-seed application tank mix	Pre-seed application tank mix
If **volunteer HT canola** is present	USE **Valtera™ + Roundup XTEND VaporGrip**	**Valtera™ + BlackHawk™ + Glyphosate**
If **cleavers** are present	USE **Valtera™ + Roundup XTEND VaporGrip**	**Valtera™ + BlackHawk™ + Glyphosate**
If glyphosate-tolerant **kochia** is present	USE **Valtera™ + Roundup XTEND VaporGrip**	**Valtera™ + BlackHawk™ + Glyphosate**
PLANNED IN CROP HERBICIDE	**Glyphosate**	Roundup XTEND VaporGrip XTENDIMAX VaporGrip

[1]Data from Purdue Extension Weed Science and Ohio State horticulture and crop science extension fact sheet "The benefits of Preemegence herbicides in Roundup Ready soybean" April 2008.

*Fickett et al., 2009, Jeschke et al., 2011, Ali et al., 2013

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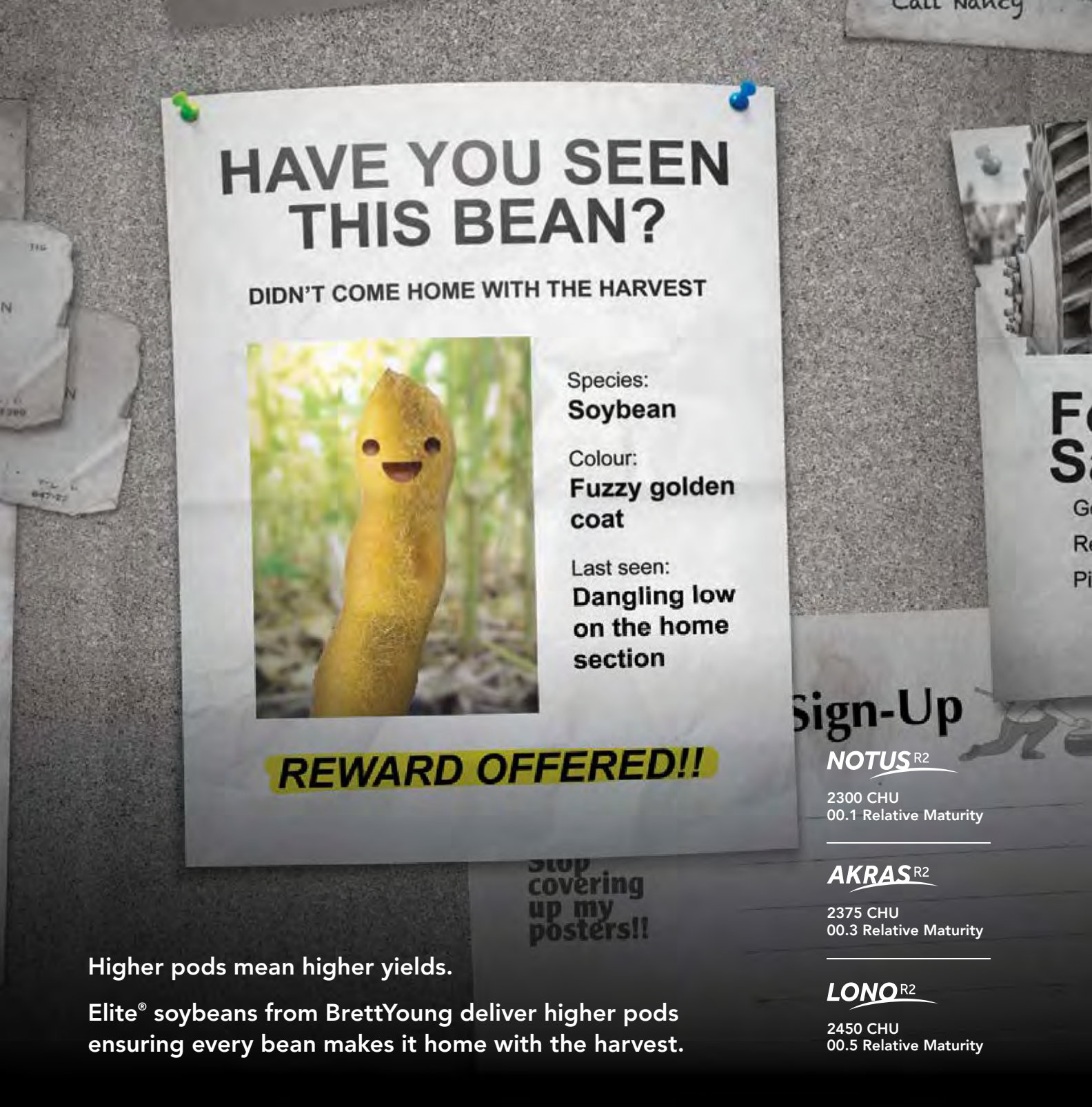

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