April 2018

PULSE•POINT

BEST PULSE AGRONOMY FOR 2018

Considerations for a Dry, Dry Year
Coming off a record dry year and a dry winter means planning now for soil moisture retention

The Protein Problem
Some soybean crops in Saskatchewan are struggling to make the minimum protein

Improving Pulse Crop Storage and Profitability
Long-term storage options for peas and lentils

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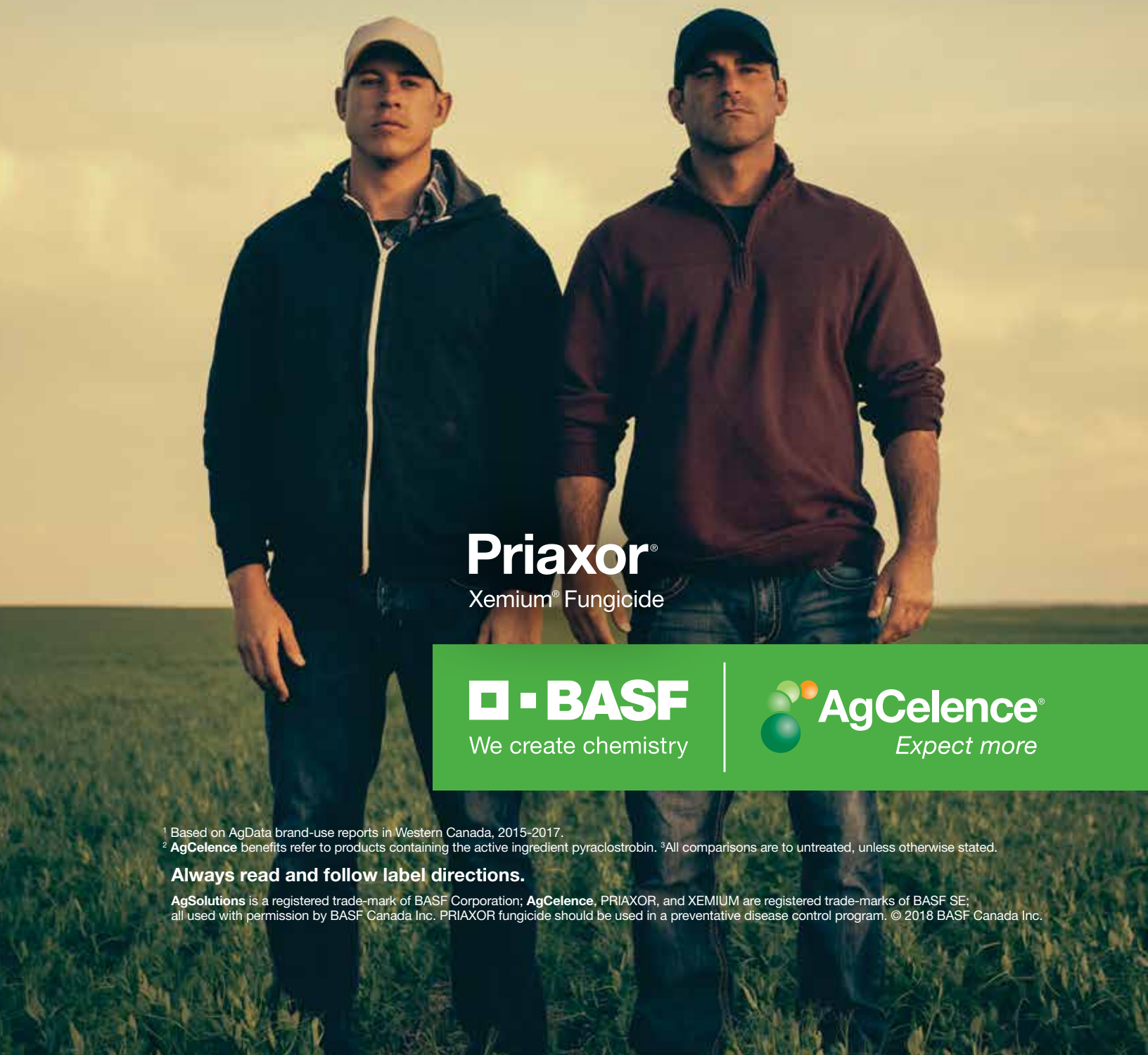

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Chair's Message

The way forward in pulse variety development

BY COREY LOESSIN

SASKATCHEWAN PULSE GROWERS (SPG) is in the early stages of making important decisions related to pulse crop variety and breeding.

The current pulse crop breeding agreement with the University of Saskatchewan's Crop Development Centre (CDC) is nearing its expiry date of September 30, 2020. This has been, and continues to be, a very influential arrangement for the development and growth of the pulse industry in our province. The improvement of varieties has been beneficial to farmers. Entire new segments of the industry (red lentils for example) have been developed in part by the insight and ingenuity of breeders at the CDC. The royalty-free access of these varieties has kept seed costs reasonable, and allowed farmers to obtain and multiply new varieties rapidly. In short, this has been an arrangement we have all benefited from.

What does the future hold? What is the best way to fund future crop variety development? Does our current system prevent other investment from even more rapidly advancing pulse crops? Will ever-increasing producer contributions lead to better results in the future? Do some pulse crops lend better to another funding model than others? There are many options as to how the pulse industry and variety development could move forward in Saskatchewan. As we draw near to the end of the breeding agreement, SPG has been working closely with the CDC and others to evaluate what SPG's role in pulse crop breeding should be in the future.

In the ongoing discussion with the CDC, other funding models like end-point royalty have been discussed. The changes resulting from UPOV '91 adoption needs to be considered in a new funding model. The recent SPG Winter Regional Pulse Meetings, held at eight locations across the province, all had a component to engage farmers in discussion on this topic.

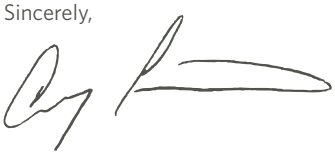
I truly feel the direction of this decision will have long-term implications for the pulse industry and we have to consider all the possibilities. We must make the best decision for farmers for years to come.

The SPG Board is committed to consulting with growers as widely as possible, and the Winter Regional Pulse Meetings were a part of that. The more input we receive on this issue, the better. I would strongly encourage you to email or phone any Board member to express your views on the best path forward, from your perspective.

One thing seems certain, costs for variety development keep rising and farmers ultimately pay all of those costs, regardless of the funding model chosen. The question is which model maintains some farmer influence on those costs, and provides us with the tools we need to compete in the future.

I wish each of you a safe seeding season, and I look forward to hearing from you on this very important issue.

Sincerely,



Corey Loessin
Chair

Executive Director's Message

Diversifying demand for pulses is a tool to mitigate market risks

BY CARL POTTS

MARKET ACCESS FOR CANADIAN PULSES CONTINUES TO BE IN THE SPOTLIGHT, ever since India announced the 50 per cent tariff on peas in November, followed by 30 per cent tariffs on lentils and chickpeas in December, which were subsequently increased to 33 per cent and 60 per cent, respectively. In February of this year Prime Minister Trudeau and Prime Minister Narendra Modi committed to working on fumigation barriers in 2018.

When we experience market issues in a major export market like India, it underscores the importance of why we need to diversify market opportunities for Canadian pulses. While Canadian pulses are exported to more than 100 countries, the bulk of our exports are concentrated in just a few including India, China, Turkey, and Bangladesh. Demand growth in these markets has driven strong prices in recent years, but has also created considerable risk.

The pulse industry has been working to mitigate the risk involved with exporting the bulk of our crop to just a handful of markets. In particular, the industry has focused on expanding and diversifying pulse demand into new uses. Pulse demand is increasing not only with non-traditional consumers of pulses, but also as an ingredient in food products. Recognizing the opportunity in this area of new demand, the industry has set a goal to have 25 per cent of pulse production marketed into new uses by 2025.

There are three key drivers that will help guide and grow the use of pulses as an ingredient, shaping food choices and food production in the future. Human health is an area of increased focus and interest by consumers. Average consumers are more health conscious now than they have ever been, and are looking for food that aligns with a perceived healthier lifestyle. Environmental health is an area that food companies are making commitments to around improved sustainability practices. Consumers in turn are actively looking to find food products produced in a sustainable manner. The last key driver for food production is accessibility to safe, affordable food for the world's growing population.

Over the last decade the pulse industry laid the groundwork in pulse ingredient development, working with researchers and food companies to expand the uses and applications of pulse ingredients. This work helped to support recent investments by private companies including infrastructure announcements that will continue to support the developing pulse ingredient market. Once fully operational, new facilities announced across Western Canada will create more than 600,000 tonnes of additional demand for peas. Taken together, these facilities would become Canada's third largest market for yellow peas, slightly behind China and India.

While the situation with India will continue to demand time and attention from the Canadian industry and government, the investments being made in pulse processing and the steps being taken to create new demand for pulses, will help remove some of the risk from producing pulses by creating new, more stable demand opportunities.

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Contents

3 • **Chair's Message**
The way forward in pulse variety development

4 • **Executive Director's Message**
Diversifying demand for pulses is a tool to mitigate market risks

Research

8 • **Constant Vigilance**
Watch for root rot, even in dry years

11 • **Taking a Bite Out of Weeds**
Using agronomic practices to manage weeds in pulses

14 • **Entering a New Decade for Pulse Research**
Canadian Agricultural Partnership federal research funding application reflects the industry's refined research and development goals

This Issue

17 • **The Protein Problem**
Some soybean crops in Saskatchewan are struggling to make the minimum protein

21 • **Improving Pulse Crop Storage and Profitability**
Long-term storage options for peas and lentils

23 • **Long-Term Storage of Lentils, Peas, and Chickpeas**
Safe moisture levels and temperatures recommended to store your pulses

26 • **Supporting Variety Development Through the Clearfield® Commitment**
Growers utilizing Clearfield® technology able to leverage funding for variety development

Best Pulse Agronomy for 2018

28 • **2017 Research Demonstration and On-Farm Trial Results**
Digging into the data from applied research demonstrations and Pulse Replicated On-Farm Independent Trials

30 • **Soil Temperatures and Weed Control**
Is it better to start early, or wait for a stronger start in warmer soil?

32 • **Keeping Soil Insects at Bay**
What insect pests should you be aware of this growing season?

34 • **Tackling Disease in Pulse Crops**
With warmer winters and wet springs, disease tends to crop up

36 • **Considerations for a Dry, Dry Year**
The growing season may prove to be more average, but coming off a record dry year, and a dry winter, means planning now for soil moisture retention

Market Access

40 • **Market Access Work Ongoing for Canadian Pulses**
The Canadian pulse industry is working to mitigate market access issues in India

42 • **Making Sure to Keep It Clean**
Knowing the maximum residue limits can help your crop get access to market

46 • **Lentils on the Menu**
Universities are interested in lentils to meet student demand for healthy and sustainable food

On Point

48 • **On Point**

Profile

50 • **Grower Profile**
Randy Cay, Cay Seeds, Kinistino, SK

Constant Vigilance

Watch for root rot, even in dry years

BY NOELLE CHORNEY

WITH A DRY YEAR BEHIND US AND ANOTHER DRY YEAR IN THE FORECAST, growers may be tempted to relax their vigilance toward root rot. Even in dry years, however, the problem does not go away.

Dr. Sabine Banniza, Plant Pathologist at the University of Saskatchewan, was involved in a root rot survey in 2017. "The *Aphanomyces* pathogen is widespread," she says. "It was present in the vast majority of fields that we studied. What we know now is that while it was likely always present, short crop rotations of peas and lentils, and a string of wet years made it a more serious problem."

"There are no in-crop management options for root rot, but keeping an eye on roots enables growers to develop long-term strategies to manage the disease," says Banniza.

Here is what you can do to protect your fields in the coming growing season.

Assess Risk

Do you have a field adjacent to another field that you know to be infected and which may still contain infected crop residue? Do you have a field that has high moisture levels? Start there, as the risk is highest.

A pea crop infected with Aphanomyces.

Watch for Signs

"Generally, root rots have the highest impact during the seedling stage, but even later growth stages are affected," says Banniza. Head into the field and scan for signs of plant weakness. Check your peas and lentils at the seedling stage for signs of chlorosis (yellowing), stunted plants, or weedy areas where your plants are having more difficulty competing.

Test Your Soil

If you see warning signs, get your soil tested, or better yet, test the roots of lentils and peas in a lab. If *Aphanomyces* is present, it is recommended you start taking measures to control the disease.

Dr. Syama Chatterton, Research Scientist at the Agriculture and Agri-Food Canada, Lethbridge Research and Development Centre, has confirmed through 2017 infectivity modeling that the fungus spores are usually uniformly distributed through out the soil. She still recommends collecting samples from lower areas where water accumulates, as well as getting roots tested. "Testing roots give you better positive results. Soil-only testing is more likely to give a false negative because it is more difficult to extract DNA from soil," she says.

The infectivity modeling is also closer to confirming the threshold of oospores in the soil that will cause disease. One hundred or more oospores per gram of soil is detectable, and at that rate infection is likely. Fewer than 100 oospores per gram may still cause disease, however, but has a 30 to 40 per cent false negative rate.

Prevent the Spread of Disease

Aphanomyces is entirely soil bound, so it cannot be spread on seed or by the wind. However, you can spread it by moving clumps of soil from an infected field onto another field. If you know a field is infected, plan to harvest or seed that one last, Dr. Chatterton suggests, or wash your equipment before moving to a different field.

Crop Rotation

If you have proof from soil or root testing that *Aphanomyces* is present, says Banniza, "the recommended crop rotation is six to eight years." If you do not have proof of *Aphanomyces,* it is still wise to use a four-year rotation for prevention purposes.

Resistant Cultivars Are on the Way

"We have identified partial resistance in lentil and in pea," says Banniza. "In pea we are further ahead and hope to have the first lines with partial resistance ready for registration by the end of 2020."

Aphanomyces-resistant lentil strains are farther off because researchers have to do the ground work that had already been done for peas, beginning with making crosses with wild relatives of cultivated lentils, which have good resistance. With resistant cultivars two or more years off, crop rotation and good crop management are the only sure prevention for *Aphanomyces.*

Grow Healthy Crops

The best resistance to disease is soil and plant health. Make sure your fields are planted at the appropriate density, have adequate nutrients, and are as weed-free as possible. "Keep your plants stress-free and happy, whatever it takes," says Banniza. "Know your plants' optimal growing conditions and do what you can to provide them."

Reconsider the temptation to plant lentils and peas in high-risk fields, even if it is likely to be a dry year. "In the case of *Aphanomyces*-infested fields you are not contributing to reducing the inoculum if you grow susceptible crops in close rotations because you can get away with it in the drier weather." Take the long view — and keep *Aphanomyces* in check for future economic success. •

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Dr. Chris Willenborg digs out flixweed.

Taking a Bite Out of Weeds

Using agronomic practices to manage weeds in pulses

BY KIM WAALDERBOS

RESEARCH AT THE UNIVERSITY OF SASKATCHEWAN is identifying ways for growers to better manage weeds in pulse crops.

The multi-year, multi-project program has a team of professors and graduate students exploring various projects that together will build the tools available to growers to take the bite out of weeds, sustainably.

"We are aiming to manage weeds and herbicide resistance over the long term," says Dr. Chris Willenborg, Associate Professor with the Department of Plant Sciences, leading some of the research. He says the growing resistance to Group 2 herbicides highlights the importance of looking at alternative practices for weed management.

Among the projects, the team has been working on discovering new herbicides, studying the effects of pairing herbicides, understanding varietal differences among pulses, and applying agronomic practices to manage weeds in season, he says.

Already, grower recommendations are being developed.

Dr. Steve Shirtliffe and plant science graduate student Alex Alba have found cultural methods can provide effective weed management. The rotary hoe, tine harrowing, and inter-row tillage can "provide some benefit on their own, but are better when paired together," says Shirtliffe.

Their research has found better than 80 per cent weed control — the standard used for registering new herbicides — by using a competitive seed rate (260 plants per metre squared - double the norm in lentils), along with two types of cultivation. Best results were obtained with the rotary hoe, followed by inter-row cultivation. The research also found tine harrowing plus inter-row cultivation can be effective. "We need to get in early when weeds are emerging," Shirtliffe says.

Higher seeding rates, particularly with lentils, help to crowd out weed competition, says Shirtliffe, of his research findings to date.

In peas, the older-style leafed varieties with long vines have been shown to outcompete weeds better than newer pea varieties. However, the older-style varieties lodge. In continuing research, Willenborg says peas are being used as a model crop to understand how to make pulses more weed competitive.

"Peas do not produce true leaves to canopy, so we are looking at its ability to compete with a modified leaf," Willenborg says. "Our research has shown there are differences among pea varieties for competitiveness, so we will try and pin down what underlies this mechanism."

The Shirtliffe research team is looking at blending semi-leafless and leafed pea varieties to achieve some of the advantages of both.

In continuing research, Willenborg, along with graduate students Stefanie De Heij and Khaldoun Ali, is studying the impact of weed seed predators. In particular — the carabid beetle, which is the most abundant seed predator naturally occurring in agri-ecosystems.

"Weed seed predators offer a potential solution for managing weeds by destroying them in the seed bank, instead of waiting for the weed to develop above-ground where it has to be treated with a herbicide," says Willenborg.

A rotary hoe demonstration at the Scott Research Farm.

This first-of-its-kind research in Canadian pulses aims to identify what pulse crops better attract predation from carabids, and why. Willenborg and team are setting traps to sample catches of carabids to discern who is there and get a sense of their activity to better understand their biology. The team also lays out cards with seeds affixed that the carabids can eat to help estimate what they remove from the seed bank.

Weed seeds can be an important food source for the carabid beetle. Eating the seeds makes them non-viable and unable to germinate — a benefit to pulse growers, Willenborg says. "It is free weed control, absolutely free, and it can be complimentary to herbicides and other management tools." The team has two more years of field-level trials planned.

Above ground, Shirtliffe is studying the effect of clipping weeds at the flowering and seed-production stage, when they are extended above the lentil crop canopy. He says early results look promising.

Shirtliffe and research officer Lena Syrovy are also exploring the benefits of weed wiping. That is, wiping the surface of weeds extending above the pulse crop canopy with a herbicide, in the hopes that the weed plant will absorb the product wiped selectively on its surface and translocate it down to the roots. Early results indicate some success with wiping glyphosate and 2,4-D, however there has been shown to be risk of damage to the underlying pulse crop from herbicide vapours.

This research is being conducted at field-level in the next few years to further understand the possibilities to these weed management tools, and their benefits on pulse quality and yields.

Ultimately, both Willenborg and Shirtliffe aim to develop tools through their research that will allow growers to use agronomy to help control weeds in pulse crops — and slow the evolution of herbicide resistance.

"Anything you rely on too much will eventually let you down," Shirtliffe says. "Herbicides need to be reserved as the final nail in the coffin for weeds." •

Kim Waalderbos is a freelance writer and dairy farmer. She can be reached at kwaalder@gmail.com

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Entering a New Decade for Pulse Research

Canadian Agricultural Partnership federal research funding application reflects the industry's refined research and development goals

BY DELANEY SEIFERLING

OVER THE PAST EIGHT YEARS, the pulse industry and the Federal Government have partnered to jointly invest more than $30 million into pulse research through the Pulse Science Cluster program.

And now as it heads into the third phase of the program, known as the Canadian Agricultural Partnership (CAP), the knowledge gained from the past two phases has sharpened the focus of the Canadian pulse industry's goals for the next decade, says Dr. Lisette Mascarenhas, Director of Research and Development for Saskatchewan Pulse Growers (SPG).

"We worked collaboratively with other provincial pulse grower groups, and Pulse Canada, to ensure that this application is targeted to the areas the pulse industry is looking to make advancements in," she says.

One timely priority for the pulse industry is diversifying markets and products, Mascarenhas says, which is the goal of all processing and end utilization, and health-related research in the new slate of Cluster projects.

"Some of the areas which have been a focus in recent years, such as increasing production and variety performance, and reducing business risks by looking for new markets and end uses for pulses, are experiencing a renewed sense of priority in light of current market volatility."

Another focus for the next phase of research will be developing varieties with increased nutrient density.

"It is not only improving yield that is important," says Mascarenhas. "We are also looking at developing varieties with certain nutritional attributes — for example, high protein."

This will be increasingly important as consumer demand continues to grow for food products that meet specific nutritional requirements. Already grain companies have begun to pay a premium for higher protein levels in yellow peas, a result of growing market demand.

This next phase will also include two projects that focus on health benefits associated with whole pulses, as past research and stakeholder feedback has indicated that this is the area with the greatest amount of potential right now, says Julianne Curran, Vice President, Food and Health, at Pulse Canada.

This is also the type of information that the food industry is looking for, as incentive to include pulses in their products, Curran says.

"That is what we have consistently heard from them for the past decade — they are looking for this type of information, whether it leads to health claims, positions pulses favourably in dietary guidelines, or if it is just newsworthy and draws attention to pulses."

The food processing industry has also made it clear that this information needs to come from trade associations and government, rather than for-profit companies, Curran says.

"That way it is perceived as being more credible, with less associated bias."

Another one of Pulse Canada's ongoing goals has been obtaining health claims for pulses in Canada. Curran believes that

the next phase of Cluster research might move the dial forward on that goal, through one specific study that will look at health benefits associated with specific doses of Canadian-grown bean varieties.

"That is really the study that is needed to finalize the dossier for the claim on beans," she says.

Process for Choosing Projects

Because the this partnership program represents a significant and rare opportunity to leverage grower and industry dollars — the government has contributed up to 70 per cent funding to the industry's 30 per cent in the last two phases — SPG and other provincial pulse grower groups are very strategic in choosing research projects, to ensure they complement and do not duplicate the organization's already robust research program, Mascarenhas says.

The process for the third phase of Federal funding began in September 2016, with a gathering of select members of the Canadian pulse industry to define industry priorities, followed by a call for letters of intent in October 2016, which resulted in approximately 100 research applications.

From there, staff spent more than a year carefully scrutinizing the applications, choosing projects that were aligned with SPG's strategic plan, the needs of pulse growers in Saskatchewan, and the pulse industry's goals. They also sought external expert reviews to assess technical feasibility of the proposed work and potential outcomes.

"There were several layers of scrutiny that went into this process before we finalized," shares Mascarenhas. "There were instances where we asked researchers to work together on certain strategic topics and/or modify their submission based on what we felt the industry needed."

Once this was complete, SPG met with the other provincial pulse grower and industry groups, and a science and industry advisory body, to decide on a final list of projects for submission to Agriculture and Agri-Food Canada.

The application was submitted in early 2018 and SPG anticipates information on funding confirmation and government investment amounts will be available in the spring. Watch for more information about these projects on the SPG and Pulse Canada websites. •

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Pulses are being increasingly used in end-use food products.

Pulse Science Cluster background

The previous two Pulse Science Cluster programs ran from 2010–2013 and 2013–2018, under Agriculture and Agri-Food Canada's Growing Forward 1 and 2 programs. The overall goal of this program was to invest in research that will help build a strong, sustainable, and globally competitive pulse industry in Canada.

Growing Forward 1 funding contributions were split at 72 per cent AAFC funding, and 28 per cent industry funding. Growing Forward 2 funding leveraged 70 per cent AAFC funding and 30 per cent industry funding.

The third phase of the program, now called Canadian Agricultural Partnership (CAP), will run from 2018 to 2023.

Participants in the pulse science cluster program include Pulse Canada, Saskatchewan Pulse Growers, Alberta Pulse Growers, Manitoba Pulse and Soybean Growers, Ontario Bean Growers, and private industry partners.

The Protein Problem

Some soybean crops in Saskatchewan are struggling to make the minimum protein

BY LYNDSEY SMITH

NO MATTER WHAT THE CROP, THE QUEST FOR PROTEIN COMES AT THE EXPENSE OF YIELD. That said, some Prairie soybean growers struggled with harvesting soybeans that achieved an acceptable protein level for buyers even when yields have not been impressive.

There are several unknowns currently under review, but here is what we do know — the closer you farm to the equator, the higher the protein content of soybeans. That is not likely incentive enough to pack up and move south, but it does offer us the first clue in the protein problem.

"Unfortunately, we have more questions than answers on why some soybean crops are not achieving the industry standard," says Glenda Clezy, Agronomy Specialist with Saskatchewan Pulse Growers (SPG).

If you compare with the traditional soybean growing area in Canada — Southern Ontario — average protein content drops as you move north and west. "It leads us to believe that (low protein) is the result, in part, of environmental factors," she says. These less traditional soybean growing regions also use short to very short season varieties which may be another factor.

Garry Hnatowich, Research Director for the Irrigation Crop Diversification Corporation, says that, very likely, it is all of these things and more working in combination.

Developing shorter season soybean varieties that will actually mature in Western Canada has been an impressive achievement of plant breeders. A breeding program focused on bringing one major trait forward has to do so with several other factors, yield being the biggest. Yield and protein always exist in an inverse relationship, and the same is true for soybeans.

"We bred for short season beans. Is the maturity shutting the plant down before the line is fully able to put protein into the seed? That is possible," he says. Breeding for higher protein potential is likely the biggest factor in success, but that is a long-term game.

That said, Hnatowich is not sure there is not another agronomic factor at play — that perhaps the window between nodulation and maturity is just too small to get adequate nitrogen fixation. Could the rhizobia bacteria strains used to inoculate soybeans in Saskatchewan be good, but not quite what is needed for the compressed, cooler growing season?

"My gut tells me we can address this challenge agronomically," he says, "but the increases are probably incremental and not enough to get us to high protein levels."

All About That Nitrogen

Protein is roughly 16 per cent nitrogen. It makes sense, then, that agronomic management of nitrogen has been a major focus when addressing this seed-protein challenge. Recent research funded by SPG has shed at least some light on the subject, but the findings are preliminary.

Chris Holzapfel, Research Manager for the Indian Head Agricultural Research Foundation, says he is still crunching through the 2017 data, but a few interesting findings from the 2015 and 2016 data have popped up.

For starters, what is good for yield is generally good for protein, says Holzapfel. Proper inoculation is key. In the trials, all seed was treated with liquid inoculant, and dual inoculation showed to have an advantage when talking final protein numbers. He cautions, however, that the response was not necessarily an economic one.

Soybean trials at the Indian Head Agriculture Research Foundation, in 2017.

"Environment itself seems to be important with overall averages ranging from 3.3 per cent to 6.3 per cent nitrogen (about 19 to 36 per cent protein)," he says. The low end of that scale was at Outlook in 2016, but it is a bit of an outlier, he says possibly because it was a wet, very high-yielding year. Interestingly, this was the only site with previous soybean history and also the only site where we did not see a yield benefit to dual inoculation, he says.

Starter nitrogen either had no effect on protein or a slight, but significant, negative effect, says Holzapfel, but it was never beneficial. There were no yield benefits to starter nitrogen either, according to the research.

When looking at adding late-season nitrogen, the study suggests that when nodulation is poor, late-season nitrogen sometimes increased yield, but had inconsistent effects on protein. One year (2015), there was no effect at the Indian Head site, but it did offer a slight increase in protein at the same site in 2016.

New Crop, New Challenges

Hnatowich, who has been involved in the multi-site soybean research, says that results suggest that either nitrogen is not available to the plant or is there but is not being turned into protein. Hnatowich suspects this is a factor of that compressed season.

"Soybean is where canola was 30 years ago," he says. "We have only recently grown enough acres to really even get a sense of what the challenges are in growing the crop."

Sound agronomic practices are the baseline for what this crop can do, but Hnatowich says there is a complicated interplay between existing varieties, Saskatchewan soil and climate conditions, the length of the growing season, and more.

"Soybean is still a new crop for Saskatchewan. When North Dakota began growing soybeans, their farmers struggled with achieving high protein, too," he says.

"It is a matter of matter of exploring all factors together. We need the breeding component, the agronomy, the inoculation question, all of it to be looked at together," Hnatowich says. "It is a long-term, big-picture challenge that will require a coordinated approach to solve." •

Lyndsey Smith writes from the Ottawa Valley. Find her across social media platforms as @realloudlyndsey

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Students Bryson Lekatch (on the platform) and Ian Pekrul (on the ground) load test bins with peas for PAMI's pea drying trial.

Improving Pulse Crop Storage and Profitability

Long-term storage options for peas and lentils

BY TRUDY KELLY FORSYTHE

IN 2016, CANADA EXPORTED PULSES WORTH OVER $1.1 BILLION TO INDIA, accounting for 27.5 per cent of Canada's global pulse exports for that year. Changes imposed by India in 2017, including a 33 per cent tariff on lentil imports, and mandatory fumigation of pulses destined for India, have producers wondering how they can extend their long-term storage capabilities without impacting quality.

The simple answer is to keep them in the dark, in cool, dry conditions. "For red and green lentils, if they are at 13 per cent moisture content and stored at 15°C, they can be stored for up to a year," says Dr. Joy Agnew, Project Manager with Prairie Agricultural Machinery Institute (PAMI), Agricultural Research Services. "Peas are considered dry at 16 per cent, but to extend their storage, producers should store them at about 13 to 14 per cent."

Producers should cool the bin as much as they can in the winter, then monitor it the rest of the year. They do not want to let it get it too cold though, because seed is damaged more easily the colder it gets.

While there is currently no data on exactly how cold is too cold, Agnew says producers report few issues when temperatures are kept between -5°C and -10°C. "Colder than that and we do not know what can happen," she says, adding producers should try not to handle the pulses if the temperature is below -10°C. "The recommendation is -20°C but I have heard of quite a bit of damage below -10°C."

Handle With Care

If producers do need to handle pulses below -10°C, they need to do so carefully. This is because all pulses are susceptible to cracking and splitting, especially when cold. If they are really cold and producers do have to handle them, they should use a belt conveyor if available. Another option is a screw conveyor auger, run slowly at a low elevation with a bean ladder.

Agnew admits there are challenges with maintaining an even temperature. "Producers could cool pulses to 5°C or lower, but with natural heating from the sun beating on the sides of the bin, it is difficult to keep cool," she says. "That is why we say target moisture so they do not have to maintain a specific temperature for a year."

That said, there is some research-supported data for canola, following a two-year study that looked at the best way to maintain a bin's lowest temperature, using three strategies: leaving it alone, turning the canola, and aerating the bin with slightly warmer air.

"The bin we left alone had an average temperature of approximately 15°C throughout summer. We were surprised the grain at the centre stayed so cool," says Agnew. "It is pretty easy to keep the average temperature at 15°C or lower if the grain is cooled over the winter and left alone in the spring, so that is our recommendation for

canola, but with pulses we do not know if we can expect the same thing."

Another tip for extending storage time for pulses is to ensure good ventilation in the head space. Pea producers say they frequently see a crust form at the top of the bins.

"Rapidly warming and cooling from the change in temperatures during the day and night in the head space results in condensation that can create a crust," says Agnew. "Peas at 16 per cent moisture content — that is a lot of water. You should consider installing active ventilation in the head space to prevent this crusting action."

Monitor Bins

The concern with extending storage is that the longer pulses are in storage, the greater the risk for moisture migration and more problems in the bin. This makes monitoring the bin extremely important. "You do not know what is happening in the bin so if you are not watching, you will have no forewarning whatsoever," says Agnew.

In-bin sensors are the most commonly used by producers these days and PAMI strongly recommends them. But, producers should watch for improved monitoring technology that is currently being developed. "There are newer technologies expected in the next year or two that will create a 3D moisture map of the bin to show the entire moisture content of an entire bin," says Agnew. "And alternatives to the cables for monitoring temperature in the bin are being developed also."

Future Research

Up-to-date information is the best way to avoid spoilage and maximize profit. While there has been some baseline work done over the years to establish drying and wetting characteristics of pulses, it has never been validated or widely adopted.

PAMI researchers are in the second year of a project to validate equilibrium moisture content charts for peas and lentils, to assess the effect of airflow rates on natural air drying, and to determine resistance to airflow in pulses — information that will help producers minimize the risk of over-drying. The researchers are also collecting baseline data on how repeated wetting and drying cycles affect seed quality.

"We want to give producers confidence they are making appropriate storage management decisions and reducing their risk of loss," says Agnew. •

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Long-Term Storage of Lentils, Peas, and Chickpeas

Safe moisture levels and temperatures recommended to store your pulses

BY BRUCE BARKER

INDIA'S IMPORT DUTIES of 33 per cent on lentils, 60 per cent on chickpeas, and 50 per cent on peas have some farmers considering holding on to these pulses while looking for other markets, or hoping for a timely solution to the trade issue. Little research has been conducted on how to safely store lentils, chickpeas, and peas over the longer term, and how long-term storage will impact quality. However, based on known principles of storage, and extrapolating best practices from other crops like canola, long-term storage of pulses may be possible.

Store at Safe Moisture and Temperatures

The foundation for long-term storage is dry, cool grain. The Canadian Grain Commission (CGC) sets seed moisture content for grading and storage purposes. Most pulse crops are considered to be dry enough for safe storage at the CGC dry grade. Processors also generally follow the same CGC moisture specifications when purchasing seed.

Crop stored under cool, dry conditions can be stored for long periods, but as seed moisture or temperature rises, storage length becomes less. The drier and cooler the grain, the safer it is during storage. The target temperature for all grains provided they are dry is 15°C or lower.

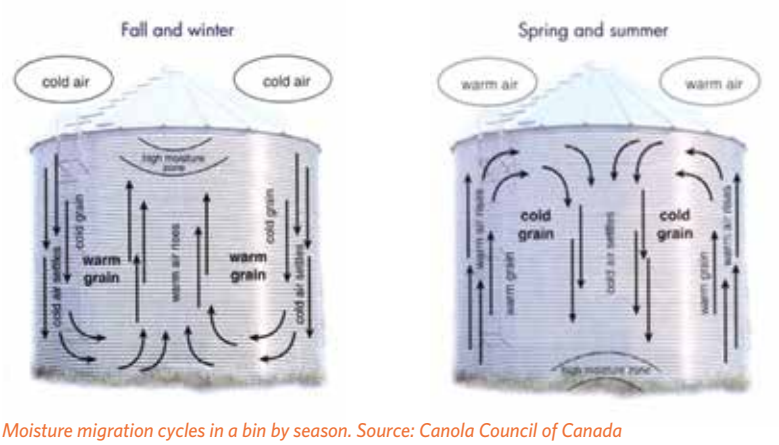
Noel White, formerly with the Cereal Research Centre with Agriculture and Agri-Food Canada at Winnipeg developed safe storage charts for different grains, including peas. Pea storage information has been extrapolated to cover green and red lentils.

Even if the crop went into the bin dry, cooling with aeration will help extend the safe storage timeframe, and is especially important for longer-term storage. For example, using the safe storage charts, green lentils at 14 per cent moisture content and at a 20°C temperature could be safely stored for about 23 weeks, but if the temperature was cooled to 10°C , the lentils could be safely stored for 80 weeks.

Monitoring

Peas and chickpeas often respire or go through a sweat after being placed in storage. Extra care should be taken to monitor the grain inside the bin for moisture build-up or spoilage. Moisture levels should be tested often for large Kabuli chickpea types, because seed testing dry can sometimes hide seed with higher moisture levels internally in the grain mass. Monitor regularly for hot spots and other changes in moisture and temperature. A variety of manual and automated systems are available to help keep track of seed condition.

During the winter, cold air moves downward along the outside of the bin and moves warm, moist air up through the core of the grain bin. Pulse growers should monitor their bins, especially where high moisture may concentrate. If high moisture areas become a concern, recommendations for other crops like canola include moving one-third of the bin to disrupt the moisture cycle and help cool the centre grain mass.



Moisture migration cycles in a bin by season. Source: Canola Council of Canada

In the spring, the opposite moisture migration cycle occurs. Warm air moves upwards along the bin walls and cold air carries moisture down the core of the bin, concentrating moisture near the centre/ bottom of the bin. This can create potential concentrations of warm, moist air where spoilage may begin.

The Prairie Agricultural Machinery Institute in Humboldt researched canola and found that there was no advantage to aeration in the spring with very dry canola.

Canadian Grain Commission Moisture Specifications for Pulse Crops

	Peas	Green Lentils	Red Lentils	Faba Beans	Chickpeas	Dry Beans	Soybeans
Dry	< 16	< 14	< 13	< 16	< 14	No dry	< 14
Tough	16.1 – 18	14.1 – 16	13.1 – 16.0	16.1 – 18	14.1 – 16	No tough grade	14.1 – 16.0
Damp	> 18	> 16	> 16	> 18	> 16	> 18	16.1 – 18

Source: Canadian Grain Commission

Number of Weeks for Safe Storage of Peas at the Specified Grain Moisture Content and Storage Temperature

Moisture Content (%)	12	14	16	18	21
Temperature (°C)	**Maximum Safe Storage (weeks)**				
26	31	16	7	4	2
20	55	28	13	7	4
16	100	50	20	12	6
10	200	95	38	20	21
6	370	175	70	39	20

Source: Sokhansanj, 1995

Number of Weeks for Safe Storage of Lentils at the Specified Grain Moisture Content and Storage Temperature

Moisture Content (%)	12	13	14	16	18	21
Temperature (°C)	**Maximum Safe Storage (weeks)**					
25	31	16	13	7	4	2
20	55	28	23	13	7	4
15	100	50	40	20	12	6
10	200	95	80	38	20	21
5	370	175	150	70	39	20

Source: Extrapolated from pea data, Sokhansanj, 1995

Temperature changes occurred within the bin, but no moisture migration was observed. Leaving the bin alone was the best strategy. Whether this would be the same for peas, lentils, and chickpeas is unknown, as pulses are stored at a higher moisture content and have larger seed size, which may allow moisture migration to occur. The best advice is to continually monitor bins for any high moisture concentration.

Quality Considerations

Pulses that contain tannins in their seed coats oxidize over time, losing colour and grade. Peas (except for maple and dun varieties), Kabuli chickpeas, zero-tannin faba beans, and zero-tannin lentils have zero-tannin seed coats so these should store well. Other pulses will tend to oxidize and darken in colour over time in storage.

Discolouration is a function of oxidation and light degradation. Producers should store lentils in dry, dark conditions. Ensuring proper cool, dry, and dark storage conditions may help lengthen the time before any discolouration occurs. Seed from successive years should not be mixed, as the oldest seed can cause downgrading of the entire sample. The current recommendation for green lentils is that they should not be stored through a second summer season, in order to avoid excessive discolouration and downgrading.

Handling

If pulses require handling, they should be moved as little as possible, and handled gently to reduce chipping and splits. Use belt conveyors instead of augers. If using augers, run the auger full and at a reduced speed. Use bean ladders on equipment to minimize the dropping of seed from more than a few feet.

Lentil and pea seed should not be handled below -20°C, as they are more susceptible to chipping and peeling at low temperatures.

The irregular shape of chickpeas really must have gentle movement in order to keep from breaking the beaks from the seed coat, and to ensure that the seed coat integrity is not damaged.

Stored Grain Insects

Stored grain insects are generally not a problem in pulses that are stored under dry, cool conditions. Blaine Timlick with the CGC says that while there are several weevils that exist in Canada, in 20+ years he has only seen pulses infested on three occasions. This includes railcar delivery into terminal monitoring, and the sampling/testing that the CGC performs during vessel loading.

In general, all bins should be monitored not only for moisture and temperature, but also the presence of insects. Timlick suggests that if the temperature and moisture are managed, then quality should be maintained for taste and nutritional value.

Insects very rarely infest pulse crops. Monitoring should take place as standard practice. When monitoring pulse bins, insects that could be watched for include: vetch weevil *(Bruchus brachialis Fahr),* pea weevil *(Bruchus pisorum (L.)),* broadbean weevil *(Bruchus rufimanus Boh),* and bean weevil *(Acanthoscelides obtectus (Say)).*

More information on stored grain insects can be found at the CGC website. •

Supporting Variety Development Through the Clearfield® Commitment

Grower support for the Clearfield® Lentil System ensures continued variety development and advancement

BY AMANDA RYAN

WITH OVER THREE MILLION ACRES OF CLEARFIELD® LENTIL VARIETIES PLANTED IN 2017, the Clearfield® production system launched by BASF Canada in 2007 accounts for a substantial amount of Saskatchewan lentil production.

"The Clearfield® system for lentils is the only herbicide tolerant system that supports the use of a broad spectrum post-emergent herbicide (BASF imidazolinone) in lentils," says Trevor Latta, Brand Manager — Clearfield® Technology with BASF Canada.

The Clearfield® lentil varieties available to growers were developed by the University of Saskatchewan's Crop Development Centre, and are accessible through Saskatchewan Pulse Growers' (SPG) Variety Release Program.

"Clearfield® lentils have helped to expand the adapted area of lentil production in Saskatchewan. Today, a vast majority of the lentils planted in the province are Clearfield® lentil varieties," says Carl Potts, Executive Director of SPG. "Clearfield® lentil varieties are tolerant to BASF Clearfield® herbicides such as Ares, Odyssey®, and Solo®. They provide growers with good weed control options, particularly when Group 2 resistant weeds are not a problem."

Farmers who have purchased or are planning to purchase Clearfield® lentils must sign an Evergreen Clearfield® and/or register their acres annually. This is an agreement between the grower and BASF, which is not only a license to use the technology, but also a tool that helps

BASF implement proper stewardship and protect the integrity of the Clearfield® system and ensure its future development and sustainability.

"The Evergreen Commitment provides stewardship guidelines, which allows growers a license to use BASF's Clearfield® trait technology," adds Latta.

The Clearfield® Commitment is an important part of growing Clearfield® lentils. Growers who have signed the commitment are required to register their acres and adhere to proper stewardship of their crop system by using only registered Clearfield® lentil herbicides.

"Signing the Evergreen Clearfield® Commitment and adhering to the stewardship practices is important, because it outlines and explains proper and responsible use of the Clearfield® trait technology regarding seed and BASF herbicide responsibility, which meets government and industry regulations. In addition, it manages product identity, integrity, and quality, which provides confidence in Canadian-produced lentils of high quality for export," says Latta.

As with all crop protection products, it is critical that growers apply only registered products and apply them according to the label to mitigate market risks. "The vast majority of pulses are exported and growers understand the importance of maintaining access to those markets. The Canadian pulse industry is working together with the Cereals Canada and the Canola Council of Canada to promote the *Keep it Clean!* program to minimize risks when accessing our important international markets," notes Potts.

"It is really about continued grower education and awareness with the terms of use in the Evergreen Commitment and the benefits that the Clearfield® lentil system provides to growers," explains Latta.

Potts adds that having a signed Clearfield® Commitment in place provides growers access to complimentary testing of seed to confirm the presence of the Clearfield® trait, and to provide seed quality and disease testing information. The BASF Clearfield®-confirm test ensures that the Clearfield® lentil seed sample has not been contaminated with non-Clearfield® seed, and that it maintains the appropriate level of tolerance to Clearfield® lentil herbicides.

Growers that sign a Clearfield® Commitment and purchase BASF registered products are also supporting ongoing research and the development of new Clearfield® lentil varieties to advance the pulse industry.

"Through SPG, Saskatchewan pulse producers make major investments in pulse crop variety development at the CDC at the U of S, so having a Clearfield® Commitment in place helps to leverage growers' investments with additional revenue from BASF in support of pulse crop variety development," says Potts. "When growers sign a Clearfield® Commitment, register Clearfield® acres, and use registered herbicides, a portion of BASF's herbicide sales are reinvested into pulse crop variety development at the CDC, resulting in better varieties for growers in the future."

To date, BASF has contributed over $10 million to the CDC since the launch of Clearfield® lentils in 2007. This leveraged funding supports research and development into new, innovative Clearfield® lentil varieties for Saskatchewan growers, resulting in a better return on investment. •

Amanda Ryan is an agriculture communications freelance writer based in Calgary, AB.

2017 Research Demonstration and On-Farm Trial Results

Digging into the data from applied research demonstrations and Pulse Replicated On-Farm Independent Trials

BY NOELLE CHORNEY

INITIAL RESULTS ARE IN FOR SASKATCHEWAN PULSE GROWERS' (SPG) 2017 applied research demonstrations (ARD) and Pulse Replicated On-Farm Independent Trials (PROFIT). The ARD projects were set up to demonstrate potential crop responses to management practices. Further testing is needed to confirm or develop any recommendations based on initial findings.

Applied Research Demonstration Projects

1. Remote Sensing: Potential Uses in Pulses

Crop Command Agronomy in Southey, in collaboration with Saskatchewan Crop Insurance Corporation, tested remote sensing as a tool to predict yield prior to harvest. This could allow growers to make marketing decisions before harvest, and help crop insurance companies make more accurate and timely predictions with field evaluations.

The goal was to get within five per cent of actual yield in terms of predicting harvest in field peas and soybeans. There was some success with field peas — predictions were within six per cent of actual harvest.

Yield predictions in soybean fields were less accurate. "Dry conditions prevented the immature pods from filling that were counted in the predictions," says SPG Agronomy Manager, Sherrilyn Phelps. "We may need to count less developed pods separately or count closer to harvest to improve accuracy in soybeans."

2. Intercropping

Peas and lentils were intercropped with mustard at the South East Research Farm at Redvers, with a goal to reduce lodging, and *Aphanomyces* root rot, as well as increase production compared to monocropping systems.

Initial results found reduced lodging with the mustard/yellow peas and the mustard/large green lentils intercrops, but the dry conditions meant there was little root rot pressure. "The land-equivalent ratio — the unit produced per unit of land — was higher in all the intercrops compared to monocrops," says Phelps. "The economics are also promising."

Separating the grain after harvest may be critical as there is no information on storage of mixed grains. Marketing may also be a challenge and is something to consider.

The value of pulses in silage intercrops with corn and barley was explored by the Wheatland Conservation Area (WCA) at Swift Current. While the dry year hindered biomass, the best economics overall was the barley monocrop followed by barley

intercropped with silage peas. Faba beans, alone or with corn, showed the highest protein but had low biomass as a result of dry conditions. The corn monocrop had the highest biomass, however, the cost of inputs lowered the economic returns.

3. Solid Seeding Dry Beans

Dry beans under row cropping require specialized equipment and extra cultivation. The Irrigation Crop Diversification Corporation at Outlook compared growing dry beans under both row cropping and solid seeding systems. While solid seeding did lead to slightly lower yields, the cost savings of using regular equipment and avoiding extra cultivation made the economics comparable.

There are still some issues to work out with the solid seeding of dry beans — such as getting seed into the ground and harvested without any mechanical damage. "Solid seeding dry beans is definitely doable, but we need to minimize that damage," says Phelps. "Swathing was a more successful method of harvest than straight cutting, but straight cutting is still possible with careful tweaking of combine settings."

4. Nutrient Responses in Pulses

Three projects were undertaken to demonstrate nutrient responses of pulses, to show growers that nutrient management can affect yield.

Red lentils and durum wheat were grown in 2017 with increasing rates of phosphorous at the WCA. "Even in a dry year, we did see responses," says Phelps. "The economics of phosphorus fertilizer with lentils showed a slightly positive return up to, and including, 60 pounds per acre (lb/ac) phosphorus with red lentil pricing of $12 per bushel ($0.20 per lb). We are going to continue this project in 2018, with durum grown on lentil plots and lentils grown on the durum plots to see the impact of phosphorous fertilization in the year prior to growing the crop."

The impact of phosphorous fertilizer rates and placement on faba beans was carried out by the Indian Head Agricultural Research Foundation. "Results from this site demonstrate the high tolerance of faba beans to seed-placed fertilizer. There was no difference between side-banding and seed-placing phosphorus with faba beans at this location over two years," says Phelps. There was a linear yield response even up to the highest rate tested, which was 80 kilograms P_2O_5 per hectare (71 lb/ac), which demonstrates the need to consider phosphorus when planting faba beans.

Response to sulfur rates and formulations were also demonstrated with peas and lentils in southwestern Saskatchewan by the WCA, where soils are known to be sulfur-deficient. "The limited moisture conditions did restrict yields in both lentils and peas. However, lentils did show a response to increasing rates of ammonium sulfate, with the highest yields at 20 lb/ac. Various sulfur products were evaluated, but under the dry conditions only ammonium sulfate and ammonium thiosulfate showed positive returns.

5. Pollinators in Faba Beans

Faba beans are a cross-pollinating crop and require pollinators for top yields. Little is known on faba bean pollinators in Western Canada. Project lead, Dr. Sean Prager from the University of Saskatchewan (U of S), was surprised to find a wide range in diversity in the bee populations in faba beans surveyed. Understanding the impact of pollinators on yields of faba beans, and how to best manage them, is of interest for future research.

The outcome of the ARD projects have created a definite interest in pursuing more on fertility, expanding dry bean acreage, and intercropping, to understand what systems work best. Two new projects are also in planning stages for 2018: controlling volunteer canola in Roundup Ready® soybeans and chickpea disease management.

Pulse Replicated On-Farm Independent Trials

The purpose of SPG's PROFIT trials is to take successful small plot studies and test them out in the field with growers' equipment, in their environments, on a larger scale, to see whether the results on small plots hold true.

1. Lentil Seeding Rates

The current recommended seeding rate of small red lentils is to target 120 plants per square metre (m^2). Research by Dr. Steve Shirtliffe from the U of S suggests that with small red lentils, higher yields and returns can be achieved at higher seeding rates, up to 240 plants/m^2. To evaluate the impact of increasing seeding rates under a larger scale, 12 growers participated in the 2017 PROFIT trial.

An interesting finding with this project was that a number of growers are still setting their seeding rates based on pounds per acre, rather than calculating rates based on the thousand kernel weight of their seed. With variations in seed size, they may be overseeding in some cases, and underseeding in others.

"We have got some great results from year one, but before we make a recommendation to adjust seeding rates, we would want to test this under multiple years, and different environmental conditions," says SPG Agronomy Specialist, Glenda Clezy.

2. Soybean Inoculation Rates

At nine sites across the province, soybean growers tested the benefit of increasing manufacturers' recommended inoculant rate up to two times. "Of the nine sites, six were responsive to the increase in inoculant. Of those responsive sites, many saw a positive economic response to the increased inoculant rate," says Clezy. In general, it was observed that yields needed to increase by at least one bushel per acre to reach a break-even point, to cover the cost of the extra inoculant.

"What we did find is that the three sites that did not really show a response were due to agronomic factors in the field that played a more important role in yield development in soybeans, such as extreme dryness, high weed pressure, and poor field selection for soybeans based on soil quality."

These results are consistent with other research done at Outlook and Indian Head, and will need to be tested again over multiple years and environments to determine whether there is a significant trend that can be predicted. •

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Soil Temperatures and Weed Control

Is it better to start early, or wait for a stronger start in warmer soil?

BY MEGAN MADDEN

DECIDING WHEN TO SEED PULSE CROPS CAN HAVE AN EFFECT on germination, plant stand, weed competition, and ultimately, yield.

According to Saskatchewan Pulse Growers' 2018 Saskatchewan Pulse Crops Seeding and Variety Guide, peas, lentils, and faba beans should be seeded earliest, as they can germinate in soils as low as 5°C. Desi chickpeas should be seeded into slightly warmer soil temperatures of 7°C but large Kabuli varieties, dry beans, and soybeans do not germinate and emerge well in temperatures this low. Seed these crops into warm, moist soils (10°C at the depth of seeding). Today's direct seeding allows producers to seed shallower because residue on the soil surface keeps moisture closer to the surface, with no need to chase moisture at depths in some years.

Some simple measures in the fall can help improve soil temperature earlier in the spring. Ensure your combine is evenly spreading chaff and chopped straw so seeding equipment will not plug in heavy residue areas, and so soils will warm evenly.

A recently completed study by Ramona Mohr of Agriculture and Agri-Food Canada in Manitoba found residue management influenced soil temperature at seeding at all of their trial sites. Mohr's summary states "the average soil temperature of treatments where straw was retained on the soil surface was approximately 1°C to 3°C lower than those where straw was removed. Despite these early-season differences, residue management had limited effects on plant stand, soybean yield, and seed quality, including test weight and seed weight in 2015." If fall management is not adequate, a heavy harrow can be used to slightly blacken the soil in the spring, increasing the warming ability for seeding.

Timing decisions will also impact factors beyond germination and emergence. Dale Risula, Provincial Specialist, Special Crops with the Saskatchewan Ministry of Agriculture (SMA) says, "Seeding date can also have an impact on how that plant competes with weeds. Warm season plants start slower, which means they compete less with our cool season adapted weeds. For example, chickpeas are less tolerant of a cool spring, with the Desi varieties being slightly better suited than the Kabuli."

Clark Brenzil, Provincial Specialist Weed Control in the Crops and Irrigation Branch for the SMA says that pulse crops have a critical weed control period defined as the growth stages in the crop that must be kept weed free to prevent yield loss.

"The critical period for most crops is based on yield loss due to weeds of no more than five per cent, since it is the level of statistical relevance that is often used. In other words, the crop has to be weed-free during these critical stages to prevent a yield loss of more than five per cent," Brenzil explains. "For example, there is no real advantage to controlling weeds in a soybean crop before the first trifoliate. Weeds not controlled in soybeans between the first and third trifoliate stage can cause upwards of 50 to 60 per cent yield loss, whereas yield losses outside of this range generally result in less than five per cent yield loss, much of this at the early end of the range."

Temperature Requirements for Seeding for Various Pulses

CROP	RECOMMENDED MINIMUM AVERAGE SOIL TEMPERATURE AT SEEDING DEPTH (°C)	ESTIMATED SEEDING DATES FOR SASKATCHEWAN	RECOMMENDED SEEDING DEPTH IN CM (IN.)
Peas	5°	Mid-April to Mid-May	3–8 cm (1.2–3.2")
Lentils	5°	Mid-April to May	2.5–7.5 cm (1–3")
Chickpeas	7° (Desi) 10° (Kabuli)	Prior to May 25	3.5–6 cm (1.5–2.5")
Faba Beans	3°–5°	Mid-April to Mid-May	5.1–7.6 cm (2–3")
Dry Beans	12°	May 25 to June 5	5–6 cm (2–2.5")
Soybeans	10°	May 10 to May 25	1.9–3.8 cm (0.75–1.5")

Source: Saskatchewan Ministry of Agriculture

Seeding Rate Calculation

The following formula will assist you in determining the target seeding rate for pulse crops:

$$\text{Seeding Rate: Kilograms per hectare (kg/ha)} = \frac{\text{(target population per square metre x TKW* in grams)}}{\text{\% field emergence or survival (in whole number, i.e. 85)}}$$

To convert to pounds per acre, multiply the seeding rate (in kg/ha) by 0.89.
**TKW = Thousand Kernel Weight*

Temperature requirements for seeding pulses and how to calculate your seeding rate can be found in the Saskatchewan Pulse Crops Seeding and Variety Guide.

Pulses are generally poor competitors, and with limited in-crop weed control options, pre-seed burnoff timing can also affect crop yield. Brenzil says that there is a disadvantage to waiting to do burnoff until just prior to late-seeded crops, particularly this year when moisture resources may be limited. "Do your burnoff as soon as you can get in the field," he recommends. "When dandelions are just beginning to bloom is the best time to control them for optimal yield."

The benefit of early pre-seed weed control also applies to winter annual weeds. Brenzil adds that this recommendation comes from a series of research projects completed by Rick Holm and Ken Sapsford at the University of Saskatchewan, that studied timing of pre-seed burndown treatments with respect to the yield of wheat. These studies found that early dandelion removal during the burnoff treatment resulted in better crop yield, when compared to later burnoff treatments.

Timing of seeding will play a role in the decision to use a seed treatment with your pulses. Brenzil says that seed placed into cold soils benefit from a seed treatment to protect the seed viability, as the longer the seed sits in the soil, the more susceptible it is to seed rot.

Risula encourages producers to test their seed beyond the standard germination test to determine pathogens present. He recommends always treating Kabuli chickpeas, as they are sensitive to seed- and soil-borne pathogens, and have high seed-to-seedling transmission for seed-borne Ascochyta.

While seed size in itself is not a reliable indication of seed vigour, it can impact seeding rate which, in turn, will affect plant stands and ultimately competitiveness. Risula recommends using the thousand kernel weight to calculate appropriate seeding rate to target plant densities that allow the crop to compete with weeds.

"Even a relatively uncompetitive crop like lentils will suppress weed growth and produce higher yields if seeded at higher densities," says Brenzil.

There is no magic formula for when to plant which of your pulse crops, but utilizing a combination of these strategies will ensure your crop is set up for success. •

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Keeping Soil Insects at Bay

What insect pests should you be aware of this growing season?

BY GEOFF GEDDES

SOIL INSECTS ATTACKING PULSE CROPS ARE LIKE PARTY CRASHERS, uninvited and hard to dislodge once they settle in. Though the impact of soil insects varies by species, the common concern is yield loss due to root damage affecting nutrient uptake by the plant.

"Plant death is a possibility, especially with cutworms that can cut the stem and consume foliage," says Dr. Meghan Vankosky, Research Scientist — Field Crop Entomology with Agriculture and Agri-Food Canada (AAFC). "There may also be indirect effects where initial damage leads to pathogen infection. The infection causes most of the damage, but it gets in because of an insect feeding on the plant initially."

Like most aspects of farming, the soil insect issue is largely weather dependent.

"The size of insect populations and their feeding rate fluctuates with temperature," says Vankosky. "In general, you see less damage during cold, wet weather compared to warmer and drier conditions, as insects are more active when it is warmer."

With soil insects, however, moisture can be helpful as it keeps them from desiccating in the soil. Also, some soil insects tolerate moist conditions better than others, leading to more plant damage.

Pea Leaf Weevil

One pest causing a lot of concern is the pea leaf weevil, an insect whose geographic range continues to expand across the Prairies.

"When attacking field peas and faba beans, the adults feed on the foliage, and the larvae consume the root nodules," said Vankosky. "That nodule damage interferes with nitrogen fixation and can be worse than the harm to foliage, especially if the plants are grown in low nitrogen soil to naturally improve soil nitrogen content for subsequent crops."

To combat pea leaf weevil, most research points to insecticide seed treatments as the best bet for protecting field peas and faba beans. In addition to guarding the foliage against adults, treatment can delay development of the larval population, and may even reduce damage below the ground.

"Effectiveness of insecticide seed treatment depends on the population density of the pea leaf weevil and when they arrive. If there are too many of them, they may overcome the protection. However, our preliminary data from an experiment in Swift Current, Saskatchewan showed good yield protection from seed treatment, so that is promising."

From an economic standpoint, Vankosky says the nominal threshold for pea leaf weevil is to consider spraying a foliar insecticide when 30 per cent of plants sampled in a field have feeding damage on the terminal leaves.

Scouting for pea leaf weevil is done in early spring as pea seedlings are emerging from the ground. Keep in mind, though, that seed cannot be treated with insecticide at that point. Consulting the pea leaf weevil risk map on the Prairie Pest Monitoring Network Blog (prairiepestmonitoring.blogspot.ca) can help growers determine if they are farming in an area of high weevil risk.

Cutworms and Wireworms

Two of the biggest pest threats to pulses are cutworms and wireworms.

"Both can lead to stand reductions and if the stand is too thin, yield reductions may occur," says Scott Meers, Insect Management Specialist — Pest Surveillance Section with Alberta Agriculture and Forestry.

Pea leaf weevils can be extremely damaging to pea and faba bean crops. Photo Credit: Agriculture and Agri-Food Canada

Although cutworms are found throughout the Prairies, wireworms favour the Dark Brown soil zones in the dry, southern parts of Alberta and Saskatchewan. Neither pest is a welcome sight for producers, but cutworms are of greater concern to pulse growers.

"Cutworms usually cut the plant off just below the soil surface," says Meers. "Wireworms are more likely to target the seed itself, and since pulses tend to be larger-seeded, the damage is often less severe than with cutworms."

The two pests also differ in the approach needed to address them.

"Wireworms like cereal crops the best, so if there are cereals in a grower's rotation, they should watch for wireworm damage in one year to predict damage in the next," says Dr. Haley Catton, Research Scientist — Cereal Crop Entomology for AAFC.

Seed treatments containing neonic insecticide offer some protection against wireworms and aid in crop establishment. "The treatments do not kill the wireworms, but stun them for a few weeks or months, giving enough time to get a crop off that year," says Catton.

On the other hand, no such protection exists for peas plagued by cutworms, though Meers suggests a foliar application of insecticide to manage the cutworm population once it appears.

As for the threshold dilemma, Meers says decisions should be based on when plant stands fall below acceptable levels. He suggests consulting the Cutworm Pests of Crops on the Canadian Prairies field guide from AAFC, for more information on cutworm thresholds.

Dealing with soil pests is no easy task for pulse growers, yet it is well worth the effort. The longer pests stick around, the more damage they do. •

Geoff Geddes is a freelance agriculture and business writer based in Edmonton. Contact him at geoffgeddes@thewordwarrior.ca

A wireworm eating its way through a faba bean seed. Photo Credit: Aegis Agricultural Consulting

Tackling Disease in Pulse Crops

With warmer winters and wet springs, disease tends to crop up

BY JANE CAULFIELD

DISEASE IN PULSE CROPS CAN LEAD TO MAJOR CROP LOSS and have devastating results for producers. In Saskatchewan, root rots caused by fungi and fungal-like pathogens are the most prominent early season diseases in pulses. In 2016, 97 per cent of pea fields tested were positive for the fungus *Fusarium avenaceum.* High levels of other pathogens, such as *Pythium ultimum* and *Aphanomyces euteiches* were also present.

"Plant diseases can be caused by living factors, such as fungi or bacteria, and non-living factors such as adverse environmental conditions," says Barbara Ziesman, Plant Disease Specialist for the Saskatchewan Ministry of Agriculture (SMA). "It is important to determine what the cause of the disease is before management can be effective."

When talking about plant diseases, researchers and experts refer to the "disease triangle" — a trio of factors that come together to create an ideal situation for disease to occur. Presence of pathogen, plant susceptibility, and environmental conditions all play a contributing role in the development and movement of disease, but experts believe the environment is often the driving force for disease development.

"Even if the pathogen that can infect the host, such as the fungal spores, is constant and the same variety is grown, there will be some differences in disease levels due to differences in the environmental conditions," says Ziesman.

The Problem with Wet Feet

Many pathogens that affect pulse crops, such as *Aphanomyces,* need a lot of water to grow and spread. This means that an excessively rainy spring can cause a lot of problems and frustration for producers.

"Peas and lentils are more sensitive to excess moisture as they do not like wet feet," says Sherrilyn Phelps, Agronomy Manager at Saskatchewan Pulse Growers (SPG). "Some pulse crops, such as soybeans and faba beans are more tolerant of higher moisture conditions."

With the exception of last year, the past few growing seasons in Saskatchewan have been abnormally wet, which, when combined with shorter rotation periods and increased inoculum in the soil, increases the risk of plant stress and disease at any point during the growing cycle.

"Any time a plant is stressed, they are more susceptible to disease," says Phelps. "If the soil is a heavier texture or if there are cooler temperatures during the early season, the germination process can slow down, stress the plant, and can lead to seedling diseases."

"Plants will show signs of yellow and reduced nodulation and root growth under excess moisture conditions," says Phelps.

Other causes of plant stress include shortened rotations, soil compaction, and nutrient deficiency.

Understanding each impacting factor and having some knowledge about the various pathogens themselves, can help producers make crop-saving decisions and develop disease management plans.

Managing Disease

One of the most effective ways to deter in the development of seedling diseases in pulse crops is to ensure that disease free seed goes into the field. This means getting the seed tested for both quality and the presence of pathogens.

"Getting seed tested before planting can help producers determine whether or not that seed should be used," says Ziesman "It can also help the producer determine if a seed treatment should be used and assist in developing a management plan."

Certified seed, according to the *Federal Seeds Act,* only needs to meet standards of germination and purity but not all diseases. This is why experts suggest producers get seed tested by an accredited laboratory or ask to see the lab certificate before purchasing.

"Planting pulse seed that is free of seed-borne illnesses is the primary way to limit the introduction of pathogens into the field," says Ziesman.

If some pathogen is present, producers can use seed treatments. But these treatments tend to only be effective for three to four weeks after seeding. Crop rotation can be used to break disease cycles and prevent the build-up of the pathogen within a field.

"Planning crop rotations is important activity during the winter months," says Phelps. "With peas and lentils, if the desired field has had issues in the past then it is a good idea to stick to at least a four-year rotation."

If a field has a history of *Aphanomyces* root rot or has tested positive for the pathogen *(Aphanomyces),* then the rotation should be even longer.

"If there were problems on the field the last time pea or lentils were grown, then growers should be moving to a six-to-eight-year rotation for these crops," says Phelps.

Both Ziesman and Phelps mention that SPG and the SMA produce a variety of fact sheets and resources designed to help producers develop disease management plans. The more producers can do to prevent disease or stop the spread of disease, the better the growing season will be for everyone. •

Jane Caulfield is an experienced journalist and writer, and is the owner of Tin Box Digital Content.

Considerations for a Dry, Dry Year

The growing season may prove to be more average, but coming off a record dry year, and a dry winter, means planning now for soil moisture retention

BY LYNDSEY SMITH

AFTER A GROWING SEASON OF VERY LIMITED MOISTURE IN SASKATCHEWAN and a below-average snowfall in many areas, pulse growers are understandably nervous about what the soil moisture situation will look like at seeding.

The good news is pulses are well-adapted to dry conditions. The bad news is there is a limit to how well a crop can perform in a drought, and we are headed into a historically low soil moisture situation in many areas.

While no one can predict the in-season rainfall we will get, you can tweak production practices at every step of the crop production line in order to conserve moisture, avoid herbicide carry-over wrecks, and make the most of what is there.

Shannon Chant, Regional Crop Specialist for the Saskatchewan Ministry of Agriculture (SMA), based at Swift Current, says there are at least three pre-seeding decisions to make before you head to the field.

First, take a long, hard look at what is to go on each field. Pulses draw moisture from a shallower depth — 2017 cereal acres may be a better fit for a pulse crop, keeping in mind herbicide carry-over may play a role. Part B to this point, Chant says, is the all-mighty importance of field records. "It does not have to be a fancy app or even on a computer. A notepad works just fine, but keep good records," she says. Crop types, soil test results, herbicides used, yields — the more details you have, the better decisions you can make under adverse conditions.

Secondly, taller stubble traps more snow and slows moisture loss in the spring. Could you swap some acres around based on potential snow trap? Different crop types have different water use efficiency ratings (see the sidebar on pg. 38) — this could mean moving more drought tolerant crops on to drier fields or vice versa.

Third, seeding rates should not suffer because of a dry season. Optimal plant stand numbers means the crop — and not weeds — can use what moisture and nutrients are there. Seed size variability can significantly change actual seeds planted per acre if you still use a "bushels/acre" or "standard" seeding rate. Start with a thousand kernel weight of your actual seed and work to a desired plant stand.

Into the Ground

A dry year is all about moisture retention — the more disturbance of the soil, the more water you are going to lose. Tillage is a non-starter, which for those that have been adding it back in to field management, may prove an issue. But for many, the next consideration is going to be the seeding pass itself — where can you conserve moisture?

Nathan Gregg, Program Manager of Applied Agricultural Services for Prairie Agricultural Machinery Institute, says that row spacing and opener selection are really your only two modifiable options. As a general rule, narrower row spacing means more even distribution of seed in a given land area, decreasing the amount of bare ground, hastening canopy cover, and increasing the likelihood of roots accessing what water is there. But narrower row spacing also means more openers relative to wider row spacing, and therefore proportionally higher disturbance of the soil surface.

Row spacing is typically fixed, so the next best option is moving to a narrower, lower disturbance opener to decrease the amount of moisture loss through exposed soil (think knife versus paired row or shovel-type openers). Consideration should be given to seed-placed fertility rates as the seed-bed is narrowed. The seeding pass may require some adjustments, too. Dry soil can be harder to penetrate, requiring more pressure, but a wider opener/tip could cause more fractures and pull up clods of soil. In-field fine-tuning is likely to be the name of the game this year, he says.

Gregg says it is important to recognize that dry soil can be more flowable. "It is possible that the seed gets buried deeper than ideal as granulated soil flows around the opener into the furrow, especially at higher speeds," he says, which is one more reason to stop and evaluate the job you are doing in the field.

"In a dry year, everything is drier, including the seed you are using," says Gregg. Handling, moving, and metering dry seed in dry, low relative humidity conditions could result in more cracks or broken seed, so plan accordingly.

At seeding, the depth you chose could make a huge difference on emergence. Some crop types are more forgiving — but there is a limit. A larger seed usually can emerge from a lower depth if it is in to moisture, but a seedling that has pushed up through several inches of soil comes out already stressed and depleted of energy reserves. Of note, soybeans, because of how they emerge, are less tolerant of deep seeding. Crusted soil and compaction will make emergence even more difficult for soybeans. Increasing seeding rates can help soybeans push through crusted soils.

Scorched Seed

Dry conditions also increase the risk of fertilizer burn from seed-row-placed fertilizers. "Dry conditions aggravate the salt effect of seed-placed fertilizer," explains Dr. Jeff Schoenau, Professor and Ministry of Agriculture Strategic Research Chair, with the Department of Soil Science, University of Saskatchewan. "Most fertilizers are salts. Too much salt close to the seed can hold back water from the seed, decreasing germination and emergence."

Under dry conditions, urea and ammonium sulphate fertilizer are likely to generate more ammonia that remains as a gas in the soil, further risking injury to the emerging seedling.

"One option is to redistribute your fertilizer and move more into a band that is separate from the seed-row," Schoenau says. Remember that published seed-placed guidelines are based on good seed-bed moisture conditions, he says. "If a separate band is not an option, staying conservative with seed-placed fertilizer is your best bet."

How much fertilizer nutrient you need is best assessed using a soil test, Schoenau says. For example, a dry 2017 means that you might have more residual soil nitrogen in your cereal stubble than you realize, which would reduce or eliminate any need for seed-placed starter.

"Anything that preserves surface residue helps too," Schoenau says. Residue helps trap snow that fell over the winter, reduces run-off and erosion risk, and helps reduce moisture losses through evaporation in spring and summer.

On the subject of seeding, recognize that nodulation and nitrogen fixation also require water to happen. It is critical that farmers use best management practices for maximum effectiveness of inoculants. Make sure it is stored properly and used quickly, reducing the amount of time from the container to the ground. Placing the inoculant in moist soil is beneficial, if at all possible.

Herbicide Carry-Over and Injury

Besides a lack of moisture, perhaps the biggest risk to a seeded pulse crop is herbicide injury. That is because herbicides are broken down and deactivated through two main processes — microbial activity and hydrolysis — that both require water to happen. It means that carry-over risks may be greater than normal, and potentially cause damage even though you have followed all the re-cropping restrictions.

To gauge the risk of extended carry-over on any given field, it is important to understand what moisture matters when it comes to breaking down herbicides.

Snowfall over the winter does not help, says Clark Brenzil, Provincial Specialist, Weed Control, for the SMA. "Rainfall from June 1 to September 1 is what is going to drive microbial activity and hydrolysis, the two primary mechanisms that break down herbicide actives," he says.

It is oversimplified, but herbicide molecules that were not broken down in the previous growing season remain in the top inch or so of soil, attached to soil particles. Heavy rainfall presents a greater risk of movement of herbicide residue into the rooting zone. High organic matter and high clay content soils can hold on to more of these molecules, creating a buffer between the crop and the herbicide when rain eventually comes.

A very dry year, such as in the southwest part of Saskatchewan in 2017, actually becomes a non-year when it comes to calculating replant restrictions, says Brenzil. If you used something with a two-year re-cropping interval, such as Authority®, in 2016 and were planning to go back into that field in 2018, Brenzil suggests caution. "The 2017 season would not count as a year because it was so dry. Add a year and rotate into a non-restricted crop," he says.

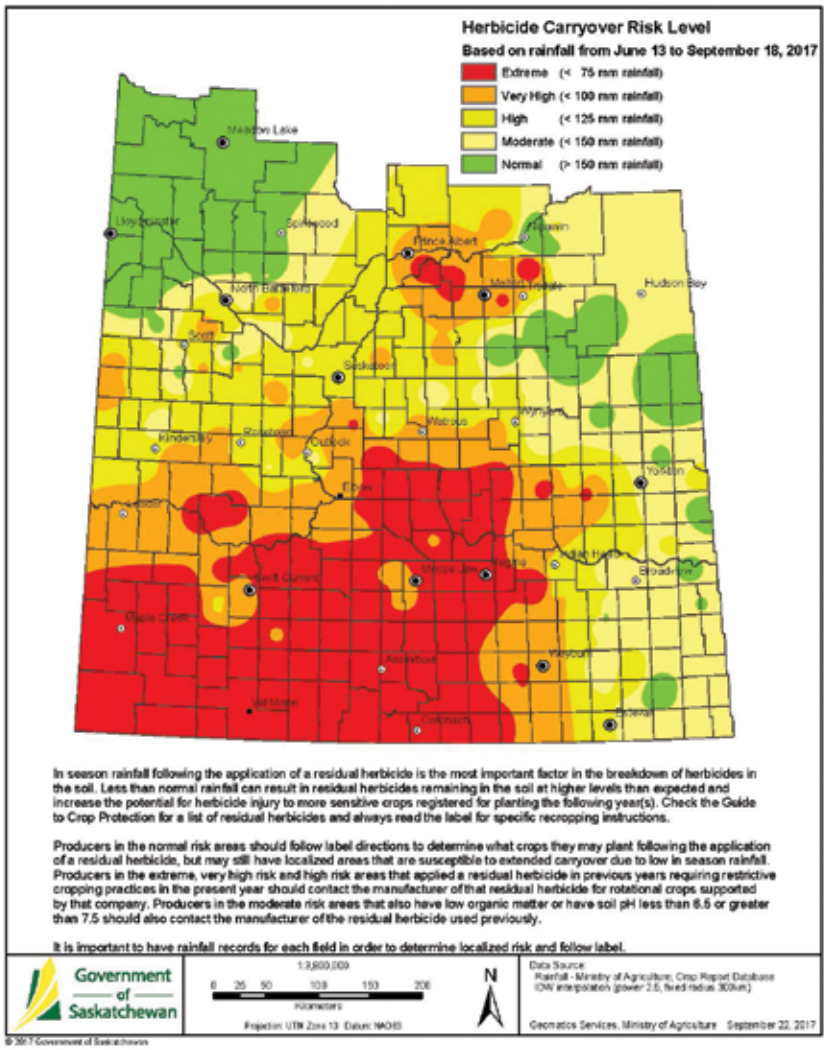
If you are concerned about herbicide residue being a problem this year, your testing options are somewhat limited. If you were proactive and took soil samples in the fall, you could send them to A&L Laboratories at London, Ontario, for a full grow-out bioassay test. If you missed that chance, the best you can do for 2018 is gauge your risk based on field history, soil texture and organic matter, and cumulative rainfall.

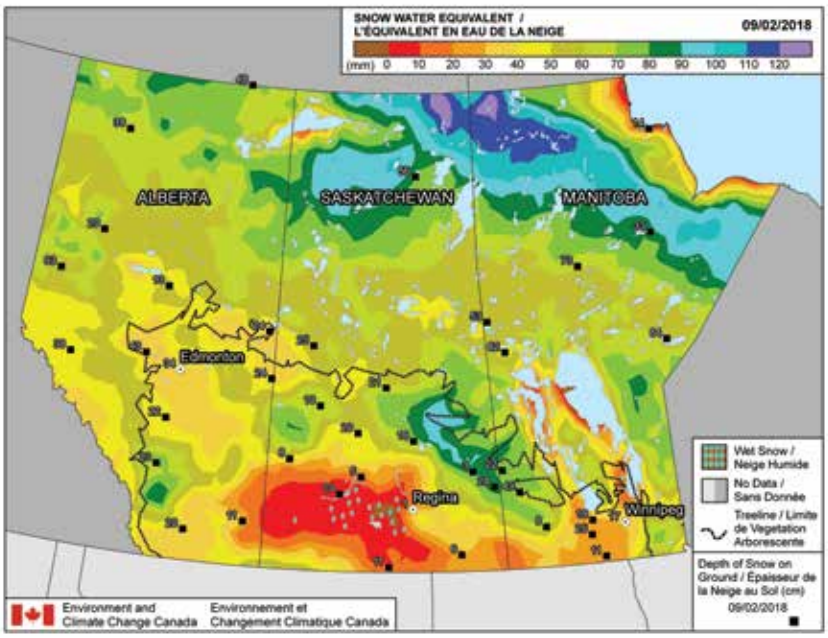
Brenzil says you could also run in-field bioassay test strips this year that will certainly alert you to any issues within a particular field, but that does not inform 2018's cropping decisions. If 2018 turns out to be another dry year, however, it could help with 2019 field selection. It is also important to consult with the manufacturer of the herbicide used in 2017 (possibly even 2016) for their recommendations.

If 2018 is also a dry year, in-season herbicide effectiveness could be an issue. Full water volumes and full surfactant loads are key, as weeds themselves will be putting up extra defences, like more waxy coatings or more hairs, to protect against dry conditions. Also, ground water changes could create issues even before the actives mix in the tank.

"As dry conditions go on, mineral in ground water becomes more and more concentrated," Brenzil explains. A water quality test only takes a week or two and will be well worth it, as minerals, such as calcium, magnesium, and bicarbonate can interfere with product mixing and effectiveness. "Water quality issues can be a pretty easy fix, using ammonium sulfate at different rates for either hard water with glyphosate or bicarbonate problems for the Group 1 "dim" herbicides, such as Poast®, tralkoxydim, or clethodim. There is no reason to not test."

He adds that a dry weather cycle also causes a shift in weed species (over time C4 plants, such as pigweeds, kochia, and Russian thistle, will thrive), and we already have confirmed herbicide and sometimes multi-herbicide resistance for some of these species. In very dry areas, some farmers may turn to back to summerfallow. Brenzil encourages these farmers to be aware of resistance issues and to watch for misses or trails of weeds that make it through a control pass. "You just cannot let those weeds go to seed," he says. •





Water Efficient Crops

How much water does every pound of crop need? It may seem like a large question, but some neat research recently ranked common Canadian crops by their water use efficiency. Expressed in pounds of yield per inch of water, here is how some crops stack up, in order of more efficient (less water used) to less efficient:

- Peas — 253
- Wheat — 193
- Chickpeas (Desi and Kabuli) — 167
- Lentils — 128
- Canola — 117
- Mustard — 115

2019 BOARD OF DIRECTORS NOMINATIONS

SASKATCHEWAN pulse Growers

Saskatchewan Pulse Growers will be accepting nominations this summer to fill two positions on the Board of Directors.

Nominations are being accepted until 12:00 PM Central Standard Time on Friday, September 14, 2018.

Responsibilities:

- Approximately seven Board meetings per year
- Conference calls as required
- Typical time commitment of a Director ranges from 21 to 53 days depending on the Director's involvement in other committees
- Terms are for three years, with the possibility of being re-elected twice, for a maximum of three consecutive full terms

If you are a registered pulse producer (i.e. You have sold a pulse crop and paid levy to Saskatchewan Pulse Growers within the last two years), and would like to be instrumental in growing Saskatchewan's pulse industry, fill in the nomination form below. It must be signed by three other registered producers.

* If you or one of your nominators sells pulses under a company name, you must also complete a designated representative form. See note at the bottom of this form.

Nomination Form

In accordance with the Saskatchewan Pulse Growers Regulations, I, the undersigned, hereby submit my name as a candidate for election to a seat on the Board of Directors of the Saskatchewan Pulse Growers.

First Name (please print) _____ Last Name (please print) _____

Address/Town _____ Postal Code _____

Email _____ Telephone _____ Fax _____

Signature _____

I have grown the following pulse crops:

	2017	2018

I nominate the above pulse producer as a candidate for election as a Director of the Saskatchewan Pulse Growers.

Name (please print)	Name (please print)	Name (please print)
Address (box number and town/city name)	Address (box number and town/city name)	Address (box number and town/city name)
Telephone	Telephone	Telephone
Fax or Email	Fax or Email	Fax or Email
Registered Producer (signature)	Registered Producer (signature)	Registered Producer (signature)

PLEASE RETURN THIS FORM TO:

SASKATCHEWAN PULSE GROWERS, 207-116 Research Dr., Saskatoon, SK, S7N 3R3 **FAX**: 306-651-3043 **EMAIL**: election@saskpulse.com

Note: Only registered producers can hold office, vote, or nominate others. If your dealings with the Saskatchewan Pulse Growers (e.g. levy) have been through your company name, rather than your own name, you must sign a "Designated Representative Form" which designates you as a representative of the company for election and nomination purposes. Please contact the Saskatchewan Pulse Growers Office at 306-668-0590 if you think this might apply to you.

Market Access Work Ongoing for Canadian Pulses

The Canadian pulse industry is working hard to mitigate market access issues in India

BY DELANEY SEIFERLING

THERE IS STILL A LOT OF UNCERTAINTY around market access for Canadian pulse exports to India this year.

But the Canadian pulse industry has been working closely with the Federal Government to do everything in its power to address and remove the constraints the Indian government has created in the last year.

"The pulse industry has come together to do everything we can to help sort out these issues," says Gord Kurbis, Pulse Canada's Director of Market Access and Trade Policy.

India's treatment of Canadian pulses has been a focus for the Pulse Canada team for some time now.

In December of 2016, Pulse Canada contributed to a dossier of scientific information that was sent by the Canadian government to the Indian government, documenting in great detail how Canadian pulse exports do not create plant health concerns that would warrant fumigation.

In February of 2017, this information was re-submitted with updates, including information about the rigorous procedures Canadian exporters and Canadian government agencies, such as the Canadian Food Inspection Agency (CFIA) and the Canadian Grain Commission, follow to prevent phytosanitary risks of exported crops.

Last year, members of the pulse industry and government travelled to India twice to discuss market access issues with Indian officials, and continue ongoing discussions to find a long-term trade solution.

The second of these trips, last November, included International Trade Minister Francois-Philippe Champagne, Transport Minister Marc Garneau, and Innovation Minister Navdeep Bain.

Prime Minister Justin Trudeau also led a mission to India in February. After the visit, the Canadian and Indian governments released a joint statement saying that they would work together to finalize an arrangement by the end of 2018 to enable the export of Canadian pulses to India free from pests of quarantine importance, with mutually acceptable technological protocols. The statement also noted that transparency and predictability of market access conditions are key in advancing the food security goals of both countries.

Since this statement was released, Pulse Canada has continued to press the Canadian government to take actions to ensure the commitments outlined are met, with emphasis on policies that are predictable, transparent, and that can be implemented with sufficient advance notice to respect contractual commitments between Indian and Canadian companies.

Pulse Canada also emphasized that Canada and India must affirm their support for science-based approaches to plant health, food safety, and environmental protection.

However, the big question is, how much of an impact will this work have?

There is general consensus that the motivation behind the Indian government's heavy regulation of imported pulses is motivated by domestic politics rather than scientific safety concerns. After their trip to India last fall, Federal Agriculture Minister Lawrence MacAulay and International Trade Minister Francois-Philippe Champagne issued a joint statement noting their disappointment in this unfair treatment.

"The Government of Canada is deeply concerned and disappointed with the recent regulatory and tariff decisions made by the Government of India affecting the Canadian pulse trade," the statement read.

Also lending to the current problem is the fact that India's domestic pulse production has seen higher-than-usual volume for the last two seasons, meaning the country was less reliant on Canadian exports.

"India increased its Minimum Support Prices (MSP) for pulses, and Indian growers did what growers all over the world do, which was to increase plantings in response to higher pulses prices," Kurbis says. "They also had favourable weather, so they do not need imported pulses as much right now. The question is for how long."

One school of thought is that above-average production may be the start of a longer-term trend towards a more sustainable agricultural system in India.

In 2016, India released a report outlining a goal of becoming self-sufficient in pulses by producing 24 million tonnes of the crops domestically by 2020. The report also noted that pulses are a major source of dietary protein in India, especially for the majority of low-income households, and observed that demand had increasingly outstripped the supply at the time, resulting in rapid price increases, costing the Indian treasury over $1 billion annually.

Among the report's recommendations was that the Indian government "incentivize the pulse producers through attractive (substantially high) MSPs and a robust procurement network."

India has since increased its MSP twice and amassed 1.5 million tonnes of government stocks.

But some industry insiders are skeptical. G. Chandrashekhar, a journalist and global agribusiness specialist based in India, does not foresee this becoming a longer-term trend.

"Indian agriculture is fragile and vulnerable," he says. "India is only one bad monsoon away from a major farm disaster. So it would be sensible to ... keep the import window open by following a dynamic trade and tariff policy and not alienate traditional suppliers who have supported India's quest for nutrition security."

However, he cautions that the market access issues will not be alleviated any time soon.

"Given that the current domestic price situation is still not favourable for growers and good prospects for the impending rabi harvest, I do not foresee a quick easing of the current market access issue that Canadian pulses encounter at present. The Indian government is surely faced with domestic socio-economic and political compulsion to be seen to be supporting growers." ▪

Delaney Seiferling is a freelance ag writer. She can be reached at delaney@dseiferling.com

Background on the Market Access Issues

Market access issues for Canadian pulse exports to India officially began in 2003, when India created a regulation requiring that all imported pulse crops be fumigated in their country of origin with methyl-bromide.

Canada has since been given exemptions to this regulation, for a variety of reasons including that Canadian temperatures are too cold for the fumigation to be effective. The latest exemption expired last September and was not renewed, putting Canada at a competitive disadvantage to other countries that were granted further extensions.

Adding further challenges, in November India unexpectedly introduced a 50 per cent tariff on dry pea imports — the highest pulse duties have ever been for the country — and in December also applied a 30% tariff on lentil and chickpea imports, followed by later increases to 33 per cent for lentils, and 60 per cent for chickpeas. The justification for these tariffs is to provide support for local pulse growers, according to the Indian government.

Making Sure to Keep It Clean

Knowing the maximum residue limits can help your crop get access to market

BY MEGAN MADDEN

CANADA EXPORTS 85 PER CENT OF ITS PULSE PRODUCTION, REACHING 130 COUNTRIES WORLDWIDE, making trade access critical to the profitability of the industry and its producers. A significant factor in maintaining this access is ensuring that all crop protection products are being used legally and responsibly, to ensure product residues remain at trace levels, or levels well below accepted maximums on exported pulses.

The *Keep it Clean!* campaign advises there is no need for caution if products are applied properly early in the season, but very late applications of fungicides or insecticides may result in residue levels found in the seed. With desiccants and harvest aids, there could be more risk with residue on the seed as these products are applied very late in the season. As a result, growers must ensure that they take appropriate risk mitigation steps to assure product residue remains below maximum residue limits (MRLs) set by regulatory agencies.

"More countries, including China and Korea, are moving away from the global standard (CODEX) and are implementing country-specific, national MRL lists. A national MRL list means the country sets their own acceptable residue levels for each crop and active ingredient," says Mac Ross, Manager, Market Access and Trade Policy with Pulse Canada.

"In many cases, countries employing national MRL lists will have missing MRLs and not have a clear deferral policy on how they will handle these missing MRLs. Default MRLs are also used by some markets when a missing MRL is encountered and are commonly set at zero or near-zero (0.01 parts per million) levels."

Saskatchewan Pulse Growers (SPG) Chair and Radisson area farmer Corey Loessin comments that most of the potential market interruption could arise from one of those absent MRLs, rather than an exceeded tolerance in a particular shipment. "This is really the largest area of concern and one that the pulse industry, and the agriculture industry as a whole is working on to minimize the likelihood of it being a problem," he explains.

"This means working at the international level to try and get uniform MRL coverage established in importing countries that have their own MRL lists, and encouraging CODEX (the body established by the Food and Agriculture Organization of the United Nations and the World Health Organization to develop food standards), to become more current on establishing MRLs for other countries to reference."

Ross adds that residue testing equipment can now test down to one part per billion, which is relative to three seconds in a century, for perspective. Although simply detecting the presence of something is not a cause for concern to human health, these advancements in residue testing technologies have created the opportunity for countries to find an exceedance of a zero default MRL if they wish to do so.

"MRL non-compliance can cause a whole slew of issues such as trade disruptions, reputation damage, even restriction to crop protection tools that are available to Canadian farmers," warns Ross. "MRL issues can lead to reduced investment in crop protection innovation by life-science companies, due to the complexity of the global marketplace."

Further to the reputation issue, Loessin adds that has the potential to make importers wary when bringing in shipments from Canada, perhaps heightening scrutiny and testing, and potentially losing those markets due to the perceived risk. But risk is not just to the industry, it can directly affect the non-compliant producer as well. "Most grain companies have systems in place to trace

shipments back to delivery points and even individual farms," Loessin says. "Therefore, costs associated with a MRL violation could be passed back to the farm or origin of the issue."

In 2011, there was a market disruption issue with green lentils in Europe and as a result, the pulse industry was the first to create a grower advisory to ensure growers are informed and using crop protection products in ways that are both safe and accepted internationally.

Currently, a committee consisting of grain merchants, agrologists, market representatives, Pulse Canada market access specialists, and growers meet multiple times per year to examine markets of interest, identify use patterns and products with missing or misaligned MRLs, and identify new products in various stages of MRL acceptance, to create the advisory (see pg. 44). This advisory is distributed to all pulse growers in the Prairie provinces, and the information is available on the keepingitclean.ca website. The *Keep it Clean!* initiative is a partnership between the Canola Council of Canada, Cereals Canada, and Pulse Canada, working together to continuously monitor potential risks in major export markets. •

Megan Madden is the owner of Southpaw PR Inc., a strategic communications consultancy. She can be reached at @southpawMegan or megan@southpawpr.com

How Can You "Keep it Clean"?

1. Do not exceed product labelled rates. If you exceed the labelled rate, you risk surpassing recognized MRLs and this can have serious consequences in terms of both domestic pesticide laws, and international acceptance of the crop.
2. Use products at the labeled timing and crop stage.
3. Consult with your exporter or processor. Ask which crop protection products are acceptable in international markets for your crop.
4. Visit keepingitclean.ca regularly for specific products and recommendations.

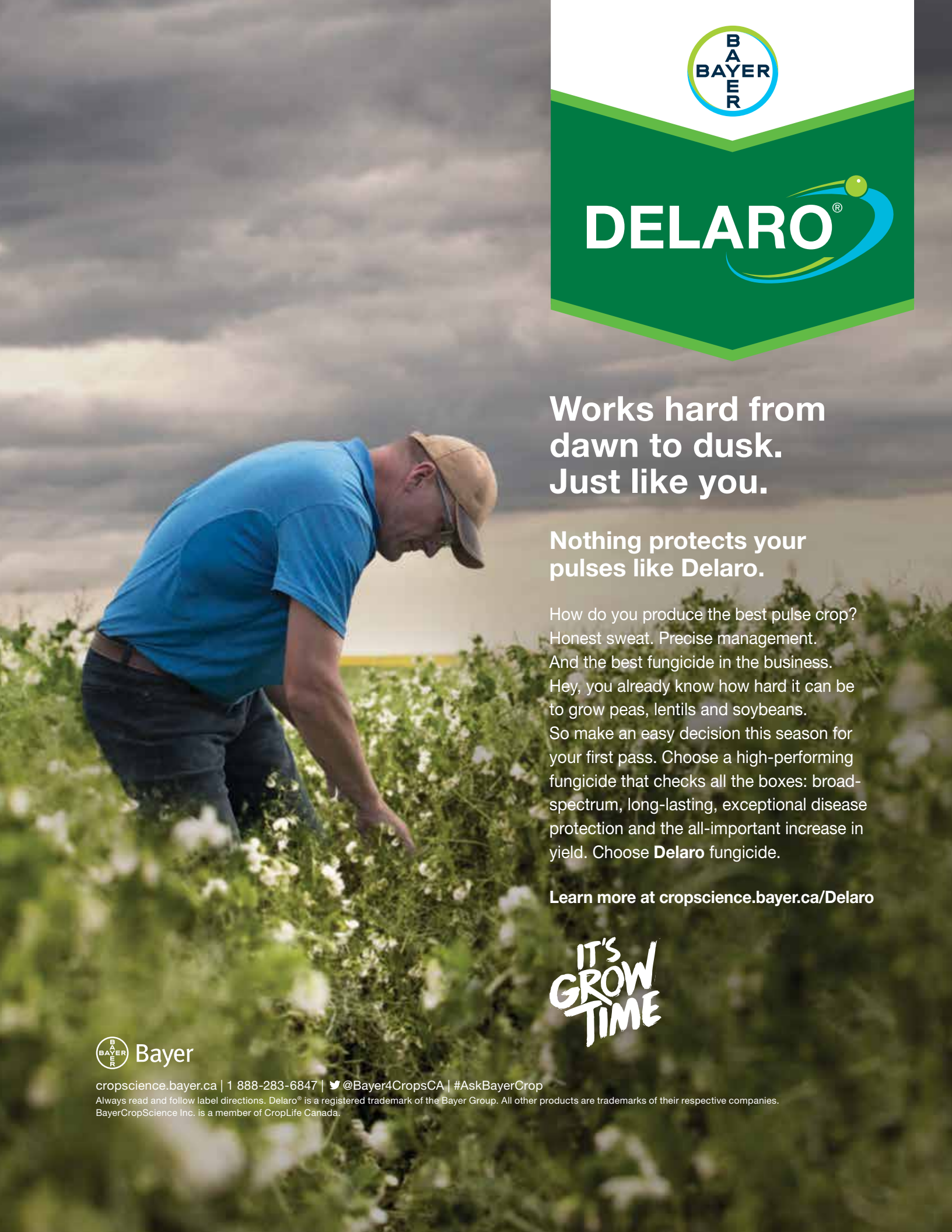
MARKET CONSIDERATIONS FOR USE OF PULSE CROP PROTECTION PRODUCTS

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

- ✓ No marketing issues.
- ! Know your market. There is at least one market where MRLs are not established. Consult with your exporter/processor.
- ✓/! No marketing issues associated with early application. If late application during pod development or seed fill to maturity (e.g. for late season grasshopper control), consult with your exporter/processor.
- ✋ Do not use after 20% flowering.
- NR Not registered. Only use registered product.

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

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

Universities are interested in lentils to meet student demand for healthy and sustainable food

BY SASKATCHEWAN PULSE GROWERS STAFF

WHEN LOOKING TO CHANGE CONSUMER BEHAVIOUR IN NORTH AMERICA, Saskatchewan Pulse Growers (SPG) knows it is not something that happens overnight. "North Americans are not traditional consumers of lentils, so it is our job to promote lentils and make them more familiar to the average consumer, in order to gain a larger share of the plate," explains Rachel Kehrig, SPG's Director of Communications and Market Promotion. "With emerging trends including a strong interest in plant-forward foods, we believe there are tremendous value opportunities for Saskatchewan pulse growers in the North American market."

SPG has been working to promote pulses in the United States (U.S.) and Canada for several years, with a particular focus on lentils. By creating new market opportunities in these countries, particularly the U.S., SPG is looking to increase overall global demand for lentils, while also alleviating some of the risks Saskatchewan growers face in dealing with less stable international markets.

One of the ways SPG is trying to familiarize consumers with lentils is by working closely with college and university campus dining services across the U.S. to make lentils a more regular feature on their menus. Some of the college and university dining services are serving more than of 25,000 meals to students every day, and are trying to do it with a limited budget. These dining programs are also striving to meet their student customer's demands for innovative, sustainable, and healthy food choices. "Lentils really fit the bill across the board for college and university dining programs. They are cost-efficient, sustainably produced, and lend well to the plant-forward eating trend that is emerging amongst Generation Z and millennials, who make up the college and university demographic," says Kehrig.

One of the recent activities SPG undertook to promote lentils to this market segment, was to host a chef-training program in partnership with Harvard University, located in Cambridge, Massachusetts. The hands-on program engaged 12 chefs that work across the University's dining program, to build ideas and innovate around the ways lentils could be further incorporated into their daily menus. "By bringing these chefs together with their peers across campus, we were able to identify some of the challenges they had been facing when it came to cooking with lentils, and brainstorm solutions that would address these barriers," says Amber Johnson, SPG's Manager of Market Promotion, who coordinated the training program with Harvard University. "The hands-on aspect allowed the chefs to get creative with lentils and try new things, with support from SPG, to help them expand their knowledge base on lentils."

Technical information about different lentil applications including using purees, as well as different ways to better build flavour in lentils resonated with the chef participants. These topics led to the group producing a wide array of menu ideas including lentil "fries", lentil gnocchi, lentil-filled empanadas, a lentil vegetable stir fry, and even sweet lentil fritters. "The chefs really challenged each other to innovate in creative ways, very much outside of their comfort zones and produced, in a very short time, some impressive dishes that could end up on menus within the week," says Johnson.

By engaging with the culinary leaders who are in the kitchens every day, responsible for feeding such a high volume of meals, SPG believes there is opportunity to inspire immediate change in the way consumers think about lentils, and how they eat them. "I believe programs like this will impact the way Harvard chefs build menus, and we will see more lentils appearing more often and in more varied applications across their daily menu offerings," says Johnson. ▪

By engaging with the culinary leaders who are in the kitchens every day, responsible for feeding such a high volume of meals, SPG believes there is opportunity to inspire immediate change in the way consumers think about lentils.

Harvard University chefs innovate creative lentil dishes for campus dining menus.

On Point

SPG Board of Directors Profile

Corey Loessin

Corey Loessin joined the SPG Board of Directors in 2012. Corey and his wife Joan Heath, along with their children Audra and Aidan, farm 3,000 acres in northwestern Saskatchewan growing peas, lentils, faba beans, canola, and wheat. He holds a Bachelor of Science in Agriculture degree from the University of Saskatchewan (U of S) and worked as a District Agriculturalist in Alberta for several years prior to returning to Saskatchewan to farm. While farming, he also taught crop science courses at the U of S for 12 years. Previous board experience includes Director on the Saskatchewan Soil Conservation Association Board and the Sask Ag Grads Association. Corey serves as a director on the Pulse Canada Board, and as the western pulse representative on the Western Grains Research Foundation Board. Corey served three years as Research and Development Committee Chair, two years as Board Vice-Chair, and is currently Chair of the SPG Board.

Feed Benchmark Reports

Saskatchewan and Alberta Pulse Growers provide information and estimates of the feeding value of dry peas and faba beans in Western Canada, based on the value of competing feed ingredients in swine rations on a bi-weekly basis. Models have been updated to reflect the latest nutrient compositions of feed ingredients, which is done periodically. For the latest feed prices for Saskatchewan, Alberta, and Manitoba visit saskpulse.com.

Pulse Promoter Award

At SPG's annual general meeting on January 8, Dr. Steve Shirtliffe was recognized with the Pulse Promoter Award. Shirtliffe was recognized for his research into mechanical, cultural, and chemical methods to help control weeds in pulse crops. He has also won several teaching awards and has trained students on pulse agronomy.

Shirtliffe is a professor in the Department of Plant Sciences at the University of Saskatchewan, where he teaches, conducts research, and provides extension in the areas of weed control and agronomy. He was raised on a grain and oilseed farm in Manitoba where, after completing a B.Sc. in Agronomy, he farmed with his family for five years. He returned to school to receive his M.Sc. and Ph.D. in the 1990s.

Undergraduate Scholarships Call for Applications

Saskatchewan Pulse Growers is now accepting applications for 2018 undergraduate scholarships. To be eligible for a scholarship, the student or student's parent(s) must be registered Saskatchewan pulse growers, they must have a minimum average of 70 per cent on five core high school subjects, and must be accepted as a full-time student this fall in a Saskatchewan-based, post-secondary program that is associated with the pulse industry or agriculture.

The deadline for applications is May 4, 2018. For application information, visit saskpulse.com or email pulse@saskpulse.com.

Upcoming Events

Pulse Agronomy Webinar Series

Saskatchewan Pulse Growers will be putting on a number of webinars this spring and summer, and you are invited to register for these in advance. Here is the list of upcoming webinars with dates, topics, and speakers:

- April 11 — Micronutrients in Pulse Production, with guest speaker Dr. Jeff Schoenau from the University of Saskatchewan
- May 9 — Maximum Residue Limits and Traceability, with Gord Kurbis and Mac Ross from Pulse Canada
- June 6 — Insects and Scouting in Pulse Crops, with guest speaker James Tansey, Provincial Specialist, Insect/Pest Management, with the Saskatchewan Ministry of Agriculture

Online registration for these webinars is now open, so visit the Events section of saskpulse.com

Crop Insurance Deadlines
June, 2018

Saskatchewan Crop Insurance Corporation (SCIC) reminds its customers of the following deadlines:

- June 21 — Yield Loss Coverage begins. Full yield-loss coverage beings on establishment spring and fall-seeded crops.

- June 25 — Seeded Acreage Reports on all crops due. If acres are too wet to seed, this is the deadline for Unseeded Acreage claims.
- June 25 — Deadline to report any stored grain, to avoid it being counted as new production in the event of a claim.

SCIC also reminds customers that, to be insurable, a crop is expected to reach a reasonable level of maturity before the final fall frost date in your area. If you are unsure about a crop or variety, please talk to a customer service office. Visit saskcropinsurance.com to learn more.

Save the Date! Upcoming Field Days

Mark your calendar for upcoming field days this summer. We have the latest list for field days happening across the province:

- Western Applied Research Corporation (WARC) Annual Field Day (July 11) — Scott, SK
- Indian Head Crop Management Field Day (July 17) — Indian Head, SK
- Ag in Motion (July 17–19) — Langham, SK
- Wheatland Conservation Area Field Day (July 19) — Swift Current, SK
- Crop Diagnostic School (July 24 & 25) — Melfort, SK

For information on these field days, and how you can register for one, visit the Events page at saskpulse.com

Pulse and Special Crops Convention
July 10–12, 2018 Regina

This convention, hosted by the Canadian Special Crops Association, is the largest event of its kind in North America and provides attendees the opportunity to network and discuss important issues impact the pulse and special crops industry. The convention will be held in Regina this summer and will cover topics such as the economic forces that triggered drastic changes to the world pulse markets in 2017, what market trends and policies will create new demand for pulses and special crops, and the latest information on transportation and commodity outlooks. For more information, or to register, please visit the Pulse and Special Crops Convention site at pulseandspecialcropsconvention.com.

For recent news on the pulse industry, visit the SPG website at saskpulse.com

Grower Profile

Randy Cay,
Cay Seeds,
Kinistino, SK

What convinced you to try growing faba beans?
I wanted a pulse in my rotation but it has been so wet over the last few years in the northeast, that it was starting to make it difficult to grow peas (which we had always done).

I started growing faba beans in 2015 because I like to try new things, and I was intrigued by them as a commercial grower, and as a seed grower. At first we grew zero-tannin faba beans, and we did some research into what varieties we should plant on our land. We have found that Snowbird faba beans have performed well for us, showing some extra yield potential. Two out of three years, we have been able to sell our Snowbirds into the human consumption market.

What challenges have you encountered growing faba beans?
One of the biggest challenges for any farmer is the seeding of faba beans. During the first year we chose to seed our faba beans doing one pass and going very slow. There was some plugging in our air drill lines, but seeding was not unmanageable.

I own a Bourgeault air seeder, and in the spring of 2016 I switched my drill over to one inch lines. That made a huge difference with our seeding, as we could travel 25 per cent faster than we had in 2015, with zero plugs. In 2016 the conditions were ideal for our faba crop and we had bean sizes that were huge. Average thousand kernel weight for faba beans is 495, but my beans in 2015 were 555. It made calculating my seeding rates interesting for 2017. But again, we used the same seeding speed and rate as the year before, and even with the large seed size, seeding was not a problem.

We have found combining faba beans marvelous. They stand up really well and they go through the combine very easily.

My only concern with faba beans is what will happen when we go into a drier trend, like what we experienced last summer. I wonder what will happen with my faba bean production if they are not drought tolerant.

Have you noticed benefits in your rotations from growing faba beans?
I have noticed some nitrogen benefits from growing faba beans, when I get my soil tested, but not quite to the extent that I had been expecting. I have noticed a bump in yield and protein content with my wheat when it has been grown on my faba bean stubble.

Has the market changed for faba beans? Are things improving to help bring faba beans to markets?
I was fortunate in my first year growing faba beans, we had contract with LegumexWalker and our beans went immediately into the human consumption market. In our second and third years growing faba beans, we were not on contract but we worked with another representative to get our faba beans sold into feed markets. So far markets have not been as much of a barrier for us selling our crop as we had first anticipated.

I think that if we can get a faba bean fractionation plant up and running, that would be extremely beneficial for growers, and would help to increase more faba bean acres.

What is your long-term vision for faba beans in Saskatchewan?
I think as long as we grow the faba bean market alongside with the acres, I have no problem with the market getting as big as possible. There is no downfall with growing faba beans in my opinion. We are constantly hearing about *Aphanomyces* plaguing our pulse crops and growers needing to go to longer rotations. We are going to try a longer rotation using peas, putting them in a four-year rotation, and then substituting faba beans in for peas, for the next four-year rotation, and eventually going back to peas. We hope that this can help us keep peas in the rotation, but still offer the recommended six to eight years break recommended from the disease cycle.


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