MANITOBA Pulse Soybean GROWERS

pulse beat

Issue 96 • Fall/Winter 2022

The Bean Report
2022 Growing Season
p. 31

Soybean Seeding Rates – The First and Longest Running On-Farm Trial
p. 34

Fava Beans - Redefining Success for Manitoba's Pulse Industry
p. 20

Relay Cropping Soybeans and Winter Wheat - Boom or Bust?
p. 16

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Please direct your comments or concerns to Melissa Denys at 204.745.6488 or email melissa@manitobapulse.ca.

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Manitoba Pulse & Soybean Growers 2022 Board of Directors and Staff

ELECTED FARMER DIRECTORS

Chair – Melvin Rattai – *Beausejour*
Vice Chair – Brendan Phillips – *Hartney*
Alex Burgess – *Minnedosa*
Bryce MacMillan – *Marquette*
Ben Martens – *Boissevain*
Bryce Pallister – *Portage la Prairie*
John Preun – *St. Andrews*
Frank Prince – *Waskada*
Garrett Sawatzky – *Altona*
Ernie Sirski – *Dauphin*

STAFF

Executive Director – Daryl Domitruk – *daryl@manitobapulse.ca*

Director of Finance and Administration – Melissa Denys – *melissa@manitobapulse.ca*

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Research and Check-off Administrator – Wendy Voogt-Howard – *wendy@manitobapulse.ca*

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Production Specialist – West – Laura Schmidt – *laura@manitobapulse.ca*

Agronomist – On-Farm Network – Leanne Koroscil – *leanne@manitobapulse.ca*

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

Production Specialist – East – Jennifer McCombe-Theroux – *jennifer@manitobapulse.ca*

Message from Board Chair

Melvin Rattai, Chair, MPSG

I AM HONOURED and privileged to serve you as Chair of Manitoba Pulse & Soybean Growers (MPSG), a position I have held since our last AGM. It feels good when your peers, with whom you have worked for many years, have faith in your ability to lead. Prior to this role, I served as an MPSG board member for seven years, and was vice-chair for three of those years.

I have also served on the board of Soy Canada for the last five years, a post I have found to be quite fascinating. Soy Canada has a lot on its plate. There are many challenges associated with exporting pulses and soybeans. Tariff and non-tariff trade barriers, container shortages and a myriad of other factors come into play with respect to the crops you and I grow.

As we've said many times in this magazine over the years, there is a lot of behind-the-scenes activity going on inside agricultural groups. 2022 has been a year of wild market swings and challenges, keeping farm groups busy and on the edges of their seats.

MPSG has had many shining moments this year – concrete examples of the association truly serving you, its farmer members. One such moment was pushing for Manitoba Agricultural Services Corporation (MASC) to extend the soybean seeding date to the first week in June.

After talking with MASC, we combined our soybean data with theirs to create a clearer picture of what was happening in the interplay between seeding date and yield. We learned that shortening the growing season would be no problem for the varieties currently available to farmers. Most of the data by far came from MASC itself. By combining our data, insurer and insured now have common ground.

We put the MASC extension to good use on our family farm this year. We seeded most of our soybeans by June 4.

MPSG Board Chair Melvin Rattai, right, working with multiple generations on his family farm.

My son and daughter were impressed that we were able to still achieve an average of 48 bushels per acre crop. The research that MPSG supplies to MASC and the resulting changes to their crop insurance policies, for me, is a great example of how the investments we as farmers make into research do, in fact, pay off.

There were many more shining moments worth mentioning and you'll hear about a lot of them as you dive into this issue of *Pulse Beat*.

All of MPSG's research and other information related to the association can be accessed on the our website - manitobapulse.ca. If you need more information, feel free to contact a staff member at MPSG. They'd be more than happy to hear from you.

I wish you all a great and safe holiday season, and the clearest of heads as you tackle winter holidays, the agriculture conference season and the upcoming 2023 growing season. Until next time! ■

— Melvin

Message from Executive Director

Soybeans - A Wild Ride in Manitoba

Daryl Domitruk, Executive Director, MPSG

THE ROLLER COASTER known as the Manitoba soybean industry continues its wild ride. The 2022 season started with a nervous tug on the seatbelt as seeding delays caused acres to lurch below 1 million for the first time since 2012. Even with good crop establishment and adequate heat for development in July, many of us tightened our chin straps in ominous preparation for an upside-down twist into early frost. Instead, the crop tracked into a sustained period of calm as a series of threats failed to materialize. First, pressure from insects and diseases proved rather timid. Second, and more importantly, the stress we were dreading from a searing August drought and a resulting plunge in soybean yield did not occur. In fact, growing conditions in August were downright favourable and continued to be so through an extended fall and well-timed harvest. By early October a sense relief started to set in. The ride was over. No one got hurt and, in the end, yields and prices meant just about everybody had a ton of fun.

What's more, after a big drop in seeded acres the dry bean crop provided a similarly fun ride with a result that in many cases exceeded soybean. No doubt, some dry bean yield records were broken? Peas were a little wobbly in places where their feet got too wet. Although the 2022 ride with peas was anything but consistent, there were some excellent yields in the mix.

So, are we on a long, slow climb back to the top of the roller coaster? For soybeans in 2023 the answer is most probably yes. Factors have conspired to favour low-input crops, and soybean checks all the boxes. Assuming dry bean prices continue to entice the committed core farmer, will recent converts to beans return? Peas will be interesting. Many farms have become re-acquainted with the crop. Some have become friends, others not.

Supporting members' immediate planting decisions is why farmer-funded organizations exist. With research results flowing in on a consistent basis and staff achieving expert status in translating those results into solutions for farmers, MPSG is maturing as a company. From the increasing number of factsheets delivered to members, or the expert in-season advice available via *Bean Report* radio spots, to customized results from the On-Farm Network, MPSG has hit full stride in supporting grower decisions. Anyone wanting to experience this in person is invited to see the announcement for *Getting it Right* in this edition of *Pulse Beat*.

Maturing as an organization means directors and staff have developed a keen sense of where pulses and soybeans need to go in the longer term. The excitement of a slow climb up the roller coaster can be dampened by the prospect of another eye-popping drop just ahead. MPSG has committed to doing everything it can to smooth the ride and sustain production at a consistent level. We're taking a responsible approach by suggesting an annual legume could be grown one in four years on most fields. That's 25 percent of Manitoba's acres or about 2.5 million acres. We think about 1.5-2.0 million acres would be dedicated to soybean. In 2022, legumes were grown on about 1.3 million acres. Soybeans were grown on 900,000. On the way to achieving our one-in-four year goal, MPSG will steadfastly strive to keep farmer costs down and productivity up.

That effort starts with previously described research into drought-tolerant soybean, and carries on through efforts to make dry beans into efficient nitrogen fixers and soybeans, and to conquer root rot in peas. However, what's extraordinary about the future is that it's not likely to be just farmers pushing for stability in legumes. The fact is, greenhouse gasses continue to accumulate, and no easy solution has appeared on the horizon – except, if you are in Manitoba, where the room available to grow legumes represents real and achievable reductions in emissions. It also represents a profitable path to those reductions. Governments are starting to recognize the public has a stake in farmers achieving stable legume production.

An MPSG-sponsored session at *Ag Days* in January will explain this unique need shared by farmers and the public. It will also show the link between society winning the climate battle in the long term and the knowledge-supported decisions MPSG members make today. ■

— Daryl

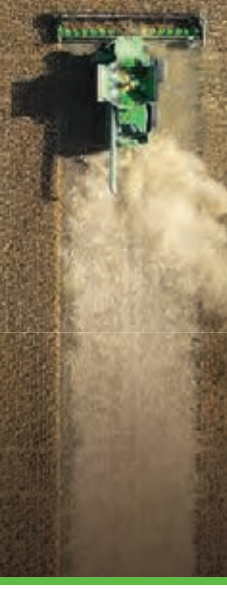
SOYBEAN SCOUT

What are the differences between these aphids?

Answers can be found on page 33

MANITOBA Pulse Soybean GROWERS

NOTICE OF 2023 ANNUAL GENERAL MEETING



Manitoba Pulse & Soybean Growers will be holding their Annual General Meeting as part of the 2023 CropConnect event.

JOIN US ON FEBRUARY 15, 2023 | 8:00 A.M. Victoria Inn and Convention Centre in Winnipeg, MB.

There will be an option to attend the AGM virtually.

Call for director nominations: become a voice for manitoba's pulse and soybean growers!

Manitoba Pulse & Soybean Growers board members play a large role in making decisions affecting the directions of the pulse and soybean industry in our province.

In 2023, there are FOUR board positions up for election.

The 2023 Boardof Directors Nomination Package is available at www.manitobapulse.ca, or by contacting melissa@manitobapulse.ca.

For information contact: NOMINATIONS COMMITTEE

Garrett Sawatzky
Garrett.sawatzky@umanitoba.ca

Alex Burgess
alexburgess@burgesslawoffice.net

Manitoba Pulse & Soybean Growers 2022 Committees and Representatives

MPSG COMMITTEES – *The first named is chair*

Executive – M. Rattai, B. Phillips, E. Sirski

Governance/HR – B. MacMillan, F. Prince

Policy – B. Phillips, A. Burgess, B. Pallister, E. Sirski

Finance/Audit – J. Preun, B. Phillips, M. Rattai

Resolutions – G. Sawatzky, A. Burgess

Nominating – G. Sawatzky, A. Burgess

Communications/Member Relations – G. Sawatzky, A. Burgess, B. MacMillan , staff

Market Development – J. Preun, B. Martens, B. Pallister, staff

Research – F. Prince, A. Burgess, B. Martens, B. Pallister, M. Rattai, staff

U of M Research Agronomist Advisory Committee – F. Prince, J. Preun

MPSG REPRESENTATIVES

Canadian Grain Commission Pulse Sub-Committee – G. Sawatzky

Grain Growers of Canada – B. Phillips
- **Trade and Marketing** – E. Sirski
- **Business Risk Management** – B. Phillips

Keystone Agricultural Producers
- **General Council** – D. Domitruk
- **Pulse/Oilseed Sub-Committee** – D. Domitruk
- **Commodity Group** – D. Domitruk

MCVET – Staff

Prairie Recommending Committee for Pulse and Special Crops – D. Domitruk

Pulse Canada – B. Martens, J. Preun

Soy Canada – E. Sirski, M. Rattai

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Getting it Right

March 8, 2023

Canad Inns, Portage la Prairie

SOYBEAN AND PEA PRODUCTION MEETING

8:30 a.m. to 1:00 p.m.

Getting it Right is a half-day, farmer-focused event, equipping Manitoba's soybean and pulse farmers with the tools required to face production challenges and market access issues. Interactive table talks covering pea and soybean agronomy, pests, research and more will be the highlight of this farmer-exclusive event.

Register at manitobapulse.ca/getting-it-right

View from the Field

Jennifer McCombe-Théroux, Production Specialist - East

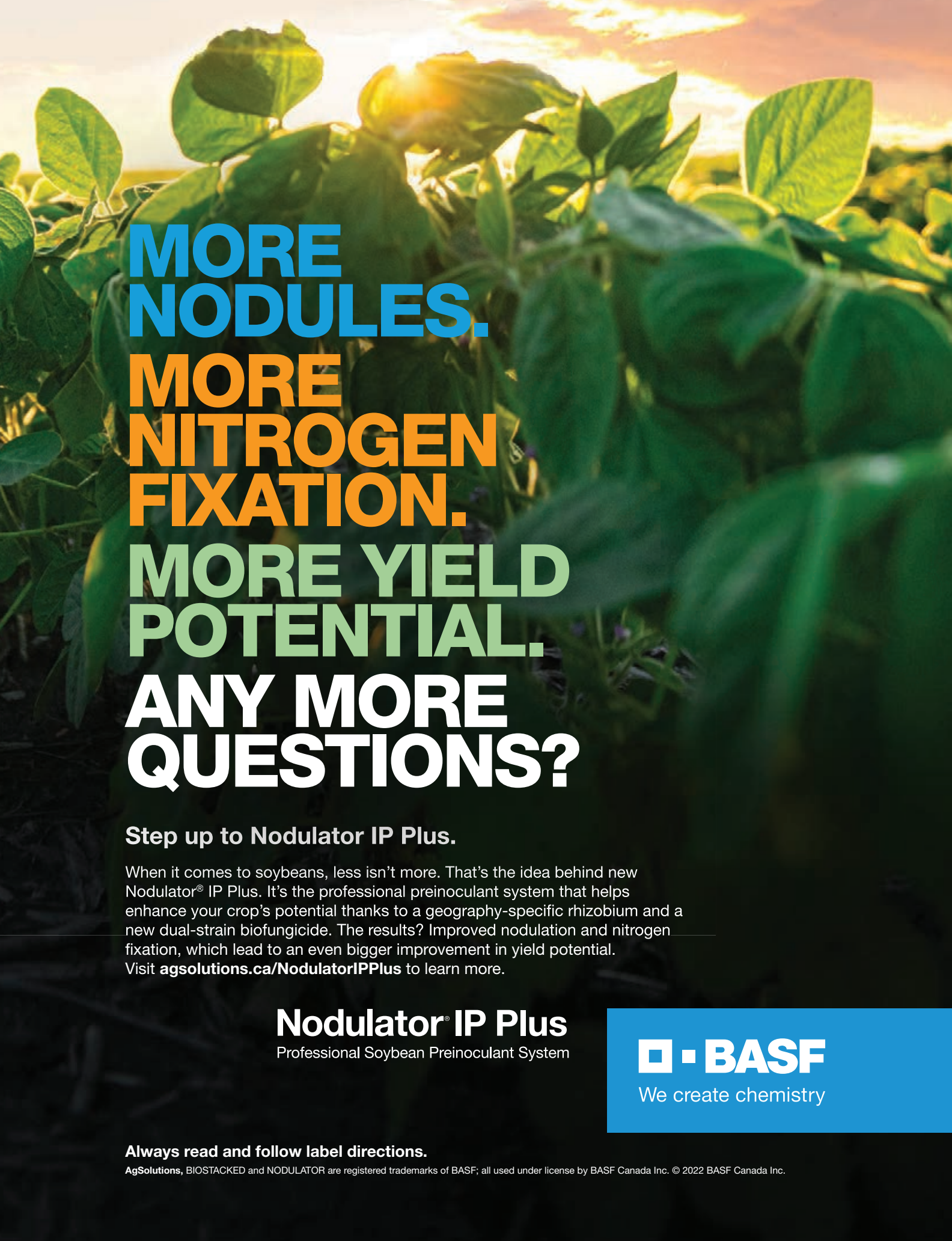
STUMPED ABOUT DRY BEAN SEEDLINGS?

Are you seeing dry beans emerge with stumps at the growing point? These stumps are known as **bald head**. If this term is new to you, it's sure to stick once you see and hear it, due to its name and its unique impact on seedlings. Bald head is caused by physical damage to the seed, specifically the growing point. Depending on the level of damage to the seed and growing point, cotyledons and leaves may be present.

It is common to see some bald heads each year in dry bean fields. Levels are affected by overall handling of seed and the mechanical injury it causes during seeding, cleaning and harvest. This damage results in cracked seed coats. Bald head prevalence is also affected by seed quality and moisture. Lower seed moisture can amplify injury as the seed becomes more prone to damage when handled.

If you noticed more bald head in your dry bean fields this year, keep in mind that it's caused by mechanical injury to the seed. Since these bald heads seedlings do not produce healthy productive plants, reducing the impact of bald head within your field is important for a competitive plant population and optimal yield potential.

Bald head seedling with and without cotyledons.



Step up to Nodulator IP Plus.

When it comes to soybeans, less isn't more. That's the idea behind new Nodulator® IP Plus. It's the professional preinoculant system that helps enhance your crop's potential thanks to a geography-specific rhizobium and a new dual-strain biofungicide. The results? Improved nodulation and nitrogen fixation, which lead to an even bigger improvement in yield potential. Visit **agsolutions.ca/NodulatorIPPlus** to learn more.

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Pulse Canada – Market Innovation Spotlight

Julianne Curran, Vice President, Market Innovation, Pulse Canada

Plant Forward

On November 1 and 2, Pulse Canada partnered with Protein Industries Canada and Plant-Based Foods of Canada to host the first ever international event showcasing Canada's plant-based ingredients, food supply and innovation. The event, held in Toronto, hosted over 250 senior-level food industry professionals from across Canada and around the world inviting them to plug into the Canadian ecosystem.

The event featured a robust program with global perspectives and unique conversations on where the industry is headed. Plant Forward's agenda covered themes across the ecosystem, from research and development and access to capital, to sustainability goals and opportunities for innovation.

Attendees had the opportunity to network with like-minded leaders and taste an unparalleled plant-forward menu. Our goal was to spark new ideas, create new connections, and help companies leverage exciting opportunities in the Canadian plant-based sector. We know that Canadian pulses have a home on any plate, and increasing awareness about the potential of Canadian pulses can drive real value back through to the farm gate.

Throughout these projects and others, the Pulse Canada Market Innovation team is working hard on behalf of farmers: to showcase the opportunity within Canada's pulse ecosystem and support the growth of innovation in the sector. If you have any questions on any of the initiatives Pulse Canada is undertaking on your behalf, please don't hesitate to get in touch with me at ***jcurran@pulsecanada.com***

THE PULSE CANADA Market Innovation team has been hard at work creating opportunities for Canadian pulses to take a front-row seat in the evolving global food industry. Over the last year, our team has launched multiple initiatives that will help bring more investment and attention to the Canadian pulse sector.

STIP

One of these initiatives is the recently launched Science & Technical Industry Program, or STIP. This program invites organizations and businesses across the value chain to co-invest, guide and shape the future of Canada's pulse industry. The program provides a collaborative forum for pulse industry stakeholders to prioritize and develop downstream public-good or pre-competitive research projects critical for the success and growth of pulses and pulse ingredients.

To partake in STIP, organizations and businesses must be a member of Pulse Canada or the Canadian Pulse and Special Crops Trade Association. Members have the opportunity to join any of the four technical committees: nutrition and health, environmental sustainability, processing and co-product valorization, and supply chain and traceability.

Under these themes, STIP technical committees will strategically identify and fund research to enhance efficiencies, increase value and support growth of the Canadian pulse industry.

Not only does this program give all members of the value chain, including the private sector, the opportunity to define and address downstream research priorities for the industry, it also brings more investment and expertise to the table in growing what the Canadian pulse industry has to offer.

IPIC

Another exciting project led by the Market Innovation team is the International Pulse Ingredient Consortium (IPIC). IPIC is a not-for-profit industry group whose mission is to support the growth of the global pulse ingredient sector by certifying pulse ingredients according to industry-aligned definitions. Certified members receive an IPIC certification mark to use in the sale and promotion of registered ingredients, and are listed on the IPIC website for food companies looking to source certified pulse ingredients.

IPIC definitions were developed by a committee of industry peers. They reflect major categories of general pulse ingredients and major commonalities within each category. Unlike ingredient standards, these definitions provide an opportunity for pulse ingredients in each category to be distinguished from one another, and allow for flexibility in labelling and naming. IPIC definitions cover ingredients made exclusively from pulses. Any ingredient that a member would like to have certified must go through a verification process specific to the IPIC definition to ensure alignment.

As a growing number of pulse ingredients enter the marketplace both in Canada and globally, IPIC provides a framework for food industry customers to navigate the diversity in pulse ingredient supply and ensure greater transparency and consistency in quality when sourcing. While the initiative is just getting started, we are looking forward to seeing "IPIC Certified" ingredients in products and on store shelves in the not-too-distant future.

Head to **www.pulseingredients.com** to learn more about IPIC. ■

Demand for Canadian Soybeans Remains Strong in a Volatile World

Brian Innes, Executive Director, Soy Canada

GLOBAL CONFLICT AND INFLATION have made markets incredibly volatile in 2022. With the Russian invasion of Ukraine sending markets into chaos and many countries still recovering from the impacts of the global pandemic, commodity markets have been on a roller coaster.

Despite volatility, global demand for soybeans remains strong and continues to grow. Decreased production and low ending stocks combined with increased demand for livestock feed in the Middle East, renewed interest in biofuels in the United States and strengthened soy food consumption in Asia and West Europe are all driving soybean demand.

As the world's fifth largest soybean exporter, Canada is well positioned to help fill this growing demand for both commodity and non-GMO food grade soybeans. Our incredible farmers and a world-leading value chain make us an important supplier of sustainable sources of protein and oil for a hungry world.

Global soybean production levels are expected to increase for the current marketing year (September to August) due to record levels in South America, but Canadian soybean demand is expected to remain strong.

In 2021, Canadian soybean exports were 4.4 million metric tonnes (162 million bushels) representing approximately 70 per cent of production.

Export markets for Canadian soybeans have shifted in recent years. Despite the EU remaining the largest destination for Canadian soybean exports, Iran, Algeria and Bangladesh are seeing growing volumes. Thanks to expanding livestock industries seeking cost-competitive feed options and shifting geopolitics, Canadian exports have seen significant growth to each of the countries.

No understanding of global soybean demand is complete without looking at China, the world's largest soybean market. Recently, Chinese demand has slowed due to continued COVID restrictions, slow economic growth and a drop in pork consumption. While increased demand is anticipated for the 2022-23 marketing year, import projections remain lower than prior to the pandemic.

Helping to offset lower demand from China is renewed interest in biofuels from the United States, Canada and other developed countries. Leading the way is renewable diesel, a "drop-in" renewable fuel for diesel engines that can be blended at any level with fossil diesel. Significant investment in renewable diesel, which is seen as a solution to reducing greenhouse gas emissions, is taking place due to government regulations that favour low-carbon fuels and major investments by oil companies and private industry.

The market potential for soybean oil as a low-carbon feedstock or renewable diesel is significant. It is causing a major shift in US soybean demand and an unprecedented expansion of soybean processing capacity. It is estimated that renewable diesel

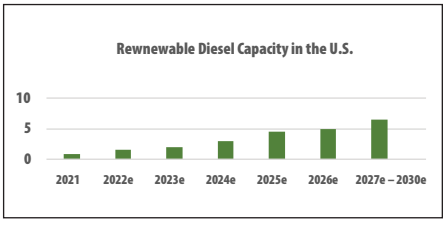
continued on page 10

Source: Statistics Canada

continued from page 9

capacity in the United States will reach 6.5 billion annual gallons by 2030. This expansion is driving demand for vegetable oils, including soybean oil, and will change the mix of soybeans and soy products available for export from North America as more soybeans are processed on this continent.

RENEWABLE DIESEL CAPACITY IN THE UNITED STATES



Source: Energy Information Administration and CoBank

FOOD-GRADE SOYBEANS

Demand for food-grade soybeans continues to exceed supply as the global soy food industry is expected to grow at a Compound Annual Growth Rate (CAGR) of 5.6 per cent over the next ten years, reaching $73 billion by 2032.

For over 40 years, Canada has been a global leader in producing quality, sustainable food-grade soybeans for international markets. With 1.2 million metric tonnes (44 million bushels) produced each year, virtually all of this production is exported to over 20 different countries around the world.

While exports to traditional markets such as Japan remain stable, significant growth has occurred in new areas such as Indonesia, creating more demand for Canadian food-grade soybeans. As demand for food-grade soybeans is currently outpacing supply in Canada, there is an opportunity for the country to expand production. Because many varieties are suitable for Manitoba's diverse growing conditions, from longer to shorter season offerings, the province is well-positioned to help meet this growing demand.

DOMESTIC MARKET

Meat consumption in Canada is on the rise. According to the Organisation for Economic Co-operation and Development (OECD), per capita meat consumption in Canada is increasing annually, especially poultry. Poultry meat consumption in 2016 was 33.3 kilograms and has been increasing continuously, reaching 33.9 kilogramsin 2021. In the past year, meat and livestock exports have remained stable, though hog exports to the United States have been growing due to logistical challenges with domestic processing.

With domestic meat consumption on the rise and export markets holding steady, the Canadian compound feed market is projected to register a CAGR of 3.7 per cent over the next three years, according to a report by Modor Intelligence. As populations increase and income levels rise, meat and livestock exports are increasing, creating more demand for feed ingredients.

WHAT DOES THIS MEAN FOR CANADA?

As populations, income levels and urbanization expand around the world, demand for sustainable feed grains and protein meals from soybeans will continue to grow. Thanks to our incredible farmers and a world-leading value chain, Canada is well-positioned to meet the growing demand for sustainable sources of protein and oil from a hungry world. ■

AG DAYS MPSG MORNING SESSION

Manitoba Pulse & Soybean Growers will be hosting a morning session at Ag Days in the MNP Theatre at the Keystone Centre in Brandon, MB, on January 19, 2023.

Join us on January 19 from 9:00 a.m. until 12:00 p.m. to hear our speakers cover the following topics:

9:00 a.m. "Soybeans & Peas: Emerging Pests and On-Farm Research"
Laura Schmidt, Production Specialist, Manitoba Pulse and Soybean Growers

What does the next chapter of soybean and pea production hold for Manitoba farmers? Laura will discuss insect and disease pests of concern and the latest results from the On-Farm Network research program.

———

9:45 a.m. "Nitrous Oxide Emissions and Sustainability in Soybeans"
Mario Tenuta, Research Chair in Applied Soil Ecology, University of Manitoba

10:30 a.m. "Positioning Pulses with Life Cycle Assessment"
Denis Trémorin, Director, Sustainability, Pulse Canada

As nitrogen-fixing crops, pulses have an advantage in terms of environmental impacts which can be easily used in marketing. Denis will focus on how Canadian agriculture can lead the development of transparent data sets that satisfy the demands of various sectors to strongly position our crops.

———

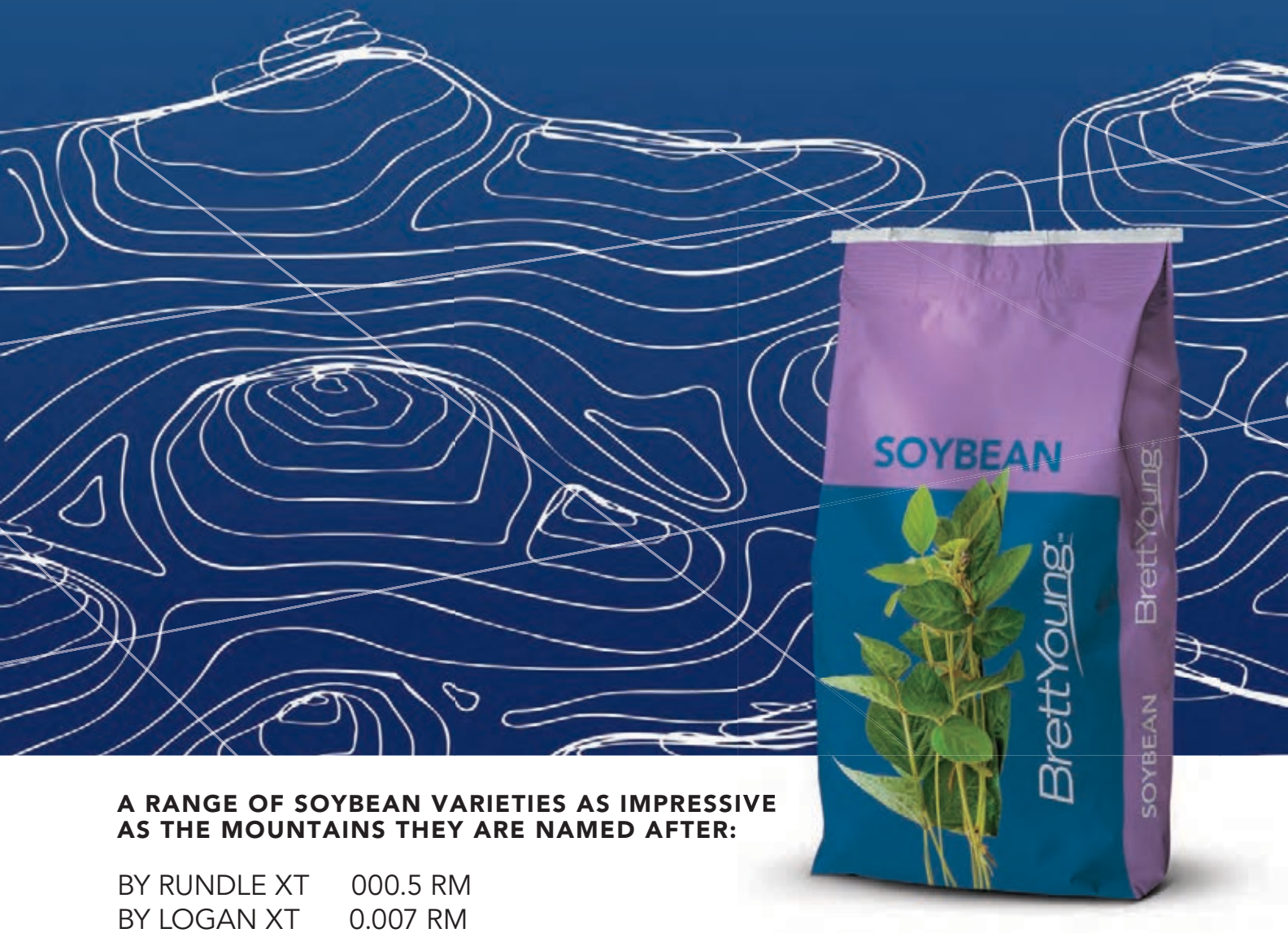
11:15 a.m. "Sixty-Bushel Soybeans – How Do We Get There?"
Kristen MacMillan, MPSG Agronomist-in-Residence University of Manitoba

Bringing together field observations and research data, Kristen will review the environmental conditions and agronomic management choices that impact soybean yield potential on the prairies.

Manitoba AG DAYS .com

Don't forget to come visit us at our booth for more information, and to follow us on Twitter @MbPulseGrowers! We are located at Booth 1142.

ELEVATE YOUR FIELD.



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The Winding Road to Sustainability – Why There is Not Just 'One Way'

Erin Gowirluk, Executive Director, Grain Growers of Canada

CANADIAN GRAIN FARMERS want to lead the development of the policies and programs that will shape agriculture's contributions to Canada's net-zero commitment. Canada is a big country and our agricultural landscape is varied. Green agriculture policy cannot be developed solely in boardrooms on Parliament Hill. Policymakers need to work with farmers through direct and early consultations if we want to achieve our net-zero goals.

Let us start with the facts. Over the last 20 years, Canada's agriculture sector has reduced our greenhouse gas (GHG) emission intensity by 50 per cent, compared to 36 per cent for the total economy. Already innovators by nature, farmers enacted this change without any regulation requiring them to do so.

Seeing how impactful the farmer response has already been on this issue (through emission-reducing actions, not simply words), our association announced the Road to 2050 initiative to reach net-zero emissions from grain farmers by 2050. By creating a regulatory environment that relies on farmers' expertise, we can provide direction to the federal government on policies and programs that will help meet the unique needs and opportunities within our sector.

While we are all committed to reducing our environmental impact, we face looming challenges as global insecurity has resulted in more of the world's population falls victim to food shortages. We have a moral obligation to consider the impact of our environmental policies on production. Governments worldwide must be encouraged to apply a productivity lens to each of these policies and programs to ensure that we do not put farmers and the rural economies they support at risk. We must continue to look for new and innovative ways to do what Canadian farmers have been doing for generations – growing more food on less land with fewer inputs. It must be about sustainable intensification if we are going to increase the global supply.

Farmers are on the front lines of climate change. Last summer, western Canadian farmers faced a devasting drought. Climate events like this are increasing, both in frequency and intensity, and putting farmers' livelihoods and the global grain supply at risk. As a result of a global policy shift on production practices and access to key inputs, farmers also face record-high fuel and input costs accompanied by policies that seriously impact productivity.

An increase in agri-food production will not only help offset some of these higher costs (and keep farmers profitable) but will also contribute to the global grain supply for a growing population and increasingly food-insecure world.

So how do we achieve this increase in the face of rising adversity? The key is access to innovation and science-based policies. For example, the introduction of herbicide-tolerant crops combined with herbicides has resulted in the widespread adoption of no-till or conservation tillage practices in Canada. These practices have significantly improved soil health and dramatically lowered the carbon footprint of Canadian farms.

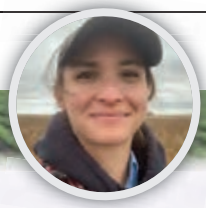
Canadian farmers are also looking to use biotechnology and new genomic techniques (NGTs) to contend with the effects of climate change, including severe droughts, more extreme weather events and increasing pest pressures.

However, in the global context, we can't lose sight of the fact that there is more than one way to achieve our collective sustainability goals. Differences in cultures, environments and economies all impact individual regions' production systems and needs. As the EU considers policies to incentivize sustainable food production, we hope that governments will adopt flexible, outcome-based approaches to ensure other jurisdictions can use the sustainability approaches that produce the best results in their region and on their farms.

We have an opportunity to shape agri-environmental policies that will have a very real impact at the farm level. It is critically important that the Road to 2050 generates a robust set of meaningful recommendations that remind the government of the need to understand the impacts of policies and programs on production. We look forward to releasing our recommendations in the spring of 2023. ■

View from the Field

Leanne Koroscil, On-Farm Network Agronomist, MPSG



ALBINO PEAS

Albinism is a curious genetic mutation affecting a wide range of species around the globe. You're sure to have seen it in rabbits, peacocks and maybe even in your field. Albino peas were spotted across pea fields in Manitoba this year and sparked a lot of intrigue. The genetic mutation that causes albinism halts chlorophyll production in plants. The seedlings emerge from the soil using energy reserves from the seed, but without chlorophyll, photosynthesis cannot occur. Once the seed reserves are depleted, the plant will die off. It is for this reason that fully albino plants never produce seed because they will not survive to full maturity. Plants with partial albinism have been known to survive through the season, though with less vigor than their green counterparts.

Albinism in pea plants can be mistaken for herbicide carryover or sprayer drift symptoms, but these would affect plants in a more predictable widespread pattern, while on the other hand, albino pea plants tend to appear individually and can be found randomly scattered throughout a field.

Albino pea plants (top-right) and partial albinism (BR).

Soybean and Pulse Marketing Insights - Making Sense of 2022 and Anticipating 2023

By Toban Dyck, Burr Forest Group and Lyle Wiens, IntelliFARM

I'D LIKE TO introduce you to Lyle Wiens. He lives and works in southern Manitoba as a marketing advisor with IntelliFARM. He is no stranger to farming. He was raised on a farm, where he worked and gathered insights into the unique business that is primary agriculture in Canada. He understands the financial stresses and considerations of running a farming operation. He understands the family conflicts that such duress can create. He understands global commodity markets. And he has a clear grasp of the many other nuances that affect how we, as farmers, make financial decisions and/or find ourselves in financial predicaments. He gets it. I know him and I can vouch for this.

I asked Lyle to walk *Pulse Beat* readers through the wild and irrational year that was 2022. He did that in his write-up below, but he also went the extra mile and gave us some insight into how he sees 2023 playing out.

Side note: Lyle Wiens is also an expert fabricator and makes custom bicycles under the banner LT Wiens Fabrications.

Here's Lyle:

The world of marketing is a scary and confusing one, especially right now. Wars, COVID lockdowns in China, rising interest rates, inflation, government policy and a looming recession are just a few of the things muddying the waters. I don't like the word *unprecedented*, because my memory is unreliable and I'm not nearly old enough to have the experience needed to use it. But, cliché or not, it is a word many use to describe the world today, and it certainly seems like a suitable descriptor.

As a marketing advisor, I am regularly asked to make sense of the markets and predict where they're headed. I sympathise with the people asking this question, because I, too, would like an answer. Unfortunately, I can't say with any certainty where exactly the markets are going. All I can do is offer a little insight.

The last two years have given farmers a crack at what may be once-in-a lifetime prices for their crops. After years of slim margins for farmers, prices climbed so much in 2021 that revenues per acre grew exponentially. Many of you have just experienced the most profitable year your farm has ever had. I am sceptical about these prices and I don't think they are here to stay. In other words, and to dump a bucket of cold water on some of your hopes, I don't think the high prices we see today will become the new normal.

While the last year has been good for commodity prices, we've also witnessed farm expenses increase. Inflation continues to ramp up, and with it, the cost of just about everything. Interest rates are climbing in order to reign in inflation and it doesn't appear they'll be slowing down any time soon. I heard one analyst predict that interest rates will have to climb above the rate of inflation before they stop – close to 9 per cent using today's rate of inflation. Equipment, land rent, crop insurance, fertilizer and labour costs are all on the rise, too.

As of today, prices are high and holding, and expenses are on the rise. Another thing we can safely assume is that expenses aren't going to decrease anytime soon. We don't know what commodity prices will do, but we do know they have the potential to drop and, at some point, they likely will.

So what should you do as a farm business owner? You should hedge for a future of higher expenses and commodity prices that may drop by locking in profits right now. Forward sell some of next year's crop and/or use a hedging tool like an option, as well. You have an opportunity to sell grain for the 2023 crop year at VERY high prices. Don't miss out.

Consider these scenarios:

1. You choose to not sell anything today and prices go lower in the future.
2. You choose to not sell anything today and prices go higher in the future.
3. You choose to sell some crop today and prices go lower in the future.
4. You choose to sell some crop today and prices go higher in the future.

In which scenario are you most upset? Believe it or not, my clients usually pick scenario 1 and not scenario 4. ■

Dry Bean Tour Summary

On August 3, 2022, Manitoba Pulse & Soybean Growers welcomed members of the dry bean industry, including farmers, to the dry bean research plots at Agriculture and Agri-food Canada's Morden Research and Development Centre.

The centre's director, Dr. Scott Duguid, welcomed everyone after a long break from in-person events due to COVID-19. MPSG's Laura Schmidt shared the latest on our On-Farm Network trials and available production resources.

Attendees learned about the latest in dry bean research, including disease management, dry bean variety trials and nitrogen fixation, from a variety of speakers including the centre's researchers, Dr. Anfu Hou and Dr. Ahmed Adbelmagid, Manitoba Agriculture's pulse specialist Dennis Lange, and the University of Manitoba and MPSG's Agronomist-in-Residence Kristen MacMillan.

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FEATURE

Relay Crop Soybeans And Winter Wheat – Boom Or Bust?

Kristen P. MacMillan, MPSG Agronomist-in-Residence, University of Manitoba

Core funding for the MPSG Agronomist-in-Residence applied soybean and pulse agronomy research program is provided by Manitoba farmers through Manitoba Pulse & Soybean Growers.

HARVESTING A SOYBEAN crop in the same year following harvest of a winter wheat or fall rye crop is one of the latest cropping systems to be evaluated in Manitoba. Termed "relay cropping", the idea is to maximize growing season resources by seeding one crop, then seeding another crop and having their growing seasons overlap for a period. The first crop is harvested, and the second crop continues to grow until it is harvested. The winter wheat-soybean system has been popularized in Indiana and other parts of the mid-western US.. The concept of constant canopy cover and the potential for increased revenue have gained interest from farmers in the northern prairies. What would a relay crop system look like in Manitoba?

The soybean and pulse agronomy team has been experimenting with relay crop systems at Carman, MB since 2017. We've tested several crop combinations that include winter wheat, fall rye and winter camelina as the fall-seeded crops with soybeans, dry beans and peas as the spring relay crop sown directly into the established fall crop. The focus of this article will be the winter wheat-soybean relay crop system.

When evaluating alternative cropping systems, objective-based metrics should be identified. To most farmers, the primary objective is to maximize profitability, but secondary objectives, specifically when considering relay crop systems, may include over-yielding, increased soil cover and biodiversity, improvement in soil quality and risk mitigation. The metrics chosen to evaluate cropping systems in this study are Land Equivalent Ratio (LER) and Gross Margin (GM). LER is commonly used in multi-crop systems to compare how much land is required to produce the same amount of crop in monocrop vs. multi-crop systems. However, LER is inflated when monocrop yields are low, so considering multiple metrics is important.

AGRONOMY

Winter wheat was planted between September 18 and 21 using a drill or planter at 26-35 seeds/ft^2. In the relay crop systems, the inter-row spacing was the same, which reduced the overall seeding rate by about half, depending on the spatial arrangement. In the relay crop system, we tested alternating rows of winter wheat and soybeans as well as twin rows where two rows of winter wheat (7.5" spacing) were planted and then three or five rows were skipped for a row of soybean (15" and 22.5" spacing). Fertilizer application included 60-100 lbs N/ac and 30 lbs P_2O_5/ac for both winter wheat and relay crop systems. Soybeans were planted between May 16 and 26 at 200,000 seeds/ac. Some variations of row spacing and seeding rates were also tested. In our trials, we hand-harvested the winter wheat, but specialized row guards are used on commercial combines to push down the soybeans. Combine tires must also align with the winter wheat rows to avoid damaging soybeans.

In-crop herbicide options are limited in the relay crop system – specifically, to a broadleaf herbicide (groups 4 + 6) application prior to soybean emergence. In some years, we applied a directed spray of glyphosate on the soybean rows, but this can damage the wheat. Using an RR2 Extend soybean variety would provide group 4 dicamba as an in-crop herbicide option but the application window is limited by the growth stage of the winter wheat. Alternatively, using a conventional soybean variety would reduce the seed input cost of the relay crop system.

RESULTS

Over five growing seasons, relay cropping winter wheat and soybeans have reduced productivity and profitability compared to growing either winter wheat or soybeans alone (Table 1). Neither crop was able to produce at least 50% of its monocrop yield in the relay crop system, thus the LER has been <1 and additional expenses have not been recovered. For the first four growing seasons (2018-2021), my hypothesis has been that moisture deficit is the limiting factor. So, in 2022, with near normal precipitation at Carman (but

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Table 1. Yield, Land Equivalent Ratio (LER) and Gross Margin (GM) of winter wheat and soybean monocrops compared to relay crops at Carman, MB from 2018-2022.

Year	System	Wheat	Soybean	Relay wheat	Relay soybean	LER	Wheat GM	Soybean GM	Relay GM
		Yield[x] (bu/ac)					Gross Margin[y] ($/ac)		
2018	Single row, full rates	n/a	23.6	15.5	3.7	n/a	n/a	n/a	n/a
2019	Single row, full rates	44.7	8.9	30.3	0	0.68	185	-21	7
	Single row, ½ cereal rate			25.8	0	0.58			-6
2020	Single row	67.0	30.5	64.4	0.4	0.97	322	178	207
	Twin row			39.2	4.5	0.73			149
2021	2021 Twin row 100% soy rate	20.1	25.9	7.7	11.7	0.84	-23	250	61
	Twin row 80% soy rate			7.1	10.2	0.74			51
	Twin row 60% soy rate			8.2	8.8	0.75			61
	Twin row XL			6.9	10.7	0.76			61
2022	Twin row 100% soy rate	59.2	66.2	24.3	24.7	0.79	411	843	404
	Twin row 80% soy rate			28.3	20.4	0.79			396
	Twin row 60% soy rate			21.9	24.4	0.74			416
	Twin row XL			22.8	25.2	0.77			431
Range		20 to 67	9 to 66	7 to 64	0 to 25	0.58 to 0.97	-23 to 411	-21 to 843	-6 to 431
Average		48	31	24	11.1		224	313	187

[x] Gross Margin ($/ac) = Gross revenue – Seed – Fertilizer – Pesticide – Separation ($0.25/bu)

[y] Land equivalent ratio (LER) = $\frac{\text{yield of relay crop species 1}}{\text{yield of monocrop species 1}} + \frac{\text{yield of relay crop species 2}}{\text{yield of monocrop species 2}}$

still below average), I expected to see the relay crop system shine. The relay crop system improved, but not nearly to the extent that the precipitation favoured soybeans, which surpassed all production systems. Thus, the ideal precipitation amount and pattern for successful relay cropping in Manitoba is unknown, and likely rare. Soybeans produced an impressive 66 bu/ac in 2022, beating out the winter wheat yield of 59 bu/ac and the relay crop system which produced 24 bu/ac of winter wheat and 24 bu/ac of soybeans. Thus, even under near-average moisture, the relay crop system did not improve productivity or profitability at Carman. Also of note is that seeding rate and row spacing rarely had an overall impact on relay crop yield or gross margin.

MOISTURE

Although this applied study did not attempt to explain the ecological principles of relay cropping, a lack of available soil moisture is likely the primary factor. Over the course of this study, growing season precipitation (May through August) has been between 175 and 265 mm (55-83% of normal). Growing season precipitation in Manitoba ranges from about 260 to 320 mm which is generally sufficient to produce most annual crops that use between 260 to 430 mm. Even with additional precipitation from the shoulder season (i.e., September and April), we still do not receive adequate rainfall to sustain two full-season cash crops in Manitoba, or elsewhere on the prairies. Areas where relay crop systems have been popularized have longer, warmer, and wetter growing seasons. Indiana, for example, receives about 550 mm of rain throughout the growing season.

VERDICT

Relay cropping winter wheat and soybeans has been a bust at Carman under dryland conditions over the past five years (2017-2022). Over-yielding has not occurred (LER <1) and profitability has been reduced (Table 1). In some years, gross margins have been comparable to the underperforming monocrop, but our gross margin calculation includes input cost only, and not the additional labour and fuel cost of a second seeding and harvest operation.

We have been studying this system during a five-year period of below-average precipitation. which has been 5 years in a row. At this point, winter wheat and fall rye are best utilized as

cash crops alone. Winter cereals also serve well as fall seeded cover crops with the objective to reduce soil erosion and provide some weed suppression ahead of low-residue crops like soybeans and dry beans, with termination occurring at or before planting the cash crop. Attempting to harvest both for cash crops is a risky endeavour in our dryland region. Future work could test relay crop systems under irrigation, and one crop combination that warrants additional investigation is the winter cereal-yellow pea relay intercrop. Full details on our relay and intercropping studies will be available in the 2022 Annual Report this winter. ■

Twin row winter wheat (7.5" spacing) relay cropped with soybeans (22.5" spacing) at Carman 2022.

FEATURE

Fava Beans, the Pyramids and Redefining Success for Manitoba's Pulse Industry

By Toban Dyck, writer and farmer.

"The success of smaller crops hinges on being able to develop partnerships and identify areas in which you can succeed," says Kelley Fitzpatrick, president of NutriScience Solutions and technical advisor for Prairie Fava. "It is important to develop strong industry linkages in order to capitalize off the opportunities that come up."

THE FIRST TIME I reached out to Fitzpatrick, she was far, far away.

"All our puny sorrows are put into perspective when you see things like the pyramids," she said. "When you first contacted me, I think I was on the Nile."

This story has nothing to do with Egypt or the Nile, but it is about how success for novel and niche pulse crops involves seeing the forest for the trees, and thinking more broadly than our home borders.

What began as a curiosity in 2019 has, as of spring 2022, grown into something Fitzpatrick enthusiastically calls "the greatest success story."

This story is also a uniquely Manitoban one. It involves many players working together in ways that should assure all of us farmers that, whether or not we're paying attention, the agriculture industry is abuzz with innovation and strategic partnerships.

In 2019, on behalf of Red River College Polytechnic's Prairie Research Kitchen (PRK), Fitzpatrick contacted the team at Manitoba Pulse & Soybean Growers (MPSG) to put together a short list of pulse varieties that PRK could start experimenting with. PRK wanted to investigate new sources of protein alternatives for tofu.

"I've known [MPSG Executive Director] Daryl Domitruk for years," says Fitzpatrick. "It was so great to chat with him and his team and we absolutely needed their expertise in selecting varieties that could potentially substitute for soy protein in tofu. In the end, we supplied PRK with pintos, navies, fava and hemp."

According to its website, Prairie Research Kitchen is an arm of RRC Polytech that "brings together a unique blend of food science and culinary arts to develop solutions for our clients." It's a busy place and it seems to be a ground zero for a lot of interesting food innovation initiatives.

For this particular study, PRK partnered with the University of Manitoba's Department of Food and Human Nutritional Sciences, the Food Development Centre, Manitoba

Agriculture's Canadian Agricultural Partnership and MPSG.

But that's not the whole picture. The project, titled "Development of value-added food platform technologies using plant-based proteins sources including bean, soy and hemp," also involved a number of food scientists and culinary experts with the support of industry and MPSG.

The focus was investigating the coagulation properties and characteristics of various pulses. Traditional tofu is, simply put, coagulated soy milk pressed into the shapes associated with the food. It has a distinctive texture and its market share is growing, as consumers continue to grow an appetite for plant-based proteins. In 2020, tofu had a market size of USD $2.5 billion, a number that is higher today and growing. Soy is widely respected as a high-protein use Tofu alternative to meat.

PRK determined that, out of all the pulses and the hemp that it tested, fava beans were not only a suitable alternative to soy, but, in some cases, a better ingredient for tofu.

"It has a unique protein structure," says Fitzpatrick, who helped manage the project. "There is no aftertaste. It was perfect for tofu."

Prairie Fava is run by Manitoba farmers and innovators Hailey and Cale Jefferies. They have been innovating the fava bean industry for many years.

Fitzpatrick has worked closely with Prairie Fava since 2017. She has watched and helped them model a unique – and, perhaps, ideal– way to market crops outside the sell-at-bulk mindset associated with other crops grown across the prairies.

I have written about Prairie Fava for *Pulse Beat* before. Hailey Jefferies is a former MPSG board member. Her business prowess and desire to innovate was strong then, and, from what I can tell, it may be stronger now.

Through linkages between Protein Industries Canada (a federally funded innovation promoter), Big Mountain Foods (a plant-based company based out of B.C.) and Prairie Fava, a new market for fava beans has been established.

"Developing a great relationship with Big Mountain Foods has been fantastic," says Hailey Jefferies, CEO of Prairie Fava. "It means what is grown in Canada is also being processed in Canada and the end product is manufactured in Canada – this is the best example of adding value to a crop."

In response to a market seeking alternatives to soy, Big Mountain Foods took interest in the research being done by PRK after being alerted to its research by Protein Industries Canada. Fitzpatrick's role as the facilitator for the project, her connection with MPSG and both MPSG's and Fitzpatrick's connection to Prairie Fava meant that all pieces of this somewhat disparate collection of actors could work together with efficiency.

Fast forward to spring 2022: Big Mountain Foods releases a product called Soy-free Tofu. "A first-to-market innovation, the Big Mountain Foods

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Photo by Bill Phelps

Soy-free Tofu is made 100% with Canadian fava beans and contains so much protein it's THE superfood of superfoods," reads a product description from Big Mountain Food's website. "In fact, the Soy-free Tofu contains 95% more protein than leading soy-tofu brands, making it the perfect plant-based protein alternative.

"Fava beans pack a powerful punch of goodness rich in dietary fibre, proteins, vitamins and minerals, and like all Big Mountain Foods products, Soy-free Tofu is the perfect addition to any meal, tastes delicious, and is simply really good for you."

"In addition to these attributes, they have agronomic benefits, as well," says Laura Schmidt, MPSG production specialist. Faba beans are an effective disease-break crop, as they are non-host to *Aphanomyces*. Faba beans are not as prone to lodging as other crops. They can withstand high levels of moisture and faba beans have the best nitrogen fixing abilities of all pulse crops."

Soy-free tofu is made from Manitoba fava bean flour from Hailey's and Cale's won the Product Of The Year gold medal at the 2022 *B.C. Food and Beverage* awards ceremony.

"Big Mountain Foods' Soy-Free Tofu took the spotlight for the evening, winning the top award for Innovation as well as the first-place prize (gold) for Product of the Year. A product six years in the making, Big Mountain's category-disrupting soy-free tofu product is a testament to the company's leadership position in plant-based foods," read a release from a food innovation website. "It is the first tofu product on the market to be made entirely from Canadian fava beans, sourced from a local farmer who shares Big Mountain's commitment to sustainability."

Manitoba's pulse industry usually hovers at around 350,000 acres. While small compared to larger crops like soybeans, canola and wheat, the market potential for pulses seems to be only limited by one's imagination and drive.

"Pulses are not the biggest industry we have here in Manitoba, but they are important crops in terms of economic and agronomic diversification," says MPSG's Daryl Domitruk. "Prairie Fava's success in bringing a new product to market through the strong industry connections they have developed is a business model that could potentially apply to many more crop types. There is a segment of the marketplace reserved for this niche and novel approach to food production. Similarly, we find most farmers are willing to reserve a few acres to test new crops for their agronomic financial potential. Within the pulse family we've only scratched the surface of may be possible in Manitoba."

Fitzpatrick agrees. She has been working in the industry for at least 25 years and she knows a lot about pulse proteins and where that market is heading.

She predicts there is plenty of room for more innovation around the uses of pulse crops. Conversations are happening now about using pulses in whole food ingredients, isolates and extruded products.

"We need to continue adding value to crops grown in Canada," says Jefferies. "We have seen over the last few years just how critical supply chains are, and I think continuing to add value to all crops, not just fava, is crucial to keeping them strong. Even though we are focused on fava beans as a company, we believe in biodiversity and how important that is for farmers and the consumer."

Manitoba's MERIT Functional Foods, Protein Industries Canada, Pulse Canada and Manitoba Pulse & Soybean Growers are all involved and interested in continuing to innovate the pulse protein market.

This, however, is a specific story involving a specific crop, and it's a story that Manitoba should be proud of.

"They were at the right place at the right time and they came to the table with a strong grower network and solid industry partnerships," says Fitzpatrick.

Well done, Prairie Fava! ■

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View from the Field

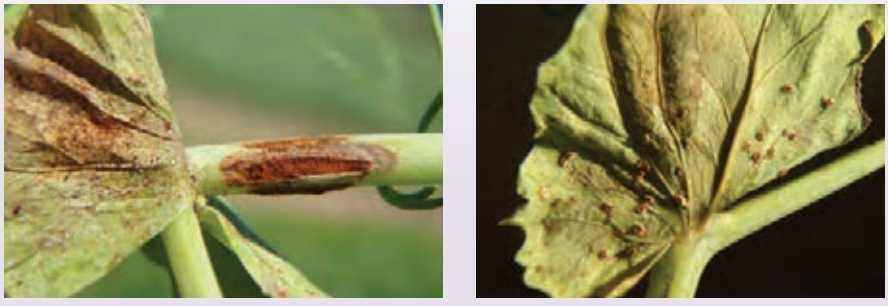
RUSTY PEAS

Rust is a pea disease that occurs annually in the prairies but has not been common in Manitoba most years. This year, however, rust was observed in some pea fields across western Manitoba. The pictures below right are from fields near Minnedosa and Roblin and were taken in late July.

Pea rust is caused by *Uromyces* fungi and is favoured by warm, humid conditions. Resting spores survive on crop residues and are carried long distances by the wind to infect host crops (peas, fabas, lentils and chickpeas) and host weeds (volunteer peas, peavines and vetches).

Rust pustules erupt from leaves and stems, resulting in craters and lacerations full of dusty burnt orange spores that rub off easily. This year, these symptoms were primarily found on the undersides of leaves and stems lower in the plant canopy.

This disease does not appear to cause significant yield loss in peas. Moderate levels of resistances are available in commercial varieties, and fungicides from groups 3 and 11 have been reported to be among the most effective at managing rust in peas.



Rust pustules on the underside of a pea leaf (R) and pea stem (L) in the lower canopy.

Agriculture Education at the Centre of Busy Year for AITC-M

Submitted by Ag in the Classroom - Manitoba

A RESOURCE HUB highlighting foundational commodities in Manitoba. The second season of a popular virtual farm tour. A new resource, two years in the making, highlighting the 'whole plate' story of Canada's Food Guide. Presentations about career opportunities within the agriculture industry.

These are just some of the exciting goings-on that Agriculture in the Classroom-Manitoba (AITC-M) has been busy with as a new school year gets underway in 2022-23.

In September, with the help of expertise and support from commodity and industry partners, including foundational sponsors like Manitoba Pulse & Soybean Growers, AITC-M proudly launched the Foundations of Manitoba Agriculture virtual resource hub.

The hub is a series of interactive courses and information sheets that invite teachers and students to explore the different crops grown and animals raised in Manitoba, including pulses, soybeans, chickens and more.

It targets all students, from kindergarten to Grade 12, and includes curriculum connections for each age group in-depth learning sheets for older students and bite-sized sheets for younger students.

"We're really excited about Foundations of Manitoba Agriculture, which is aimed at helping kids in our province become agriculturally literate adults," says Katharine Cherewyk, AITC-M's new executive director. "Not enough Manitobans know where their food comes from and this new virtual resource hub can connect those dots in the classroom in a fun, interactive way."

The fall also brought another connection point from the farm to the classroom — season two of the *Follow the Farmers* virtual farm tour series.

In *Follow the Farmers*, students get to watch a pre-recorded tour of the farm, then ask the farmer questions during a virtual Q and A session.. AITC-M also provides activities for students to do before and after each tour to reinforce the learning.

In October, the first livestream brought Grade 3-6 students into the world of canola through Will Bergmann of Bergmann Bros. farm. Students got a chance to ride along with Will during harvest season, seeing on the livestream how a combine works, how many canola seeds are in a pod, and how it looks to unload seed into a grain truck.

"For students who can't make it to the farm, *Follow the Farmers* is an amazing opportunity to bring the farmers to them," says Cherewyk. "We're so thankful for the support of Penner Farm Services for being our video presenter and bringing the tour to life for urban and rural classrooms alike."

The next *Follow the Farmers* was on December 12. It featured Jason Rempel's farm, Rempel Co. Acres, where students learned all about wheat. The third livestream in the spring will feature beef production on Andrew Steppler's farm.

"These virtual tours are a wonderful way for my urban students (and I!) to see the world beyond the classroom," says Allison Sirdar, a Grades 3/4 teacher at Robertson School in Winnipeg. "My students had a ton of questions after, which will spark some great in-class learning going forward."

While *Follow the Farmers* tells the first part of the farm-to-table story, *Eat Well: Exploring Canada's Food Guide* — a new AITC-M resource for Grade 5-8 students — explores how pulses can be part of healthy eating.

The kit provides interactive lessons, display materials and playing cards that introduce students to nutrition labels, the new protein food group and how pulses such as beans, lentils and chickpeas fit in, and an 'Eat Well plate' with plenty of fruit and vegetables.

AITC-M is also helping older students think about potential careers in agriculture and the wide variety of jobs available in the industry. At the *thinkAG* Expo at Kildonan East Collegiate in November, Winnipeg high school students explored careers with presentations from industry experts as well as classroom kits that helped further connect them to careers in ag.

Along with these ventures, AITC-M is continuing to run its regular programs, including Little Green Thumbs, CALM, and an exciting in-person return to the Ag Days Adventure planned for January.

"None of this would be possible without the help of our amazing sponsors, donors and volunteers," says Cherewyk. "With core funders including Manitoba Pulse & Soybean Growers, we were able to send out a record number of resources this fall and help bring agriculture education to new classrooms across Manitoba."

> To donate to AITC-M and hear more from teachers about their programs, resources and activities, head to aitc.mb.ca ■

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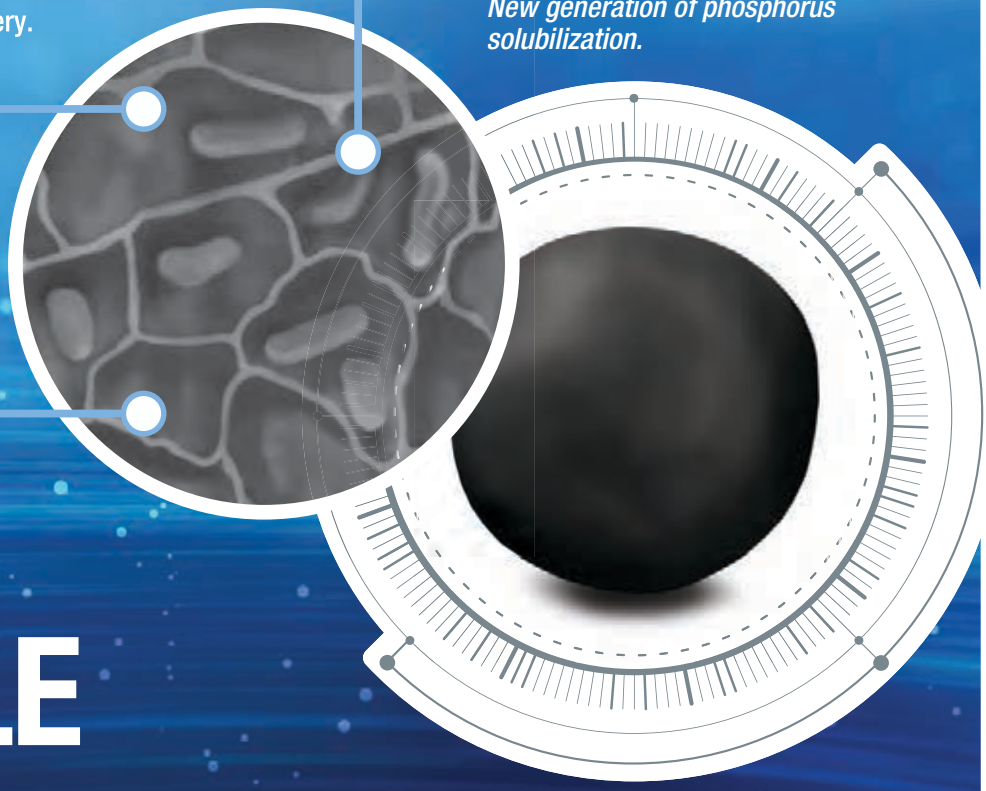

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Purchase a minimum 160 acres worth of Lallemand inoculant products and be entered in the Hometown Roots Family Contest for your chance to support your community with:

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Forging New Paths for Research

Cassandra Tkachuk, Research Project Manager, MPSG

PULSE ROOT ROT NETWORK

The Pulse Root Rot Network (PRRN) is a new initiative MPSG has been involved with in 2022. This network was launched by the three western Canadian pulse organizations – Saskatchewan Pulse Growers, Alberta Pulse Growers and Manitoba Pulse & Soybean Growers. According to the National Pulse Research Strategy, discussed in the spring 2022 issue of *Pulse Beat*, root disease was identified as one of the top priorities to tackle to protect Canadian pulse production.

The mission of this network is to eradicate the risk of root rot in pulses. In the near-term, the focus will be on connecting farmers, agronomists, researchers and funders to tackle the issues of *Aphanomyces euteiches* and *Fusarium spp.* in peas and lentils. From a Manitoba standpoint, our wish is to expand the network over time to include soybeans and dry beans as well.

A two-day, virtual workshop called the *Root Rot Rodeo* was held this past June, which saw approximately 35 participants who were separated into agronomy, breeding/genetics and pathology breakout rooms. Each breakout group discussed current root rot research projects that are nearing completion and identified three levels of research priorities: 1) the quick wins that yield applicable results within a year or two, 2) the short-term approaches which produce results over the next five years and 3) long-term approaches that will take more than five years to offer meaningful results. These discussions laid the groundwork on how to proceed with root rot research in western Canada.

The next steps for the PRRN are still evolving. So far, we have secured a website domain, rootrot.ca, to house any information developed by this network moving forward. The site is not yet ready to go, but our goal is to make it a one-stop-shop of root rot information. The PRRN also plans to hold annual meetings where stakeholders can connect and share information. The plan is to host a session at the next *Canadian Pulse Research Workshop* in Windsor, Ontario from February 19-22, 2023.

WHOLE FARM RESEARCH

MPSG has recently become involved with the Manitoba Crop Alliance's (MCA) Whole Farm Research program, along with the Manitoba Canola Growers Association (MCGA), to participate in reviews of proposed research. This program was created by MCA to approach research from a whole-farm, cross-commodity perspective, recognizing the needs of diverse cropping systems across Manitoba. Our collaboration with other Manitoba commodity organizations is common, but this program offers a more formalized platform for us to routinely meet to discuss

continued on page 30

Assiniboine Community College Prairie Innovation Centre

Our seed is made for your acres. With the widest seed portfolio in Western Canada built on local trial data, we know our seed will be at home on your soil.

Find your seed at: **ProvenSeed.ca/seed-selector**

Proven® SEED

Exclusively at Nutrien Ag Solutions

Maximize rotations, manage weed resistance, and control volunteers with XtendFlex® Soybeans

A comprehensive and effective weed management program can be easily derailed when resistant weeds develop in a field. On top of that, previous year's herbicide tolerant crops can become next year's problem. A solid weed management program that includes the best available tools for the upcoming crop rotation now has a new option for soybeans.

An effective weed management program should be comprised of a scouting and documentation process and using a strong rotation of herbicides in-crop as well as in preseed and postharvest burn down situations. With the advent of resistant weeds and the integration of more herbicide tolerant crops there is an added complexity that comes with the benefits of the new herbicide trait crops.

Soybeans are a staple crop in many areas of Manitoba and often are placed in a rotation that includes one or more herbicide tolerant crops over the years. Having flexibility to make herbicide choices in-crop that work well with a multi-year crop plan and a resistance management plan is very beneficial, especially when every season is different.

Resistance management – three modes of action

For western Canadian growers the Roundup Ready® Xtend crop system is a great advancement for weed and rotational management, and it has now improved. XtendFlex® soybeans are built on the Roundup Ready 2 Xtend® technology platform with the addition of glufosinate tolerance to help fight tough-to-control weeds and herbicide resistant weeds. A triple tolerance package that provides choice and flexibility.

Dicamba (Group 4) | **Glyphosate (Group 9)** | **Glufosinate (Group 10)**

Early control of weeds is key in maximizing yield potential in soybeans. XtendFlex soybeans have the benefit of being able to utilize specific dicamba products as a pre-seed burndown or first in-crop option for early season control and short-term residual that manages small seeded broadleaf weeds. The glufosinate and glyphosate tolerance allows for later season in-crop applications that can be matched to the weed spectrum observed.

Proven® Seed's soybean portfolio continues to expand

Proven Seed has a fit for every field with a wide assortment of crop lines from canola to corn, cereals to soybeans, and more. In addition, Proven Seed has a diversified herbicide tolerance portfolio that bridges the multiple crops lines. Backed by local testing under western Canadian conditions, the best seed partner for a multi-year crop plan is Proven Seed.

Proven® SEED

NEW for 2023

PV S004XF13 is the newest addition to the Proven Seed soybean line up. It's a great mid maturity, medium tall variety that has the triple tolerance of dicamba, glyphosate and glufosinate for flexibility and tough weed control situations. This hardy variety performs exceptionally well in yield and agronomics on all acres in soybean growing areas and does particularly well on light textured soils.

continued from page 27

University of Manitoba Prairie Crops and Soils Research Facility

research priorities and co-funding opportunities.

Research priorities that fit well under the Whole Farm umbrella include crop rotations, soil health, cover crops, intercrops, pest management and water management. The goal is to issue a call for letters of intent each year through this program to see what ideas researchers have cooking and assess how we can collaborate. And of course, matching dollars will be sought wherever possible.

So far through Whole Farm, MPSG has co-funded with MCA and MCGA the continuation of a crop rotation study led by Dr. Ramona Mohr (AAFC-Brandon), looking at the agronomic, economic and environmental performance of soybeans, peas, wheat and canola grown in different rotations in western Manitoba. And moving forward, any future extremes of moisture projects beyond the previous Canadian Agricultural Partnership umbrella project will be assessed through this program. Projects slated to begin in 2023 are currently under consideration.

ASSINIBOINE COMMUNITY COLLEGE AND UNIVERSITY OF MANITOBA INVESTMENTS

MPSG has taken new steps to build research capacity in western Manitoba through our $200K contribution to in the Assiniboine Community College (ACC) Prairie Innovation Centre and subsequent launch of the Spray and Weigh Testing Program through this centre in 2022.

Spray and Weigh is an applied research program designed to answer farmers' questions on product comparisons, in pursuit of maximum protection against pest pressure and the best return on investment. We started small this year with two field pea fungicide trials at Roblin and Portage, coordinated by Baljeet Singh, ACC instructor.

We have also funded another project led by Baljeet Singh, on the development of a weather-based fungicide application decision support tool for managing white mould in dry beans in western Manitoba.

In eastern Manitoba, we have also contributed $200K to the University of Manitoba Prairie Crops and Soils Research Facility. This facility will allow Agricultural and Food Sciences students and faculty to conduct their research in a high-quality environment, which will lead to improved quantity, quality and efficiency of sample (seed, soil and plant) processing.

NEW ROUND OF FUNDING

With the close of the present federal-provincial five-year funding cycle, we have been deeply involved in reviewing the various research projects proposed for a spring 2023 start. This includes everything from projects submitted to the federal Agri-Science Clusters, including the soybean, pulse and integrated crop agronomy clusters, projects submitted to Genome Prairie and those initiated individually by MPSG based on our highest research priorities. We look forward to showcasing the suite of projects that we will be co-funding over the coming year. ■

2022 Growing Season

Mother Nature Offers Balance

Jennifer McCombe-Théroux, Production Specialist - East, MPSG

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

SPRING

Farming and each growing season never fail to amaze me. We plan, prepare and then execute – all while never knowing what Mother Nature will throw at us. This spring was a complete 180° from last year: we went from early seeding and persistent dry and hot conditions to a prolonged wet and cold environment that continued well into late spring. In early May, heavy precipitation and flood waters caused extensive overland flooding across Manitoba, with 26 municipalities declaring flood-related states of emergency.

Seeding operations were delayed overall, and occurred on a field-by-field basis that depended on which field was ready, with the same crop type being sown across a wide range of seeding dates on each farm. For example, one farm that was part of the Manitoba Pulse and Soybean Growers (MPSG) Scouting Network had seeding dates for field peas ranging from May 25 to June 15. This wide range of seeding dates added another level of complexity to each farming operation. Switching crop types involved recalibrating drills and prioritizing field operations between seeding, spraying, rolling, and in some cases cleaning up debris from flood waters. As spring progressed, challenging weather conditions continued. Farmers started prioritizing the crops to sow based on maturity and crop insurance deadlines. By May 31, the provincial seeding progress sat at 40 per cent completion, in comparison to the five-year average of 92 per cent seeded.

Due to wet conditions and calendar dates, some farmers switched crop types out of longer season crops, including soybeans. The Morris soybean variety trial site was discarded due to saturated wet conditions that did not dry up enough to allow proper seeding within a reasonable timeframe.

This spring, Manitoba Agriculture Services Corporation (MASC) permanently extended the soybean seeding deadline (Table.1). More varieties have adapted to Manitoba conditions since soybean seeding deadlines were last determined, and the change reflects an accumulation of new and more up-to-date data. This review was well-time, considering the season's delayed timed seeding. These changes were made in consultation between MASC, MPSG and Manitoba Agriculture.

Soybeans in standing water.

Table 1. New MASC soybean seeding deadlines

	Seeding deadline (full coverage)		Extended seeding period (20% reduced coverage)	
Crop Soybeans	Soybean area 1	June 8	Soybean area 1	June 9 - June 13
	Soybean area 2	June 4	Soybean area 2	June 5 - June 9
	Soybean area 3	June 4	Soybean area 3	June 5 - June 9
	Soybean area 4	May 30	Soybean area 4	None

Good, vigorous emergence was common this year due to adequate moisture and shallower seeding, along with little to no crusting. Many low spots were not seeded due to standing water and conditions that were unsuitable to pass through with the seeder. Due to wet conditions and time management, many farmers were forced into post-emergent rolling instead of right-after seeding for soybeans and pulses, an option that adds flexibility if conditions are not suitable for the former method. Rolling in saturated fields can cause soil crusting and sealing which inhibits emergence. Soybeans can be rolled post-emergence at the first trifoliate stage (V1), and field peas up until the third true leaf node stage (V3). There were some signs of seedling stress and disease, along with strong winds, sand blasting and hail reported in various areas, which did impact crops, but most grew through it.

SUMMER

July had great growing conditions with warm weather and consistent rainfall, resulting in incredible growth in pulse and soybean crops. It was a late start, about a month behind normal, but pulse crops grew rapidly. The growing season conditions were conducive to disease development in many regions. Thanks to consistent rains, high humidity and thick canopies from established plant populations, canopies stayed wet for prolonged periods. On many fields foliar and stem diseases did not impact peas and soybeans as early as anticipated. For peas, fields with good drainage, first-time fields or fields with extended rotations experienced the least amount of disease pressure. On heavier ground with poorer drainage, pea crops remained stressed, and stunted, and root rots developed. Pockets of root rot also appeared in low laying areas of fields. The importance of field selection and choosing the right

continued on page 32

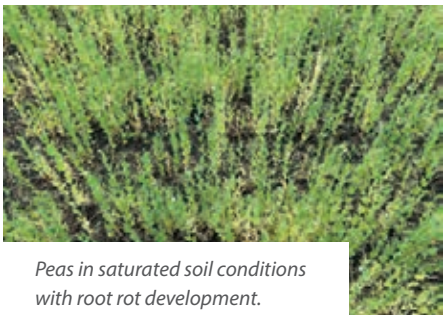
continued from page 31

fields for peas was magnified this year as they do not like standing water or prolonged wet conditions. Choosing fields with good drainage, and coarser soil types, and evaluating your rotation for disease carryover, proved especially important. In drier seasons prior to this year, farmers decided between one fungicide application versus none, whereas this year, they had to choose between one or two applications.

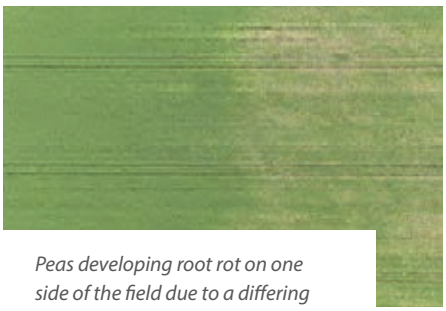
Fungicide applications for dry beans are purely preventative, meaning you spray before you see signs of white mould. Many farmers applied two passes of fungicide as conditions for disease development were strong, along with excellent yield potential. Some fields were impacted by late season white mould.

The resiliency of soybeans under a wet season shone through this year, and overall incidence of foliar and stem diseases was low. On heavier soils with consistent saturation, yellowing from moisture stress was observed, along with iron deficiency chlorosis (IDC), although most fields grew out of this, especially if a variety semi-tolerant to IDC was grown. Where more severe IDC symptoms occurs, it's a good idea to test your soil for both carbonates and soluble salts. This information (Table.2) can aid in selecting a variety with the right IDC tolerance. This information is available in MPSG's Soybean Variety Guide. Some fields were affected by *Phytophthora* root and stem rot (PRR), which showed up later in the season along with some late infection of white mould.

As soybean acres continue to rise and become more common in rotations, PRR is a soybean disease that may become more challenging for Manitoba farmers. Once PRR is present in fields, the spores can persist in the soil for up to 10 years. PRR is unique in that it can infect soybeans throughout the whole season. Rotation and variety resistance are the best strategies to manage PRR but additional tools to address this disease are important to support the sustainable growth of soybean production. MPSG is collaborating with AYOS Technologies and seed companies to independently rate variety field tolerance or partial resistance to PRR, and trialing a soil test to identify which PRR pathotypes are present in fields infected by the disease. This information will help farmers select varieties with major gene resistance to those pathotypes. Read more about this research on page 33.

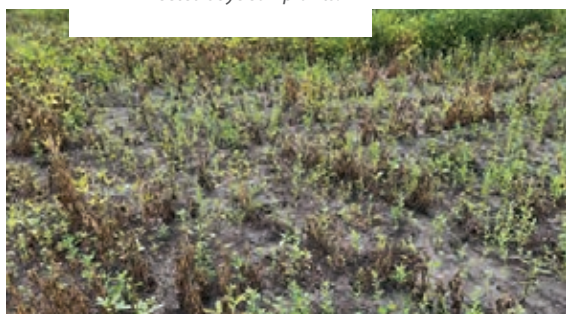


Peas in saturated soil conditions with root rot development.



Peas developing root rot on one side of the field due to a differing rotation history from the other side of the field.

PRR infected soybean plants.



Thanks to heavy rains, strong winds and some hail, bacterial blight was observed in soybeans, peas and dry beans. Generally, this is not yield limiting. It is important to differentiate Bacterial blight from other diseases as the blight is not managed with a fungicide. Bacterial blight generally impacts the top of the plant canopy as the damage is caused by environmental factors.

Distinctive pest issues of 2022:

1. Springtails were found feeding on soybean seeds in some fields. Springtails are tiny, wingless, white insects that live below ground. They are most harmful to seedlings.
2. Pea leaf weevil surveys across western Manitoba found low to moderate population densities in 2022 (more on page 43).
3. Pea and soybean aphids were widespread and some at spraying thresholds across Manitoba (more on page 42).
4. Grasshoppers were widespread in soybeans, field peas and dry beans but in many fields were mainly found along the edges.
5. Pea rust was observed in some fields in western Manitoba (more on page 24).
6. Root rots were present in low-lying areas and saturated pea and dry bean fields.

Table 2. Field risk of IDC based on carbonate and soluble salt soil test levels.

Soluble salt	Carbonate (%)		
(mmhos/cm)	0 to 2.5	2.6 to 5	>5.0
0 to 0.25	Low	Low	Moderate
0.26 to 0.50	Low	Moderate	High
0.50 to 1.0	Moderate	High	Very high
>1.0	High	Very high	Extreme

Source: Agvise Laboratories

7. Late-season white mould infection was observed in both soybeans and dry beans.
8. Over 90 suspected samples of water-hemp were submitted to the Pest Surveillance Initiative Lab, and the majority were confirmed. Water-hemp is a Tier 1 noxious weed, meaning all plants must be destroyed if found. Do not put water-hemp through the combine, or you risk spreading the seed. Water-hemp is a prolific seed producer (with an average of 250,000 seeds per plant), so we recommend that you physically remove it from your field by pulling it up, digging up the roots, and bagging it for removal.

HARVEST

Soybeans, peas and dry beans each demonstrated a fantastic number of pods per plant and seed per pods. The yield potential of each looked strong.

Pea harvest started in mid-August this year and varied across the province based on seeding date. Large biomass, high moisture conditions, and heavy winds and rains meant many pea crops had lodged in-season, which made harvest slow going. Based on field characteristics and moisture, there was a wide spread of yields for field peas, most averaging between 50 and 80 bu/acre.

Four bean soybean pods to the top.

Dry bean harvest started in early September on earlier sown fields and reported fantastic yields reaching 2,000 – 3,000 lbs/acre in a wide range of bean classes. 2017 holds the record average for dry bean yields at 2,100 lbs/acre. Signs are promising that the average may exceed this in 2022.

This year the concern in soybeans was if maturity would be far enough along to withstand a frost. As soybeans reach R7 staging (early maturity,) the risk of yield loss from frost declines. While Manitoba soybean fields experienced a a range of staging based on seeding dates and maturities, some earlier soybeans started reaching R7 by the second week of September. A killing frost arrived in much of the western side of the province on September 22 with the rest of the province following on September 27. Thankfully, most soybean crops were then past the risk of frost damage.

August rains are critical for seed fill and yield. Throughout the season, rains were consistent, especially in August, which contributed to a strong yield potential with a high number of pods per plant and seeds per pod. In soybeans, many fields saw four or five beans per pod. Soybean harvest slowly started mid-September in central Manitoba in earlier maturing varieties and earlier sown fields. The resiliency of soybeans throughout this challenging season shone through, with yields averaging between 40 and 65 bu/acre.

Although it was an unusually late start to a season that confronted farmers with countless challenges, Mother Nature provided some balance and offered an extended fall without an early frost, along with some fantastic yields to make us all optimistic for next year.

For more specifics on the past growing season, visit the catalogue of Bean Reports at manitobapulse.ca/the-bean-report. You can also sign up at manitobapulse.ca to receive this timely e-newsletter. ■

SOYBEAN SCOUT ANSWERS

A – Soybean aphids are a pest specific to soybeans. They generally do not overwinter in Manitoba and arrive in July after being carried north on southern winds. Soybean aphids are very small (less than 1/16 inches in length) and excrete a sticky, shiny honeydew on plants.

Scout for soybean aphids from the R1 (beginning bloom) to R5 (beginning seed) stages during July to mid-August. Soybean aphids are not easily dislodged from plants so sweep net counts are not recommended. Count or estimate the number of aphids per plant on at least 30 plants in the field.

The economic threshold for soybean aphids is 250 aphids per plant and increasing. If control is necessary, assess efficacy after application. In non-outbreak years, beneficial insects are often sufficient at managing soybean aphid populations.

B – Pea aphids are a pest of peas, faba beans, lentils and alfalfa. They overwinter as eggs in perennial legumes. Pea aphids are larger than soybean aphids and are roughly three mm (1/8 inch) long as adults.

Scout for pea aphids from R2 (early flower) to R4 (full pod) stages during late June to mid-July. Pea aphids can be knocked off plants easily, so sweep net counts are an option to determine population levels, or the number of aphids may be counted per plant tip (top eight inches).

The economic threshold for pea aphids in peas is two – three aphids per plant tip or nine to 12 aphids per single sweep. If the threshold is exceeded, insecticide applied when pods first form (R3) protects yield better than earlier or later applications.

Read more about aphids on page 43.

Soybean Seeding Rates – The First and Longest Running On-Farm Trial

Leanne Koroscil, On-Farm Network Agronomist, MPSG

WHEN ASKED ABOUT his profession, my dad would often quip, "Professional gambler." This is only partly true because he's actually a farmer. But the seasonal complexities of farming enhance the importance of making economical and sustainable production decisions to ensure you're playing your best hand.

One of the cards that can be played is seeding rate.

Small-plot research conducted at eight sites across Manitoba provided a general recommendation for soybean target plant stands of 140,000 to 160,000 live plants/ac. Note that target plant stand is not the same as seeding rate. Target plant stand is the ideal number of live plants/ac and accounts for factors that may affect seed survival rate:

Environmental

- Insects and plant pathogens can impact seed survivability.
- Cool temperatures may delay emergence.
- Soil crusting may inhibit emergence.

Handling

- Seed can be mechanically damaged at seeding depending on handling and equipment used.
- Results from our On-Farm Network (OFN) report an average of 80% survivability with a seeder and 82% survivability with a planter, though these rates may vary as not all equipment is alike.

Seed Lot Condition

- Condition of seed lots influences germination and survivability. Soak or germination tests are simple tools to prepare you for your season: Soak 200 seeds in water and calculate the percentage of seeds that swell to determine seed coat damage. If a seed loses its seed coat, it will not produce a viable plant in the field.
- Germination tests can be sent off for analysis at an accredited lab, or you can obtain one from your seed dealer, or you can conduct your own test in-house by placing 100 seeds on a well-watered paper towel, then returning after a day or two to calculate the percentage of seeds with emerging radicles. Ensure the sample tested is a proper representation of your seed lot.

Plant stands can also be counted in-season at first trifoliate to calculate the percentage of seed survival. Future seeding rate decisions can be more informed by using the following calculation:

Percentage of Seed Survival

$$\frac{\text{Plant Stand At First Trifoliate (plants/ac)}}{\text{Seeding Rate (seeds/ac)}} \times 100$$

Once collected, these variables can easily be entered into the *Soybean Seeding Rate Calculator* on MPSG's Bean App to calculate the appropriate seeding rate. Couple the rate from the app with knowledge from previous years and experience in your fields to start the season off on the right foot.

Every farm, piece of equipment, seed lot and season is different, which means there is no optimal seeding rate number represents the entirety of Manitoba. What is realistic however, is to consider seeding rate thoroughly, since a difference in seeding rate can mean major economic implications for your farm. To put seeding rates to the test and determine the most suitable rate for individual farms, seeding rate trials have been conducted through the OFN.

OFN SEEDING RATE TRIALS

Soybean seeding rates were the first (and now longest) running trial type in the OFN. As of 2022 there have been 107 soybean seeding rate trials conducted across agro-Manitoba, seven of which were established this year. The objective is straightforward: to quantify the agronomic and economic impacts of different seeding rates on soybean production.

Over the years, OFN trials have been conducted with several seeding rate combinations ranging from 100,000 to 252,000 seeds/ac. Seeding rates for trials are traditionally chosen based on the farmer's typical seeding rate, plus or minus at least 30,000 seeds/ac between treatments. The OFN trials aim for this variation to ensure the treatments are different enough from each other and to analyze distinctions in agronomic and yield potential. The seven trials from the 2022 season specifically ranged between 110,000 to 226,000 seeds/ac. To further investigate seeding rate results, plant counts are collected twice after to determine if the plant population after seeding changed throughout the season. This is an important factor in data collection because of the effect plant population can have on soybeans throughout the season. More plants can increase competition between soybeans and can cause shade avoidance characteristics (thinner stems, taller plants). Higher plant populations can also create a thicker canopy which translates into less airflow, encouraging disease growth in a wetter year. Conversely, a thicker canopy can provide greater competition against weeds in the field.

To determine if any of these conditions may have affected the crop, plant counts are collected early and late in the season and compiled. Higher seeding rates have been shown to have a lower survivability rate in OFN trials, especially by the reproductive (R) stages compared to lower seeding rates (Table 1).

Finally, yield is calculated at harvest, taking into account economic considerations such as inputs and equipment costs. An economic yield

Table 1. Survivability comparison between two popular OFN seeding rate treatment sets (130,000 vs. 160,000 vs. 190,000 seeds/ac, and 150,000 vs. 180,000 vs. 210,000 seeds/ac).

Number of trials	Seeding Rate			Average Early-Season (V)		Average Late-Season (R)		Difference
				Plant Stand	Survivability	Plant Stand	Survivability	V to R
#	seeds/ac	units/ac	$/ac	plants/ac	%	plants/ac	%	% change
34	130,000	0.93	$63	113,000	87	109,000	84	-3
41	160,000	1.14	$78	129,000	81	123,000	77	-4
44	190,000	1.36	$92	152,000	80	141,000	74	-6
15	150,000	1.07	$73	132,000	88	127,000	84	-3
25	180,000	1.29	$87	144,000	80	134,000	75	-5
12	210,000	1.50	$102	162,000	77	145,000	69	-8

increase implies that the seed costs were paid for by the increase in yield as a result of the trial treatments. The results are compiled into individualized reports and shared with the farmers.

2022 TRIAL UPDATE

The delayed start to the season brought with it a late harvest, and at the time of this writing, all but one of the trials from the 2022 season were analyzed. Of the six trials analyzed, one had statistically significant differences between the seeding rate treatments of 166,000, 196,000 and 226,000 seeds/ac (Figure 1).

OFN research prior to 2022 saw 18 statistically significant responses only to yield, 12 of which also had economic yield increases. To be considered economic, the increase in yield must overpower the original seed costs (Table 2).

The *2022 Cost of Production Guidelines* published by Manitoba Agriculture calculated soybeans to be $67.90/unit (1 unit = 140,000 seeds), thus a 30,000 seeds/ac difference can equate a cost difference of $14.55/ac. This is no small number, and underscores the importance of optimizing your seeding rate on your farm.

Table 2. Yield increase required at various soybean sell prices to justify a 30,000 seeds/ac increase in seeding rate.

Sell Price ($/bu)	Yield Increase Required (bu/ac)
10	1.5
15	1.0
20	0.7
25	0.6

WHAT'S NEXT

Continued interest in this trial type signals that seeding rate questions still exist for soybean farmers. Until that interest dwindles, the OFN will continue to grow the dataset.

> Curious about which rate is ideal for your farm? Contribute to soybean seeding rate results with a trial by contacting Leanne Koroscil, OFN Agronomist, at leanne@manitobapulse.ca or 204-751-0439. ■

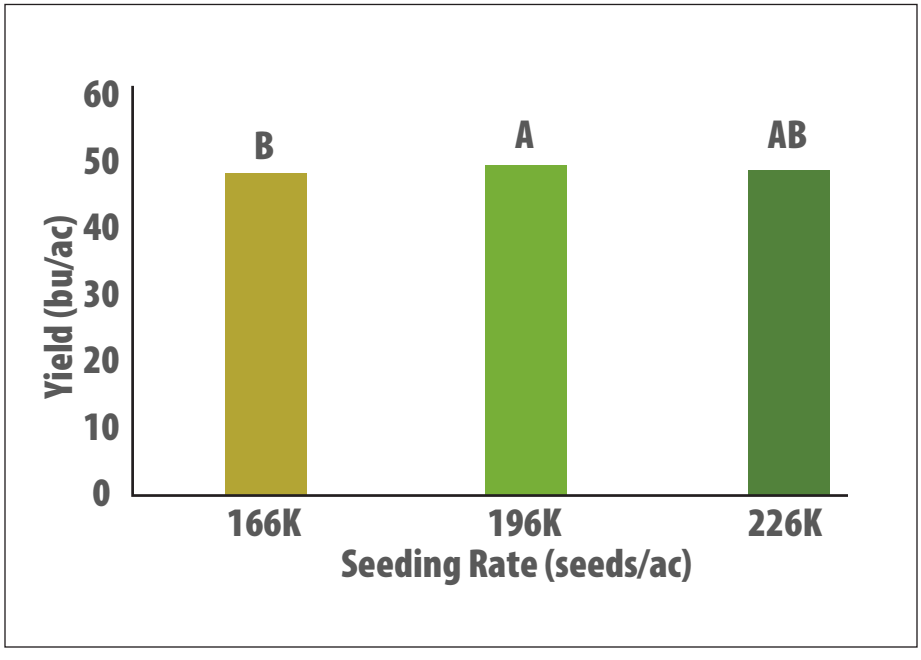


Figure 1. At the time of writing one seeding rate trial from the 2022 season showed significant differences between treatments.

Soybeans and Why We Choose Chips over Exercise

By Toban Dyck, writer and farmer.

HOW TRENDS GAIN a foothold is an interesting topic. I have listened to many podcasts talking about the human brain and how certain stimuli and/or tactics can be used to change it. I'm sure you've heard such theories before.

Why do I opt to sit on the couch when I know exercising will serve me better in the long run? Why do we do things that we know are bad for us? And why is it taking so long for soybeans to become a staple crop in Manitoba?

In 2017, optimism surrounding soybean production in the province was sky high. Acres had surpassed two million and the trend since 2014 revealed an upwards trajectory that was so steep that the messaging from farm groups like Manitoba Pulse & Soybean Growers changed from "grow more soybeans" to "make sure you're growing other crops, as well." In other words, the outlook just seemed too positive.

Meanwhile, in Saskatchewan, soybean acres reached about 850,000, the most ever grown in a province that typically grows crops more adapted to dry conditions.

Then, everything changed. The rains stopped. The prairies became dry. Soybeans were no longer yielding like they did the year before. Agronomists and farm associations began reminding farmers that soybeans were particular about receiving late-season moisture to push them through that final stage of growth.

After 2017 and before 2022, late-season rains were scarce.

Perhaps the trend of growing soybeans hadn't reached habitual status yet, and that's why farmers were so quick to drop them from their rotations and go back to what they knew. Or perhaps there are other reasons why the acres plummeted like they did. I am not sure.

Acres in Manitoba and Saskatchewan dropped tremendously.

And here is where it gets murky, at least for me.

According to the 2022 cost of production report issued by Manitoba Agricultural Services Corporation, the break-even yield for soybeans to cover operating costs was about 20 bushels per acre, compared to about 25 for canola.

Fertilizer and chemical costs surrounding soybean production are lower than many other crops and the global demand for soy is only increasing.

However, like exercising instead of sitting on the couch, new habits are difficult to form and our allegiances to certain cropping choices are often seated so deep inside our brains that we don't really know why we do some of the things we do.

Nate Ort, a PhD student at the University of Saskatchewan, and whose MSc research at the University of Manitoba focused on soybean adaptation and adoption in the prairies, has been growing soybeans in Saskatchewan.

"Soybean adoption into prairie crop rotations has increased," he says. "There are now early maturing varieties available to farmers that can successfully complete their life cycle in our short growing season."

Ort has observed that Saskatchewan's soybean acres trend in parallel to Manitoba's. When Manitobans grow more, the same can usually be said of Saskatchewan.

"Soybean is very sensitive to day length (photoperiod) and long days slow the reproductive development process and delay flowering and maturity," says Ort. "Day length is directly related to latitude, and so, as you go north, the days are longer in the summer and soybean development slows down, they flower later, mature later, and might get hit by a fall frost, which reduces yield and quality. The Canadian prairies mark the northern edge of soybean production in North America, so photosensitivity in soybeans is a big deal for their adaptation to the prairies. Breeders and physiologists overcame this by figuring out how soybean's flowering genes are controlled by day length and then selected varieties that have alleles of these genes with reduced photosensitivity or are not sensitive to photoperiod at all."

But the story doesn't end here. There are other things to figure out.

With the help of his research advisor, crop physiologist and University of Saskatchewan« professor Dr. Rosalind Bueckert, their soybean trials are poised to contribute to a growing body of knowledge centred around figuring out why western Canadian soybeans routinely have less protein than the same varieties grown in Ontario.

Ort offers an hypothesis.. "I think the« cold nights in August lead to lower protein. This is when the pod and seed are developing and I think our lower temperatures means a few less drops of nitrogen make it to the seed to be synthesized into proteins. I have field experiments in Saskatchewan exploring this, that are now done, but the lab work is still ongoing."

Ort's research is furthering the soybean narrative on the prairies. Soybean varieties suitable for prairie growing conditions are a relatively new and continually evolving phenomenon.

The crop doesn't, after all, have the Canadian cachet that canola does, nor does it carry with it the political heft of wheat. Instead, it seems, market demand pushed soybean onto our laps and now we're actively trying to make it our own. We will. The metrics are there. We can grow it. It's too profitable to ignore. The world wants it. And it's good for the environment in a myriad of ways.

This year, farmers across the prairies were rewarded for their commitment. Those late-season rains reappeared. ■

Spray Drift Management Under Changing Operational Requirements

Ian Paulson, Technical Services Lead, Prairie Agricultural Machinery Institute

OVER THE PAST four years, researchers from Agrimetrix Research and Training Ltd., the Prairie Agricultural Machinery Institute (PAMI), and the University of Saskatchewan's College of Agriculture and the College of Engineering, have been collaborating in a multidisciplinary study investigating the impact of high clearance sprayer operating parameters on pesticide drift. Plot trials, field-scale spray drift measurements, in-field sprayer wake measurements, and numerical modeling were employed to investigate aspects of pesticide drift.

Within this study, a further understanding was found regarding the operational parameters affecting pesticide drift on the Canadian prairies. With the development of new chemical formulations and increasing crop diversity, more scientific data was required on the impact of operational parameters on spray drift as well as a crop's sensitivity to drift. Additionally, high-clearance sprayers have become large machines that operate at relatively high speeds, so a better understanding of the aerodynamic properties and how they interact with droplets is required to maintain high productivity while minimizing spray drift. By collectively studying these factors, a deeper understanding of the link between machine-induced drift potential and the range of impacts has been gained.

PLOT TRIALS

Plot trials were conducted over two years to study the impact of off-target application of several herbicide formulations on soybeans (Engenia®, Xtendimax® and Enlist™) and canola (Simplicity™, Varro® and Paradigm™). Through the trials it was found that soybeans were extremely sensitive to both dicamba formulations (Engenia®, Xtendimax®) with estimated ED50 (50% yield response versus the control) ranging between 0.242% and 0.590% of the label rate across the two trial years and two formulations. Soybeans showed a higher tolerance to 2,4-D (Enlist™) with an estimated ED50 ranging between 4.34% and 9.02% of the label rate during the two trial years.

Across the two study years of canola, the differences between ranges of ED50 values for Simplicity™, Varro® and Paradigm™ were not statistically significant ($p < 0.05$), although there was a tendency for canola to be slightly more sensitive to Varro® (ED50 between 7.60 and 12.2% of label rate).

FIELD DRIFT QUANTIFICATION

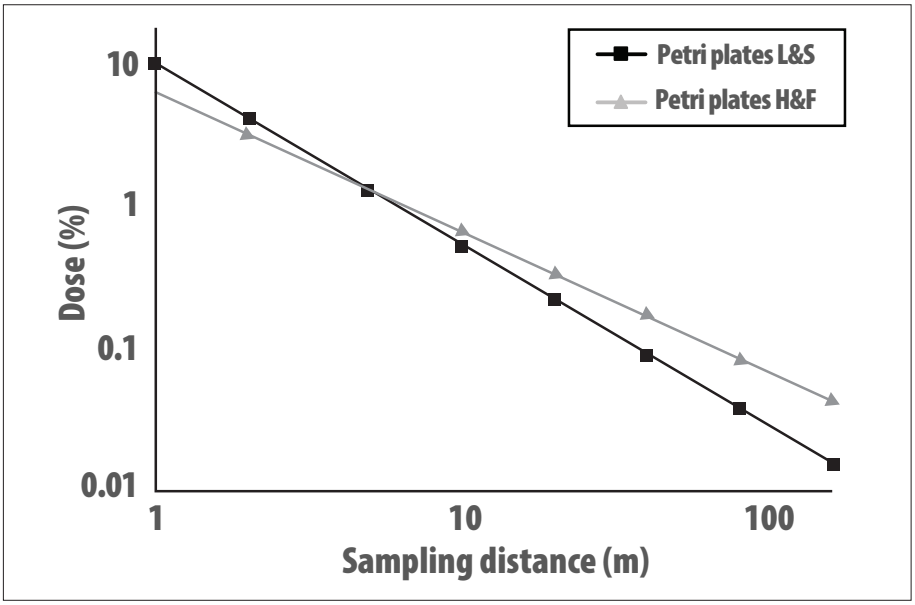
Another objective of the study was to quantify pesticide drift from a high-clearance, self-propelled sprayer. Travel speed and boom height were varied during these field-scale experiments to represent two operational conditions: "low and slow" (0.64 m boom height at 14 km/h) and "high and fast" (1.14 m boom height at 40 km/h). XtendiMax® with VaporGrip® Technology was applied to a 400 m long strip of Roundup Ready® soybeans during the 2019 and 2020 growing seasons. On-swath and downwind deposits were captured using petri plates at 1, 2, 5, 10, 20, 40, 80 and 160 m downwind. Visual damage was assessed 14 days after treatment, and seed yield and plant biomass were measured at harvest.

The general relationship between deposited drift (as a percentage of applied rate) and the distance downwind is shown in Figure 1. Despite a greater windspeed during the "low and slow" (L&S) pass, greater deposition was measured far downwind in the "high and fast" (H&F) pass.

These trials indicate that dicamba poses a significant drift risk to soybeans without dicamba resistance. The severity of the damage tended to be over-estimated by visual ratings but was nonetheless very significant. The plot trials exhibited a greater sensitivity to herbicide exposure compared to the field-scale experiments, but several possible factors were identified for future study to improve agreement between the two methods.

The reduction of travel speed and lowering the boom height reduced spray drift by approximately 50% at 40

Figure 1. Drifted dose of dicamba versus distance downwind following application using petri plate samplers.



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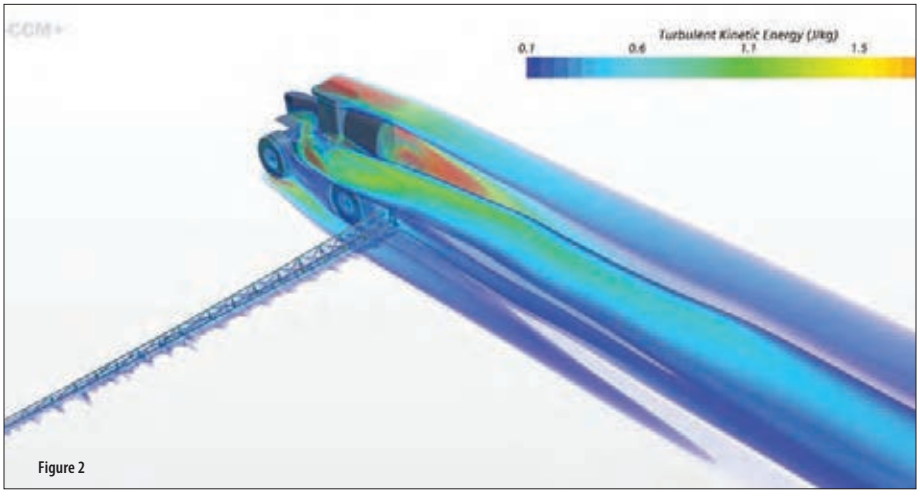

Figure 2

Figure 2. Turbulence values (TKE) around and behind the sprayer when traveling at 11 m/s with a boom height of 0.64 m.

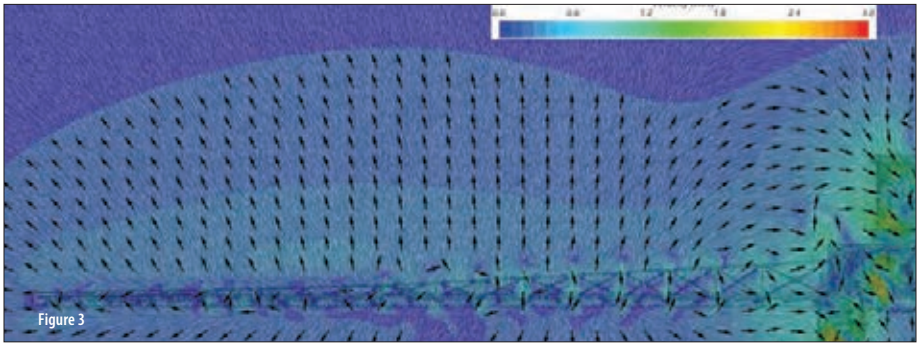

Figure 3

Figure 3. Velocity vector plots on a vertical plane 0.43 m behind the nozzles. View is from behind the sprayer looking forward traveling at 11 m/s with a boom height of 1.14 m.

to 80 m downwind of the spray swath, despite a greater windspeed during the "low and slow" application pass. These improvements may be considered additional to other practices such as the use of coarser sprays, whose benefit is already well documented.

NUMERICAL MODELING OF SPRAYER WAKES AND SPRAY DROPLET MOVEMENT

Finally, extensive computational fluid dynamics (CFD) computer simulations were conducted. First, the changes in sprayer wake features due to different operating parameters were characterized. Then, the movement of spray droplets through the sprayer wake was simulated. These simulations were in addition to field measurements of the airflow patterns around a high-clearance sprayer during operation.[1]

Regions of high turbulence were identified from the simulations. An overall view of sprayer turbulence is shown in Figure 2. Complex flow patterns were present behind the tractor unit due to the large blockage that it created, as well as behind the rear tires. The turbulence that results from these complex patterns increases the variability of the aerodynamic forces that act on the spray droplets. Furthermore, increased turbulence downstream of large obstructions on the spray boom (hydraulic cylinders, larger structural elements) was observed.

Numerical modeling enabled multiple operating conditions to be evaluated. In Figure 3, the vertical and horizontal components of air flow are visualized in an operating scenario with a high boom position (1.14 m). This scenario was compared to an operating condition with a low boom position (0.64 m). Larger vertical and horizontal components were present with the high boom, particularly near the rear tire. These components can contribute to spray droplets being directed off-target.

KEY TAKEAWAYS: REDUCING DRIFT AND ITS IMPACT

Depending on the herbicide and off-target crop, notable crop damage can occur even at small fractions of the herbicide label rate. Boom height and travel speed were both identified as influential operational factors that affect spray drift. Detrimental wake features increased in size and severity with airspeed, especially when considering the contribution of headwind. A greater boom height further increased the risk potential of spray drift due to the longer droplet travel time, the impact of the boom position on the wake structure of the sprayer and the introduction of droplets into a more severe wake near the sprayer tractor. Reducing travel speed generally reduces boom oscillations, which further enables a lower boom position to be used. As measurable yield effects were noted multiple sprayer widths downwind of the application pass, great diligence should be paid to environmental and operational conditions when spraying the headlands of a field, particularly when adjacent to a highly sensitive crop (of course, in addition to observing other buffer zone requirements per label instructions). The specifics that inform the choice of exact operational conditions of the sprayer will vary depending on a multitude of factors (wind, temperature, humidity conditions and the crop type and staging of both target and adjacent fields in combination with the applied pesticide). However, the important conclusion is that these factors be considered and adjusted for throughout the application process. ■

[1] *Paulson, I. W., Gerspacher, J., Gagnon, B. J., Landry, H., Sumner, D., & Bergstrom, D. J. (2022). Experimental Characterization of the Aerodynamic Wake of a High-clearance Sprayer with Changing Operational Parameters. Journal of the ASABE, 65 (3).*

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Supporting Soybeans In The War On Weeds

Charles Geddes, Research Scientist – Weed Ecology and Cropping Systems , AAFC - Lethbridge

BREEDING EFFORTS ARE serving up soybean varieties that are better adapted for growth in northern climates. However, weeds in these locations tend to emerge quickly and compete early – two things that are still unfamiliar to today's soybean crops. Weed communities that dominate prairie cropping systems thrive in cool environments, giving them a competitive edge over warm season crops. This can lead to herbicide-only programs in soybeans that result in large selection pressure for herbicide-resistant weeds.

Herbicide-resistant weeds are a growing issue in Manitoba and the new frontiers of soybean production. Recent surveys across the Canadian prairies have shown that the majority of kochia populations tested are now glyphosate resistant, while dicamba-resistant kochia populations are also found in the soybean-growing areas of western Canada. In addition, the overlap of canola and soybean growing areas in western Canada creates a unique issue for managing volunteer canola in soybeans, since both crops have similar herbicide resistance traits. There is a need to bolster the competitive ability of soybeans in western Canada crops to help mitigate and manage the impact that herbicide-resistant weeds have in soybeans currently, but also down the road.

A five-year research project began in 2019 to understand how agronomic practices could be used to improve the competitive ability of soybeans grown in western Canada. This project, funded by Manitoba Pulse and Soybean Growers, Western Grains Research Foundation, and the Governments of Manitoba and Canada through the Canadian Agricultural Partnership, set out to provide soybean farmers with recommendations on how to support soybeans in the "war on weeds".

Preliminary insights from the first three years of research show how agronomic decisions can aid weed management in prairie soybean production.

VARIETY SELECTION

Genotype by environment interactions suggest the optimal soybean genetics in one region will differ from those in another. However, across six site-years of research in Portage la Prairie, MB (2019 and 2020), Saskatoon, SK (2019 and 2020), and Lethbridge, AB (2019 and 2020), the highest-yielding soybean varieties under weed-free conditions within each location also tended to have the highest yield under weed competition. This is good news for soybean farmers because it suggests that breeding efforts aimed at improving soybean yield have not compromised the traits that lead to a competitive crop. Another observation was that growing a bushy soybean variety resulted in greater yields under both weedy and weed-free conditions compared with a slender variety at one of three research sites.

PLANTING DATE

A study comparing different soybean varieties planted early (May 13-22), mid (May 23-June 1) or late (June 2-11) showed that the impact of planting date on weed competition varies among locations, and depends on the timing of weed pressure. For example, about 18% greater soybean yield loss was observed due to weeds emerging after an early planting date compared with mid or late planting dates in one of two years in Lethbridge, AB. In Saskatoon, SK, however, about 20-30% greater yield losses were observed in both years when planting later, while differences were absent in Portage la Prairie, MB. In another study, soybean yield losses were greater when soybeans was planted early compared with mid in two of three environments. Weed density and biomass were also greater in early-planted soybeans compared with mid in all three

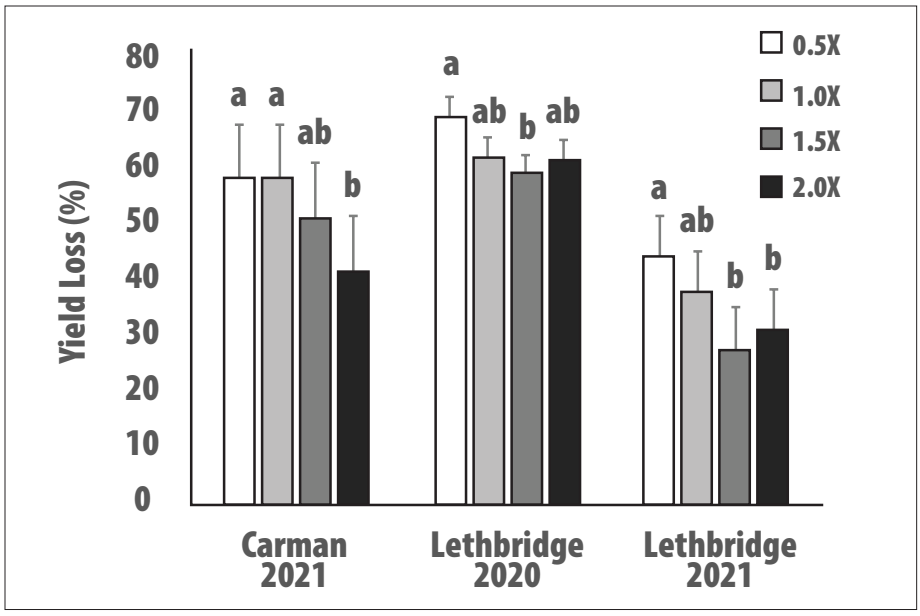


Figure 1. Soybean yield loss due to weeds when planted at target densities equivalent to 0.5X (80,000 plants/ac), 1.0X (160,000 plants/ac), 1.5X (240,000 plants/ac), and 2.0X (320,000 plants/ac) the recommended density. Different letters within each environment indicate significant differences (p = 0.05).

environments. These results suggest that the impact of soybean planting date on weed competition varies depending on the timing of weed emergence within the field, which is often related to the accumulation of growing degree days and the timing of precipitation events.

ROW SPACING

One study showed that growing soybeans in narrow (9 inch) compared with wide (27 inch) rows resulted in greater yield both in the presence and absence of weeds in two of two years at Lethbridge, AB, but not in Carman, MB (7.5 vs. 30 inches).

SEEDING RATE

Data from Carman, MB (2021) and Lethbridge, AB (2020 and 2021) showed that increasing soybean target densities from current recommendations (160,000 plants/ac) could make the soybean crop more tolerant of weed competition (Figure 1). For example, soybean yield losses were lowest when targeting a very high density of 320,000 plants/ac in Carman, MB, while in Lethbridge, AB, yield losses were lowest when planted at 240,000 plants/ac. Current recommendations for soybean target densities (160,000 plants/ac) resulted in similar yield loss to that of half (80,000 plants/ac) of the recommended target density. These results suggest that higher soybean densities could help to maintain soybean yield when competing with problematic weeds.

COVER CROPPING

Planting soybeans in narrow (7.5-9 inch) rows into a fall rye cover crop terminated with the pre-plant burndown herbicide halved mid-season weed biomass, compared with wide (24-30") row soybeans without a cover crop. This result was observed across four sites in Carman, MB (2021), Indian Head, SK (2021), and Lethbridge, AB (2020 and 2021). These results suggest that both fall rye cover cropping and narrow soybean rows could interact to help improve the competitive ability of soybeans grown in the Canadian prairies. However, further research is required to determine the potential impact of the cover crop on soybean yield in the presence and absence of weed competition.

Overall, the first three years of this prairie-wide research project have started to uncover which agronomic tools could aid weed management programs in soybean production. However, the efficacy of many of these cultural weed management tools varied depending on the location. It is therefore critical to use these non-chemical practices in combination to help improve the potential weed management benefits of a competitive soybean crop.

INTEGRATED WEED MANAGEMENT

Integrated weed management principles suggest that the use of multiple diverse weed management practices can add up, leading to reduced selection pressure for resistance to a single weed control tool (such as herbicides). This means that the weed management strategies discussed above should be implemented in combination to achieve the greatest benefit. It is noted that many of these options require additional investment in weed control programs, which can be difficult to pencil out if economics of the farming operation are considered only on a year-to-year basis. Rather, proactive investment in the form of integrated weed management takes a longer-term focus on the health of farming systems, suggesting that a small investment in integrated weed management today could help prevent the necessity for large investments down the road. ■

Chewers, Sap-Suckers and Root Feeders

Insects in Pulse and Soybean Crops in 2022

John Gavloski, Entomologist, Manitoba Agriculture

WEATHER WAS ONCE again a big factor in how insects interacted with pulse and soybean crops. Seeding was quite late in many areas this year, mainly because of excessive rainfall and overland spring flooding in some areas. This resulted in some crops remaining in susceptible stages to some insect pests later in the season than normal. Few insect issues were reported for dry beans this year, and pea aphids were the main insect concern in peas. Soybean aphids and grasshoppers were the main insect concerns in soybeans. The range and levels of pea leaf weevils continues to be tracked.

Pea aphids and soybean aphids are very different in how they colonize peas and soybeans respectively,as are the levels of each that are considered economical.

A PLETHORA OF PEA APHIDS

Levels of pea aphids were high in many fields of peas, with insecticide applications occurring in many fields. Aphid feeding on peas in the flowering and early pod stage can cause lower yields due to less seed formation and smaller seed size. Protein content and other quality issues do not appear to be affected.

Sampling and thresholds: Sampling to determine aphid levels should be done when about 50 to 75% of the pea plants are in flower. The economic threshold is two to three aphids per 20 cm plant tip, or nine to 12 aphids per sweep (90 to 120 aphids if doing a 10-sweep sample). If the economic threshold is exceeded, a single application of insecticide when about 50% of plants have produced some young pods will protect the crop against yield loss and cost-effective. Most of the damage that aphids do to peas is to the pods before they start to fill. If most of the pods have already started to fill, spraying would be too late to have an economic impact.

Pea aphid on alfalfa

SUPERFLUOUS SOYBEAN APHIDS

The first report of any soybean aphids was on July 5. Soybean aphids reached economic levels and control was needed in some fields in August. There were reports of insecticides being applied for soybean aphids in the Eastern, Interlake and Central regions. Until this year, soybean aphids had not been at economic levels in Manitoba since 2017.

Thresholds to use for soybean aphids: The action threshold for soybean aphids (where insecticide application is recommended to prevent economic loss) is:

- 250 aphids per plant on average,
- and the population is increasing,
- and the plants are in the R1 (beginning bloom) to R5 (beginning seed) growth stages.

The reason that "and the population is increasing" is part of the threshold is because the economic injury level, where control costs will equal yield loss, is actually about 670 aphids per plant. The action threshold, where control is suggested, has been set much lower than 670 to allow time for an insecticide to be applied before increasing populations could potentially reached 670 per plant. The population doubling time for soybean aphids is on average about seven days.

Should the action threshold for soybean aphids be adjusted for higher crop values?

There was some discussion this year on whether the economic threshold for soybean aphids should be adjusted because of the high price of soybeans, but this was discouraged.

When the value of the soybean crop has increased or is high, it is not advised to use an action threshold below 250 per plant and the population increasing. There is already a large gap between the economic injury level and the action threshold suggested. Setting an action threshold at lower aphid densities increases the risk to producers by treating an aphid population that is growing too slowly to exceed the economic injury level in seven days, eliminates generalist predators, and exposes a large portion of the soybean aphid population to selection by insecticides, which could lead to the development of insecticide resistance. Continue to use the action threshold presented above.

Soybean aphids

Hover fly larva and aphid mummies

Natural enemies such as lady beetles, hover fly larvae and aphid mummies, which are parasitized aphids, were noticed in some pea and soybean fields. Where

Dead grasshoppers infected with Entomophaga grylli

these are abundant, consider them in your decisions since they can regulate aphid populations to below economic levels.

GRASSHOPPERS GALORE, BUT SOME GOOD NEWS

Grasshopper levels were once again high in many areas. There were reports of insecticide applications to control grasshoppers in soybeans from the Southwest, Central and Interlake regions. Some of the applications were to borders, and in other instances whole fields were treated.

Late in the season, a high level of infection by a pathogenic fungus, called *Entomophaga grylli*, was noticed in grasshopper in some areas. This fungal pathogen results in dead grasshoppers left clinging to the stems of plants. It is most effective under warm, humid conditions.

Pea leaf weevil larvae on roots

Photos by Laura Schmidt – MPSG

A very high level of infection by *E. grylli* was noticed in a canola field in the Central region near MacGregor. Many dead grasshoppers were easy to spot clinging to tops of the plants as you looked over portions of the field, and the dead grasshoppers were so thick that in some areas they were found clinging to other dead grasshoppers. Hopefully this pathogen results in some lower levels next year in areas where it was abundant.

Some predators of grasshoppers, such as certain species of blister beetles and bee flies, were also abundant in some areas, which could help regulate levels somewhat. There are many species of both blister beetles and bee flies, and the larvae of some species of both these groups specialize in feeding on grasshopper eggs.

PEA LEAF WEEVIL SURVEY

Hollowed-out nodule

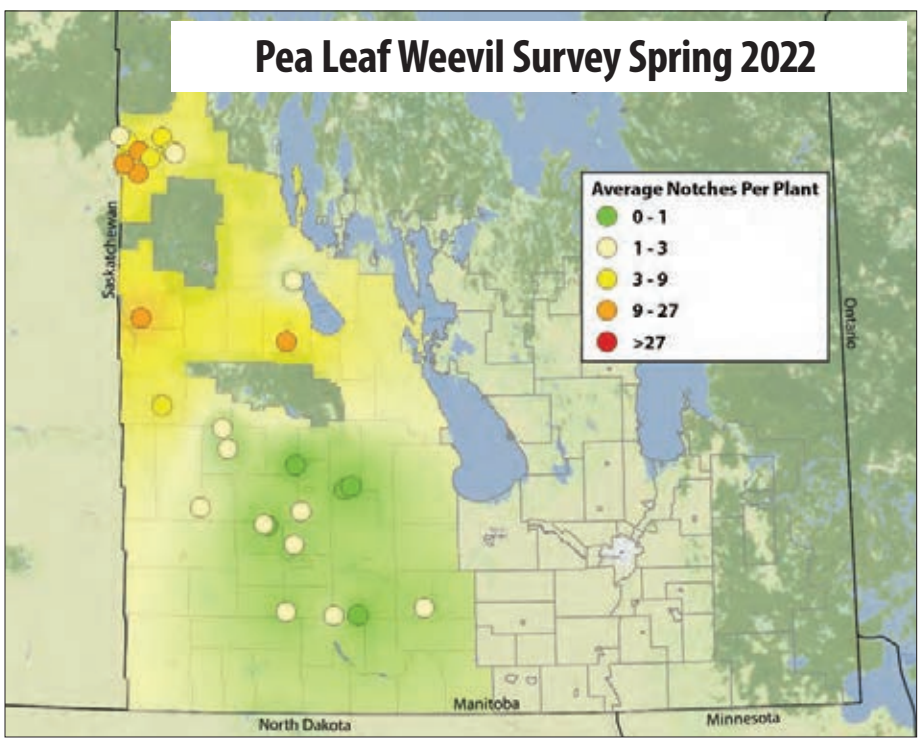
Larvae of pea leaf weevil feed on the nodules on the roots of pea and faba bean plants, and if there is excessive feeding, the reduction in nodules can lead to the plants failing to fix enough nitrogen. Pea leaf weevil was found in Manitoba for the first time in 2019, after an agronomist in the Northwest region sent in a sample for identification. In 2020 and 2021, pheromone-baited pitfall traps for pea leaf weevil and samples collected by agronomists were used to determine range and relative levels. Pea leaf weevils were only found in the Northwest in 2020, but the known range expanded considerably in 2021. In 2021, pea leaf weevils were found in some areas of the Southwest and Central regions, as far east as fields near Cyress River and Holland.

In 2022, a survey was done when peas were in the 2nd to 6th node growth stages. The survey counted the number of crescent-shaped notches in the leaves made by the adult weevils. This helped determine the relative abundance of pea leaf weevil in various regions. The map bottom-left shows the results.

Highest levels of pea leaf weevil are currently in the Northwest region, although how economical these populations are is uncertain.

Regular crop scouting is essential to ensuring insects and other potential pests do not do economic damage to your crop. Stay vigilant for grasshoppers and pea aphids, and if insects arrive from the south, such as soybean aphid, we will update you through the Manitoba Crop Pest Updates.

> Anyone interested in participating in the pea leaf weevil leaf notching survey, or who suspects that they have found pea leaf weevil in an area outside their known range, please contact John Gavloski, at Manitoba Agriculture, or Laura Schmidt at MPSG. ■



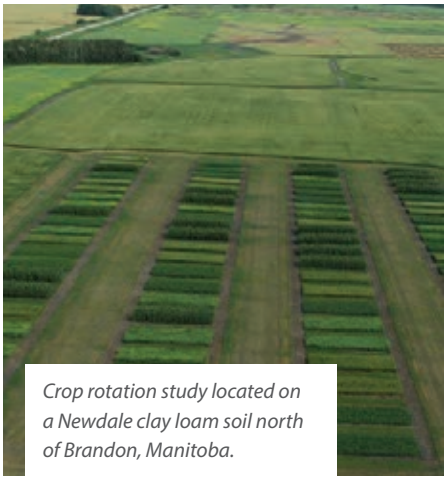
Emerging Crop Rotations for Western Canada

Ramona Mohr, Research Scientist, AAFC - Brandon

MANITOBA CROP ROTATIONS have changed significantly over the last 20 years. While the eastern prairies were once dominated by cereals and canola, Manitoba is now second only to Ontario in soybean production with roughly 1.1 million acres grown in 2022, a five-fold increase in seeded acreage compared to 15 years ago. With the availability of better-adapted varieties, soybeans have also made some inroads further west in recent years, with Saskatchewan soybean acreage peaking at 850,000 acres in 2017 before declining to 45,000 acres in 2022, and small amounts of soybeans also grown in Alberta. Although corn has not seen the same level of growth as soybeans, grain corn acreage in western Canada has roughly doubled over the last fifteen years, from 210,000 acres in 2007 to more than 414,000 acres in 2022, with more than 90% grown in Manitoba.

Diversifying rotations with corn and soybean is not a new idea for western Canada. In the early 1980s grain corn acreage in Manitoba was more than 200,000 acres, not reaching this level again until 2003. Soybean acreage also reached a peak of about 16,000 acres in south-central Manitoba in the early 1980s before declining. Although not successful then, better adapted varieties combined with a warming climate may provide new opportunities for expanded production in western Canada.

Establishing new crops in non-traditional growing areas is not without its challenges. Less than ideal growing conditions, agronomic and pest issues, and uncertainty about how best to fit these new crops into existing rotations can present production and economic risks. Although a significant amount of crop rotation research has been done across western Canada over the last century or more, relatively little information was available about corn and soybeans due to their limited acreages.



Crop rotation study located on a Newdale clay loam soil north of Brandon, Manitoba.

In 2018, a series of crop rotation experiments were initiated across western Canada to gain a better understanding of the risks and benefits of including soybeans and/or corn in rotation with wheat and canola. As part of this project, seven rotations are being studied at each of Brandon, Indian Head, Saskatoon and Lethbridge: wheat-canola, soybean-corn, soybean-wheat-canola, corn-wheat-canola, corn-soybean-wheat, corn-soybean-canola, corn-soybean-wheat-canola. In this study, all crops are direct-seeded into stubble, and grown using best management practices. Soybeans are is seeded whereas corn is grown as a row crop.

Researchers from five AAFC research centres and three western Canadian universities are working together to investigate the effects of these rotations on yield and quality, disease, weed pressure, soil health, nutrient cycling, mycorrhizal colonization, profitability and economic risk, and to assess the weather-related risks and opportunities of growing corn and soybeans in western Canada. Effects of rotation length, the combination of crops grown in rotation, and the sequence of crops in rotation on agronomic and economic performance are being studied. One of the longer-term goals of this research will be to use data from this project, together with results from other crop rotation studies in western Canada, to develop a crop rotation economic calculator that will allow producers to compare current standard rotations with new and emerging rotation options.

The end of the 2022 growing season marked the first time since the crop rotation project started that all rotations have completed a full rotation cycle, and also the first year that soil quality will be assessed in each rotation. The aim over the next few months will be to analyze the information collected so far to see how the various rotations have performed to date. Preliminary results from the first few years of the study have shown occasional effects of preceding crops on yield and seed quality, but these effects have generally been inconsistent across sites and years. Similarly, although root diseases have been detected, no strong trends related to rotation treatments have emerged at this point. These limited effects are not necessarily surprising in that changes in the plant-soil system related to rotation often tend to occur slowly over time as rotations mature.

Recent years of this study have also demonstrated some of the weather-related challenges of growing soybeans and corn in western Canada. Although the Brandon site has generally had adequate growing season moisture and timely rains, dry conditions in Saskatchewan significantly reduced soybean and corn yield potential at Indian Head and Saskatoon in some years. In 2019, cold wet fall conditions combined with an early snowfall delayed corn and soybean harvest at some sites, while, at Saskatoon, the corn did not mature and no grain was harvested. The implications of these effects in terms of net revenue and economic risk at the various locations are being assessed.

The aim going forward is to try to continue these experiments for at least another five years in order to determine the longer-term performance of the various rotations. Because effects of rotation on the plant-soil system tend to accumulate over time, whether in the form of changes in soil quality, root disease pressure, or other factors that may affect crop productivity, rotations that provide the best economic returns in the short term may not necessarily be the most productive and sustainable in the longer term. Understanding how rotations perform and change over time, not only in terms of yield and economic returns, but also in terms of disease and weed pressure, soil quality, nutrient cycling, and other factors, will help to identify those rotations that reduce production risk and optimize economics over the longer term. ■

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Dry Bean Narrow-Row Production Guidelines

FIELD SELECTION

Moisture

Dry beans are susceptible to excessively wet soils or waterlogging. Choose fields that are well-drained with medium to coarse texture. Under optimum soil moisture conditions, dry beans will use 12–15 inches of water.[1]

Salinity

Dry beans are less tolerant to salinity than soybeans. Select fields with soluble salt levels below 0.8 mmho/cm.[2]

Crop Rotation

Dry beans are most commonly grown following cereals, corn or canola. Recent research in Manitoba found that preceding crop (wheat, corn, canola) did not affect pinto bean yield, suggesting there is flexibility in the placement of dry beans in rotations.[3] According to MASC data, navy beans grown on spring wheat or corn stubble have reported a 111% yield response and an 89% yield response following canola.[4] One risk associated with growing dry beans following canola is white mould sclerotia carryover.

VARIETY SELECTION

Pinto, navy and black beans are the most common market classes grown in narrow-row (<15 inches) production in Manitoba. Select varieties with upright growth habits and higher pod heights that are better suited to straight cutting. Dry beans require 105–120 frost-free days from planting to maturity. See the MPSG *Pulse and Soybean Variety Guide* or *Seed Manitoba* for days to maturity, yields and disease tolerance ratings.

SEEDING

Residue Management

Dry beans may be successfully grown in conventional, minimum or no-till systems, provided that the previous crop residue is standing or well distributed. If the preceding crop was corn, seed between the corn rows to avoid root balls. Recent research found pinto bean yields and plant stands to be similar under direct-seeded and tilled conditions. At two of six site-years under dry seeding conditions, direct seeding improved yield by 10–17% compared to tilled stubble.[3]

Seeding Date

Plant dry beans during the third and fourth weeks of May or in early June into warm soils. Dry beans are susceptible to cool soils and late spring frosts. The minimum temperature for dry bean germination is 12°C, while warmer soil temperatures (≥15°C) will result in faster emergence.

Target Plant Stand and Seeding Rate

Target plant stand (live plants/ac) varies by market class (Table 1). Adjust seeding rate (seed/ac) to account for expected seed survival. Conduct a soak test to inform seed survival by submerging seeds and calculating the percentage that swell or lose their seed coat. Assess plant stands during early vegetative stages to inform future seeding rate decisions.

TABLE 1. TARGET PLANT STAND FOR EACH DRY BEAN MARKET CLASS WHEN GROWN ON NARROW (<15 INCHES) ROWS.

MARKET CLASS	TARGET PLANT STAND (live plants/ac)
Pinto[5]	90–120,000
Navy[5,6]	> 115,000
Black[6]	90–120,000

Seeding rates must account for germination, expected seed survival and seed size to achieve target live plant stands. For example, to result in a living plant stand of at least 115,000 plants/ac with 95% germination and 85% expected seed survival, at least 142,000 seeds/ac need to be planted. For navy beans with a seed size of 2,200 seeds/lb, this means a seeding rate of at least 65 lbs/ac.

Mechanical Damage

Baldheads, or seedlings without growing points, are caused by mechanical damage to the seed. Use seed that has greater than 14% moisture, minimize seed handling and opt for gentle handling techniques when available (e.g., conveyors instead of augers).

If using an air seeder, increase the seeding rate to account for losses from more mechanical seed damage. Reduce fan speed and ground speed while maintaining proper seed distribution.

Seeding Depth

Seed dry beans between 0.75–1.5 inches deep, placing seeds into moisture. Dry beans pull their cotyledons above-ground like soybeans and are sensitive to deeper seed depths.

Rolling

Rolling is more common in dry beans if you are planning to direct harvest. Soil clods and stones are pushed down, allowing for lower cutting heights at harvest. It is best to roll dry bean fields before emergence. If rolling after emergence, target the unifoliate (VC) to first trifoliate (V1) stage, roughly 10–13 days after emergence, and roll during the hottest part of the day (>25°C) when plants are most flexible. Be careful to avoid the hook stage (VE) as beans emerge since broken stems will not recover.

CROP NUTRITION

Inoculant

Dry beans are relatively poor nitrogen fixers, so they are typically fertilized like a non-legume crop. However, recent research has showcased the ability of dry bean crops to nodulate. Further investigation is underway in Manitoba on inoculants for dry beans containing *Rhizobium leguminosarum biovar phaseoli*.[3] To date, these inoculant products have not been widely available.

TABLE 2. AVERAGE DRY BEAN NUTRIENT UPTAKE AND REMOVAL RATES.[8]

NUTRIENT	REMOVAL	
	lbs nutrient/cwt seed	lbs/ac*
Nitrogen (N)	3.0–3.5	54–63
Phosphorus (P_2O_5)	1.1–1.4	20–25
Potassium (K_2O)	1.9–2.1	34–38
Sulfur (S)	0.2	4

*Based on a 1,800 lb/ac dry bean crop.

continued ➤

Fertility

Roughly 4.5 lbs N/cwt of yield are required for plant uptake, derived from a combination of residual soil nitrogen (N), biological N fixation or N fertilizer. Nitrogen recommendations are currently under review for Manitoba. Emerging guidelines suggest targeting 70 lbs total N/ac as a combination of soil residual N and fertilizer N.[3]

The maximum safe rate of seed-placed phosphorus (P) is 10 lbs P_2O_5/ac in rows <15 inches and none in wide rows. North Dakota State University (NDSU) research at Carrington (2012–2017) has shown that in-furrow applied 10-34-0 at rates of 2–3 gpa increased yield by 11% compared to the untreated check.[7] There were no differences between in-furrow and banded applications, while broadcasted and mid-row banded applications did not increase yield relative to the check.

PEST MANAGEMENT

Insects

Monitor for wireworms, seedcorn maggots and cutworms from May to June. Most insecticide seed treatments only protect against wireworms and seedcorn maggots. Assess the need to use these products on a field-by-field basis.

Scout for leaf and pod feeding insects such as grasshoppers, green cloverworms and potato leafhoppers from June to August. Also watch for lygus bugs in navy beans as they can cause quality loss. Western bean cutworms have not been confirmed in Manitoba.

Weeds

Dry beans are poor competitors against weeds and herbicide options are limited. Particular attention must be paid to weed control to minimize seed staining and downgrading at harvest. Start by selecting fields with low perennial weed pressure. Maximize crop competitiveness by utilizing narrow row widths, adequate seeding rates and appropriate fertility. Layer herbicides using a pre-emergent option with residual activity and timely post-emergent applications to target weeds while they are small.

DISEASES

Dry beans are susceptible to the root rot complex, including *Fusarium* spp., *Pythium* spp. and *Rhizoctonia solani*. Fungicide seed treatments can offer protection from these diseases for up to three weeks after planting.

Scout for foliar and stem diseases from July to early September. The main yield-limiting disease of concern is white mould (*Sclerotinia sclerotium*) when weather conditions are conducive for its development (high humidity and cool summer temperatures) during dry bean flowering. Foliar fungicides for this disease are purely preventative, meaning they must be applied before symptoms are visible. Fungicides work best when maximum coverage of flower blossoms is achieved at the R2 (early pin bean) stage. Use the *Fungicide Decision Worksheet for Managing White Mould in Dry Beans* to determine if a fungicide application may be beneficial.

The most common foliar disease in dry beans is caused by the bacterial blight complex (including common bacterial blight, halo blight and bacterial brown spot), which often infects plants following damage from strong storms, high winds or machinery. Severity levels are often low and infrequently yield limiting. Foliar products are available, but their effectiveness has been variable.

Bacterial Blight

White Mould

HARVEST

Direct harvest (straight cutting) or swathing are the most common harvest methods for narrow-row production with upright-type varieties. Dry beans are often swathed or desiccated to dry down the crop and manage green plant material to avoid seed staining and downgrading.

Swathing and desiccation timing are the same, targeting when at least 80% of the field has reached R9 (full maturity) and seeds have dried down to <30% moisture in the least mature parts of the field. Consult the *Dry Bean Desiccation and Harvest Guide* for proper staging and pictures.

Dry beans are ready for harvest at 16–18% seed moisture, within a week after swathing and 7–10 days after desiccation. The safe storage moisture for dry beans is 16%.

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Weed Control

Field peas are an excellent rotational crop for an organic system. Effective weed control is critical to maximize yield and grain quality of an organic pea crop. Peas are naturally poor competitors with weeds and yield loss can be as high as 80% in the absence of effective weed control.[1] For organic field peas, three strategies will help maximize weed control:

1. Establish a competitive plant stand.
2. Ensure timely and effective mechanical weed control.
3. Intercrop peas to increase competition with weeds.

1. ESTABLISH A COMPETITIVE STAND

Field Selection

Crop rotation influences the competitive ability of a pea crop. Field peas should follow dissimilar crops, like cereals or oilseeds, as they generally yield best when grown after competitive crops such as winter/spring wheat or barley.[2] Select fields where good control of aggressive perennial weeds, like Canada thistle and quack grass, has been achieved.

Nutrient management will help improve the competitive ability of peas. Ensure phosphorus and potassium are adequately supplied prior to growing peas. Inoculate with *Rhizobium leguminosarum* bacteria, even on fields with a history of peas, to facilitate biological nitrogen fixation.

Seeding Date and Soil Temperature

One challenge facing organic systems is to balance seeding timing with spring weed control. It is optimal to seed peas from late April to mid-May, as they are tolerant of cool soil temperatures and spring frosts. This seeding window promotes early emergence, which improves crop competition against weeds. Later seeding may be necessary if pre-plant tillage for weed control is required, as you should seed into a clean field. However, planting in late May or early June can reduce yield by >20%.[3]

Seed Quality

Using #1 certified seed ensures high germination, purity and low cracked seed coats. This will support rapidly emerging seedlings that are healthy, vigorous and competitive with weeds. If using saved seed, send it to a lab to test for germination.

Target Plant Stand and Seeding Rate

Semi-leafless peas do not readily tiller or branch like crops such as cereals. This magnifies the importance of establishing a plant stand that can compete with weeds. Target 120 live plants/m^2.[4] Adjust the seeding rate to account for expected seedling survival, germination and thousand seed weight (TSW), which varies by variety and seed lot. Adjust survival based on expected plant stand loss from in-crop mechanical weed control. Expected loss from mechanical weed control is in addition to the normal survival loss. Plant stand loss will vary by implement, its settings and crop staging. In-crop tine harrow and rotary hoe applications will cause greater plant stand losses as they are non-selective, affecting both the crop and weeds. Versus an inter-row cultivator that is selective and cultivates weeds between crop rows, causing less crop damage.[5]

SEEDING RATE (lbs/acre)

$$\frac{\text{TSW (g/1,000 seeds)} \times \text{Target Plant Population/m}^2}{\text{(Seed Germination \% (e.g., 0.95)} \times \text{Expected Survival \% (e.g., 0.85)} \times 100)} \times 0.89$$

Note: Under ideal conditions (soil >5°C average, ideal moisture), an estimated 85% of seeds will result in a plant. If soil temperatures are averaging <5°C for the first 21 days the peas are in the ground and/or soil moisture is excessively wet or excessively dry, seed survivability can drop to 60% or lower, even with >90% lab tested seed germination.

Seeding Depth

Rapid and uniform emergence will help pea seedlings compete with emerging weeds. Prepare a firm seedbed and ensure good seed-to-soil contact when planting. Seed 1.5–2 inches deep, but under dry conditions, peas can be sown deeper to reach soil moisture. Ensure the seed is placed half an inch into moisture.

2. TIMELY AND EFFECTIVE MECHANICAL WEED CONTROL

The critical weed-free period in peas, which is the duration of time a crop must be kept weed-free to minimize yield loss, is the first two weeks after emergence. Pea yield can be reduced by up to 25% if weed control is delayed until four weeks after emergence.[6]

There are several options for the timing and method of mechanical weed control and field peas are surprisingly tolerant to in-crop methods. Multiple passes are often necessary to obtain acceptable weed control.[1] The optimal timing and method will depend on environmental conditions, weed and crop staging and access to equipment.

The optimal weed staging for the rotary hoe and flex tine harrow is the white thread stage. To identify this stage of weeds, move the top surface of the soil around by hand—the weeds will be white and tender and not yet exposed to sunlight. This is the staging just before emergence when weeds can easily be injured by mechanical weed control.[5] Generally, the smaller the weed, the easier it is to control, and the larger it is, the more challenging it is to uproot or bury. Ideal conditions are dry soil surfaces and hot, sunny conditions when the pea plants are more flexible and uprooted weeds can dry out easily. Stop and inspect often to ensure weeds are controlled and crop damage is minimized.

Pre-Plant

A variety of tillage tools can be used once or multiple times before planting to control early emerging weeds. Depending on soil moisture conditions, tillage can dry soils to seed depth, leading to delayed and uneven emergence. A good rule of thumb for tillage depth is as deep as necessary and as shallow as possible.[7] Tool selection should be governed by the size and type of weeds being controlled. For instance, annual weeds can be controlled with flex tine harrows or a rotary hoe operating at shallower depths. Larger weeds will likely require a cultivator set to deeper depths. Seeding should follow as soon as possible after the final pre-plant tillage pass to increase the likelihood that the crop will emerge ahead of newly germinating weeds.

continued

Pre-Emergent

After seeding but before crop emergence, a rotary hoe or flex tine harrow can effectively control small-seeded annual weeds. To maximize performance, ensure weeds are at the white thread stage (Figure 1). The rotary hoe is most effective in fields with heavy crop residues. With either tool, adjust the working depth so that germinating peas are not damaged.

Early Post-Emergent

The rotary hoe has a narrow post-emergence window. Effective weed control is achieved until the first leaf stage in grassy weeds and the cotyledon stage in broadleaf weeds. A rotary hoe can be used up to the emergence (VE) stage in peas and controls weeds within and between crop rows.[5]

Flex tine harrows can be used up to the 5th true node stage in peas and can control weeds up to the cotyledon stage within and between crop rows.[5] Tine harrows can be adjusted by their angle, speed and depth. Adjusting the tine harrows at 45° has shown reduced crop injury and improved weed control. Settings should account for crop and weed staging, weed populations and impact on plant stand.[5]

Figure 1. A post-emergent rotary hoe pass in peas with weeds uprooted at the cotyledon and white thread stages.

Late Post-Emergent

Post-emergent mechanical weed control should occur during the heat of the day when pea plants are most pliable and least likely to be damaged.

Inter-row cultivation can be used from the 5th–10th true node stages in peas prior to row closure, and requires mechanical or electronically guided equipment to prevent crop damage.[1] It is more effective at controlling larger weeds than a tine harrow or rotary hoe between crop rows but provides little control of weeds located within the row.

Late post-emergent inter-row cultivation in peas (left) versus no cultivation (right).

3. INTERCROPPING

Intercropping, the practice of growing two or more cash crops together, increases pea competition against weeds by providing additional ground cover. Peas seeded with cereal crops like oats or barley can support earlier seeding by competing with wild oats. Seeding peas with mustard is more suitable for suppressing warm-season weeds in fields with low wild oat pressure.

Keep a Weed Control Journal

Mechanical weed control in field peas is as much an art as it is a science. The success of a weed control operation is determined by factors including (but not limited to) weed species present, crop and weed growth stages, machinery settings, tractor ground speed, the weather and soil conditions during operation. These factors can change during an operation, requiring adjustments to ensure performance. Keep a detailed weed control journal to document your experiences, including plant stand reductions from each mechanical weed control operation to fine-tune your seeding rate. This will be an important reference to help you build the knowledge and skills needed for consistent weed control success each year.

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Field Pea Insect and Disease Identification Guide

DISEASES

Aphanomyces root rot

Photo: Syama Chatterton, AAFC

Root rot and seedling diseases – *Pythium, Rhizoctonia, Fusarium*

Environmental damage
– physiological, not a pathogen

Fusarium wilt

Photo: Alberta Pulse Growers

Mycosphaerella (Ascochyta) blight

Bacterial blight

White mould

Photo: Alberta Pulse Growers

continued ➤

Downy mildew

Powdery mildew

Photo: Alberta Pulse Growers

INSECTS

Pea leaf weevils

Wireworms

Pea aphids

Cutworms

Grasshoppers

Lygus bugs

Photo: Tharshi Nagalingam

Refer to the *Field Pea Insect and Disease Scouting Calendar* for scouting timelines and pest impact on yield and quality.

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May 2022

Recipe Corner

Black Bean Enchilada Casserole

COURTESY OF MPSG

SERVINGS: 10-12 | PREP TIME: 30 min
COOK TIME: 45 min | TOTAL TIME: 1 hour, 15 min

INGREDIENTS

Homemade Enchilada Sauce (makes 3 cups/750 mL):

- 1 Tbsp (15 mL) canola oil
- 2 tsp (10 mL) sugar
- 1 medium onion, diced
- ½ tsp (2 mL) garlic powder
- 3 cloves garlic, minced
- ½ tsp (2 mL) dried oregano
- 3 Tbsp (45 mL) chili powder
- 2 8 oz cans tomato sauce
- 2 tsp (10 mL) cumin
- 1 cup (250 mL) water
- ½ tsp (2 mL) cayenne powder

Casserole:

- 8 flour tortillas
- 2 19 oz cans black beans, drained and rinsed
- 1 12 oz can corn, drained
- 2 bell peppers, diced (green, red, yellow, orange)
- 4 cups (1 L) grated cheese – marble cheddar & Monterey jack
- 3 cups (750 mL) enchilada sauce (see recipe left)
- 1 Tbsp (15 mL) jalapeño sauce/hot sauce (optional)

METHOD

Casserole

1. Drain and rinse black beans, one can at a time. Add one can to a large bowl and mash slightly to break the beans up.
2. Add the other can of beans, diced peppers, corn and stir. Set aside until ready for assembly.
3. Grate cheese into large bowl. Set aside until ready for assembly.

Enchilada Sauce

The sauce will keep in the fridge for up to five days in an airtight container and will keep in the freezer for up to three months.

1. Heat oil in large skillet. Add onions and sauté until translucent, about 5 minutes.
2. Add garlic, chili powder, cumin, cayenne powder and sugar. Cook until fragrant, about 30 seconds.
3. Add garlic powder, oregano, tomato sauce and water. Bring to a simmer and cook to thicken, about 5 minutes.
4. Set aside until ready to use.

Assembly

1. Preheat oven to 375oF (190oC) and grease a 9” x 13” dish.
2. Place about ½ cup (125 mL) of sauce on the bottom of the prepared dish. Cover with 4 tortillas, making sure the sides of the dish are covered as well.
3. Add another ½ cup (125 mL) of sauce and spread over tortillas.
4. Add half the bean mixture and cover with ⅓ of grated cheese.
5. Cover with 2 tortillas, repeat with ½ cup (125 mL) sauce.
6. Add the remaining bean mixture and another ⅓ of the cheese.
7. Cover with 2 tortillas, remaining sauce and remaining cheese.
8. Bake in preheated oven for 45-50 minutes until golden brown and bubbly. sLet stand about 10 minutes before cutting and serving.

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