MANITOBA PULSE & SOYBEAN GROWERS

pulsebeat

Issue 85 • Fall/Winter 2018

Seventy-Two Bushel Soybeans and the China-U.S. Trade War

p. 15

Rethinking the 49th Parallel: Working Together to Feed a Hungry World

p. 17

The Bean Report

Post-Harvest Opportunities with Pulse and Soybean Crops

p. 26

Rethinking Soybean Protein and Seed Quality in Manitoba

p. 31

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Publisher Manitoba Pulse & Soybean Growers

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Design and Production Imprint Media Services Inc.

Manitoba Pulse & Soybean Growers thanks the authors who have taken the time to contribute to this publication.

Publications Mail Agreement #40016070

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Pulse Beat is the official journal of and published by Manitoba Pulse & Soybean Growers (MPSG) – a farmer organization funded by sales of pulse (beans, peas, lentils and faba beans) and soybean crops grown in the province of Manitoba. Circulation is approximately 4,600 distributed to farmers, government, researchers and industry involved in pulses and/or soybeans.

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In This Issue

Cover photo courtesy of Chris Unrau

Manitoba Pulse & Soybean Growers – 2018 Board of Directors and Staff

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Vice Chair – Calvin Penner – *Elm Creek*

Hailey Jefferies – *Brandon*

Bryce MacMillan – *Marquette*

Ben Martens – *Boissevain*

Brendan Phillips – *Hartney*

Frank Prince – *Deloraine*

Melvin Rattai – *Beausejour*

Ernie Sirski – *Dauphin*

Rick Vaags – *Dugald*

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Dennis Lange, Manitoba Agriculture

Yvonne Lawley, Department of Plant Science, University of Manitoba

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

Extension Coordinator – Laura Schmidt – *laura@manitobapulse.ca*

Notice of Annual General Meeting 2019

MANITOBA Pulse Soybean GROWERS

NOTICE IS HEREBY GIVEN that a meeting of the members of Manitoba Pulse & Soybean Growers (MPSG) will be held during the CropConnect Conference

February 13, 2019
8:00 AM – 9:00 AM
Victoria Inn Hotel and Convention Centre
1808 Wellington Avenue • Winnipeg, MB

The purpose of the meeting is to

1. approve the minutes of the 2018 members meeting
2. receive the financial statements of MPSG for the current fiscal year
3. appoint the auditor of MPSG
4. receive the board chair and executive director's report
5. elect directors to the MPSG Board of Directors

> *Nominations to serve on the Board of Directors can be made by submitting the candidate's name to the Nominating Committee or the MPSG office prior to the commencement of the meeting.*

CALL FOR DIRECTOR NOMINATIONS

Each year director positions come up for election.

If you are interested in becoming a director on the MPSG board, now is your opportunity. In 2019, one director is resigning and the terms of John Preun and Calvin Penner are expiring.

If you are a farmer of pulse and/or soybean crops and are in good standing with MPSG (you have not requested a check-off refund but have sold a pulse/soybean crop in the past two years), and would like more information on becoming a director, contact:

NOMINATION COMMITTEE

- Bryce MacMillan (chair) – bryce_mac3@hotmail.com
- Hailey Jefferies – hailey@prairiefava.com
- Brendan Phillips – grandbendfarms@gmail.com

Elections will be held at the MPSG Annual General Meeting February 13, 2019

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, G. Bartley, C. Tkachuk, L. Schmidt, I. Kirby, W. Voogt, S. Robinson, industry advisors

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'M AN ETERNAL optimist. To a fault, perhaps. But, nevertheless, when I think of soybeans, dry beans and peas in Manitoba, I can't help but think they're here to stay.

This year has been unique (aren't they all, though?). The weather has been all over the map. Some areas got average rainfall. Some areas didn't get nearly enough. And then some areas got too much. The growing season started out dry and farmers, including myself, were nervous about our crops not reaching potential.

And then, as if the spotty and sometimes frustrating weather patterns weren't enough, farmers had to deal with another moving target: fluctuating commodity prices due to the U.S.'s loss of China as a soybean trading partner. This is still going on and there's not much I can say about it. Every day something new surfaces. It's hard to know what's going to happen next. The soybean value chain is moving in interesting ways. U.S. soys are finding their way to Canada and transportation of our domestic supply seems to be smooth and healthy. Prices are pretty good right now, too (knock on wood).

Manitoba Pulse & Soybean Growers (MPSG) continues to monitor the situation, as best we can. It's hard to pin down what's happening to our friends down south. But if we can learn something from what we've been observing, it's that good trading relationships are important.

Harvest has been slow this year with many weather-related interruptions. The dry conditions leading up to September had some farmers threshing soybeans that were too dry. I also heard from some farmers that they were seeing lots of green seeds in their samples, an issue MPSG Production Specialist Cassandra Tkachuk talked about in the September 12 *Bean Report*.

I think the outlook for soybean production in Manitoba is positive. The Red River Valley and other areas that didn't get those important late-summer rains may not have had the yields they could have, but areas that did get more timely moisture are reporting a 50–55 bu/ac crop. This is encouraging.

We need to remember that soybeans are a relatively new crop to Manitoba. MPSG continues to work with researchers on equipping farmers with the best, independent resources to grow the most profitable and sustainable soybean, dry bean and pea crops possible. It's our mandate and we take that seriously.

I'm also encouraged to see that pea acres increased this year. They are proving to be a profitable crop to grow in Manitoba. They can take advantage of spring moisture and are seeded early in the growing season – great for staggering harvest times. This year's weather made for a good pea crop. This is especially encouraging, as Roquette solidifies plans to roll out a pea program for the 2019 crop year. Pea growers, keep an eye out for contracts.

MPSG has taken steps towards building a relationship with fellow commodity groups in North Dakota. We share a lot of the same soil. They grow a lot of soybeans and so do we. On challenges such as soybean cyst nematode, they have experience Manitoba's growers could benefit from.

AMALGAMATION

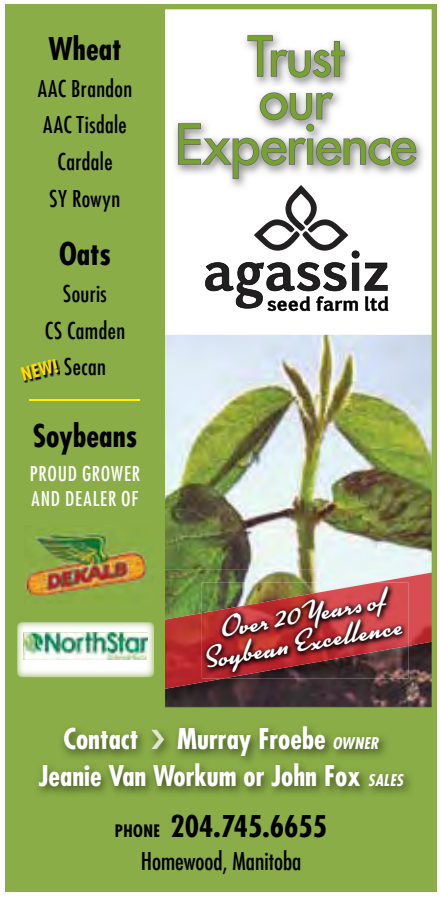
MPSG has decided to step away from the amalgamation talks currently taking place between multiple commodity groups in the province. We, as a board, did a full evaluation of the options and felt that this decision was in the best interest of the crops we represent.

MPSG is merely stepping back for now. We will continue to watch the process with interest and we look forward to discovering new and exciting opportunities to collaborate with the other groups in ways that will benefit our farmers, such as our On-Farm Network, which has broadened its scope to include more crop types.

MPSG continues to do good work delivering value to Manitoba's farmers. Check out our website for the latest research. Sign up for our newsletter to receive news, updates and the *Bean Report*. I can't stress enough how important it is for farmers to receive independent information. There is a lot of information floating around. It's important of find a source you can trust, and, as chair, I can confidently say you can trust us.

It's winter and there may not be a lot happening on your farms right now, but whether you're transporting grain or attending meetings, stay safe and remember to take time to be with your families. There is nothing more important than that.

– John ■



Getting it Right 2019

CROP PRODUCTION MEETING

Join us!

MPSG PRESENTS **FOUR** FARMER-EXCLUSIVE SOYBEAN AND PULSE PRODUCTION MEETINGS

Getting it Right is a series of half-day, farmer-focused events, equipping Manitoba's soybean and pulse growers with the tools required to face production challenges and market access issues. These events offer an opportunity for farmers to see where their MPSG research investments are going, while networking and receiving production support.

We're coming to you!

TUESDAY	THURSDAY	TUESDAY	THURSDAY
February 26	**February 28**	**March 5**	**March 7**
DAUPHIN	STONEWALL	WINKLER	BOISSEVAIN

HALF-DAY EVENT **9:00 AM – 12:00 PM**

Registration – 8:30 AM • Lunch provided

This farmer-exclusive event is free for MPSG members to attend.

To register, visit **manitobapulse.ca**, drop by our booth at Ag Days, see us at CropConnect or contact Laura at **laura@manitobapulse.ca**

REGISTRATION CLOSES FEBRUARY 22, 2019

MANITOBA Pulse Soybean GROWERS

Soybean Scout

Why are these soybean leaves discoloured?

A

B

Answers can be found on page 47

Message from Executive Director

François Labelle, Executive Director

BE IT PRODUCTION, research or markets, each year raises more questions. The old adage, "the more you know, the more you don't know" sure hold true. We have no idea what normal is and after a growing season with such erratic weather, we are all very surprised by the outcome – good and bad.

WEATHER

Speaking of the weather – what's next? Apparently, for many years we had predictable weather and now we are in a time, either a cycle or part of climate change, where it's more erratic. This growing season was very dry and at times very hot. Precipitation did not happen at critical times in some areas of the province, while other areas were fortunate and did get those late-season rains. We saw a wide variation in yields across Manitoba.

Several years ago, Manitoba Pulse & Soybean Growers (MPSG) hosted a group of farmers and researchers from Australia. One comment they made at that time was that they would harvest once terminal drought hit. When the moisture was used up, the crop died and they would harvest. I think we can say we experienced this in the valley this year. In late July and early August the crop dried down so quickly. We ended up with green soybeans, as they just did not have time to go through the normal maturing process. Later harvested crops did not have the same issue.

So, how do we position ourselves for the wild weather rides? We can expect it to get worse, so we need to pay attention to this important issue. Drought-resistant crop varieties were once a dream. But that's not the case anymore. There are some coming.

Well, now what will this winter and spring bring? Let's hope we do not see too many negative extremes during the next few months.

CROP

We talk a lot about the soybean crop and its challenges, but we need to mention the other pulse crops.

Peas did well in many areas this year. They were in the ground early and harvest began at the end of July. Much of the pea crop got off the field and into the bin in great condition.

Overall, some of the early harvested crops were too dry while other crops remained unharvested longer than expected, but by late October, most pulses and soybeans were in the bin.

continued on page 6

MANITOBA CORN GROWERS ASSOCIATION (MCGA) provides Cash Advance loans on most crops grown in Manitoba.

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Kidney Beans
Lentils
Millet
Mustard
Mustard, Ethiopian
Oats
Other Coloured Beans
Peas
Pinto Beans
Fall Rye
Rye
Rye Grass Seed, Annual
Rye Grass Seed, Perennial
Soybeans
Sunflowers, Confectionary
Sunflowers, Oil
Triticale
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Wheat
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› *Forms are ready for the 2019 program – fall seeded crops*

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Canada

continued from page 5

MARKETS

Along with the discussion about dealing with unpredictable weather, let's talk markets. The soybean market is especially interesting. When the wind blows, things sure change and are totally unpredictable. Where will next year be and what will prices bring?

PESTICIDE ISSUE – RESIDUE

I read some articles this past summer looking at what farming would be without pesticides. Is this really a possibility – reduced pesticides, no pesticides? From some of the reviews on various chemistries, some are being removed from our farmers' toolbox. Neonic? Matador? What's next? We at MPSG are watching this issue closely and we are representing our farmers wherever we can.

What we do know is that there are reviews being done on many pesticides. This is the ongoing work of the Pest Management Regulatory Agency (PMRA). They are mandated to review registrations of pesticides on a scheduled basis. Once a pesticide is registered that registration does not last forever. The PMRA takes into account new uses and new information on the chemicals it reviews.

We also need to be concerned about following labels on all pesticides, ensuring end products fall within the Maximum Residue Limits (MRLs) established for products. There is much more scrutiny on MRLs in both domestic markets and international markets. More and more people are testing for residues. We need to follow labels.

I read a scary article about MRLs. Most consumers hearing about pesticide residue on their food do not understand what MRLs are and that there could be very small amounts of residue on their food. Many people are surprised to learn that there are allowable levels of residue on foods that are safe for human consumption. The thought was there should not be any on their food.

It's the consumer that still has the final say. They can decide what products they will buy.

AMALGAMATION

After a few years of work and some long heart-to-heart discussions this past summer, the board decided it was not beneficial to the members to continue the process toward amalgamation. At a steering committee meeting of the five groups in July, MPSG Chair John Preun announced the decision that MPSG was withdrawing from the discussion and process for the time being.

MPSG is still working cooperatively and collaboratively with the groups. And we hope to continue to do so.

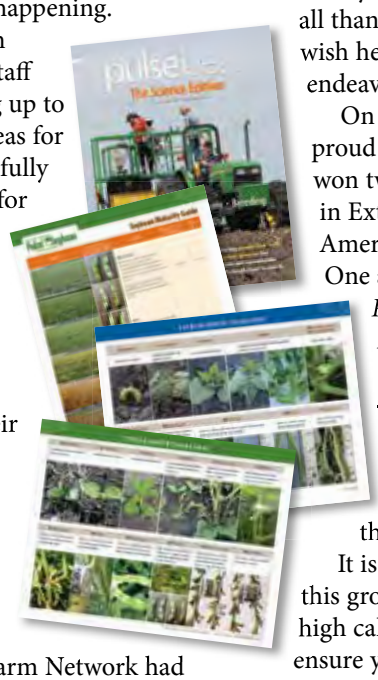
We also wish the remaining four groups the best in their endeavour to better serve their growers and industry.

ROQUETTE

I know there were lots of questions this past summer about what is happening with Roquette, as there is little to no activity on their site in Portage la Prairie. Well, Roquette recently announced that the project was proceeding as planned and earthwork was happening.

We have met with their procurement staff and they are gearing up to begin contracting peas for 2019. They will hopefully be in full operation for the 2020 growing season.

Stay tuned. I expect there will be a meeting coming up where you will hear more about their programs.



ASSOCIATION – STAFF – PROGRAMS

Staff was very busy this past summer with a number of activities. The On-Farm Network had a full workload. Results of these trials should be available on MPSG's website before the end of the year.

Production staff spent a good part of their time in the field, doing surveys, following crop developments, as well as being on the lookout for emerging issues. They worked hard to keep everyone informed through the *Bean Report*.

Research takes up most of our budget and takes up lots of time from a number of staff. This year is no exception. Every five years federal/provincial funding programs are renewed. MPSG's Director of Research Daryl Domitruk did a great job leading us through the final steps of this program. There are always many research ideas, and between the research committee and staff input, decisions are made on which projects we will support. We then apply to the various government programs for additional funding support – a time-consuming process.

Reports and results from our research program will be in *Pulse Beat: The Science Edition* in the new year, as well as on the website. Be sure to check it out.

Unfortunately, at the end of the growing season Laryssa Stevenson decided to leave the association. Laryssa was involved in many important activities within our organization over the three years she was with us. We all thank her for her efforts and wish her the best in her future endeavours.

On a positive note, we are very proud to announce that MPSG won two Certificate of Excellence in Extension awards from the American Society of Agronomy. One award was for our magazine *Pulse Beat*: *The Science Edition* and the other award was for our resource material – *Soybean Growth Staging Guide, Soybean Maturity Guide* and *Dry Bean Growth Staging Guide*. Thanks for the good work!

It is great to be recognized by this group. It's testament to our high calibre staff who work hard to ensure you, our farmers, have the latest information about your crops.

We expect a busy winter with lots of meetings. With volatile markets, I am sure decisions will be difficult this year. On the weather side, it was good to get some fall rains so it looks better going into spring.

Hope to see you this winter at CropConnect and elsewhere.

– François ■

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Food Starts at the Farm, Not the Grocery Store

Agriculture in the classroom

IT'S SHOCKING WHEN we ask a room full of students, "how many of you know a farmer?" and only a fraction of hands go up. But it's not a surprise. Today, students are three generations removed from the farm – many having never been to one before.

But students deserve to know where their food comes from. That's why we bring agriculture education into the classroom.

At Agriculture in the Classroom – Manitoba (AITC–M), we believe all Manitoba educators and students deserve to understand and value the contribution of agriculture to society. It's why we provide schools with programs and resources that inspire them to care about agriculture and think critically about what they hear in the media using science-based information.

Through grades K–12, students who join our programs experience a firsthand glimpse of Manitoba's agricultural industry, ensuring students have the most accurate and balanced and current portrayal of Canadian agriculture. This is the ABC mandate we use in everything we do.

Our Little Green Thumbs (LGT) program teaches students that food doesn't start at the grocery store, but at the farm. LGT's classroom gardens show students how to plant, grow and harvest food that will help feed their school – just like how farmers help feed the world.

Canadian Agriculture Literacy Month (CALM) shows students exactly who grows their food. CALM brings Manitoba farmers and industry representatives directly into classrooms across the province, so they can share their story. Through CALM, students learn more about where our food comes from and how farmers work to keep our food safe and abundant.

Amazing Agriculture Adventure (AAA) shows students how much there is to discover about agriculture. Through hands-on activities students learn about crops, animals, farm business and more. It shows students that agriculture is a whole system with many moving parts that rely on each other.

Our mission is only possible with generous support from our members, sponsors and volunteers. With support from Manitoba Pulse & Soybean Growers, AITC-M impacted over 30,000 students and teachers in the 2017–18 school year.

But our work is never done, because the demand for agriculture education in Manitoba is stronger than ever.

Our hope is that one day we can ask a room full of students, "how many of you know a farmer?" and every hand goes up.

Special thanks to Manitoba Pulse & Soybean Growers for its continued support over the years. With your financial support and passionate volunteers, AITC–M can ensure Manitoba educators and students make informed decisions that support the agriculture industry.

For more information on how to become an individual member or to volunteer, please visit our website: aitc.mb.ca.

MANITOBA FLAGSHIP PROGRAMS

- Manitoba Ag Days Adventure
- Canadian Agriculture Literacy Month
- Amazing Agriculture Adventure
- Little Green Thumbs
- Global Youth Institute
- Made in Manitoba Breakfast

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Spotlight on Trade-Related Developments

Ron Davidson, Executive Director, Soy Canada

Characterized by exports of 5.0 million tonnes valued at $2.7 billion in 2017, the Canadian soybean sector is inherently export-dependent. The paragraphs that follow comment on a selection of recent and upcoming trade-related developments in the sector.

UNITED STATES-CHINA TRADE DISPUTE

In a letter from September 18, and a follow-up meeting on September 27 with Agriculture and Agri-Food Minister Lawrence MacAulay, the Soy Canada Board of Directors expressed concern about the detrimental consequences of the U.S.-China trade dispute for the Canadian soy sector. The two most pertinent considerations are the trade and price disruptive impact of the 25% Chinese import duty on the U.S. futures market and the announced $1.65 per bushel payment by the U.S. government to American soybean producers. The Minister agreed that his officials would cooperate with Soy Canada representatives on the identification and quantification of the impacts in Canada of the U.S.-China trade dispute.

UNITED STATES, MEXICO AND CANADA AGREEMENT (UMCA)

The successful conclusion of the USMCA negotiations was good news as there is now a reduced likelihood of another round of U.S. import tariffs followed by Canadian retaliation. Although most agriculture and agri-food products were exempt from the tariffs that were imposed this summer, there were indications that agriculture and agri-food products and inputs would not have escaped a second round. Hopefully, it will soon be possible to achieve the removal of both the continuing U.S. "national security" import tariffs on Canadian steel and aluminum as well as Canada's retaliatory tariffs. One outcome of a free-trade agreement should be a predictable environment of tariff-free trade.

Some observers have commented on the inclusion in the USMCA of an article that states: "*Entry by any Party into a free-trade agreement with a non-market country, shall allow the other Parties to terminate this Agreement on six-month notice and replace this Agreement with an agreement as between them (bilateral agreement).*" Although this provision could be problematic in the context of a comprehensive free-trade agreement, Canadian and Mexican authorities have both emphasized that it would not prohibit an intensification of economic relations with China. For example, Canada and China may continue to pursue progress on a sectoral basis, such as greater regulatory alignment on approvals of new traits, maximum residue limits for pesticides, and low level presence of GMO grains in non-GMO shipments.

CANADA-ASEAN TRADE NEGOTIATIONS

In an October 16 submission to the federal government, Soy Canada strongly supported the initiation of free-trade negotiations with the 10-country Association of Southeast Asian Nations (Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam). A free-trade agreement should not only eliminate import tariffs, but also provide a strengthened framework for addressing technical barriers.

In 2017, Canadian *commodity* and *food-grade* soybean exports to ASEAN member countries totalled almost 350,000 tonnes value at $203 million. Six of the ten ASEAN countries ranked in the top 30 Canadian soybean export markets: Malaysia and Thailand ranked 9 and 10; Thailand 16; Singapore 23; Philippines 26; and Indonesia 29. When considered as a block, the ASEAN member countries ranked as our fourth largest export market behind only China, the United States and Japan.

INCOMING CHINESE MINISTERIAL MISSION

China's Minister of Agriculture and Rural Affairs, Mr. Han Changfu, led a Chinese business delegation on the occasion of a *China-Canada Agriculture and Fisheries Business Cooperation Forum* in Ottawa on October 17. During his visit to Canada, the Minister remarked not only that soybeans originate from his home province in China, but also that his parents were soybean farmers.

MINISTER MACAULAY MISSION TO CHINA

China is, by far, the leading foreign destination for Canadian soybeans and soy products, accounting for approximately one-third of exports in 2017. Agriculture and Agri-Food Minister Lawrence MacAulay led a trade mission to Shanghai and Beijing, China from November 10–16, 2018. During the Minister's mission, the interests of the Canadian soybean sector were represented and advocated by Ernie Sirski of Dauphin, Manitoba in his dual capacities as Chair of the Soy Canada Board of Directors and member of the Board of Directors of Manitoba Pulse & Soybean Growers.

JAPAN AND VIETNAM TRADE MISSION

The next Soy Canada trade mission is scheduled to visit Japan and Vietnam during the week of February 25–March 1, 2018. The program in each country will include visits to local soybean processors and traders, a seminar and one-on-one meetings with local importers and processors. Soy Canada members are encouraged to participate. ■

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Pulse Canada

Achieving 25 by 2025: Finding a Home for 2 Million Tonnes of Canadian Pulses

THE CANADIAN PULSE industry has set an objective of creating new uses and markets for 25 percent of Canadian pulse production (or roughly 2 million tonnes) by the year 2025. Throughout 2018, Pulse Canada worked closely with Manitoba Pulse & Soybean Growers, Saskatchewan Pulse Growers, Alberta Pulse Growers and Ontario Bean Growers to develop a common strategy that will help the pulse industry achieve this goal.

The strategy for achieving the '25 by 2025' target was presented to the industry this summer at the 2018 Pulse & Special Crops Convention in Regina. It focuses on growing the use of pulses within the global processed food, pet food, feed and aquaculture markets as well as the North American foodservice sector.

EXPANDING PULSE INGREDIENT USE IN PROCESSED FOODS

To help meet 25 by 2025, the pulse industry will work to grow the utilization of Canadian pulse ingredients in processed foods by 700,000 tonnes. In North America, Europe and China, interest in pulse proteins, starches and flours is growing as food companies look for ways to meet changing consumer tastes and preferences.

With their many nutritional attributes, pulses are well-positioned to help food companies cope with the growing consumer interest in alternative proteins and plant-based foods. In products such as noodles, bakery products, snack foods, biscuits, milk alternatives, and processed meats, certain Canadian pulse ingredients can offer a competitive advantage when it comes to aspects such as nutritional quality and functionality.

Pulse Canada will work with major food companies to increase their interest in the benefits of pulses, help them overcome technical challenges and knowledge gaps, and ensure pulses are emphasized in dietary guidelines. Pulse Canada will also conduct further consumer research to understand current perceptions of pulses and how to best position them to leverage their unique attributes.

LEVERAGING OPPORTUNITIES FOR PULSES IN PET FOOD, FEED AND AQUACULTURE

The Canadian pulse industry will also work to grow demand for pulses in pet food, feed and aquaculture, with an aim of increasing utilization in these markets by a total of 500,000 tonnes. For feed and aquaculture, market development activities will focus primarily on the Chinese marketplace. China accounts for over 56 per cent of aquaculture production and 18 per cent of global feed usage. Pulse Canada will focus on higher-value opportunities in these markets by promoting the functional, nutritional and environmental aspects of pulse ingredients to feed companies.

When it comes to pet foods, consumers are becoming increasingly interested in trends such as clean label, grain-free and high protein. Research shows that more than 80 percent of pet food products launched globally have health claims. Pulses ingredients, particularly peas, are a cost-effective option that offers pet food manufacturers protein and fibre. Pulse-based pet food sales are expected to increase at an annual growth rate of four to five percent in volume terms between 2017 and 2021.

This past spring, Pulse Canada conducted a survey of pulse industry stakeholders to ascertain the types of marketing activities and research that will drive increased use of pulses in pet food. Facilitating research and marketing pulses to pet food manufacturers were identified as major priorities, and will make up the bulk of the pulse industry's work in this area.

PROMOTING PULSES TO THE FOODSERVICE SECTOR

The North American foodservice sector represents another opportunity for Canadian pulses. Nielsen data reveals that 39 percent of consumers in North America are actively trying to incorporate more plant-based foods into their diets. From school cafeterias to restaurants, menu offerings are changing to address growing consumer demand for plant-based foods. An excellent example of this trend is A&W's highly successful launch of the plant-based Beyond Burger this past year.

Pulse Canada and its provincial counterparts will aim to grow the use of pulses, especially beans and lentils, within the North American foodservice sector by 400,000 tonnes. Pulse Canada plans to work jointly with industry partners to position pulses as an affordable, nutritious ingredient to North American foodservice companies. A significant part of this work will involve the development of menu items featuring pulses that will appeal to consumers. Pulse Canada will also continue marketing the nutritional and environmental benefits of pulses to consumers to grow demand for pulse-based options on foodservice menus.

MEASURING PROGRESS TO 25 BY 2025

Pulse Canada spent the early part of 2018 benchmarking current pulse ingredient utilization in each of the target markets and product categories mentioned above. These numbers will be used as a baseline to measure progress on an annual basis toward the 25 by 2025 target. ■

www.manitobapulse.ca

Clancey's Stats

Pulse market analysis

Brian Clancey, Senior Market Analyst and Publisher, STAT Communication

DRY EDIBLE BEAN markets were taken aback by the USDA's October production estimates, which forecast production for the sector would reach a record 1.71 million metric tonnes (MT), a 6% increase from last year. Including states that are now excluded from the report suggests output is closer to 1.77 million, compared to 1.68 million last year.

Any confusion created by the report stems from the fact chickpeas are included in the dry bean estimates. Ignored chickpeas, suggest production of other classes of dry edible beans will likely drop from 1.36 to 1.2 million MT, mainly because of reduced pinto bean output.

Combined production in Canada and the United States is now expected to reach 1.55 million MT, down from 1.72 million last season. However, the carryover has increased from an estimated 194,000 MT last year to 366,000 with the result available supplies of all classes of beans should increase from 1.9 to 1.91 million, compared to the recent five-year average of 1.69 million.

There are no reliable estimates on season-ending inventories of dry edible beans in either Canada or the United States. The only independent data comes from the North Dakota State University's Upper Great Plains Transportation Institute. Its July 31 survey got a 100% return from licensed facilities in the state.

The plants said they were holding 133,371 MT of pinto, 28,375 MT of navy and 15,985 MT of black beans on July 31. Pinto bean inventories were more than double last year and 56% above the recent five-year average; while navy bean stocks were up 27% from last year and 15% above the recent average; and black bean inventories were up 24% from last year but 18% below the previous year average.

Not surprisingly, rising pinto bean inventories had a significant impact on total dry bean plantings in North Dakota. This is reflected in current North American production forecasts, with output of that class expected to

continued on page 12

NORTH AMERICAN PULSE PRODUCTION SUMMARY

Area (acres)	**2014**	**2015**	**2016**	**2017**	**2018**
Canada	305,000	262,000	311,100	363,100	305,400
United States	1,701,600	1,764,700	1,729,000	2,153,500	2,117,000
Total	**2,006,600**	**2,026,700**	**2,040,100**	**2,516,600**	**2,422,400**
Production (metric tonnes)					
CANADA					
• Coloured	195,400	168,500	193,100	259,700	262,900
• White	77,700	76,700	71,600	94,700	82,400
CDN Total	**273,100**	**245,200**	**264,700**	**354,400**	**345,300**
UNITED STATES					
• Pinto	448,562	431,008	463,280	636,471	441,198
• Black	178,490	253,515	200,176	233,877	236,872
• Navy	193,822	206,931	161,971	188,742	187,230
• Great Northern	108,183	41,504	38,329	63,640	57,823
• Other	255,012	316,429	248,206	238,749	280,153
U.S. Total	**1,184,070**	**1,249,388**	**1,111,963**	**1,361,479**	**1,203,276**
Total Production	**1,457,170**	**1,494,588**	**1,376,663**	**1,715,879**	**1,548,576**
Opening Stocks	288,000	358,000	300,000	234,000	357,000
Total Supply	1,745,170	1,852,588	1,676,663	1,949,879	1,905,576
Rolling Average	1,639,192	1,676,377	1,680,055	1,739,243	1,761,145

BASED on data from USDA, Statistics Canada and STAT Publishing.

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continued from page 11

drop 31% to almost 441,200 MT. Even so, available supplies are only expected to be down 13% at 633,300 MT.

Even if exports drop from last season's 111,166 MT to 94,000, residual supplies of pinto beans would be expected to decline, likely dropping from 185,000 to 123,000 MT a year hence. If demand from Mexico is stronger than expected, next summer's ending stocks would be further reduced, which would be expected to result in a moderate upward price trend.

Production in the country is expected to fall short of government estimates, suggesting import demand should remain strong through the winter period. Mexico's agriculture department was expecting a 1.29 million metric ton harvest, but some market participants doubt the crop will reach one million.

Black beans would also benefit from improved demand from Mexico. Heading into the 2018–19 marketing year, the United States is looking at a 37,000 MT carryover and production around 237,000 MT, for an available supply of almost 274,000 MT. This is little changed from last season, with markets needing to see strong demand from Mexico to prevent residual supplies from climbing to 50,000 MT a year hence.

Markets for white beans have become more complex because of problems with Argentina's white alubia bean harvest. Most of the crop is small calibre, resulting in higher trading levels for large calibre white beans and an increase in competition for available demand in some small calibre markets.

Many buyers cannot substitute small calibre alubia beans for great northern or navy beans. This is especially true of packagers and canners. However, in markets where beans are sold on a bulk basis to retail consumers, it is possible for price-based substitution to occur.

North American great northern and navy bean shippers are hoping the impact is minimal because of the need to reduce inventories over the marketing year. Great northern beans finished the 2017–18 marketing campaign with a stocks-to-use ratio approaching 36%, which is enough product to cover around four months of normal demand. Stocks-to-use for navy beans was almost 27%, enough product to cover three months of normal demand.

Both classes saw export demand falter during the previous marketing year, with exporters and processors hoping to regain momentum in the coming months. This could see ending stocks of great northern beans slip from 18,000 to 16,000 MT a year hence, while navy bean residuals could drop from 45,000 to 34,000 MT.

Since available supplies of both classes of beans are up over last season, exporters would be expected to adopt a more competitive tone in pricing against other origins. ■

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Seventy-Two Bushel Soybeans and the China-U.S. Trade War

Toban Dyck, Director of Communications, MPSG

WE WERE TOLD to put our bags on the floor in the middle of the room with all pockets opened or unzipped. We waited in the lobby while a security dog sniffed our backpacks and media gear.

On October 15, I got as close as I've ever been to a sitting Prime Minister and I learned a few things about our trading partner China.

Bayer invited me to attend the Fortune Global Forum conference in Toronto, which ran from Oct. 15 to 17. The by-invitation-only event brought together the CEOs of the world's biggest corporations and was facilitated by the editors of *Fortune Magazine*.

Bayer CropScience President Liam Condon was at the event. He was a panelist along with AGT's CEO Murad Al-Katib and President of General Mills's Natural and Organic Unit Carla Vernon in a session titled Feeding the World, which served as a very surface-level discussion on the important role technology plays in meeting production demands.

Feeding the World panel discussion.

Bayer requested my presence to take in the session, interview Condon on the Bayer-Monsanto merger and join him and a few other ag delegates on a farm tour in southern Ontario, where I witnessed a soybean field yield more than 70 bushels per acre. The farmer told me that one of his other fields had spots that went north of a 100.

While the panel conversation did at one point bend towards organic production as a return to the way things used to be and should be now, Condon did insert some much-needed perspective with the comment, "No farmer I've ever met wants to go back to the ways things were."

"It's always a bit of a challenge when you're on a panel where there is a very consumer, organic-like focus," he said. "The tendency then is to somehow brand everything that isn't organic farming as somehow bad farming. I think it's important we stand up for farmers and give them more support; not less."

Condon wanted to assure farmers that the Bayer-Monsanto merger would not affect them.

"In the short term, there will be no change," said Condon. "They should expect the same quality service – the same quality products. And, as we integrate, farmers should notice things get better. We'll have more data through which farmers will be able to make smarter decisions."

While the conference was not explicitly about agriculture, save for the second-last session, it was largely about trade, specifically trade with China. Most of the workshops touched on this in some capacity. And China had sizable representation at the event. It was interesting.

We hear a lot about China and its current trade war with the U.S. As farmers, we've come to learn just how large China is and how big its demands for soybeans are.

It's also become apparent just how disruptive this eye-for-an-eye trade battle has become to the global economy. It was overwhelmingly the most brought-up topic of the conference.

China's is an economy to which we have little access, both as a direct result of its efforts to keep it that way and a language barrier.

But China has made noise. And the world's gaze is fixed on it. People seem eager to learn about it.

China and the World: A New Era for Business kicked off the event. It was a panel discussion with Afsaneh Beschloss, CEO of global advisory firm Rock Creek; Louisa Cheang, vice-chair and chief executive of China's Hang Seng Bank; Chen Dongsheng, founder of China Guardian Auctions and Taikang Life Insurance; Vincent Qiu, founder of Baozun E-commerce Inc; Dr. Jonathan Woetzel, senior partner with McKinsey & Company; and it was moderated by Adam Lashinsky, Co-chair of the conference and executive editor of the magazine.

Interview with Bayer CropScience president, Liam Condon (right).

The discussion was high-level, yet not. The main thrust was to chat about China's economy, in general. I learned that China's is an economy in transition, moving from an investment-based model to a consumption-based model, whereby future growth becomes dependent on the public's willingness to adopt new products as they enter the marketplace.

continued on page 16

continued from page 15

Today, after three decades of double digits growth, China has more access to technology and quality products than it ever has. According to some of the panelists, China's is an emerging market. It's moving from high speed to high quality; from industrial to post industrial; from investment to consumption.

Companies are burdened by the steep learning curve that comes with such growth.

"The trade war is big, but it's nothing compared to Chinese companies trying to match domestic consumer demand," said Woetzel, adding that the trade war is affecting multinational companies more than Chinese companies. "About 40–50 per cent of Chinese exports are from multinationals."

It's unclear what U.S. President Donald Trump's intentions are when he provokes Chinese lawmakers. And it's equally unclear what China's intentions are when it retaliates in-kind. But what became apparent during this panel discussion is that, while this trade war is affecting U.S. farmers in devastating ways, it's not doing the same to any element of the Chinese public.

Prime Minister Justin Trudeau with Fortune Magazine president, Alan Murray.

"The hardest hit is Taiwan, Japan and Korea, as they have started manufacturing companies in China," said Dongsheng, adding that those countries deliver the raw goods and China only assembles and ships the products.

The event started strong. It was dense. That afternoon, after my backpack cleared dog security, I heard Prime Minister Justin Trudeau field one comment on his socks and a series of questions on the newly negotiated free-trade agreement USMCA.

When asked about whether Canada sees an opportunity to trade with China, Trudeau said that, "we will look for trade opportunities in a thoughtful, smart and Canadian way." He added that under USMCA, any deals Canada would make with China would have to be reported to Mexico and the U.S.

The Fortune Global Forum was more about agriculture than it knew or probably intended. It felt advantageous to learn what I did about China and it was encouraging to see an ag-themed session on its agenda. I get the sense that this will be happening more and more, as the world becomes increasingly aware of just how global an enterprise farming is. ■

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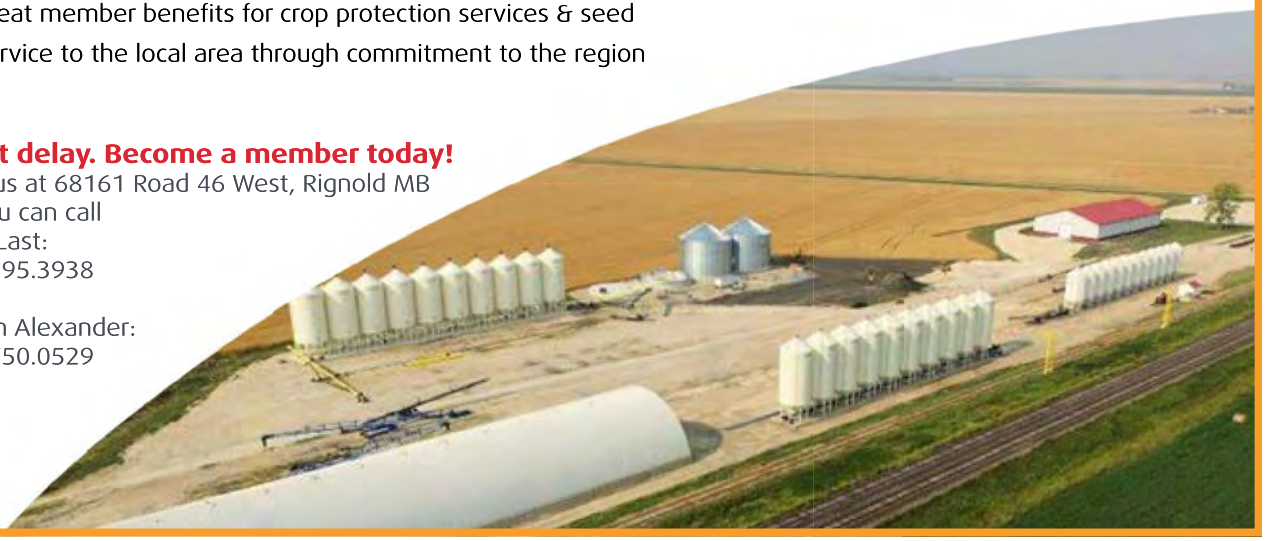


Manitoba–North Dakota border

Photo: Paul Armstrong

Rethinking the 49th Parallel: Working Together to Feed a Hungry World

Toban Dyck, Director of Communications, MPSG

BRIAN O'TOOLE'S FARM is less than an hour from my own. But to get there involves international travel and an unpredictable chat with border patrol. The soil Brian farms is similar to yours. And, while he reads his temperatures in Fahrenheit, his winters are just as cold.

"We're both trying to achieve the same thing. We're both trying to feed a hungry world. The 49th parallel used to mean nothing to people. And it should mean the same today, but it doesn't. All of a sudden, what's yours is yours and what's mine is mine. I don't think my family grew up that way. I certainly didn't grow up that way. I'd like to say my kids aren't that way."

Brian and his wife, Sara, along with three of their four children, run O'Toole Seed in Crystal, North Dakota, which, according to Brian, is "a sleepy little town," of about 180 people.

O'Toole Seed offers an extensive menu of seed-related services. They serve national, regional and local producers, specializing in custom seed cleaning and certified treating for a variety of crops including wheat, soybeans, barley, peas, lentils and edible beans.


Brian O'Toole

We sat in Brian's farm office. He is the fourth generation to operate his farm. I met his father – the third generation. He walked in, introduced himself and at 84 years of age cracked a well-humoured and topical joke about Canada's recent legalization of marijuana. "No. I did not bring any."

The nature of our visit was unique. At Manitoba Pulse & Soybean Growers we're starting to see lots of value in developing relationships with fellow associations and farmers in the northern U.S. states. Our politics may differ significantly, but our agronomics don't. And we're remarkably similar in other ways, too.

"The border was never a big issue. I remember talking to a schoolteacher who lived in Pembina. And she said that back then the border didn't open until 9 o'clock and she had to be at school by 8. She'd have to get out of her car, move the cones, cross the border, stop and move the cones back. Could you survive that today?" said Brian, laughing. We were both laughing at this point.

Brian O'Toole is the former Chairman of the U.S. Wheat Associates, the export market development agency for the U.S. wheat industry. He doesn't have a drawl. He knows Manitoba and he knows Canada. It was like talking with a neighbour.

"After 12 years with U.S. Wheat, I've now been wheat free for about four months," said Brian. "I used to work a lot with Canada. I worked with Cigi and the Western Canadian Wheat Growers Association. They were a very fun group. The first time we met, we met at the Minneapolis stock exchange to participate in some fake trading. I thought that was kind of neat."

Brian has a keen understanding of how Canada's wheat industry used to function under the wheat board and the pool elevator system.

It's important to note that at no point in our conversation did I get a sense that Brian was protectionist in the slightest. He spoke about Canada as one would a close friend.

A tumultuous trade environment, falling commodity prices and high input costs have pushed many farms in Brian's area to the edge of solvency. He's concerned about it, citing plummeting land values and an alarming amount of acres coming up for sale – and not selling.

Land is selling for half of what it was worth four years ago.

"There's no doubt times are tough. If you're in agriculture on this side of the state, you're surviving by whatever your spouse brings home. It's as tough as it's been since I've been farming," Brian said. "We were all lined up for a good year, this year. We looked at this year – year five – and thought it looked good. But, corn got down below $3 and soybeans went below $7. Our wheat was below $5. All red numbers, no matter how you look at it."

Canada's newly negotiated free-trade agreement with Mexico and the U.S. came up. As did the trade relationship

continued on page 18

continued from page 17

with China, which has gone cold for the states.

Brian thinks USMCA will be good for U.S. farmers. From what he has heard, it will allow more U.S. wheat into Canada. And Brian believes – and he said time and time again – that our two countries should be building up the agricultural sector together.

"Canada is doing a tremendous amount of work developing terminals on their west coast. You guys are building some massive terminals able to load cape vessels, which is something we can't do. You can handle heavy panamaxes. It benefits us to export to Canada to get access to those terminals."

For Brian, the solution is simple. And I left there convinced he was onto something worth pursuing.

"Canada has a problem moving commodities out west in winter," he said. "The U.S. doesn't. Canada also owns a lot of rail in the U.S. We could move things west on U.S. side then north to the Canadian ports, then move east on the Canadian side. These two countries could work together so positively if there was a round-robin rail system. If we could just think of these things globally, we could come up with some great solves for both countries. I'd love to be involved in that world. It bothers me that people are focusing on their country."

We didn't talk specifically about President Donald Trump, but we did talk about the suffering farmers have endured as a result of the some of the trade moves the U.S. and China have made.

"If our trade gets back to where it was before this happened, the republicans are going to say, 'we've sure done something good here. Look at what we've done. We've got soybeans up $2.' All they've done is got them back to where they were. Is that a win? What happened to the profitability of all the soys that left in the meantime? What happened to all the farms that had to close?"

Soybeans in Brian's area are moving to Canada, and that's the only movement he has noticed. He doesn't know where they're going. But, locally, they are loading b-trains destined for Canada.

"Obviously, there is money to be made exporting out of Canada over the U.S. We're really showing China now," Brian said with a friendly chuckle. "In these trade-war situations, the weight shouldn't have to be carried by the agriculture sector alone. Agriculture represents one percent of the U.S. population. The sector is too small to carry this burden. It will topple it. Nobody will like that."

Brian grows 007, 008 and 009 soybeans in his area. And he grows soybean cyst nematode-resistant Xtend varieties, exclusively. This year, they averaged between 45–50 bushels per acre. Similar to Manitoba, it was all about those late-season rains.

continued on page 20

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continued from page 18

While he sees it as important to grow nematode-resistant varieties, Crystal and the surrounding area don't see much evidence of it. "It's mostly in the Fargo area," he said. "We have more issues with iron chlorosis growing soybeans in our climate and soil types."

O'Toole Seed also has a lot of experience with edible beans. They grow navies, and love growing navies. And O'Toole Seed owns a large-scale receiving plant for edible beans.

On the farmyard we were chatting at, O'Toole Seed was storing tens of thousands of bushels of pinto beans and were in the process of emptying out their shed full of navies.

Columbia Grain now leases the plant from O'Toole Seed. Brian was happy to offload the responsibility of handling beans to someone else. "If I've learned anything about handling beans, it's that they are going to lose them. They shrink. Someone else can take that risk."

Brian's wife, Sara, does all the grading for the bean receiving station. She works out of an office on the yard. And she is the one who grades Brian's beans.

"I've had my own beans rejected in my own office – by my own wife," he said, smiling.

On his soybean land, O'Toole Seed alternates between corn and soybeans. But for his cash crops, such as edible beans, sugar beets and potatoes, he keeps to a five-year rotation.

The only exception to this, he confessed, is on a parcel where tolerant wild oats are starting to appear. There, he's growing three round-up ready crops in a row – corn, soybeans and sugar beets – to attack the problem.

Brian grows a lot of non-conventional corn on his farm. The royalties are cheap enough to make up for yield lag.

Soil health is important to O'Toole seeds. Earthworms are important to O'Toole Seed. At least to Brian they are. His farm, like many others, has scaled up its machinery such that you can do anything to the soil in any conditions. This means farmers till when they shouldn't, but can. Seed when they shouldn't, but can.

"As soon as they came up with those quad-tracks, we've lost our patience. It's more than likely too cold and the soil isn't ready, but we get on it anyway. The worms are starting to appear in the seeds and not the soil."

Brian farms with his wife, son, daughter and son-in law. His father is around, too, helping out and building garden-scale model trains.

His operation was settled in 1881, only a few years before my family's farm in Canada. I'm only guessing, but I bet the border back then didn't even have cones.

"On this farm, it's all Brandt and Batco and Convey-All – it's all Canada," he said. "You were parked up there by a harrow that was built in Canada. Our truck boxes are built in Canada. For the agricultural community in the U.S. to go up to Canada and purchase a piece of equipment has gotten more complicated. It used to be super easy. It isn't anymore.

"What's up with the 49th parallel?" ■

Brendan Phillips

Farming south of the Souris

Toban Dyck, Director of Communications, MPSG

I NEVER SAW Lauder, Manitoba. But I got close.

"Look for the abandoned stone house south of the highway. We're harvesting the field northwest of it."

From highway 345, somewhere between the 21 and Lauder, I pulled onto the approach and ripped across the field. There were three combines harvesting soybeans and one busy grain cart servicing them.

New Manitoba Pulse & Soybean Growers director Brendan Phillips told me to come to the grain cart. There, in the middle of a large expanse of cropland, Brendan jumped out of his quad-track Versatile and into my truck. The following conversation took place in my truck, in the middle of his field, while the farm implements worked around us.

From my cab, Brendan pointed to his yard. It was far away but visible.

"I'm the fifth generation to farm in this area," he said. "Where we live – just over there – is where my parents used to live. And my grandpa and great grandpa before that."

But the yard we were both looking at isn't where Brendan's farm began. It was originally settled in the sand hills north of the Souris River. The farm moved south of the river in the '20s – where it is now – when Brendan's great grandpa and his great grandpa's brother returned from service in World War I. They bought land side-by-side and farmed together.

"And my grandpa on my mother's side was a gunner in World War II. He didn't talk about that very much," he said. "My dad is going to Europe to observe Remembrance Day while touring the places the Canadian Forces were towards the end of the war."

Southwestern Manitoba has a unique history. The area has suffered tough years. The number of farmers has decreased as a result. It's a history that the Phillips family is tied to in an area they call home.

"My grandpa's brother was a history buff. He wrote the history books for this area," said Brendan.

Brendan, his wife Jaclyn and their two young children farm with Brendan's brother, his parents, his uncle and his uncle's family. It's a family operation in the purest sense. Brendan's sister, Brittany, also lends a hand when she has time from her job as a crop input supplier.

This year, they worked collaboratively with his cousin, Ed, as well as their neighbour, Ewen, effectively combining acres. "It's been a busy year. We've worked really hard."

Jaclyn, an agronomist, was driving the grain cart while we chatted. She left Richardson to fill a part-time agronomy position on the Phillips family farm. Bringing the farm's agronomy in-house has been a great experience, according to Brendan, saying that since they made that move, their record keeping has improved and so has their ability to interpret and implement the variable rate data.

Brendan is also a trained agronomist. He graduated with a degree in agricul-

continued on page 22

continued from page 21

ture from the University of Manitoba, after which he worked for Viterra for one summer and Bayer for four.

Agriculture was always in the cards for Brendan. He knew this, though he wasn't sure he'd take over the family operation.

He bought his first piece of land in 2008 when prices weren't as high as they are now. Subsequent purchases were more expensive, he assured me. This set in motion a trajectory that ultimately galvanized his desire to be a farmer.

In 2012, he incorporated. And ever since, the succession plan that will see him and his brother take over the operation from his dad and uncle has been plodding ahead.

"We're making decisions together," he said. "It's been really good. We've always had our say on the farm."

The Phillips farm grew its first field of soybeans in 2013. Then, following a wet 2014, grew them again in 2015. "They've been a really good crop for us."

This year, however, like most farmers in Manitoba, the soybean harvest was all over the map, with some yielding in the 20s and others in the 40s. He parroted what most are saying: it's all about where those rains hit.

Soybeans are a permanent part of their rotation. During the soybean boom years, Brendan and those he farms with, maintained steady and sustainable rotations, earmarking no more than 20 percent of their land to any one crop.

"In '91, we started zero-till," said Brendan. "It's worked well for us. It really works well with soybeans. Some say it keeps the ground too cool in spring, but it really locks in the moisture. We introduced corn to build residue up."

Brendan's farm has grown peas and lentils – all in the '90s and all quite successfully. They tried lentils again in 2012 and 2013. Those years were wet. "The lentils didn't like that."

He's toying with the idea of growing edibles, but the uncertain U.S. soybean market may drive an increase in pulse production south of the border, he fears.

Brendan joined the MPSG Board of Directors in 2018 after admiring some of the work the association had been doing representing farmers across the entire province, as opposed to just a few core areas.

"I always really admired the kind of work MPSG has done. Watching MPSG grow over the years, it felt like it would be a great place for me to learn a bit as well as bring some insights to the board table from this area of the province."

Brendan's farm participated in an MPSG On-Farm Network seeding rate trial this growing season, and had a great experience doing so. He values these kinds of programs and he wants to help the association get the word out on the great research it's doing for pulse and soybean farmers in Manitoba.

Building partnerships are important for Brendan, too. This was easy to believe, as we watched his family make quick work of the soybean field we were parked on.

Brendan isn't short on ideas. From water management to intercropping to cover cropping to communications, Brendan isn't short on ideas for improving the association and delivering more value to Manitoba's farmers.

Jaclyn drove back to the field with their two kids and Brendan's mom. I asked for a picture and I wanted one in front of the grain cart. It was a good time to end things. It was getting a little stuffy in my truck. ■

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Message from Director of Research and Production

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

Research priorities address farmers' needs

ARTICLES APPEARING IN the Research and Production section of *Pulse Beat* are built upon the results of projects initiated and funded by MPSG. The origin of the projects themselves can be traced to the demands of farmers. That is, in considering a new project MPSG simply asks, "Would the results of this project meet grower demand for information about better pulse and soybean farming?" This edition of *Pulse Beat* taps the results of projects that, when they were initiated, were forecast to meet the demands of producers in two or three years. Back then, thoughts of soybean cyst nematode were barely emerging while questions about pulse and soybean nutrient dynamics were becoming common. The ongoing conversation on dry bean disease resistance was, well, ongoing. And, the thought of MPSG securing its own applied research position at U of M was just being born. We hope this edition speaks well to those demands.

Of course, when the topic is better farming the demand for information always exceeds supply. That's why MPSG sets priorities. For example, we place value on projects that meet grower demands in all corners of Manitoba's varied pulse and soybean landscape. Lately, we've sought to enhance our demand-driven approach by slotting project ideas into four themes: improved yield and quality, reduced pest control costs, increased market demand and improved soil quality. This is MPSG striving to efficiently convert farmer ideas into projects by connecting those ideas to a larger, winning strategy. In this edition of *Pulse Beat*, you'll read about contemporary issues such as soybean protein, storage and drought stress. We hope these articles resonate with farmers fresh off their 2018 experience.

We can't linger, however. With 2019 around the corner the MPSG project cycle keeps turning. We're asking "the question" again as new project ideas come in. This time around we hope to especially build on MPSG's recent investments in projects under the Canadian Agriculture Partnership. We'll have a lot to convey once the results of those projects are in. Whether it's developing articles for future *Pulse Beat* editions or listening to farmer feedback on project results, this four-part winning strategy should come in handy. ■

on-farm network
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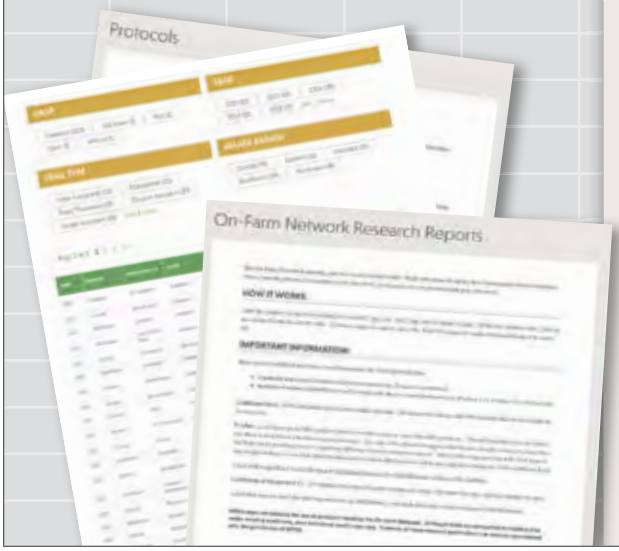

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MANITOBA Pulse Soybean GROWERS

Project details and results available at
manitobapulse.ca

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MANITOBA Pulse Soybean GROWERS

2018 Extension Programs

Summer at a Glance


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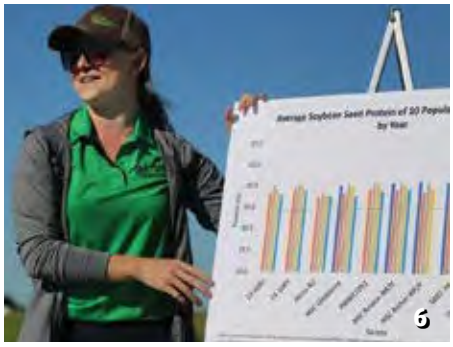
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SMART Day
July 17, Melita | July 19, Arborg

Soybean Management and Research Transfer (SMART) Day is an educational event for farmers and agronomists to sharpen their soybean-management skills.

MPSG has a major investment in agronomic research projects and the 2018 SMART Day showcased a few of those projects.

1 PESAI field site, Arborg

2 WADO field site, Melita

Rethinking Soybean Seeding Depth

3 Kristen MacMillan dug deeper into her soybean seed depth experiment results.

4 Comparing healthy seedlings with stress symptoms from seeding too deep.

Soybean Seed Quality

5 Soybean seed quality was dissected into its components at SMART Day, covering agronomic, geographic and genetic influences on protein and oil content.

6 Cassandra Tkachuk dove into protein data from Manitoba's soybean variety trials, comparing years, sites and varieties.

7 Dr. Navneet Brar indicated that soybean protein content did not change with nitrogen fertilizer rates in her three-year study.

8 The length of time spent at different growth stages was compared between Ontario and Manitoba in Nate Ort's MSc. project. Manitoba soybeans spent more time in the vegetative stages and less time flowering.

9 Extension specialists and researchers were available throughout the day to answer questions.

Feeding Soybeans – Smart Use of Inoculant and N, P, K Fertilizers

10 Laryssa Stevenson presented the facts behind soybean fertility – covering nitrogen and phosphorus needs, and inoculation requirements.


11


12

SMART DAY
SOYBEAN MANAGEMENT & RESEARCH TRANSFER

July 17 – Melita
July 19 – Arborg

CROPS-A-PALOOZA

July 25


13


14


15


16


17


18


19


20

Morden PULSE Tour

August 22


21

11 Megan Bourns communicated results of her MSc. project evaluating potassium fertility for soybeans, as they are a high K-removing crop.

12 Nitrogen rescue treatments were recommended as nitrogen-deficient plants, resulting from failed nodulation, were passed around.

Several Intercropping Combinations were on the Docket at SMART Day in WADO

13 Soybeans intercropped with flax were one of the four intercrops highlighted.

14 Scott Chalmers explained successes and struggles they've faced testing different intercrop combinations.

Crops-a-Palooza

15 Researchers and extension specialists were present from across Canada to lead seventeen interactive stations.

16 MPSG partnered with six other commodity organizations to represent all crops at this come-and-go tour.

17 The Minister of Agriculture, Ralph Eichler, welcomed participants to the inaugural Crops-a-Palooza.

18 Stations engaged participants with games.

Morden Pulse Tour

19 Dr. Anfu Hou led the Morden Pulse Tour to talk about dry bean variety development for Manitoba.

20 Dr. Bob Conner showed dry bean lines being screened for white mould tolerance.

21 Attendees viewed variety development up close and got a look at a new cranberry bean variety, AAC Scotty.

See you next season!

Post-Harvest Opportunities with Pulse and Soybean Crops

The Bean Report
Your source for soybean and pulse crop agronomy and research.

Laryssa Stevenson, MSc, PAg

Knowing how to capitalize on soybeans, dry beans, field peas and faba beans in your cropping systems allows for experimenting with practices that could save time and inputs for future crops.

KNOW YOUR NITROGEN CREDITS

The amount of nitrogen (N) pulses and soybeans biologically fix, via rhizobium bacteria, and release to subsequent crops is difficult to precisely estimate. Nitrogen contributions are a function of internal factors (crop species, variety) and external factors (soil characteristics, precipitation, temperature, tillage, inoculation and fertilization, cropping sequence and rotation, pathogens) that affect N-fixation and residue decomposition (Xie 2017). It is no surprise, then, that we find enormous variability in the range of N-fixation (Figure 1) and N contributions in literature (Walley et al. 2007, Salvagiotti et al. 2008).

Generally, crops like peas, lentils and faba beans, with a higher proportion of N-fixation relative to their total N-requirement (average of 52, 58 and 84%, respectively), have a small, but positive soil N-contribution compared to dry beans and chickpeas (Walley et al. 2007). Nitrogen nutrition for dry beans in Manitoba is supplemented with fertilizer, as N-fixation is insufficient, and therefore N credits are negligible. Dry bean residue does, however, have a low carbon (C) to N ratio (C:N), so it quickly mineralizes available N to the next crop.

Soybeans fix, on average, 58% of their N requirement (Salvagiotti et al. 2008), but soybeans remove a large portion of that N through harvested seed compared to pulses. Consequently, growing soybeans results in a neutral or even negative soil N balance. Researchers in Saskatchewan found that wheat yielded similarly when grown on soybean, lentil or pea stubble, but found lower amounts of N (and phosphorus) returned to the

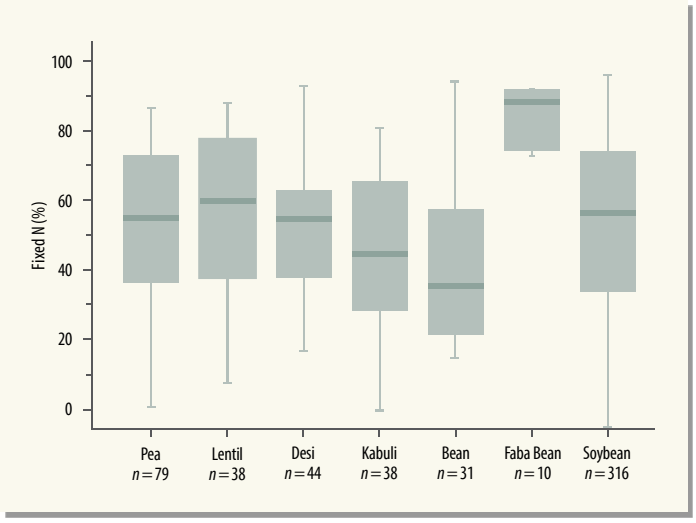

Figure 1. Nitrogen biologically fixed, as a proportion of total crop N requirements (Walley et al. 2007, Salvagiotti et al. 2008).

continued on page 27

HOW TO ESTIMATE NITROGEN CONTRIBUTIONS FROM YOUR PULSE COVER CROP

canopeoapp.com

1 Estimate biomass yield (lbs/ac) using one of two options

- Measure the height of the crop: the first six inches will produce 2,000 lbs/ac. Add 150 lbs/ac for each additional inch. Estimate % ground cover using the Canopeo App on your mobile device. Biomass yield = estimated lbs/ac multiplied by % ground cover.
- or… Cut and remove all above-ground portions of the plant within a known area (e.g. a hula hoop or metal-framed quadrat). Allow this sample to air dry for one to two days until they are "crunchy-dry." Then weigh the sample. Biomass yield = lbs of dried sample divided by square feet sampled, multiplied by 43,560 ft^2.

2 Estimate N content (%N)

Generally, annual legumes contain 3.5–4.0% N prior to flowering. For the most reliable N estimates, send a tissue sample to the lab at the time when the cover crop is terminated (i.e. by frost, herbicide or tillage).

3 Estimate rate of N release

About 50% of the N will be available to the following crop, with an additional 15% available in the second year. If the cover crop is not incorporated with tillage, only 25% will be available to the following crop.

Example – 1500 lbs biomass/ac * 3.5 %N * 50% release rate = 26 lbs N/ac available for the next crop.

soil with soybeans compared to peas or lentils (Xie 2017). Remember that the yield advantage you may see after a pulse or soybean crop may not be due to N credits, but may instead be a function of non-N benefits (e.g. breaking up insect and disease cycles).

Pulse-derived N is also released through decomposition over several years, so assigning a simple fertilizer replacement value can be misleading. Pulse rotational studies across the Prairies consistently found that peas, lentils and faba beans provided a yield and economic benefit compared to cereal-oilseed rotations, and that benefit lasted up to three years after the pulse was grown (Khakbazan et al. 2018). The slow-release nature of pulse-derived N has also been shown to improve protein levels in following wheat crops (Miller et al. 2002). Because pulses are harvested relatively early, a fall or spring soil test will capture only some of the mineralized nitrates from decomposing residue that will be available to the next crop. Factors that increase the rate of N release are tillage and crop residue with a low C:N ratio. Soybeans actually have a higher C:N than other pulses, wheat and canola, meaning their residue will tie up N and release it more slowly.

MAKE YOUR OWN NITROGEN

Peas, lentils and faba beans are absent from most farm rotations, either due to growing condition or marketing limitations. Since soybeans and dry beans provide no net N benefit for subsequent crops, there lies an opportunity to incorporate these other, higher N-producing pulses as cover crops. Compared to soybeans and dry beans, these pulses are also more frost tolerant (as low as -4 to -6°C), have a shorter season and seed is relatively easy to source locally. This makes them perfect candidates for "shoulder season" or fall-seeded cover crops.

Do we have enough time, heat and moisture to make it work? Research conducted in Manitoba found that an acceptable level of pea or lentil biomass production (i.e., approximately 1000 lbs/ac) can be achieved with less than eight weeks from seeding to killing frost (Thiessen Martens et al. 2001, Cicek et al. 2014). Peas produced greater and more consistent levels of biomass compared to lentils. More biomass generally equals more N production. Faba beans have not been tested as a fall-seeded cover crop in Manitoba, but they are the most frost-tolerant and highest N-fixing of the pulses, shown to provide an average of 45 lbs N/ac to subsequent corn crops in northeastern USA when seeded in August (Etemadi et al. 2018).

Harvest of winter cereals in Manitoba wraps up in the first to second week of August and a large portion of spring-seeded cereals are harvested by the third and fourth week. The average first fall frost (0°C) for south, central and parts of eastern Manitoba is most likely to occur during the third or fourth weeks of September (Table 1). Pulses can withstand light frosts, so realistically, fall-seeded pulses have approximately six to eight weeks to grow. Many areas in Manitoba have sufficient heat and precipitation during August, September and October to allow pulses to germinate and grow to the late vegetative stages (Table 1).

Seeding a pulse crop for N production after early harvest of a cereal can provide added benefits of 1) reducing risk of soil erosion in the fall (and early spring, if mulch is not incorporated), 2) alleviating surface soil compaction, and 3) reducing evaporative water loss and improving water infiltration if mulch is left intact. Conversely, transpiration (water use) by the cover crop in fall may reduce soil water stores for the following year's crop.

PHOSPHORUS AND POTASSIUM REMOVED, REPLACED

Phosphorus (P) and potassium (K) behave differently in soil compared to N. Nitrogen levels vary widely from year to year based on soil, weather and management practices, whereas P and K levels in soil remain more consistent. Plant-available soil N is subject to fertilizer/manure additions, volatilization, leaching and denitrification losses and crop residue/organic matter mineralization and immobilization. For P and K, the soil behaves more like a bank account, where the major source of withdrawals is usually removal through harvested grain.

As with N in soybeans, the P and K removal rates through harvested seed is high. However, the trouble with maintaining P and K fertility in pulse and soybean rotations is primarily due to limited crop capacity to tolerate seed-placed fertilizers, which is often the preferred and convenient method of application (Table 2). Potash fertilizer, in particular, has a very high level of

continued on page 28

Table 1. Long-term (30-year average) accumulated growing degree days (base temperature 5°C) and precipitation (mm) from August 1 to October 31 across Manitoba. The average date of the first fall frost for each location is included.

Location	GDD	Precipitation	Average date of first fall frost (0°C)
Morden	748	148	Sept. 21 – 24
Winnipeg	673	154	Sept. 21 – 24
Arborg	599	157	Sept. 18 – 21
Brandon	604	140	Sept. 15 – 18

Table 2. Crop P and K removal (through harvested seed) and maximum seed-placed P and K fertilizer rates (source: Manitoba Soil Fertility Guide 2007).

Crop/Yield	P Removal (lbs P_2O_5/ac)	Maximum safe rate of seed-placed P_2O_5/ac	K Removal (lbs K_2O/ac)	Maximum safe rate of seed-placed K_2O/ac
Soybeans (40 bu/ac)	33	10*	56	0
Dry beans (1800 lbs/ac)	25	10*	25	0
Field peas (50 bu/ac)	35	20	36	0

*No fertilizer should be placed in the seed row when soybeans or dry beans are planted on greater than 15-inch row spacing.

continued from page 27

seedling toxicity risk relative to other fertilizers and should be placed away from the seed.

Early harvest allows time for a large addition of P and/or K fertilizer or manure in the fall to satisfy uptake requirements and balance nutrient removal for all crops in the rotation. For example, if we expect to grow soybeans, canola and wheat (yielding 40, 50 and 60 bu/ac, respectively) over three years, we would require a total of approximately 140 lbs P_2O_5/ac to replenish the P removed. You could apply 100 lbs P_2O_5/ac in the fall, reserving an application of 20 lbs P_2O_5/ac as starter fertilizer for each of the canola and wheat crops, which are more likely to respond to seed-placed P fertilizer than soybeans. This one-time P application should be incorporated (or even better, banded) to reduce nutrient losses due to surface runoff. This fertilization strategy would maintain soil fertility over the course of the crop rotation, saving time and cart space during seeding.

Soil loss on May 15, 2018 from a field that had soybean residue cultivated and rolled the fall prior.

WHY TILL A LOW-RESIDUE CROP?

Residue management after soybeans, dry beans and field peas doesn't have to follow the usual stubble incorporation methods we prescribe to high-residue cereal and canola crops. Experimenting with eliminating tillage – even for just a year – may seem radical. We have heard the question asked – why till a low-residue crop? Recent on-farm research conducted in Manitoba by Dr. Yvonne Lawley found that when soybean residue was left on the soil surface without incorporation, the residue broke down and ground cover was reduced by 31–57% from fall to spring. Different methods of soybean residue incorporation (discing, cultivating or vertical tilling) had no effect on soil moisture or temperature at the two-inch depth during the emergence period the following spring, compared to the no-till stubble. Ultimately, none of the soybean residue management practices had any effect on yield of the following corn of wheat crops.

Farms equipped with planters or disc drills can cut through the pulse or soybean residue that remains the following spring, or will have GPS-enabled guidance to keep seeder shanks between the stubble rows. So, get lazy and consider parking the cultivator next fall!

Eliminating tillage of low-residue pulse or soybean crops may reduce wind erosion the following spring, with the added benefit of conserving soil moisture and reducing fuel, labour and equipment expenses. ■

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Rethinking Soybean Protein and Seed Quality in Manitoba

Cassandra Tkachuk, MSc, PAg, CCA, Production Specialist, MPSG

SOYBEAN PROTEIN IS an important seed quality component and export determinant. This importance stems from its nutritional value for both humans in the form of food-grade soybeans and livestock in the form of soybean meal. Most soybeans in Manitoba are grown for crush markets, meaning meal is the intended end-use and oil is a by-product. Soybean protein content has been on the minds of exporters for several years now and more recently, on the minds of farmers, as one trait that could be improved upon.

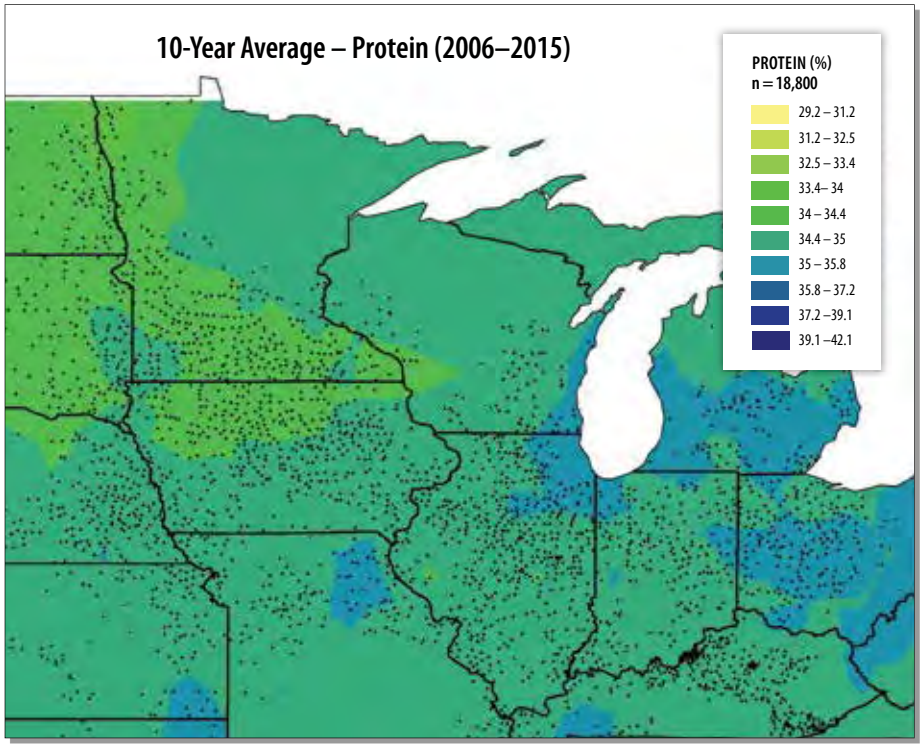
WHY THE NEED FOR PROTEIN IMPROVEMENT?

We are currently facing two broad issues related to soybean protein:

1. There is a declining protein gradient toward northcentral and northwestern North America (Figure 1).
2. North America has experienced a decline in protein levels over time.

These issues impose the risk of a potential price discount on northern-grown soybeans and reduced prospects for establishing a soybean crush facility in Manitoba. In addition, there is no price premium for high protein soybeans. The protein basis for commodity soybean export to China is currently 34% at 13% seed moisture (39% on a dry weight basis (% d.b.)). As prairie soybeans are now being shipped to the west coast and blended at western collection points, there is a greater risk of shipment rejection, which occurs at 33% (38% d.b.). Food-type soybeans must meet an export basis of 42% protein at 13% moisture (48% d.b.). However, conventional soybeans generally produce greater protein levels than those designated for crush markets.

Figure 1. Average soybean crude protein levels (at 13% seed moisture) across the U.S. Midwest from 2006 to 2015. Source: University of Minnesota Extension.



HOW DO YOU SOLVE A PROBLEM LIKE PROTEIN?

To learn more about the underlying causes of low protein in soybeans and to

continued on page 32

continued from page 31

find a way to increase levels in northern growing regions, we must look at the impact of environment, genetics and management.

Environment

The environment in which soybeans are grown may have the strongest influence on protein. According to the Canadian Grain Commission (CGC) voluntary sampling program, soybean protein levels are lower in western versus eastern Canada (Figure 2). In 2017, soybean protein levels were 36.1% to 37.4% d.b. in Manitoba and Saskatchewan, and 39.4% to 40.3% d.b. in Ontario and Quebec, respectively. Western Canada also produces lower soybean protein than the United States, although northern states are also dealing with low crude protein relative to more southern regions of North America. When we look at the 10-year average crude protein levels across a proportion of the U.S., the decline toward northwestern and northcentral regions is apparent (Figure 1).

Here we are talking about diverse geographies, in which environmental conditions are inherently different. The most notable difference between regions is perhaps growing season length. The overall process of protein formation in soybeans is less understood than in crops such as wheat. But it is understood that soybean plants need time to allocate energy and resources into protein synthesis. And there is less time for this during short growing seasons within northern regions.

Variable weather across regions and time, both annually and within the growing season, will also influence soybean protein levels. Excess moisture early in the growing season and/or lack of moisture late in the growing season (during seed fill) can reduce protein levels. High temperatures during seed-fill can increase oil and lower protein. Conversely, cool temperatures limit nitrogen fixation, which can also lower crude protein levels. Differing soil type across regions and the soil's ability to retain water can also play a role. Unfortunately, farmers do not have control over these environmental influences.

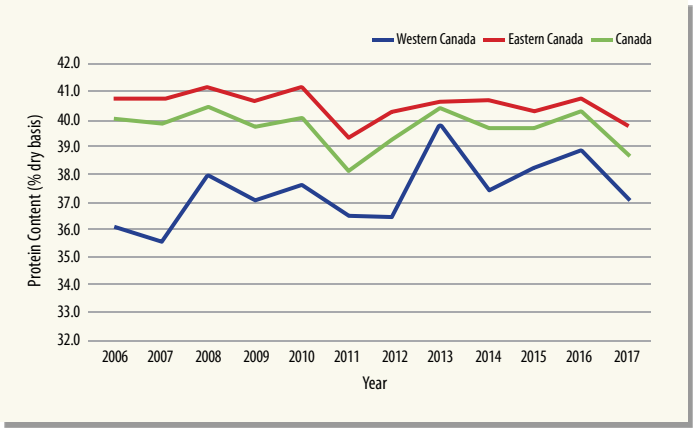


Figure 2. Average soybean crude protein levels (on a dry matter basis) for western, eastern and all of Canada. Source: Canadian Grain Commission.

Genetics

The next factor is genetics, which can also strongly influence soybean protein. This decline in soybean protein levels across North America over time is most likely due to genetics. In addition to the inverse relationship between soybean oil and protein, where one increases as the other decreases, there exists another inverse relationship between soybean yield and protein. Therefore, the demand for selection of higher-yielding soybean varieties has likely caused a decline in protein over time.

Utilizing genetics to now improve protein levels is a long-term solution that will take time, resources and collaboration. Especially since stakeholders do not want to sacrifice yield or early maturation for higher protein in northern growing regions. Each year, protein, oil and seed size data is collected from multi-location variety evaluation trials funded by Manitoba Pulse & Soybean Growers (MPSG). Presently, this data can be used to make comparisons between locations and years. In the near-future, meaningful comparisons can be made between varieties. Raw data is available at seedmb.ca/webexclusives/.

A study conducted by Dr. Malcolm Morrison at Agriculture and Agri-Food Canada (AAFC) Ottawa examined yield and seed-quality characteristics of food-grade soybeans. This MPSG-funded research determined that conventional beans often had protein levels greater than 40% , but protein rarely exceeded the 42% d.b. target for export. This research also found protein differences between varieties, suggesting that it is possible to improve protein through plant breeding efforts. More information on this recently-wrapped up project can be found in *Pulse Beat: The Science Edition* Issue 2.

Management

Finally, can farmers manage their soybean crops to increase protein? Most field research studies collect seed quality data in addition to field measurements. And there are a few projects that have recently wrapped up in Manitoba to draw information from.

The first management tool that may come to mind is fertilization. Since nitrogen (N) is a major building block of protein, will N-fertilization improve soybean protein levels? One study led by Dr. Yvonne Lawley at the University of Manitoba (U of M) examining N-fertilization of soybeans found no difference in both yield and protein levels between treatments that had 0, 15, 30, 45, 60 and 70 lbs N/ac applied. As soybeans are legumes capable of fixing N from the atmosphere, will improved N-fixation increase protein? A study led by MPSG found that inoculation of *Bradyrhizobium japonicum* increased protein by 4.8% compared to the uninoculated control in fields with no previous history of soybeans. However, inoculation had no effect on protein in fields with a history of soybeans. More information on this project can be found

continued on page 33

continued from page 32

at manitobapulse.ca/research-project/soybean-inoculant-trial/.

What about other nutrients such as phosphorous (P), potassium (K) and sulphur (S)? A field study led by Dr. Don Flaten (U of M) that examined the effect of P-fertilizer rates and placement on soybeans across Manitoba, reported a lack of both yield and protein response to P. And little is known about the effect of K and S fertilization on soybean protein levels in Manitoba.

Another management tool one might consider is soybean planting date. Will planting earlier buy more time for protein formation? Another study led by Dr. Lawley examined soybean response to a range of planting dates from April 27 to June 16 across four site-years. Planting date did not influence protein levels in this study. However, site year differences were observed, taking us back to the strong environmental effect on protein.

A third management consideration might be soybean variety selection for higher protein – a management tool that comes down to genetics, but one that farmers have some control over. According to MPSG variety evaluation data, there is a great deal of year-to-year and location-to-location variability in average crude protein levels (averaged across all varieties). A preliminary look at a subset of this data, including 10 popular Roundup Ready varieties from the past five years, has shown only minor differences in average crude protein levels between varieties. And these differences may not even be statistically significant (analysis pending). So, we turn back to plant breeding and genetics for a solution.

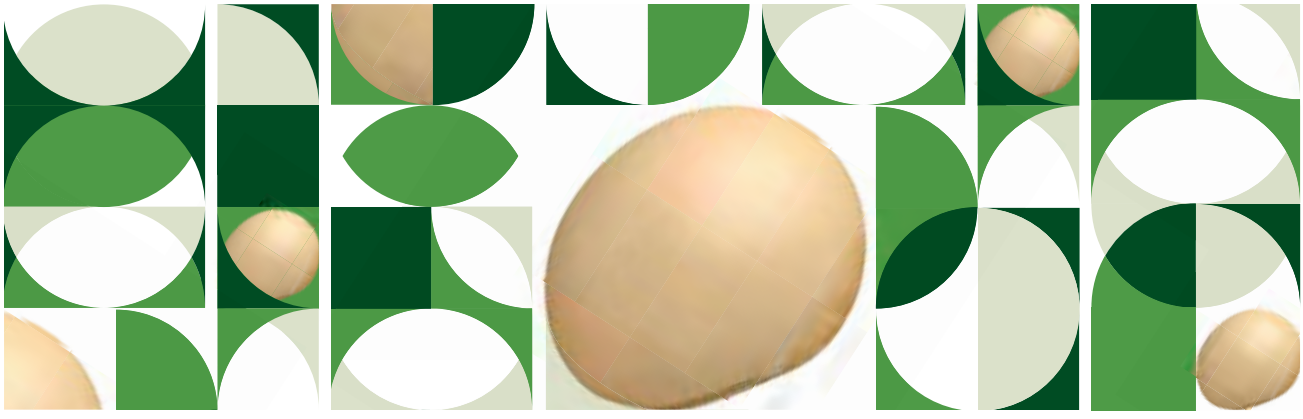
In conclusion, we do not have all the answers to solve the protein issue and it would be unwise to shift management practices solely for the purpose of increasing protein. But we do have a direction for improvement and it will take time before we have solutions. The first step is gaining a better understanding of how the environmental, genetic and management

continued on page 34

ONE STUDY INITIATED this year by Dr. James House at the University of Manitoba aims to understand soybean protein quantity and quality in Manitoba. Samples from the annual multi-location variety performance trials will be analyzed for key attributes, including moisture, oil content, crude protein and, importantly, amino acids – the building blocks of protein.

All animals require amino acids to support the maintenance and growth of body tissues, and high-quality proteins contain greater proportions of essential amino acids. Focusing more attention on the quality of the protein, by measuring key amino acids, represents a more accurate measure of the value of soy protein.

These results will provide the Manitoba soy industry with the information needed to supply high-quality soy protein and ensure maximal returns for farmers.



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interaction affects soybean protein. MPSG is collaborating with sister organizations to support this type of research. A new project being led by Dr. Elroy Cober at AAFC Ottawa will look at the G x E interaction and its influence on protein, testing soybean varieties with range of protein levels at sites across western Canada.

THE FUTURE DIRECTION OF SOYBEAN PROTEIN IN THE NORTH

Other regions dealing with low protein, including North Dakota, Minnesota and South Dakota, have been working to redefine soybean meal quality. Their method has been to examine different soybean seed quality indicators, such as sucrose and critical amino acid value (CAAV). The CAAV is the sum of five critical, essential amino acids (AAs) including lysine, threonine, cysteine, tryptophan and methionine, measured as a percent of crude protein. These five AAs are among the first limiting essential amino acids and provide a measure of nutritional completeness. Protein is of course comprised of amino acids, so this is simply a different measure of protein that gives a better indicator of nutrition than crude protein.

Interestingly, this research has identified a geographical gradient opposite to that of crude protein – CAAV increases in the direction of more northcentral and northwestern growing regions (Figure 3). A similar trend can be seen with soybean sucrose levels (Figure 4), which give an indication of metabolizable energy in a diet. Rather than extrapolate these map in our minds, MPSG has invested in this type of research in Manitoba to make our very own conclusions. In the meantime, take note of how crude protein levels are reported. There is a big difference between protein values reported as a dry weight vs. 13% moisture basis, or any other measure. ■

Manitoba Pulse & Soybean Growers acknowledges the soybean quality research provided by the University of Minnesota, Iowa State University, United Soybean Board and American Soybean Association. For more information on these results, visit soyquality.com.

Figure 3. Average soybean essential amino acid (AA) levels (sum of five AAs, as a % of 18 total AAs) across the U.S. Midwest from 2011 to 2016. Source: University of Minnesota Extension.

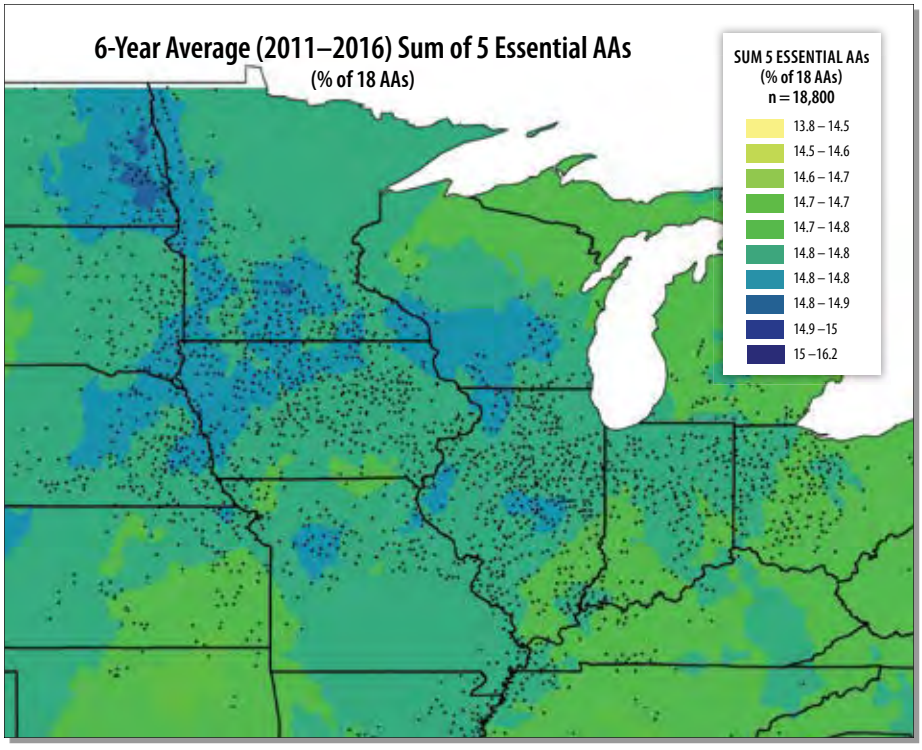
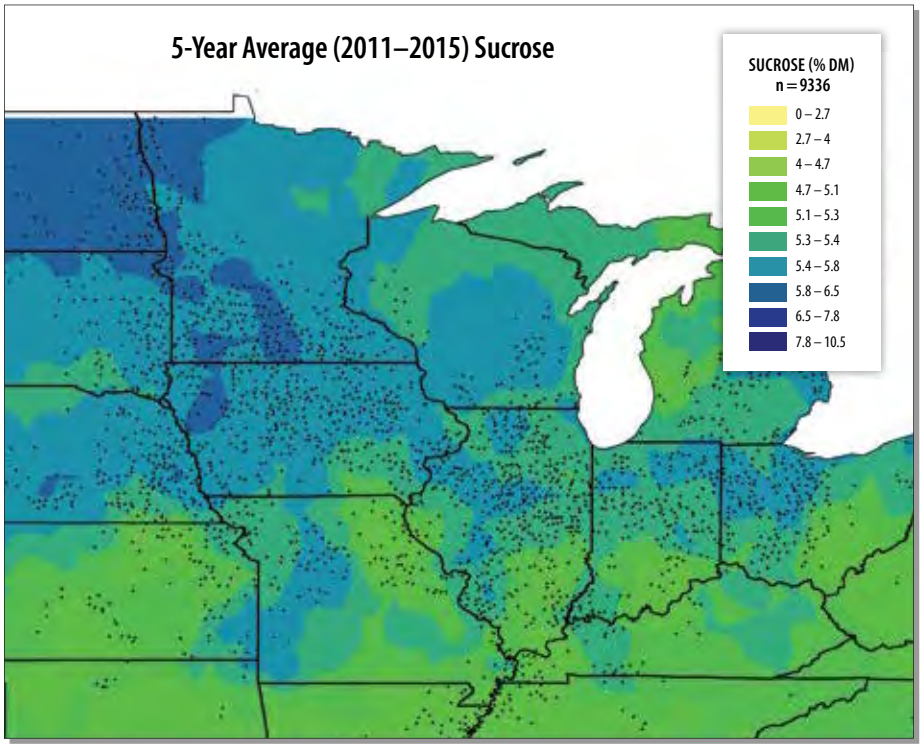


Figure 4. Average soybean sucrose levels across the U.S. Midwest from 2011 to 2015. Source: University of Minnesota Extension.



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genuity ROUNDUP READY 2 YIELD SOYBEANS

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Diversity in Crops, Research and Conversations

An update from the soybean and pulse agronomy lab

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

THIS WAS THE second growing season for the soybean and pulse agronomy lab – what have we been up to? It was a warm, dry season with the lack of rain days that increased our own productivity but limited soybean yields. Crops advanced three weeks ahead of normal, soybean leaves started turning over July 9, and on August 14, I predicted soybean harvest would be in full effect by the end of that month. Harvest did start early but as I write today in early October, I'm thinking of the crops that received snow and I hope harvest finishes before you are reading this.

In this second year of operation, we had 17 field trials spread across seven locations in Manitoba and we grew 12 different crops. Soybeans and dry beans comprise 95% of the program but we also grow peas, canola, corn, spring and winter wheat, fall rye, flax, chickpeas and winter camelina either as preceding crops to dry beans or as relay and intercrop combinations. This diversity is an important reminder following the past two dry growing seasons, which have created disparity among crop performance in Manitoba. Soybeans have been below average for many and cereals have captured a few well-deserved wins. Some are re-evaluating their soybean acreage for 2019, particularly those who went all in following the bumper years of 2015 and 2016. I'm curious if this affects how a diverse and balanced rotation is perceived as a risk management tool?

Growing season results are typically not available until November at best, but February is more realistic. After harvest, samples get cleaned, tested for moisture and seed quality, followed by data entry, summary, analysis and interpretation. It's a long process to produce good quality data and the story is best told with multiple sites and years of data. For now, here are a few project highlights.

PROJECTS IN A POD

1. Soybean seeding windows

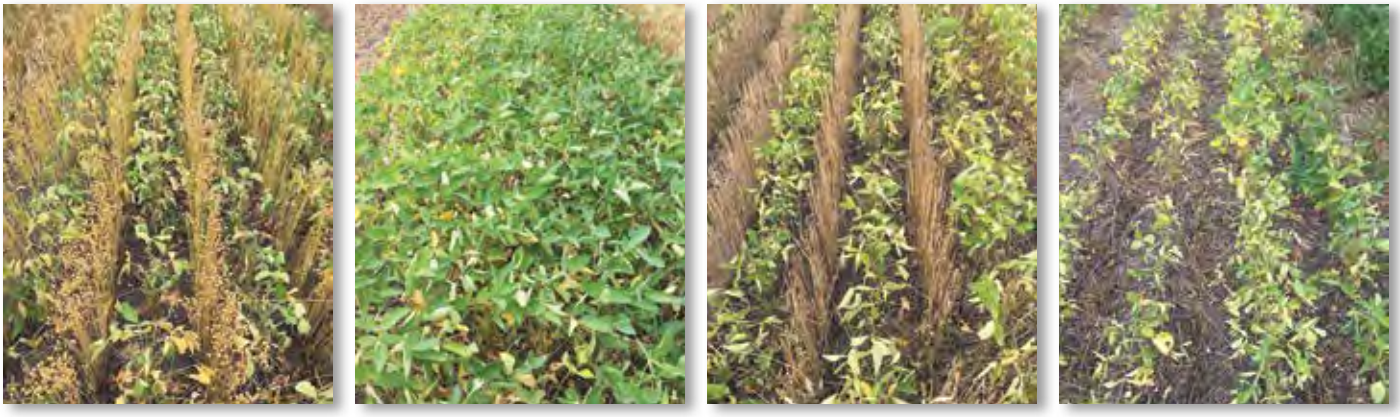
With dry spring conditions since 2015, opportunities are arising to seed soybeans earlier. Previous research by Cassandra Tkachuk demonstrated that earlier seeding produced modestly higher yields in Carman and Morden, regardless of soil temperature. This project expands that work to Dauphin, Arborg, Melita and Carman. Soybeans were seeded in four windows: very early (April 28–May 5), early (May 6–14), normal (May 15–25) and late (May 30–June 5). In 2017, soybean yields were statistically similar among the first three seeding windows followed by a 15–20% yield decline with late seeding. In both studies, seeding early hasn't shown a yield penalty but does come with the risk of soybeans being up during frost. My advice for now is to know your typical last spring frost date (May 20–June 7 in Manitoba) and if conditions are suitable, you can seed ahead of it within two weeks, which is the average time it takes for soybeans to emerge.

2. Soybean seeding depth

Do you adjust and measure seed depth in each field? I'm afraid I might know the answer. Seed depth is typically an overlooked or last-minute decision. Yet it's a cultural practice that can improve

continued on page 37

L–R: Soybean-flax intercrop, soybean monocrop, fall rye-soybean relay crop and winter camelina-soybean intercrop are some of the cropping systems being tested at Carman. Fall rye and winter camelina were harvested July 24 and pictures were taken after harvest on August 14.



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yield without investment. This project compares soybean seed depth from 0.25 to 2.25 inches in a tilled sandy clay loam (Carman) and clay soil (Arborg). The dry spring conditions as of late have also put a spotlight on seed depth and chasing moisture. In 2017, soybean yield was in fact reduced with deep seeding (2.25 inches) at Carman and in 2018, sub-optimal plant stands at 0.25 inches and >1.75 inches at both locations are not expected to optimize yield. Preliminary results have surprised the audiences who have heard this. Stay tuned for the combined results of 2017 and 2018 this winter, before you need to make your next seed depth decision.

3. Relay and intercropping with pulses

I can honestly say that I grew intercrops before they were cool! Pulse-cereal intercrops were part of my graduate research program and we've used them as green manures on the farm. They've long been part of organic and low input cropping systems and have now become a more realistic option for large commercial acres. I'm testing a combination of relay crops and intercrops to evaluate agronomic, ecological, practical and economic considerations. What are relay crops? A relay crop system is where you start growing one crop and plant the second crop directly into it before harvest – so you have both crops growing together for some time. Examples are winter wheat-soybean and fall rye-dry bean. The crops are seeded and harvested separately but share the same space in alternating rows. Intercrops, on the other hand, are two or more crops that are seeded, grown and harvested together (e.g. pea-canola). It's somewhat of an art and science to determine which crops can and should be grown together.

4. Dry bean nitrogen (N) fertility

Nitrogen fertilization practices vary among dry bean farmers in Manitoba. This parallels the reality that dry bean N-fixation varies by variety and environment. The aim of this study is to identify the "right rate" of nitrogen for Windbreaker pinto beans and T9905 navy beans. In 2017, there was no response to added nitrogen at Carman – the zero N control produced 2800 lbs/ac navy beans and 3500 lbs/ac pinto beans with spring soil tests of 40 lbs N/ac. In 2018, however, yellowing of the zero N control in Carman and Portage is likely to yield a response, no pun intended. This study has quickly become one of my favourites (okay, I say that a lot). It started out as a basic question and has quickly become complex, which is a good transition into my next thought – expanding the data we collect to further understand the variability in response and improve dry bean production systems.

GOING BEYOND YIELD DATA

Crop biomass, development, nodulation, root rot, height, yield components, maturity, seed quality – these are

continued on page 38

continued from page 37

some of the key variables measured in agronomy research, in addition to yield. This type of data is important to help explain the outcome – why did one treatment yield higher than another? And to make observations that develop new questions to advance our knowledge of the system. For example, previously I've reported on how late soybeans can be seeded in Manitoba. The practical outcomes are to guide management decisions and crop insurance, but yield component, crop development, oil and protein data is providing the scientific community a first characterization of how environment, variety and seeding date influence soybeans in western Canada.

Now back to dry beans – N response has varied and so has nodulation (without inoculation!). In the spring, I was invited to speak at the North American Symbiotic Nitrogen Fixation conference. I presented my agronomy work on dry bean nitrogen fertility, soybean iron chlorosis and intercropping. Why did I choose those three projects? They are related to the soil-plant rhizosphere and could benefit from conversations with scientists who specialize in the physiology and genetics of the bacteria responsible for nitrogen fixation and their plant hosts. I gained an appreciation for the complexity of the N fixation process, and how unique and particular dry beans are. They heard from me about fertilization practices, the widespread occurrence of iron chlorosis and the growing interest in intercropping – and I suggested that each of these systems may be improved with multidisciplinary conversations and approaches. I'm optimistic about how projects evolve and continue to provide tangible benefits to Manitoba farmers. ■

Getting it Right 2019
CROP PRODUCTION MEETING

February 26 DAUPHIN
February 28 STONEWALL
March 5 WINKLER
March 7 BOISSEVAIN

Details at manitobapulse.ca

Pinto beans were seeded May 23, 2018 into split plots of tilled and direct-seeded wheat, corn, canola and bean stubble at Carman and Portage la Prairie. Differences in emergence, weeds, biomass and root rot will help tell the story of how pinto beans respond to crop residue and management.

PRECEDING CROP/RESIDUE

RESIDUE MANAGEMENT – TILLED

Wheat | Corn | Canola | Bean

RESIDUE MANAGEMENT – DIRECT SEED

Wheat | Corn | Canola | Bean

continued on page 39

Moisture Stress and the Role of Phytoglobins

Dr. Claudio Stasolla and Dr. Robert D. Hill, Plant Science, University of Manitoba

SOYBEAN PRODUCTION IN the traditional U.S. growing areas is known to be sensitive to prolonged flooding. The effect is more pronounced in clay soils due to the slower drying of these soils after water levels recede. With the high proportion of clay soils in Manitoba, yield losses due to heavy rainfall or field areas with poor drainage are recognized as a significant problem for the farmer. The funding we have received over the past three years was to address this issue by examining how manipulation of a specific group of plant proteins, phytoglobins (Pgbs), can be used to influence plant behaviour in response to excessive moisture and, thereby, improve tolerance to the stress. In conjunction with the work on excessive moisture, preliminary studies focusing on the function of Pgbs in relation to reduced water availability will also be presented.

PHYTOGLOBINS (PGBS): MODULATORS OF PLANT RESPONSES TO EXCESSIVE MOISTURE

Phytoglobins act much like an electrical switch: when they are present in a plant cell, certain events are turned on as a result of an environmental stimulus. For example, root waterlogging; when they are absent in that cell, it responds differently to the same stimulus. We have found that the tolerance of plants to many of the common environmental stresses is dependent upon the expression of Pgbs in specific cells. In our earlier work, we could increase tolerance of corn to excessive moisture by increasing Pgb levels. Plants with high levels of Pgbs retained photosynthetic capacity during flooding while plants with reduced Pgbs levels had poor retention of photosynthetic activity. The beneficial effects of Pgbs were not only restricted to the shoot system, but also to the roots, which were able to grow and survive flooding. Spurred by these observations and corroborated by similar results in other species, we have studied the ability of Pgbs to improve tolerance of soybeans to flooding stress.

PGBS CAN BE USED TO PREDICT PLANT BEHAVIOUR TO EXCESSIVE MOISTURE

Effective methods to assess traits in lines are essential to the development of cultivars with improved characteristics. Towards this end, we have measured the Pgb levels as a function of a recovery rate of a group of soybean lines. Levels of Pgb directly correlate with the ability of the plant to recover after exposure to excessive moisture. Soybean plants characterized by high levels of Pgb in either shoot (Fig. 1A) or roots (Fig. 1B) have higher recovery rates after being fully submerged in water for seven days. Varieties with low levels of Pgbs showed the lowest recovery rate.

To further validate the protective role of Pgbs during excessive moisture conditions we generated soybean lines in which Pgb levels were experimentally altered. As expected, the recovery rate of plants over-producing Pgb was significantly higher than those under-producing the same protein. A similar improvement was also observed when the same plants were waterlogged (water level maintained 2 cm above soil surface) for 10 days. Plants over-producing Pgbs grew better, had a higher photosynthesis rate, and produced a higher number of adventitious roots (roots formed at the base of the shoot), a strategy employed by plants to cope with excessive moisture. Adventitious roots produced

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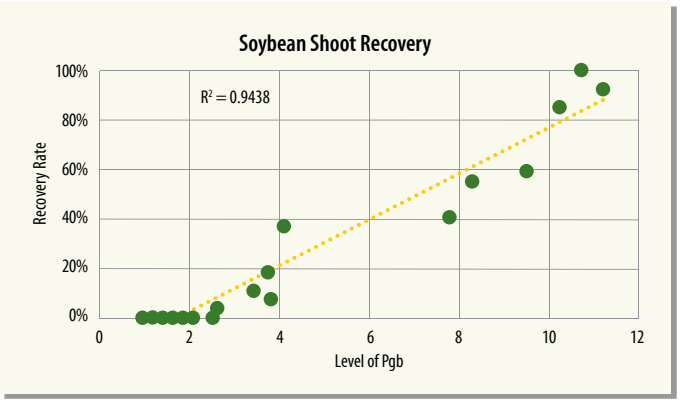
Figure 1. Correlation between level of phytoglobin (Pgb) (relative expression) and recovery rate of soybean plants submerged in water for seven days.

A



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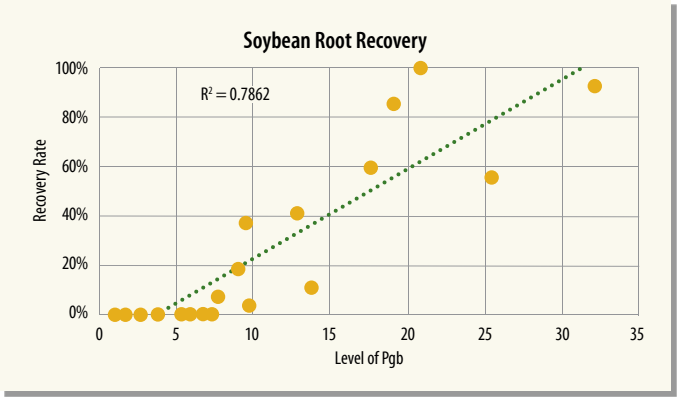
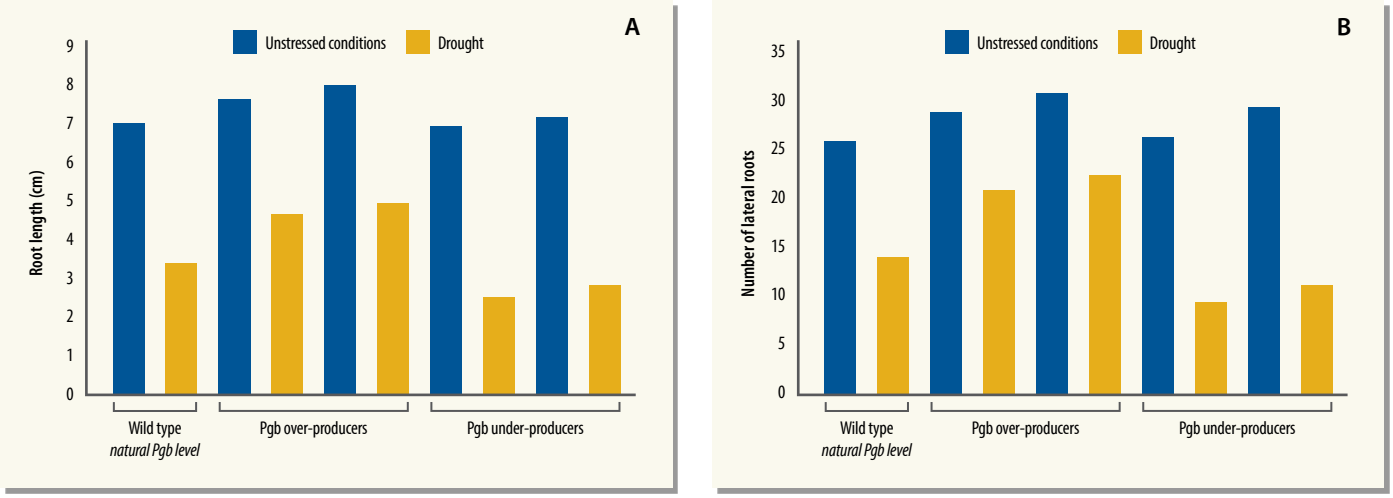


Figure 2. Root growth and number of lateral roots of two-day old soybean seedlings exposed for five days to water limiting conditions.



above the water level replenish the root system with oxygen, which is depleted in tissues below water.

Several studies have documented negative repercussions of altering stress-related proteins on agronomic traits. Contrary to this, our results showed no detectable abnormalities. Rather, preliminary studies revealed that seed number per plant is enhanced when Pgb is over-produced.

CAN PGBS ALSO EXERCISE A PROTECTIVE ROLE DURING DROUGHT CONDITIONS?

Continual root growth and production of lateral roots under drought conditions are key strategies which allow plants to "explore" the soil environment and reach the water table. Using Arabidopsis, a plant model system, we have previously demonstrated that high levels of Pgbs in the root tissue protect cells from dying during water stress, thus encouraging the growth of the root system. In soybeans, root growth retardation as a result of water depletion is attenuated in plant over-producing Pgb, and aggravated in plants under-producing Pgb (Fig. 2A). Under drought conditions, plants over-producing Pgb also develop more lateral roots relative to plants with reduced levels of Pgb (Fig. 2B). Based on these results, it is suggested that high levels of Pgbs can enhance plant behaviour to water stress.

WHERE DO WE GO FROM HERE?

This study has unequivocally demonstrated that Pgbs could be used as a tool to predict plant behaviour to excessive moisture, and its manipulation can alter plant performance and increase tolerance during both full submergence and flooding, as well as drought. The uniqueness of these result lies in the fact that tolerance to water stress (excessive or limited water conditions) can be achieved by the alteration in the level of a single protein, thus suggesting the role of Pgb as a "master regulator" of plant responses to stress. Our results indicate the high probability of using this information to develop soybean cultivars with improved flooding or drought tolerance for commercial production in the Canadian prairies. This can be accomplished using either traditional breeding techniques, using the evaluation protocol developed during the course of this research, or through the application of modern gene engineering and gene editing techniques.

Work presented in this document was conducted by Dr. Huang and supported by MPSG. ■

Figure 3. Seedling morphology in the same soybean lines exposed to drought for natural Pgb level wild-types (A), Pgb over-producers (B) and Pgb under-producers (C).

In Search of the Soybean Cyst Nematode

Dr. Mario Tenuta, Department of Soil Science, University of Manitoba

THE SOYBEAN CYST Nematode (SCN) is among the top, if not number one, damaging diseases of soybean in North America. SCN causes "yellow dwarf" disease in soybeans and some varieties of dry beans. The usual indication of high soil populations of SCN is the premature yellowing of leaves in infested areas, then stunting and poor yield.

SCN was first reported in Japan in the 1880s and in North America, in North Carolina in 1954. Once reported in North Carolina, it quickly reached the southeast, northeast and midwest of the United States, to be present in all major soybean growing areas of the U.S.. In Canada, SCN was first reported in 1987 in southwest Ontario. Since then, it has spread rapidly to almost all soybean production areas in Ontario and also into southwestern Quebec.

Of greater relevance to us in Manitoba is that SCN has also been marching north in Minnesota since first detected in 1978 and then also in North Dakota. Presently, SCN is at the Manitoba-North Dakota border, and even the mightiest of walls likely wouldn't stop it from establishing here. With the acreage of soybean in Manitoba having recently expanded, the establishment of SCN in the province is a real concern.

The Applied Soil Ecology Lab at the University of Manitoba has conducted three surveys (2012/13, 2015/16, 2017/18) of soybean fields in Manitoba for SCN. The surveys are a collaborative effort between Dennis Lange of Manitoba Agriculture who provided grower contacts for fields with a history of soybean production, and of course, you growers, that allowed your fields

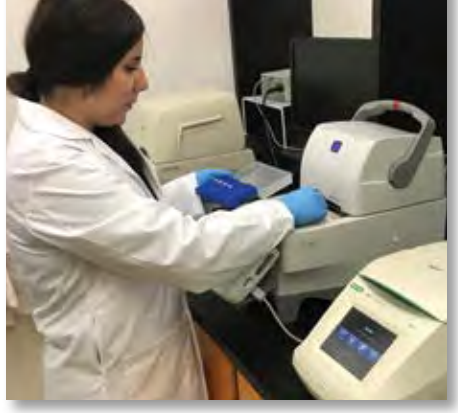


Figure 1. PhD student, Nazanin Ghavami Shirehjin, running DNA extracts of cyst nematodes from soybean fields to see if they are a match for the soybean cyst nematode.

to be soil sampled and funded MPSG to support the surveys. In total, 101 commercial fields have been soil sampled for a total of 687 samples processed. Two fields from the latest survey have contained cyst nematodes that match the genetic fingerprint of SCN. We are not calling these fields positive for SCN just yet. That won't happen until soybeans grown in soil from those fields in the greenhouse show cysts on plant roots. The greenhouse

continued on page 43

Recent Dry Bean Variety Developments Improve Disease Resistance in Manitoba

Dr. Anfu Hou and Dr. Robert L. Conner, Agriculture and Agri-Food Canada, Morden Research and Development Centre

THE MAJOR FOLIAR diseases of dry bean in Manitoba, and elsewhere in Canada, include common bacterial blight (CBB) and anthracnose. Infection by these diseases can seriously reduce yield and seed quality. Recorded field losses from CBB can be in excess of 36%, and as high as 100% for anthracnose. Seed infection can also result in reduced and uneven germination, affecting seedling vigour when the seed is sown for a subsequent crop. Both diseases are primarily seed-borne, although plant residue can also serve as a source of anthracnose infection. In commercial production, costly seed treatments and chemical sprays usually are used to control the diseases, albeit the practice is often ineffective for CBB. To avoid the seed-borne diseases, 'clean' seed often is produced in dry and distant regions such as Idaho and Wyoming, which adds extra costs to the farmers.

Development of resistant varieties is considered the most effective and economical approach to manage these foliar diseases. However, based on our screening results in last several years, the most popular dry bean varieties grown in Manitoba are generally susceptible to CBB and anthracnose.

Resistance to CBB does not exist in domesticated dry beans. However, researchers have identified resistance in alien species such as tepary beans. Through various efforts, the resistance genes have been transferred in to the commercial dry bean cultivars, such as OAC Rex developed by the University of Guelph, and the breeding lines HR45 and HR67 developed by Agriculture and Agri-Food Canada (AAFC) Harrow. In a collaborative project with researchers in Manitoba, Ontario and Alberta, the CBB resistance in OAC Rex has been transferred to the early-maturing navy, black and pinto beans in western Canada. In the disease nurseries conducted at Morden, these genetic materials showed improved resistance in comparison to the commercial checks. The presence of these resistance genes has also been confirmed with associated molecular markers. Resistant cultivars such as Portage navy beans in Manitoba, and AAC Black Diamond II in Alberta have been registered in the last few years.

Portage is a high-yielding, early-maturing navy bean cultivar with good seed quality and resistance to common bacterial blight. This variety was developed here in Manitoba at AAFC Morden. Portage is adapted to the dry bean producing regions of southern Manitoba. It has a type II indeterminate

continued on page 44

continued from page 42

tests are underway and results will be available by spring 2019.

Always, growers are urged to be vigilant for SCN in their fields. Symptoms are most visible on sandy soils where moisture stress is common or on heavier soils in years with low soil moisture. On clay soils such as in the Red River Valley, symptoms likely will only be evident when SCN levels become extremely high. Unfortunately, the symptoms of SCN damage are similar to other root health problems such as water logging, iron chlorosis and root pathogens. Sudden Death Syndrome of soybeans often results because of SCN infestation. Thus, SCN populations increase and early effects on yield usually go unnoticed or wrongly attributed to other causes.

Field scouting is the grower's most important tool in diagnosing SCN. Scout fields for problem areas of yellowing and dwarfing. Sample soil by gently digging plants six weeks after planting to three weeks before harvest. When sampling earlier, cysts appear on roots close to the stem. When sampling later, cysts appear on new roots located deeper and farther away from the stem. Use a shovel eight inches from the stem to lift the root system from soil. Dunk the root system and soil in a bucket of water to see the roots. Cysts are visible by eye but a magnifying lens is very helpful. Cysts are much smaller than nitrogen-fixing nodules, smaller than a pin-head and about the size of the period at the end of this sentence. Cysts will be white or light yellow and lemon-shaped. Consider scouting near field entrances, problem weed areas, poor yield areas, where wind has deposited soil and areas flooded in the past. ■

Figure 2. SCN cysts on soybean roots are smaller than a pin-head, white or light yellow and lemon-shaped.

MPSG FUNDING COMMITMENT
MPSG has funded six projects investigated SCN in the last seven years, representing a research investment of $472,234.

continued from page 43

upright growth habit suitable for direct harvest, while Envoy has a type I bushy growth habit. Portage possesses the major resistance gene transferred from OAC Rex, so it shows much better resistance to CBB than the commercial check (Table 1). In the 2007 and 2008 Manitoba Dry Bean Long Season Wide Row (LSWR) Cooperative Registration Trials over eight site-years, the average yield of Portage was 2589 lb/ac, whereas the yield of Envoy was 2143 lb/ac (Table 1). In the LSWR MPSG Regional Variety Trials conducted at 22 site-years during 2010–2017, Portage yielded 120% of Envoy, maturing, on average, one day later than Envoy (Table 1).

Anthracnose is another important and highly variable disease with a large number of existing races. In western Canada, races 73 and 105 constitute the two primary races present. Breeding cultivars resistant to anthracnose is considered environmentally friendly and the most sustainable long-term solution to control this disease, especially when combined with other management practices. In a recent screening and molecular marker evaluations, we have identified over forty new germplasm materials that possess various resistant genes. These materials will be very useful in future breeding and genetic studies at Morden. In 2017, the new cranberry bean cultivar AAC Scotty was registered by AAFC Morden for production in the Red River Valley. It is a high-yielding cultivar with a large seed size and resistance to anthracnose races 73 and 105 (Table 2). In the LSWR Cooperative Registration Trials conducted in 2014 and 2015, the average yield of AAC Scotty was 1429 lb/ac, which was significantly higher than Etna (1138 lb/ac) (Table 2). The average maturity of AAC Scotty is five days later than Etna. In the MPSG LSWR Regional Variety Trials conducted during 2016–2018 (data from Pulse Beat), AAC Scotty yielded 113% of Can09, maturing four days later than the check. AAC Scotty has a type I determinate upright growth habit, with a more scattered pod distribution on the plant, compared to the dense pod distribution to the top of the plant for Etna.

Table 1. Agronomic and disease traits of navy bean cultivar Portage and the check Envoy at four sites in Manitoba (Morden, Winkler, Carman and Portage la Prairie).

Variety	Yield lb/ac or % of Envoy)	Days to Maturity	1000-Seed Weight (g)	Plant Growth Habit	Common bacterial blight (CBB)	
					Severity (1–5)	Incidence (%)
Manitoba Long Season Wide Row (LSWR) Cooperative Registration Trials (2007–2008)						
Envoy	2,143	100	189	I	5	80.0
Portage	2,589*	101	193	II	2*	17.5*
# of site-years	8	8	8		2	2
LSWR MPSG Regional Trials (2010–2017)						
Envoy	100%	0	–	–	–	–
Portage	120%	+1	–	–	–	–
# of site-years	22	22	–	–	–	–

Common bacterial blight severity and incidence were evaluated in the inoculated disease nurseries at AAFC Morden Research and Development Centre; The CBB severity was rated based on leaf area infection with a 0 to 5 scale where 0 = no symptoms, 1 = <5%, 2 = 5-10%, 3 = 10-25%, 4 = 25-50%, and 5 = 50-100%.


Etna


AAC Scotty

Table 2. Agronomic and disease traits of AAC Scotty and check cultivar Etna cranberry beans at four sites in Manitoba (Morden, Winkler, Carman and Portage la Prairie).

Cultivar	Yield (lb/ac or % of Cran09)	Days to Maturity	1000-Seed Weight (g)	Anthracnose Rating 0–9)	
				Race 73	Race 105
Long Season Wide Row (LSWR) Cooperative Registration Trials (2014-2015)					
AAC Scotty	1,429*	97*	428	0.1*	0.1*
Etna	1,138	92	415	7.5	7.1
# of site-years	7	7	7	5	5
LSWR MPSG Regional Variety Trials (2016–2018)					
AAC Scotty	113%	+4	–	–	–
Cran09	100%	0	–	–	–
# of site-years	8	8	–	–	–

* Anthracnose seedling resistance was evaluated in growth cabinets with: 0 = no symptoms and 9 = 90% of veins discoloured.

With the ongoing financial support from the Manitoba Pulse & Soybean Growers and the AAFC CAP Pulse Cluster, we will continue the dry bean breeding and pathological research at the Morden Research and Development Centre, for development of improved varieties with a particular focus on disease resistance.

Acknowledgements

The authors gratefully acknowledge the technical assistance from Mark Sandercock, Larry Dyck, Janet Gruenke, Dena LaBossiere, Nadine Dionne, Waldo C. Penner and Dennis B. Stoesz. ■

MPSG FUNDING COMMITMENT

Over the last eight years, MPSG has invested $910,444 into dry bean breeding at the Morden Research and Development Centre.

Developing Safe Storage Guidelines for Manitoba-Grown Soybeans

Jitendra Paliwal, Rani Ramachandran and Lina Diaz Contreras, Department of Biosystems Engineering, University of Manitoba

MANITOBA'S SOYBEAN-GROWING BELT receives abundant rain, especially during the month of August, meaning moisture levels at harvest could be as high as 20%. These kernels need to be dried to a safe moisture level (13%) to avoid spoilage and to ensure safe storage.

Even during storage, the conditions inside the bin including temperature and relative humidity could cause biochemical changes in these nutrient-rich beans. Hence, it is important to understand the moisture content at which the soybeans reach equilibrium with their storage environment (also called the Equilibrium Moisture Content (EMC)). Although extensive research and considerable amount of data are available for other traditionally-grown Manitoba crops, little information is available on the EMC for Manitoba's soybeans.

Depending on the weather and storage conditions and post-harvest moisture of the kernels, soybeans undergo many micro-wetting and drying cycles or freezing and thawing cycles, affecting their uptake and release of moisture (also called adsorption and desorption). These cyclic variations in moisture of raw agricultural commodities are complicated physical processes during which moisture and heat are transferred through the material and exchanged with the environment. As the environmental conditions are a key factor in determining the EMC, a relationship between EMC and the Equilibrium Relative Humidity (ERH) of the inter-granular air of bulk soybeans at different storage temperatures need to be established.

Figure 1. Bioystems Engineering MSc student, Lina Diaz Contreras, putting soybean samples in her custom-designed EMC-ERH chamber at the Grain Storage Research Lab (University of Manitoba).

continued on page 46

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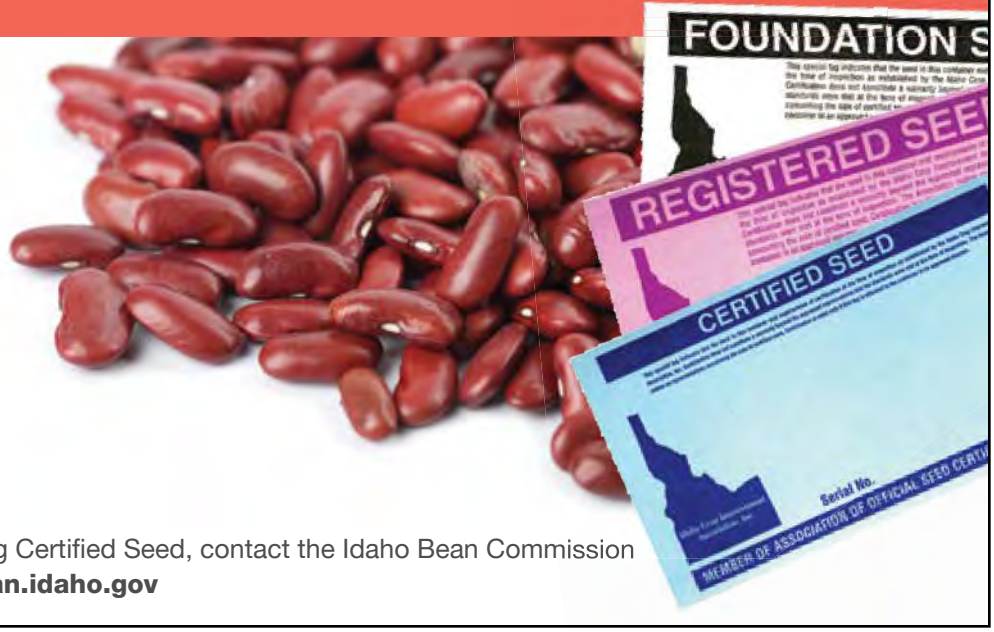

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Enhancing Soybean Storage Starts with Harvest Moisture

Dr. Ken Hellevang, Extension Agricultural Engineer, North Dakota State University

HARVEST TIMING CAN have a huge impact on soybean shatter losses and storability. Field losses, splits and cracked seed coats increase as moisture content decreases.

A moisture content of about 13 percent at harvest is optimal for mitigating mechanical damage.

Shatter losses increase significantly when seed moisture falls below 11 percent or when mature beans undergo multiple wetting and drying cycles. Also, moulds develop more rapidly in soybeans with seed coat cracks, so the amount of mechanical damage during harvest affects the beans' deterioration rate.

A moisture content of about 13 percent at harvest is optimal for mitigating mechanical damage.

Harvesting during high humidity, such as early morning, late evening or in damp conditions, may reduce shatter loss and mechanical damage if the soybeans are below 11 percent moisture content. Moisture content can increase several points with an overnight dew or decrease several points during a day with low humidity and windy conditions. Avoid harvesting when beans are driest, such as afternoons.

The market moisture for soybeans is 13 percent, which is fine for storing soybeans during cool conditions. If your soybeans will be stored through winter and into the warmer weather of spring and summer, store at 11 percent moisture to limit mould growth and deterioration. The storage life roughly doubles for each percentage point of reduction in moisture content.

STORAGE TEMPERATURE

Controlling soybean temperature during storage is critical. Free fatty acid percentages, a negative characteristic, tend to increase with storage moisture, temperature and time.

Store soybeans during the winter near 30°F (0°C).

At 12 percent moisture, free fatty acid percentages increase slowly with storage time if the beans are kept cool. In one study, the average free fatty acid content of 12 percent moisture beans stored at 50°F (10°C) stayed below 0.75 percent but exceeded this level after only four months when stored at 70°F (20°C).

Cool soybeans as they go through the fall and winter to maintain quality. Aerate to keep the soybeans within five

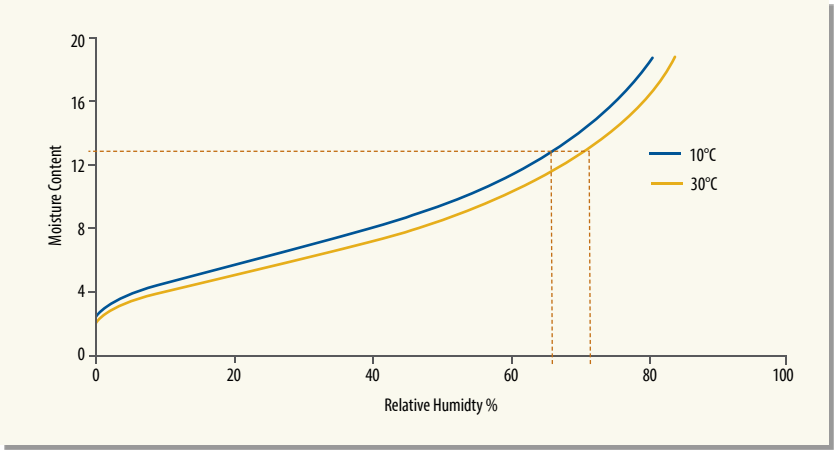
continued on page 47

continued from page 45

A recent study funded by MPSG, led by Dr. Jitendra Paliwal's Grain Storage Research Lab at the University of Manitoba aims to do just that. The study focuses on the effect of postharvest storage conditions and variety on the sorption characteristics of soybeans grown in Manitoba.

Considering the large variations in Manitoba's daily and seasonal temperatures, and relative humidity conditions, the possibility of condensation and over-drying of the beans is included in this study. Adsorption and desorption characteristics of three different varieties (Podaga R2, Lono R2, Akras R2) of soybeans grown in Manitoba are currently being measured in a custom-designed dynamic setup (Figure 1).

Figure 2. Comparison of the relative humidity of soybeans at 13% moisture content stored at 10°C and 30°C. Storage at high temperature results in higher relative humidity, which should be avoided to prevent soybeans from spoilage.



Initial results show the importance of maintaining lower storage temperatures at any given moisture content; because at elevated temperatures, soybeans equilibrate with the air causing high relative humidity inside the bin (Figure 2). Warmer storage conditions in a bin could generate high-moisture air pockets due to condensation, triggering mould growth. This shows the importance and the dependence of these parameters during storage and emphasizes the need for periodic monitoring of the bin.

In the light of the research findings, it is recommended to store soybeans at lower temperature (less than 10°C) to reduce the relative humidity thereby minimizing spoilage. Once this study is complete, the researchers plan to make the data publicly available online for producers to refer to. Such work will provide a valuable framework to tackle bigger issues that constrain production and marketing of soybeans. ■

to ten degrees of the average outdoor temperature during the fall.

Store soybeans during the winter near 30°F (0°C).

During the spring and summer, aerate stored soybeans to keep the temperature as cool as possible – preferably near 40°F (4°C), or just above 0°C. These temperatures enhance soybeans' storage life, and reduce mould and insect activity.

Soybeans at 11 percent moisture have similar storage characteristics as wheat or corn at 13.5 to 14 percent moisture. Use an allowable storage time chart for cereal grains to estimate allowable storage times for soybeans.

Approximate Allowable Storage Time for Soybeans

Moisture Content (%)	Grain Temperature (C)					
	0	4	10	16	21	26
	Approximate Allowable Storage Time (Days)					
11	300+	300+	300+	300+	200	140
12	300+	300+	300+	240	125	70
13	300+	300+	230	120	70	40
14	300+	280	130	75	45	20
15	300+	200	90	50	30	15
16	300+	140	70	35	20	10
17	300+	90	50	25	14	7
19	190	60	30	15	8	3

- Airflow through the soybeans permits maintaining the grain temperature but does not extend the allowable storage time beyond that listed in the table.
- Allowable storage time is cumulative. If 16 percent moisture soybeans were stored for 35 days at 10°C, one-half of the storage life has been used. If the soybeans are cooled to 4°C, the allowable storage time at 4°C is only 70 days.

STORAGE RECOMMENDATIONS

- **Keep fans covered**. Once soybeans are cooled, cover fan and duct openings to prevent snow or moisture from blowing into the bins during winter storage. Keep fans covered during the spring and summer to limit air from warming the soybeans. Ventilate the top of the bin to reduce solar heating affecting the beans at the top of the bin.
- **Monitor stored grain regularly**. Outside temperature changes can result in temperature and moisture changes inside the bin. Monitor soybeans at least once every two weeks during the fall until the grain has been cooled to winter storage temperatures and at least every two to three weeks during winter storage. Monitor the soybeans at least every two weeks during the spring and summer. Measure the grain temperature and watch for indications of problems such as condensation, insect activity and increasing grain temperatures. Record temperature values and grain condition to help track any changes.
- **Use available tools, but don't turn everything over to automation.** Improved technology can help you better manage stored grain, but you still need to manage the grain and inspect it visually. Temperature cables allow you to monitor the stored grain temperature at several locations, and fan controllers can operate fans according to desired air conditions. Monitor and verify that fans are operating as desired.
- **Equalize soybean moisture content.** Soybean moisture variation may lead to storage and marketing losses. Operating an aeration fan will help move moisture from wet to drier beans. Moisture movement will be minimal without aeration airflow. Initially, fans will have to run longer than required to change the temperature to equalize the moisture content. The moisture will not be all the same, but it should become more uniform.

For more information, do an internet search for NDSU Extension Alerts Soybeans. *https://www.ag.ndsu.edu/alerts/soybean-storage.* ■

Soybean Scout ANSWERS

A – Two-spotted spider mites cause stippling and bronzing on soybeans leaves. They create silk webbing on the underside of the leaf, puncture cells and feed on the contents. Severely infested leaves will dry and fall off the plant, reducing soybean yield. Dry hot conditions favour mite population growth and feeding. Infestations usually begin near field margins where spider mites overwinter. Foliar insecticide products that kill natural enemies can cause outbreaks of spider mites as well. Although there are no established economic thresholds for spider mites, the localized infestations can generally be controlled with foliar insecticide applications concentrated along the field's headlands.

B – The silver-white appearance of a soybean field is due to hot and dry environmental conditions and an indicator of drought stress. As a survival mechanism, soybean plants will expose the underside of their leaves to the sun. The underside of the leaf reflects more sunlight compared to the dark green leaf surface. Reflecting sunlight reduces temperature stress on the plant. This also reduces photosynthesis and the plant's need for transpiration (i.e. water evaporation from the plant). Under extreme conditions, outer leaflets of the trifoliate will fold together, reducing the leaf area exposed to sunlight. Prolonged drought stress at the mid-reproductive stages (R4–R5) causes the most severe reductions in soybean yield.

Recipe Corner

May be used as a side dish for meats and poultry, or omit the chicken stock for a protein packed vegetarian dish.

Lentil and Tomato Stew

Servings: 4–6 Prep time: 15 minutes Cook time: 45 minutes

2 cups (500 mL) green lentils

1 can (800 mL) diced tomatoes (*good quality*)

1 tbsp (30 mL) tomato paste

4 cloves garlic chopped

1 white onion chopped

1 tbsp (30 mL) fresh thyme

2 tbsp (60 mL) chopped parsley*

6 cups (1.5 litre) chicken stock

Olive oil as needed

Salt/pepper to taste

Method

1. In a heavy bottom pot, sweat the onions and garlic until soft and translucent and season with salt. Add the thyme and tomato paste and cook an additional 2–3 minutes.
2. Add tomatoes and cook again for an additional 2–3 minutes, cover with half of the chicken stock and simmer on low heat for 20 minutes to develop flavour.
3. Add the remaining chicken stock and the 2 cups of lentils.
4. Simmer until lentils are tender. Once lentils are cooked the stew may be served immediately or cooked further to attain desired consistency. Be sure to taste and do final seasoning with salt and pepper.

** add the parsley right before serving for that burst of freshness!*

Recipe featured on Great Tastes of Manitoba

Bannock with Lentil Purée

Servings: 10 portions Prep time: 5 minutes Cook Time: 1 hour

4 cups (1 L) all-purpose flour

3 tbsp (45 mL) baking powder

1 tsp (5 mL) salt

1 tsp (5 mL) granulated sugar

2 tsp (10 m L) garlic powder

4 tbsp (60 mL) cold fat (*animal lard, butter or shortening*)

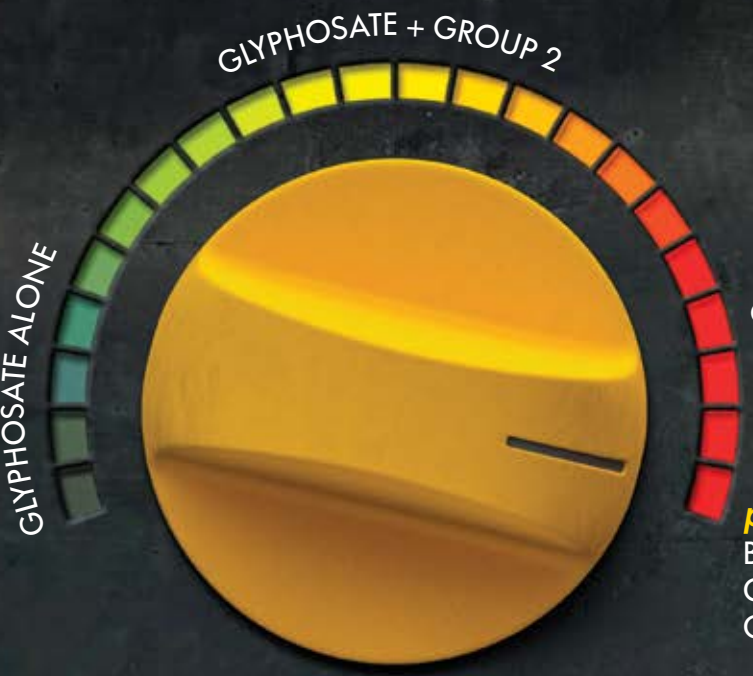
1 ½ cups (375 mL) cooked lentils

1 ½ cups (375 mL) water

Instructions

Preheat the oven to 350°F.

1. Grease a 9" x 12" (rectangle) cake pan.
2. Whisk flour, baking powder, salt, granulated sugar and garlic powder together thoroughly in a large bowl.
3. Grate or cut in cold fat to flour mixture. Combine until pea sized lumps are formed in flour.
4. Using a food processor or hand blender, purée the the cooked lentils with the water until a smooth consistency is reached.
5. Make a large hole in the flour and pour the lentil purée in the middle. Mix gently with fork until a sticky dough is formed. Bring the dough together by gently kneading with hands. Try not to over knead. Place in the greased pan. Pat down with hands softly and poke holes with a fork and season with a bit of salt.
6. Bake in oven for approx. 45 minutes to 1 hour or until cooked in the middle. A nice golden brown colour should be on top. Cool for 15 minutes on cooling rack.
7. Break pieces off with hands and eat with butter, lard or margarine.



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