FARMING SMARTER

Spring 2021 Edition

FARMING SMARTER

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FARMING SMARTER

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FARMING SMARTER

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Editor: C. Lacombe

COVER PHOTO:
Soil temperature plays an important role in seeding. This was Farming Smarter checking it in spring 2020.
PHOTO: FARMING SMARTER

The Future in Our Hands

BY RYAN MERCER

While coal mines and pandemics steal headlines, Farming Smarter is a little concerned that farmers and ranchers are not aware of just how much the agriculture research landscape changed in 2020 and what it means for the future.

It's possible to hear the disappointing headlines about budget cuts and staff layoffs and not really understand that Alberta Agriculture stepped away from doing research and extension almost completely.

Rest assured, Farming Smarter stayed in the vanguard while changes rained on our industry and we kept the organization able to pivot quickly wherever necessary to meet your needs.

Our mission is We Change the Way People Farm. Not because people farm incorrectly, but because food production changes and we want you to stay on top of those changes and remain sustainable.

It means we also need to change and, right now, possibly at lightening speed. One of the ways we made sure we could do this is by making the Board of Directors the sole voting members of Farming Smarter. This means we can quickly change our by-laws or adopt policy to make sure we sustain this organization.

We feel Farming Smarter brings an important element to our industry with our research and knowledge transfer. We've seen the benefits when we work with other like-minded organizations to help farmers make the leap when something innovative promises a better bottom line.

Farming Smarter 2020 Revenue

Municipal	$5500.00	.3%
Grower Funds	$267,215.66	14%
Industry	$364,114.64	19%
Provincial	$383,764.10	20%
Federal	$645,742.66	33%
Self-Generated	$283,053.52	14%
Total Revenue	**$1,949,390.58**	

Speaking of bottom lines, we took a big step toward taking our financial fate into our own hands. A perennial problem for us, and all research, is sharing what we learn with the people that can use that information. It doesn't matter if we know dryland grain corn is a fantastic crop for southern Alberta if we can't get that information to the crop growers.

This is a reality that we think will take a while to sink in for the community that relies on agriculture research. All the mechanisms to do research and tell you about it now lie outside Alberta Agriculture.

We need to find ways to remain an impartial, reliable source for profitable farm innovation, which means we need to find funds to continue.

We developed a Smart Partner program tied to our Agronomy Smarts subscription that offers $15,000 in potential savings to subscribers. This program offers support to our community in many ways. We designed it to bring us funds and provide you value.

We developed Field Tested so that we can partner with farmers, companies and other entities to do research on demand and share the cost.

While we remain a registered Canadian charity, going forward it will take our whole community coming together to support each other in new ways. I urge you to really look at what we bring to your table and seriously consider supporting our work.

We're about to release a new strategic plan to fit the changed landscape. In it, we looked at changes brought by 2020 in all the ways it spun us round. We hope a new equilibrium is imminent and that we'll all land on our feet — farmers, ranchers, agribusiness and researchers.

Don't forget that we're here for you and want to weather this together as a community. Join us!

Ryan Mercer
Farming Smarter Board President

Executive Director Report

A Farmer Led Fallacy?

BY KEN COLES

In February of 2016, I witnessed farmers and ranchers unite across the province in passionate protest against the newly introduced Bill 6, the Enhanced Protection for Farm and Ranch Workers Act.

We saw protests from farmers like those you see in France including tractor parades, homemade signs, chanting and, to my guilty pleasure, protest pizza. Yes, that's right, protest pizza! Outside the Lethbridge Lodge where then Minister Carlier was about to speak someone had brought pizza for protesters.

Claudette and I arrived early enough to interact with the crowd outside among the tractors. Once inside, we sat near the front and watched sweat bead on Minister Carlier's brow as he faced questions and chants from a packed room of angry folks. I leaned over to Claudette and whispered, "I think this is the closest I will ever be to feeling what it was like in the 1960s."

Bill 6 landed right on farm and ranch doorsteps creating a defensive position among farmers to draw arms. Even though the government attackers wielded personal protective equipment and clip-

boards, it was invasive and seemingly forceful.

In 2020, a new government made dramatic changes to Alberta Agriculture and I haven't seen one tractor, one sign or one piece of pizza! I wish farmers and ranchers showed Bill 6 passion about the recent changes to Alberta agriculture research as it will create gaps in history.

I'm sure there are many reasons for the quiet and I'm not making political judgements, but noting a glaring difference in reaction to two different situations.

This time, the agriculture industry asked for the change. They wanted to see reinvestment into research after losing ACIDF (Agriculture Crop Industry Development Fund). After a series of consultations, what came out didn't replace the grant; it created something entirely different.

The government created RDAR (Results Driven Agricultural Research). They touted it as a one stop funding agency that would empower farmers to decide how to spend public investment in research and extension. An interesting idea with some good promise, but not without challenge. RDAR's 33 members represent everything from goats and eggs to peas and bees. It also has an expanded advisory committee of over 50 organizations including all the applied research and forage associations. Team FarmRite (a group of seven ag research organizations and three agricultural colleges) is a voting member. RDAR ran a call for proposals this fall and is set to announce its first round of results driven research funding to the industry.

But this government completed the gutting of Alberta Agriculture's research and extension work, cuts to agriculture service boards, cuts to applied research associations and a transfer of agriculture research assets to post-secondary institutions. In addition to this, the Canadian Agriculture Partnership program is mostly frozen. (RDAR is supposed to take over two programs — Accelerating the Advancement of Agricultural Innovation and Adapting Innovative Solutions in Agriculture — that funded $12 million in research annually).

While many Albertans understand and appreciate government fiscal responsibility, there is an undeniably large decrease in investment, a loss of public focused human resources and, most importantly, a detached relationship between producers and government.

Farmer LED Research

Early in the consultations, the Alberta government noted that it was the only province doing its own research. It looked to the Saskatchewan model that supports post-secondary institutions. So, it appears the guiding direction supports transferring some Alberta government scientists to universities and colleges and, in some instances, two- to three-year access agreements for land and facilities.

While it may seem like a good thing that these resources remain in agriculture, I have serious concerns regarding their long-term stability. First, these transfers come with Alberta Agriculture funding for two to three years. When the funds run out, post-secondary institutions will compete, mainly through RDAR, to maintain support for scientists, infrastructure, and projects. All while the institutions face significant budget cuts. To make things even more precarious, everyone will compete for drastically diminished funding and that's when the bubble bursts. I must admit I'm very concerned for the future of publicly funded research and innovation development. As for extension and knowledge transfer, I believe it will soon disappear completely.

Ironically, at the beginning of all this, many felt that groups like Farming Smarter and other producer lead groups across the province would need to step up and take on the work. In fact, we were falsely blamed for making it happen. The reality is that we haven't been part of the plan from the onset and now face reduced public funding and cuts as well.

I'm sure the polarizing political ideologies of left versus right play a big role, but I can't help but wonder why the changes haven't garnered more interest, dialogue, or even debate.

Perhaps some may not lose sleep over this and I may be biased toward the value of applied research and extension. However, I have seen firsthand how we helped shape a changing landscape that kept farmers profitable while protecting valuable resources. Huge milestones include the adoption and development of reduced tillage, pulse crops, novel crops such as hemp, integrated pest management, precision agriculture and much more.

We can blame this on broken relationships, misinformation, misdirection, and overall confusion that seems to be plaguing the global political landscape. It's been fueled by apathy, political blindness and an unwillingness to dig into the issues and truly understand them. So, is this really Farmer Led? Only time will tell.

Farming Smarter is weathering the storm and adapting its organization. We will continue to change the way people farm. Please join our community of dedicated learners and best wishes for a great 2021.

Sincerely,

Ken Coles
Farming Smarter Executive Director

Farming Smarter Increases its Responsiveness

BY C. LACOMBE

Farming Smarter found a way to continue its research projects and strengthen its organization when Covid19 forced it to change for the 2020 field season.

It instituted some organizational restructuring that addressed pandemic safety concerns and improved organizational quality and impact. It also allowed for teams made up of family members or roommates so that, even off site, team members remained in a bubble.

Ken Coles, Farming Smarter Executive Director, says restructuring the organization into smaller business units helps it meet some goals.

"Business units divide the tasks, create ownership and accountability, foster a culture change for program managers and give focus to skill development and creative thinking says Coles. It also inspires unit growth."

The culture shift takes each program managers' role from simply conducting research or extension, to focusing on growing and enriching each program with an objective. Now each unit lead must think about budgets including revenue and costs, sales, and client satisfaction. An increase in skills and creative thinking go hand in hand with this.

"We may all be research nerds, but now we have more smart people thinking and learning new skills like business planning, marketing, etc.," Coles said.

The division of tasks helps the teams since there is a lot to do, it's easier to have units that have leaders with clear roles and responsibilities. Ownership and accountability give autonomy and a chance to be recognized or held accountable. All these goals should eventually lead to more growth and innovation for the organization.

■ Agronomy Research Unit

Unit Lead – Gurbir Dhillon Ph.D.

The research unit run by soil scientist, Gurbir Dhillon Ph.D., and research coordinator, Mike Gretzinger, leads grant-funded research projects either led by Farming Smarter or in collaboration with researchers from other institutions.

Dhillon and Gretzinger coordinate field research activities and data collection. They also work closely with the extension unit to present at field days and provide content for extension activities. Dhillon and Gretzinger coordinate to meet research unit goals and provide accurate research.

In a typical year, Farming Smarter has about 25-30 projects under this unit. Most projects have a three-year timeline. This unit also hires three or four post-secondary students each summer.

■ Field Tested Unit

Unit Lead – Lewis Baarda

The Field-tested unit does field-scale research with farmers and farm managers. The unit works with producers who may have a question about new technology, product or idea that needs evaluating in a real-world environment.

The Field-Tested crew design trials, take care of all the implementation details and research to get answers. The unit also creates a network of producers that facilitates data compilation to get better results. This service helps take a load of the producers' back since they don't have to worry about trial details or timing. They can know the trial will be well managed and can trust the results and data collected.

This unit also hires two or three post-secondary students each summer.

■ Knowledge Transfer Unit

Unit Lead – Jamie Puchinger

Farming Smarter Assistant Manager

This unit produces all external communication and extension. This includes the website, live and virtual events, newsletters, magazines, videos, advertising, social media and media relations.

In the past couple of years, Farming Smarter introduced a podcast, and some VR/360 video experiences. Puchinger oversees all the projects with various people responsible for specific tasks in the unit. This unit takes practicum students from the Lethbridge College Digital Media program every year and, grants permitting, keeps one student over the summer months.

■ Contract Research Unit

Unit Lead – Trevor Deering

This unit does research for private companies on crop protection, management products and technology. For example pesticide spray trials include herbicide efficacy and phytotoxicity testing. We also do crop variety trials, biostimulant, other biological studies and management trials. Projects such as pea leaf weevil protection, silage corn varieties and rolling barley management.

"By working with companies to conduct these trials, we help products and techniques reach farmers to help them farm smarter," says Deering.

This unit also hires two post-secondary students each summer.

L to R – Sean Sander, Gurbir Dhillon, Aidan Sander, Declan Sander, Cam Sande, Toby Mandel, Claudette Lacombe, Cassidy Langridge, Shelly Barkley, Ken Coles, Jamie Puchinger, Sara Gateman, Trevor Deering, Lewis Baarda, Micheala Gateman, Mike Gretzinger, Aaron Lorenz, Carlo Van Herk

Dr. Sheedy Brought Out the Best

BY KRISTI COX

The Orville Yanke Memorial Award goes to an individual who made a significant contribution to soil conservation in southern Alberta. In 2020, Farming Smarter awarded it posthumously to Dr. Claudia Sheedy who passed away from a heart attack in July 2020 while mountain biking.

Dr. Sheedy focused on soil science throughout her career. She worked for the past 15 years as a research scientist for Agriculture and Agri-food Canada. In the last years, she was a driving force behind adapting the design of a pesticide rinsate biobed system to work in our Canadian climate.

Biobeds enable anyone that uses spray tanks to reduce risk of environmental contamination by filtering tank rinsate. Rinsate moves through a biobed tank containing a mixture of topsoil, woodchips or straw, and peat or compost. As the contaminated rinsate percolates through, the biobed fill removes pesticide residues. This system uses two biobeds and by the time the water comes out of the second biobed, it is suitable for use as water for lawn or shelter belts. This process enables spray users to reduce risk of environmental contamination from disposal of tank rinsate.

Dr. Sheedy's husband, Jollin Charest, accepted the award on her behalf at the 2020 Virtual Farming Smarter Conference December 2020. He spoke about her career and passion for soil science.

"Thank you very much for giving the Orville Yanke post-humous award to Dr. Claudia Sheedy," Charest concluded. "She would certainly have wanted to share the honour with all her team who worked hard behind the scenes."

Dr. Sheedy inspired that hard-working team. Many scientists are passionate about their work and strive to do it well. Dr. Sheedy also strove to inspire and lift others to do the best they can. Examples of this were evident in discussions with two of Dr. Sheedy's colleagues; Tara Shelton, a lab technician who presented Dr. Sheedy's biobed work at the virtual award presentation, and Isabelle Darlow, an artist who worked for Dr. Sheedy.

Shelton started at the research center about the same time as Dr. Sheedy, though in a different department. She got to know Dr. Sheedy through committee work and random encounters in the center. In October 2019, Tara joined Dr. Sheedy's lab.

> **"Pretty well all of our co-workers are in the lab because we wanted to work with Claudia"**
>
> TARA SHELTON

"Pretty well all of our co-workers are in the lab because we wanted to work with Claudia," Shelton said. "It's normally because of the specific job, but for all of us it was because of the supervisor. She had a very positive influence on everyone around her."

Shelton described Sheedy's love for science and desire to encourage students of various levels.

"We would have high school students in our lab, so they could see what is out there for you after high school," Shelton explained. "We had several undergraduate students and graduate students. She had no problem sitting down with students and helping them through projects. Not everybody is willing to take the time to do that."

Sheedy didn't restrict her inspiration to the scientifically minded.

Two years ago, she approached then high school student, Isabelle Darlow to help her make her biobed presentations more visually appealing. Sheedy's children went to the same school as Darlow, and she'd admired her art. Sheedy hired Darlow and they created a character, Bio Phil, to use when presenting biobed information.

Jollin Charest posed with the plaque recognizing Dr. Sheedy for her work in soil sustainability.

"She inspired me," said Darlow. "She was one of my biggest supporters for my art. She gave me the confidence to present in front of people. I really appreciate that." Darlow now pursues multimedia studies in college.

While there is clear evidence that Dr. Sheedy contributed greatly to soil conservation through her work, another part of her legacy will be the numerous people she inspired to carry on her work and pursue their own passions.

"I know we're all committed to keep everything together and move forward on Claudia's behalf," Tara stated about Dr. Sheedy's team at the research center.

EXPECT THE UNEXPECTED:
More Wild Weather

BY MADELEINE BAERG

If you dare ask a roomful of Alberta farmers about climate change, the weather might not be the only thing getting heated. Afterall, while most farmers have struggled lately with wild weather — too dry, too wet, too cold, too warm — so too did their parents and grandparents.

Shaking one's head and one's fist at the weather seems a perpetual reality of farming. That said, decades of weather statistics do indicate change is in the works: average prairie temperatures are up 1.7 C compared to the 1940s. But, unlike the climate change finger-pointing many farmers are justifiably tired of, at least one climate expert is cautiously optimistic. In fact, Dr. David Phillips, a senior climatologist with Environment and Climate Change Canada, says Canadian farmers are uniquely positioned to capture the opportunities and meet the challenges of whatever Mother Nature throws at them.

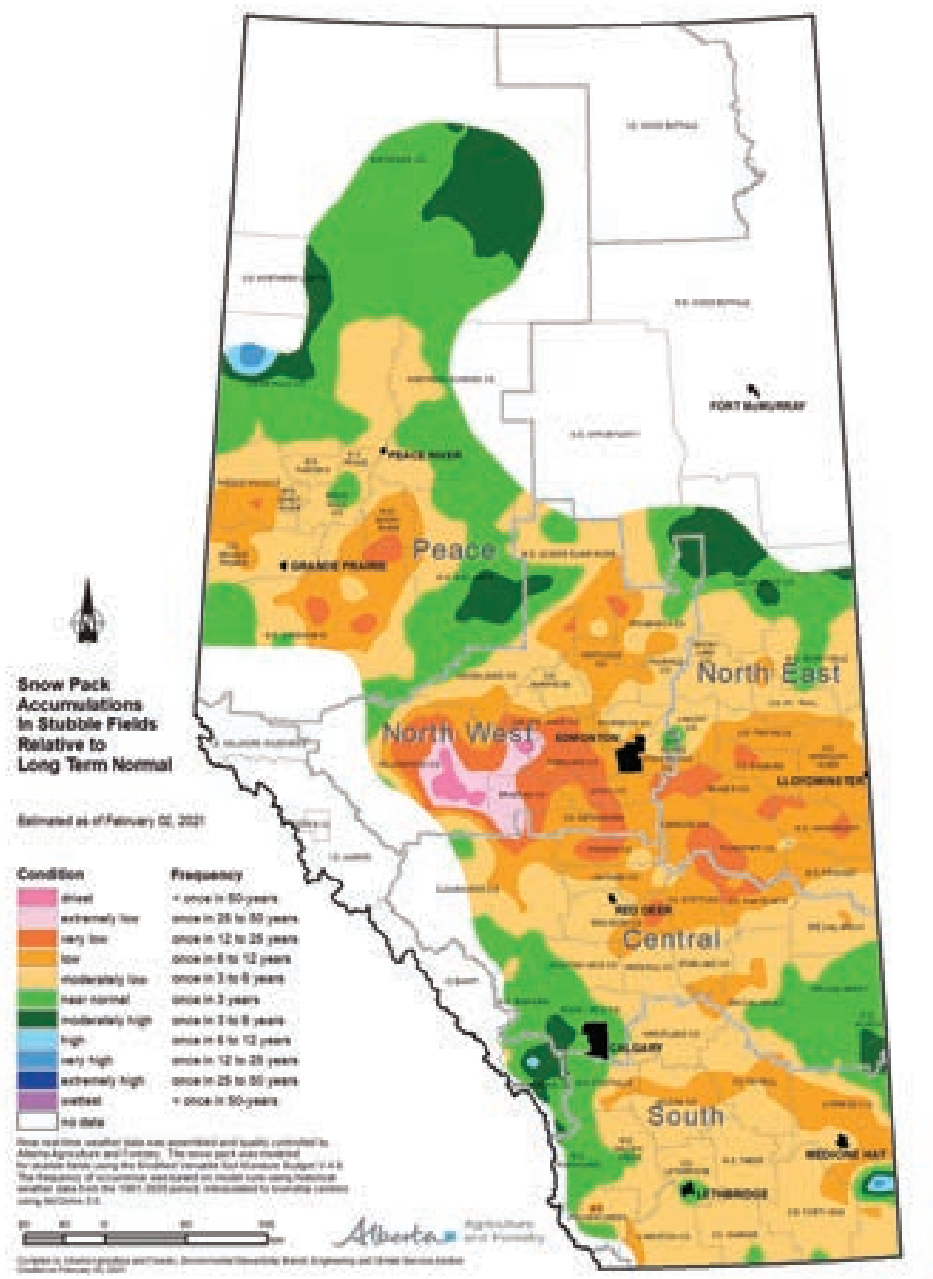
"I am optimistic. The ingenuity and resilience of farmers, their ability to adapt, everything about farmers makes me optimistic. They should see climate change as an opportunity — a challenge and a threat, yes — but also an opportunity. Knowledge is power," says Phillips.

Though a touchy subject for some, statistics are clear.

"There are things we definitely know with a lot of assurance. Our seasons are getting warmer. That's a given, particularly in Alberta and on the prairies," says Phillips. "It doesn't matter what data set you're looking at: it's considerably warmer."

Calgary has weather records for 100 years. A century ago, an average winter had 25 days below -25 C. In recent years, Calgary averages seven. While the number of hot days above 30 C hasn't changed much from 100 years ago, the number of warm nights has tripled. Farmers today are taking advantage of a growing season that is 20 days longer on the prairies on average than it used to be.

"Yes, we're still getting days that are face-numbing brutal. But that might last two to three days as opposed to two to three weeks," says Phillips.



Snow packs relative to long term normal as of February 2, 2021

The challenge for public perception is that temperature changes are averages, not daily or location-specific certainties.

"When you break it down by station, it becomes a little less convincing or obvious. You can average the hell out of it and find something a little less stable," says Phillips.

Neither is change obvious every day or even every season. "It's not that this particular summer is warm and next summer is going to be warmer. It doesn't work like that: there's variability. We have to look at trends over time," he says.

And seasonality plays a role.

While temperatures are up 1.7 C across the prairies over the entire year, springs are about 2 C to 2.2 C warmer on average than the 1940s, summer is up by about 1.0°C, and fall by about 0.5 C. The biggest difference, however, is winter: up a full 3.3 C over 80 years ago. Alberta's statistics show slightly greater increases, with winter up 3.8 C over the 1940s.

"Old timers are right when they say the winters aren't what they used to be," says Phillips.

While temperature increases are one thing, it is inconsistency that is most challenging to many farmers. The problem, he says, is weather isn't "normal" anymore.

"We used to be able to say the best thing about Canadian weather is it hits and runs; it doesn't stand around and torment you like it does in other parts of the world… Now, storms are slow and have more time to spread misery. The jet-stream is more loopy, more like a rollercoaster. Now if it's raining on Thursday, it could still be raining on Saturday."

While none of the weather is abnormal in and of itself, the frequency, longevity and intensity of weather events are different than our parents experienced.

"Some of the challenge we face [is because] we still think droughts are droughts, floods are floods. We still think we're prepared for weather. But, because that 'same old weather' has a different side to it, we're not prepared for it," he says.

While a changing climate is part of the calculation, our ways of interacting with the landscape are another factor.

"In some ways, climate changed; but in some ways, we've changed more," says Phillips. "When a raindrop falls on a grassy knoll, it takes eight hours to get to ground water. When that raindrop falls on a Walmart parking lot, it takes eight minutes to get to ground water. When you look at extremes, there are elements that are not just driven by the climate: they're driven by who we are and how we live."

He believes the loss of wetlands, which act as a natural sponge to absorb excess moisture, is a key reason nature is less able to soften the sharpest edges of some extreme weather events.

"In some parts of Ontario, we have lost 75 per cent of our wetlands, and then we wonder why we're seeing more flooding?"

So, what comes next?

"I've studied this my whole professional life. When I began, it was all about 'the Ice Age cometh'. It was about changes over eons of time. What I've seen over the last 20 years, what was considered global or hemispheric change, it started being more local," says Phillips.

Though it won't be every day, or even every season, expect more of the unexpected. Overall, the trends for prairie weather will be "warmer, wetter and wilder," says Phillips.

The big question is how farmers and — on a broader scale — Canadians will respond.

"Do we just throw in the towel and give up? No: we need to accept the fact that weather is wilder and different. The emphasis has to be on adapting: sucking it up and saying it's changing," says Phillips.

"I tend to be more optimistic than most climatologists, but only if we begin to embrace the change."

Flea Beetles Post Neonics

BY MICHAEL KAAKE

As we approach another spring, farmers will want to make flea beetles flee their crops.

Farming Smarter's field scale flea beetle research project is investigating new ways to counter these insects. Public pressure mounts to eliminate the use of neonicotinoids (neonics) in agriculture and legislation banned the use in Ontario and several European countries. Concerns relate to negative impacts on pollinator health and recently aquatic invertebrates. Farming Smarter plans to evaluate possible alternatives to neonics to control these bugs. Lewis Baarda, Farming Smarter on-farm research lead said the project is a lot trickier without neonics

The Pest Management Regulatory Agency are cautious about neonics. There's concerns about some of the off site impacts of these insecticides. There's a lot of different ways to apply neonics. It is relatively inert as a seed treatment versus aerial application.

This project will look for a best alternative option. An increased seeding rate helped because when the flea beetles come to feed on the crop, it will not thin the crops down enough to decrease yield. Baarda explained that another method is to increase foliar insecticide when flea beetle pressure reaches a certain threshold. He talked about what Farming Smarter did for the first half of the project.

Top: Crucifer flea beetle on a canola leaf. Above: Striped flea beetle on a canola leaf.

"The seeds are coated with insecticides. So when the plants grow, and the flea beetles chew on the leaves, they ingest the insecticide. It's a really effective way to do it," explained Baarda.

This project uses three treatments in each field. One treatment will use current practices with neonic treated seed. Two contrasting treatments will allow for evaluation of post-neonic flea beetle strategies (high seeding rate and foliar applications).

Hector Carcamo, Research Scientist Insect Pest Management with Agriculture and Agri-Food Canada, talked about how important it is for farmers to stay consistent with the threshold.

"The threshold that we use is 25 per cent cotyledon damage. It's really important to follow those thresholds because they actually are guides that give you an idea of whether you do or do not need to be concerned about potential losses," said the entomologist. Carcamo said flea beetles can be very unpredictable.

"They often pose a serious threat to farming. Mainly because they have the ability to do a lot of damage," explained Carcamo.

He said there is another potential way to stop flea beetles from raiding your crops. Protect the generalist predators like spiders, carabid beetles (also known as ground beetles) and staphylinid beetles (also known as rove beetles) that will eat flea beetles.

Flea beetles caught on a sticky insect trap. PHOTOS SUPPLIED BY FARMING SMARTER

Testing Crop Multi Vitamins

BY KRISTI COX

Mike Gretzinger with his biostimulant display at Farming Smarter Field School 2020.

With the array of crop treatments available to producers today, it helps to know that the products you apply to your crops make a difference. Farming Smarter, always in search of answers for you, is part of a study to determine what effect adding a biostimulant suite has on the performance of canola, wheat and peas.

There are a variety of ways that biostimulants work on a crop. Some improve nutrient or water uptake, while others might help in a symbiotic relationship. Examples include fulvic acids, humic acids and microbial inoculants.

"A biostimulant is just something that stimulates the natural process of the plant," explained Mike Gretzinger, Farming Smarter's Research Co-ordinator.

Gretzinger compares applying biostimulants to crops to people taking vitamins and supplements to improve health. While some people take all their supplements separately, others reach for a multivitamin. The biostimulants in this study fall into the multivitamin category.

Providing a mix of biostimulants that can be put in with the herbicide treatments for multiple crop types may be an effective way for farmers to improve crop production.

"Some feedback from farmers is that it's pretty complicated if there are 10 or 11 different crops and every one of them gets a different seed treatment and a different fungicide," explained Gretzinger. "If we add some of these (biostimulant) products, you add another layer. This is simplified if we can just mix one product in with all your herbicides — whatever they are."

In 2013, the Canadian Food Inspection Agency (CFIA) changed the guidelines for fertilizer registration. Biostimulants fall under this umbrella. The CFIA removed the requirements for pre-market assessments or verifications of performance or benefits. This opened the market to more products but presented challenges for producers wanting to make educated decisions about what to use. Researchers recognized the need to provide evidence for these products in our region.

This study aims to provide answers about which products can provide that multivitamin kick to a variety of crops by examining the crops on biostimulant plots vs the check plots. Four different companies, Alpine, ATP, Penergetic and Stoller provided biostimulant treatments.

The study includes three sites in Alberta at Lethbridge, Battle River and Falher. Each plot will have the same biostimulant applied over three years while canola, peas and wheat rotate over the plots. Data collected will include plant counts, vigour, biomass, tissue testing and yield, among others.

To generate results applicable to producers, one check mimics a traditional crop treatment. A soil sample determines the needed standard NPKS fertilizer treatment, and any necessary in-crop herbicides. The other check mimics advanced methods, including insecticide, fungicide, and seed treatments. These check treatments could be different in each location, depending on the requirements for that area.

Each of the four trial plots will receive the traditional treatment for the specific crop in addition to one of the four biostimulant products. The biostimulants are also customized according to the specific needs of the location.

Trials began in 2020 and will conclude with the 2022 growing season.

At a field day this first summer, Gretzinger picked a sample of plants from the plots and could see some biomass and vigour improvements on treated plots. It will take time for the data to show results, though.

"There's a lot of variability in our data still," said Gretzinger. "We need those next two site years and data to clean that up and show us what's happening."

Mix It Up In Your Fields!

BY KRISTI COX

Farming Smarter has two key studies designed to find unique ways to make you money while avoiding disease. Researchers are using crop sequencing to examine the effects of integrating potentially high value novel crops into rotations and what crop sequencing can do toward managing a disease like Fusarium head blight.

"The advantage of crop sequencing as opposed to crop rotation is that this approach allows for the introduction of much higher numbers of crops," said Jan Slaski, Principal Researcher at InnoTech Alberta.

The studies use up to 10 different crops planted in narrow bands beside each other and rotated perpendicularly each year.

"(We take) all treatments and put them on an x axis," explained Mike Gretzinger, Research Co-ordinator at Farming Smarter. "The next year we put the same treatments on a y axis so that we can get every combination and permutation."

Slaski's expertise is in novel crops like hemp, flax and quinoa. When he talks to producers about novel crops, they are intrigued by the possibility of adding high value crops but have concerns. They want to ensure that adding these crops to their rotation won't negatively impact their staple crops, which are their bread and butter.

Why not just stay with the 'bread and butter' crops?

"Look at canola," Slaski encouraged. "Even 40 years ago, it was not a normal crop on the prairies, and now it is the second largest crop. The novel crops, some of them at least, will find acres and find growers who know how to grow them where they fit."

This study is in three locations encompassing the major agro-climatic zones of Alberta and one in Saskatchewan. Crop selections reflect local production practices.

The study looks at eight crops in each location, yielding 64 plots. Researchers measure a variety of performance parameters including crop establishment, biomass of crop, biomass of volunteer crops and biomass of weeds.

The preliminary results reinforce a key message.

"I think we already (understand) that planting the same crop on itself usually isn't a good idea," Gretzinger said, noting that despite this knowledge, some producers still practice this. "The three Alberta locations showed pretty strongly that we almost always had our worst yield when we planted any crop into its own stubble."

On the flip side, Slaski explained that in Lethbridge, all novel and staple crops had their highest seed and biomass yields when planted in dry bean stubble.

Out in the crop matrix with left to right quinoa, hemp and dry bean.

Gretzinger is optimistic that this study will lead to valuable information for producers. He notes that once all the data is in, producers should be able to use this information to take five or six crops and selectively arrange them to build a lucrative crop sequence.

The other goal is to determine if crop sequences can mitigate crop diseases, particularly Fusarium head blight (FHB). This study runs in six locations across Alberta, Saskatchewan and Manitoba. The crops included in the study vary somewhat with location, but at each location there are five core crops: wheat, barley, canola, pea and corn. In contrast to producers, researchers hope to find natural levels of disease.

"We use FHB susceptible varieties for durum and wheat and don't spray any fungicide," University of Saskatchewan graduate student Alejandra Oviedo-Ludena explained. "We do herbicide treatments in the fall and spring. Any Fusarium infection is from natural inoculum, so it can mimic conditions that farmers have in their fields."

The researchers are in the process of assessing samples and data. FHB data isn't conclusive yet, but the researchers hope to determine the crop sequences that best suppress FHB, as well as sequences that result in increased FHB severity.

> **"The three Alberta locations showed pretty strongly that we almost always had our worst yield when we planted any crop into its own stubble."**
>
> MIKE GRETZINGER

Fusarium graminearum is the species most known for causing damage and toxicity on wheat and durum, but other species have shown up through the trials as well.

"In my Fusarium isolations, the predominant species are Fusarium graminearum and Fusarium poae on the prairies," explained Oviedo-Ludena. "But when we have non-cereal stubbles, we can find other species. When I was checking soybean stubble in Brandon, they didn't have much F. graminearum, but they had lots of Fusarium poae and Fusarium avenaceum."

Understanding how these other Fusarium species fit with changes in the crops grown is important.

"The toxin level will be influenced by the species of Fusarium," said Randy Kutcher, Professor of Plant Pathology at the University of Saskatchewan. "So, you would expect that to be related to the sequence of crops you've grown previously. You may see differences in the amount of damaged wheat or barley kernels, but the toxin content may not be highly correlated with kernel damage."

Kutcher explained that in durum wheat there is relatively little Fusarium resistance; fungicides decrease the symptoms and amount of toxins by about 50 per cent. A robust and calculated rotation including non-host crops is key to successful mitigation of FHB.

"Fusarium is a disease where you need to use integrated pest management," said Kutcher. "None of the techniques that we have will control the disease on their own."

2020 The Year To Go Digital

While 2020 started just like any other year, by mid-March the event landscape changed dramatically. Farming Smarter's crew rose to the challenge and still shared our research with hundreds of Albertans.

ANNUAL GROWER MEETING
February 26, 2020

Over 80 supporters joined us after Ag Expo for a fantastic pig roast dinner and to hear about our 2020 plans.

CYPRESS CONFERENCE
March 12, 2020

Nearly 40 participants and five exhibitors joined us in Medicine Hat for a day of learning.

FIRST LIVE-STREAMED FIELD EVENT
June 11, 2020

Over 30 people joined us in the field with 20 virtual attendees to learn about tank contamination & crop injury, ultra-early seeding, weeds, a soil pit, deep banding and flea beetle management.

VIRTUAL FIELD TOUR
June 25, 2020

Around 20 virtual attendees tuned in to learn about strip till canola, hemp agronomy, precision planted peas, soil sensing and benchmarking and perennial forages.

FARMING SMARTER APP

Our **Progressive Web App** became available to subscribers in 2020

MAGAZINE

Farming Smarter Magazine started as an annual publication in 2002 with 2 editions per year (Spring & Fall) in 2009. Each edition is distributed to over **10,000 rural addresses** and is available online.

E-NEWSLETTER

The E-newsletter has **1853 subscribers**. Content includes a bug and weed of the month, stewardship feature and project updates. We also include information on upcoming events and other opportunities.

TWITTER

Farming Smarter and staff accounts have over **10,237 twitter followers**

POPULAR PRESS

103 stories/articles were published in **16 outlets**

YOU TUBE

The Farming Smarter You Tube channel currently has **1845 subscribers** (420 new subscribers), **666** videos available

INSTAGRAM

Farming Smarter now has **513 followers** (199 new in 2020)

FACEBOOK

Farming Smarter currently has over **513 followers**

VIMEO

Our vimeo channel has **157 videos** available for subscribers

RESEARCH FOCUSED TOUR July 9, 2020

The 2020 Field School focused on current Farming Smarter research into Kochia, precision planted pulses, biostimulants, biobed use and barley rolling trials.

TARGET YOUR CONNECTION August 13, 2020

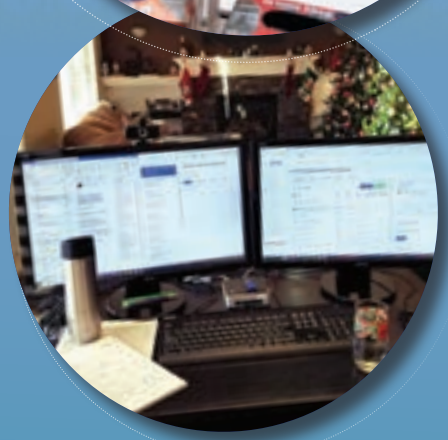
This workshop gave 24 attendees valuable tools to communicate with consumers, develop a strong brand, increase sales and so much more!

OPEN FARM DAYS AUGUST 15, 2020

A must attend event for Lethbridge residents interested in food and food production. This year, despite a global pandemic, over 170 people came to explore food production in Alberta.

LATE SEASON LEARNING July 23, 2020

Over 30 people learned about precision planted corn, FHB rotation tudy, plant pathology, Spornado spore trapping and applications for drone technology.



ANNUAL VIRTUAL CONFERENCE December 2 & 3, 2020

Although this year looked different, we had nearly 170 people sign up for the virtual event. Farming Smarter staff, Ken Coles, Mike Gretzinger, Gurbir Dhillon, Lewis Baarda and Trevor Deering shared updates on our many research projects.

Farming Smarter Economic Impact $179M

Public Media Impressions $67M$^{\Delta}$

Digital & Print Extension $15M^{+}

Event Participants $58M$^{\wedge}$

Research Program $39M*

** Calculated by using average return on investment from the following studies 40:1*

1. Review study of 292 studies. Most common return was 30:1 mean was 82:1 Source: Alston, J.M., C. Chan-Kang, M.C. Marra, P.G. Pardey, and T. J. Wyatt. A Meta-Analysis of the Rate of Return to Agricultural R&D: Ex Pede Herculem. IFPRI Research Report No. 113, 2000.

2. Book Persistence Pays: U.S. Agricultural Productivity Growth and the Benefits from Public R&D S pending. J.M. Alston, M.A. Andersen, J.S. James and P.G. Pardey, Spinger January 2010. 32:1 return.

3. The returns to WGRF cereal research 1994-2030 – Gray Nagy, Guzel (2012) 36:1 return

4. Zero till research 52:1 Gray and Nagy (2011)

5. Regional Variety trials 1971-2010, 63:1 benefit cost returns

6. Sask pulse growers 24.6 to 1

^ Information obtained from farmers directly

+ Obtained from digital analytics with the assumption of 2,000 acre farm size and $0.01/acre impact.

Δ Calculated based on reach of publications with the assumption of 2,000 acre farm size and $0.01/acre impact.

Agronomy Smarts

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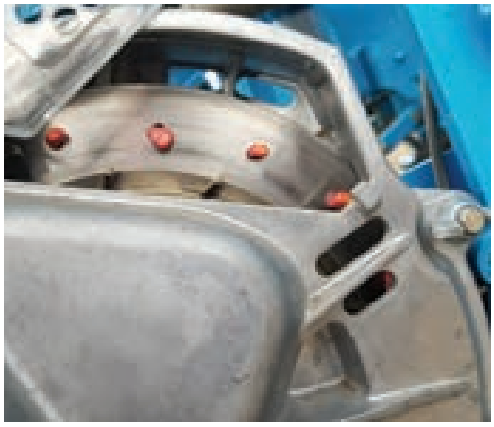

Corn kernels on the precision planter going into the strip till trial.

▲ Air drill seeding canola near Brant Alberta — the next pass is seeded with a precision planter.

Innovation is not easy. New ideas need to be studied and adapted in the real word before we can be confident they are worth adopting. We want to stand beside farmers and innovators on the leading edge, working together to change the way we farm.

Field Tested also helps farmers to evaluate themselves. We work with growers to assess the true value of the techniques and products that they use. An honest judgment, using scientific tools, can be the first step to more efficient more profitable farms.

Farming Smarter's Taber site showing Barley (first crop), Durum (second crop), and wheat (last crop) herbicide tolerance trials we conducted with NuFarm. Having sites away from Lethbridge allows the Contract Research division to offer different weather, soil, and pest conditions to our clients.

About 20 booths set up for our 2020 Open Farm Day event in August. A Canadian Agriculture Partnership grant helped us create a memorable day for visitors showcasing all facets of agriculture including plot tours, farm to table, 4-H clubs and much more.

Spectacular looking rainfed faba beans precision planted at a low seeding rate (28 plants m2)

In crop treatments get measured and double checked for the biostimulant trial.

AGRONOMISTS RECALL THE UPS AND DOWNS OF 2020

BY LEE HART

A renewed optimism among producers; concerns about soil lost to wind erosion; and some surprising yields despite some very dry conditions during August — these are among the observations southern Alberta agronomists made this fall as they looked back over the 2020 growing and harvest season.

Generally, it was a pretty good year although conditions varied depending on where people were farming. Andre Lacoursiere with 2nd Opinion Consulting at Vulcan said while flea beetles were a real concern in his area, he was impressed with some amazing yields despite several weeks of hot dry weather.

At Taber, Scott Gillespie with Plants Dig Soil said he was concerned about seeing wind lift topsoil off exposed fields, but also encouraged in other places to see that relay cropping had potential to keep the ground covered.

And in the Foremost area, Jenny Seward with Cronkite Ag said the season ended with most farmers having a renewed sense of optimism — a renewed faith in the agriculture industry. She did note however, the prevalence of some crop diseases underscored the value of following extended crop rotations.

Here are a few more thoughts about what these agronomists learned about farming in their respective areas during the past year:

ANDRE LACOURSIERE

2nd Opinion Consulting
Vulcan, AB

After four years of drought in the Vulcan area, Andre Lacoursiere says it was amazing to see the difference rain made early in the growing season that gave the crops resilience to carry them through a later dry spell.

"We had some rain last fall and then a couple inches in the spring and I can only describe it as "the ground came alive" at least through until mid-July", he says. "Producers who applied proper fertility even during the dry years, really saw it pay off this year once we had some rain. The ground showed it had great capacity to produce crops as long as we get some rain."

Lacoursiere says while it was shaping up to be a bumper crop with excellent growth, six weeks of dry conditions after mid-July brought that down to "a better than average crop".

Moisture and proper fertility, along with many growers following a recommended four-year rotation, produced a crop with good yields and minimal disease pressure. "Spring wheat yields were phenomenal with 60-bushel averages and better," he says. "That's not normal for this area."

Lacoursiere said with "brutal" pressure from flea beetles this past spring, canola growers need to be prepared for a heavy infestation of the pest in 2021. "The adult flea beetles you see in the fall will be the ones affecting your canola next year, and there were lots of them," he says.

SCOTT GILLESPIE

Plants Dig Soil
Taber, AB

Scott Gillespie is keen to see where regenerative agriculture — keeping the soil covered with a growing crop at all times during the growing season — might work for his Taber area clients.

He says he was alarmed this spring to see just how much soil was blowing in southern Alberta. That was due to a combination of more fields being tilled and exceptional winds.

"We expect chinook winds but this spring we had a couple major wind events that seemed to be exceptional," says Gillespie. "It just wasn't about top soil blowing away, it was actually causing crop damage by sand blasting some vulnerable crops that were tiny seedlings just emerging." Some fields of seed canola and quinoa were particularly hard hit. He said it didn't take much of a barrier — a ridge of soil or a few stems of stubble — to protect vulnerable seedlings.

He plans to talk to growers about the idea of seeding a nurse crop. As an example, that could involve a low seeding rate of barley planted ahead of seeding the canola. The barley starts growing, the canola is seeded and once the canola crop is established an in-crop herbicide application takes out the barley. "But at least the barley is there to protect the canola from wind and sandblasting until the canola is established," he says.

Under dryland farming, he'd like to see more producers consider relay cropping. That's a system where wheat, for example, is seeded first, and once it is established, then comeback early in the season and seed something like a slow growing clover between the wheat rows. The clover just simmers along, but once the wheat is harvested, the clover can take off to protect the soil through the fall and help fix nitrogen. "It is good in theory, but a few farmers tried it this past growing season," says Gillespie. "The clover grew but then conditions got hot and dry for several weeks through August and it died out. Farmers would have to go into it knowing the risk."

Quinoa on the left was protected from blowing sand by the soil ridge in the middle, much like a nurse crop could. PHOTO: SCOTT GILLESPIE

Jenny Seward standing in a field of irrigated corn July 2020. "It was a beautiful crop from start to finish grown by very conscientious farmers in the area." PHOTO SUBMITTED

JENNY SEWARD

Cronkite Ag
Foremost, AB

On the positive side of things, Jenny Seward owner of Cronkite Ag consulting in Foremost, AB paid tribute to all the effort that goes into plant breeding to produce varieties that are "incredibly efficient," so that in a year like 2020 they produced generally excellent yields and overall provided a boost to farming morale.

With about seven inches of moisture canola yields were coming in at 48 bushels per acre, and durum was in the 60 bushel range "that's just phenomenal," she says. New solid stem durum varieties such as AAC Stronghold stood up well to wheat stem sawfly pressure.

With the contributions that government plant breeders and researchers make, she said it was sad to see so many staff cutbacks at Alberta Agriculture. "It is important for farmers to get behind commodity organizations and research organizations such as Farming Smarter so they can provide continued support for agriculture."

While it was generally a pretty good year, Seward said canola and mustard crops were under heavy pressure from flea beetles, some pulse crops were affected by aphanomyces root rot, and while kochia "gets a lot of airtime" she feels herbicide resistance in wild oats might be an even greater concern on many farms.

"So, we have these pests and diseases affecting crops which really is a gentle reminder of the importance of crop diversity and doing our best to follow a four-year rotation," says Seward. "I know economics often dictate shorter rotations, but we also have to consider the long term as well.

"Part of my job is to work with growers and help them be the most profitable, but as we're doing that, we also have to keep in mind they also need to be sustainable," she says.

Seward says she is also interested looking more at how intercropping — growing two or more crops at the same time — might have a fit with dryland grain, pulse and oilseed operations.

On-farm Research an Essential Step Between Science, Technology and Farm Adoption

BY NATALIE NOBLE

Alberta's farm landscape constantly evolves to grow more and do better. Farmers are no strangers to innovation but testing ideas is a time and effort consuming process. It often requires expert level scientific support. Meanwhile researchers advance through small plot trials and see in-field research as a necessary step toward adapting science for real world applications.

Fortunately, Farming Smarter's Field Tested on-farm research program can help. A bridge between research plot and everyday farm use, Field Tested trials hit 20 fields in 2020. "That's big growth for the program," said program lead, Lewis Baarda. "It shows that this is an under used step in the research process."

Vital to moving the industry forward, on-farm research is a niche too often left out. "Small plot trial design is always the same. But when you get to the field you've got a variable environment and many more things you can't control," said Baarda. "There's a lot of trial going on that could use the applied scientific process brought into it, which can be rigorous at the field-level scale."

Field Tested also connects ag companies and farmers. For instance, companies may look to validate a fertilizer product using an unbiased perspective and scientific research. Or perhaps an irrigation technology or a seeder innovation needs to integrate with a farmer's system and prove its value.

"We're that connection between a company with engineering and scientific expertise who might not have that connection to producers and how their technology might fit into the farmer's day-to-day workflow," said Baarda. "Getting out in the field and collaborating with the farmer gives companies a lot of information behind the science of how and whether something works."

As data analyzed over several years provides increasing insight, Baarda shared an update on three Field Tested trials moving into year three in 2021.

THE EM38 PROJECT

Using an EM38 soil conductivity sensor to evaluate in-season moisture, this trial explores ways to apply data to make good management decisions. Although the last couple years' weather extremes — dry 2019 and wet 2020 — made identifying soil moisture variability more difficult, it pushed the Field-Tested team to test different approaches for interpretation.

Findings will guide irrigation decisions, including when to irrigate, and where to irrigate for farmers using VR irrigation. Because soil moisture influences fertility, a fertility trial is on the books for 2021 using a field already mapped multiple times with this project. The objective is to create an in-season map to explore when and where a field may need fertility applications.

MANAGING HERBICIDE RESISTANT KOCHIA

Using precision ag and electronic mapping to manage kochia, this trial aims to reduce herbicide applications. Flying a drone over the field in late season captures aerial imagery used to identify kochia patches throughout. "The way kochia behaves in a small plot is different than dealing with a full population over a field," said Baarda.

Results show kochia identification using this technique is heavily dependent upon crop type. For example, against the golden hue in a wheat field, bright green kochia is clear to see. However, the dark colour of a fava bean field evaluated last year made the distinction difficult. Crops that do display colour contrast where kochia is prevalent can drive decisions around where to target herbicide applications in relation to it.

This project moves into its three-year rotation this year. "We'll come up with the pieces that connect consistently through all

three locations," said Baarda. "We can then put together guidelines and strategies we can use to be successful with this technology."

PRECISION PLANTING CANOLA

Comparing a planter and an air drill, this trial examines the potential of the planter's singulation for effectively seeding canola. Co-ordination and field-prep at the field-level scale is challenging, so collaboration is key.

"We've been fortunate to connect with producers who've done some custom seeding for us," said Baarda. "A dealership stepped in and demonstrated its planter side by side with the farmer. Having good folks to work with helps."

The planter proves to be competitive with the air drill, but considerations remain including zero till scenarios, residue management and achieving uniform performance across a quarter mile length with a 45 ft. wide seeder. Still, results are promising. "Visually, we're seeing better emergence, taller crops and performance at least as good as the air seeder," said Baarda. "There's probably work to adapt to zero till, but farmers are thrilled to see this."

Baarda confers with a local farmer while spring seeding takes place on a trial. Field Tested brings rigorous scientific process and expertise to the larger scale field. It's the connector between science, technology and adoption.

With so much progress, Farming Smarter is grateful for important funding and partnerships that make Field Tested possible. "Canadian Agriculture Partnership grants (CAP) is a wonderful opportunity for us to do some of these trials that can be difficult and expensive to undertake," said Baarda. FMC and other partners collaborating to prove value in technologies and techniques to farmers is also key. "Their support is critical to the on-farm research we're doing," said Baarda.

Whether it's an idea for a full-scale trial or a simple question, Baarda encourages farmers to reach out. "Now that we've put this program out there, there's a lot of interest," said Baarda. "With these on-farm trials, farmers can try things they wouldn't have tried on their own. There's a lot of value to this."

Disease Spore Count and Disease Risk Don't Always Align

BY LEE HART

Two southern Alberta research projects still have a way to go before they can answer the question about whether devices that can collect airborne crop disease spores can be reliable indicators of whether to apply a fungicide or not.

One project developed by Farming Smarter begins its second year of data collection during the 2021 growing season. While an Agriculture and Agri-Food Canada (AAFC) Lethbridge Research and Development Centre project still has several questions to answer as it enters the fourth year of its research.

Both projects work with different types of spore collection technology, and to some extent are looking at different crop diseases. But for the most part, they are trying to answer the same question — can you mount a device in a field that collects disease spores from prevailing winds and use that as an early warning system about the risk of disease pressure and ultimately whether to spray or not?

The Farming Smarter project works with a spore collection device called a Spornado to determine if it is a reliable indicator of white mould and sclerotinia in dry beans and canola, respectively (it's actually the same disease with different names) as well as fusarium head blight in wheat. That project may broaden this year to also include rust in wheat. 20/20 Seed Labs Inc. based in Nisku, AB markets the Spornado disease monitoring system in Western Canada.

AAFC researchers use a different device known as the Burkald multi-vial collector biosensor as an indicator of white mould in dry beans.

Both systems have components that can collect air borne disease spores, which when exposed to different DNA tests will reveal whether it is particular disease of concern. There is one DNA test to identify white mold spores, another DNA test to identify fusarium head blight and so on. The tests can also reveal whether the device has collected a low, medium or high level of the disease spores, or perhaps none.

Lewis Baarda, Farming Smarter Field-Tested Project Lead, says with only one year of field research data it is too early to draw any firm conclusions, but notes he did learn a few things from the 2020 research season. One important lesson being: don't position the spore collector on the edge of a field near a road. It's handy for monitoring, but it collects too much dust and debris making it difficult to make a spore count.

Spornado in a Farming Smarter canola field.

> **"...we know the pathogen is often in the air but what are the critical levels to manifest itself into disease in the field"**
>
> JONATHAN REICH

"The Spornado has been used for some time in other parts of Canada so I am confident that it can be used to collect airborne disease spores," says Baarda. "So, our research looks at not just the science but also the practical side of how this technology will work in the real world. We're interested in questions such as where do you place them in a field, how many do you need per quarter section and how often do they need to be monitored?"

And then of course the big question is can the presence or absence of disease spores collected in the Spornado be a reliable indicator of disease presence or risk to the crop?

At AAFC, Jonathan Reich a PhD student and plant pathology researcher Dr. Syama Chatterton worked for the past three years to determine if the Burkald biosensor can detect and quantify the presence of white mould spores in dry beans.

Reich says during the growing season, and particularly the higher risk crop disease window, each year he monitored nine different sensors in various farmer-co-operator bean fields as well as research plots.

The Burkald multi-vial collector biosensor.

"The sensor can detect the presence of disease spores, but that doesn't necessarily correlate to disease risk," says Reich. In some cases, the biosensor would detect disease spores, but then that year in that field there was little or no development of white mould in the actual bean crop. In other cases, the opposite would be true. The sensor didn't identify any disease spores, yet the crop became infected.

In 2021, in co-operation with the bean growers, Reich says he will survey farmers to collect information on production and agronomic practices, looking at bean varieties and disease susceptibility. He will also collect agronomic information on seeding dates, seeding rates, plant density in the field and other environmental factors.

The ongoing work is to do a statistical analysis of data collected from the nine spore sampling devices and then look at the agronomic and environmental factors to see if there is a more reliable way to connect disease spore numbers to disease risk.

Referring to elements of the disease triangle, host, pathogen and environment, "we know the pathogen is often in the air but what are the critical levels to manifest itself into disease in the field," says Reich. "We need to look at other factors involved such as the environment as well as the host crop. There may be other elements that may be equally predicative of disease risk."

Dryland Cover Crops Prove Tricky

BY MADELEINE BAERG

Cover crops are one of today's trendiest ag management tools. They are credited with a host of benefits: improving soil health and structure, warming spring soil, reducing wind and water erosion, adding nitrogen to soil, improving carbon capture and more. However, little research exists to date that shows whether they can be successful and productive as a shoulder-season crop in challenging dryland prairie conditions. Farming Smarter is part of an ambitious four-year, multi-province study that aims to find key answers — and define next questions — about cover crops' viability for Canadian dryland producers.

"I certainly see the value of cover crops. The question is: how we are going to use them in a prairie context?" says University of Manitoba assistant professor Yvonne Lawley, the lead researcher on the study. "If we grow cover crops frequently in rotation, are they going to create the kind of transformative benefits to soil and to crops over time that we hear about in other areas? There's a lot we don't know at this point."

There are five study sites across three prairie provinces conducting trials. Farming Smarter houses the Lethbridge site. Western Grains Research Foundation, Manitoba Pulse and Soybeans Growers, and Manitoba Wheat and Barley Growers Association fund the study.

At each site, research teams grow four different treatments: a four-year rotation with and without shoulder season cover crops, a two-year wheat-canola check rotation, and a perennial crop check rotation. The specific crops and cover crops at each site are representative of the region. In Lethbridge, the rotation includes wheat, canola, durum, and peas.

2021 will mark the fourth and final production year of the project. Final results will come by mid-2022. It's too early for conclusive answers, but certain findings are already clear.

First: Mother Nature doesn't always play along, especially in southern Alberta. Drought in both 2018 and 2019 complicated cover crop planting and compromised results.

"One of the things we found is that implementation is a little more difficult than we might think sometimes," says Mike Gretzinger, research co-ordinator with Farming Smarter. "If it hasn't rained since the beginning of July and you harvest at the end of August, you can't go in and seed it."

Pea stubble no cover crop October 13, 2020.

Pea stubble with fall rye winter pea cover crop October 13, 2020

> **"I certainly see the value of cover crops. The question is: how we are going to use them in a prairie context?"**
>
> YVONNE LAWLEY

Farming Smarter's success rate at establishing and growing cover crops has been variable, Gretzinger says. Fall rye, winter peas and fall lentils have so far proven mostly successful. However, smaller-seeded cover crops like driller (tillage) radish and clover have provided greater challenge.

"It's too early in the study to make predictions but I do think there will be some winners. There might also be some options that might not be useful in our grow-

ing conditions. I definitely expect regional differences," says Gretzinger.

Of course, even failure in a research context is ultimately a win for producers.

"If producers try something new and have a fail one year, they sometimes say they'll never try that technique or product again. That's unfortunate since, maybe if they'd tried it in a different crop or under different conditions, it might have worked just fine. The benefit of Farming Smarter doing a trial over multiple years is we can try all different iterations: different treatments, different rotations and under different environmental conditions. That means we can give a little more nuance to the findings and, if it really doesn't work, it's not the grower finding that out on their own," says Gretzinger.

So far, Lawley says the research is generating more agronomy questions than answers, especially at the Farming Smarter site.

"What we're seeing right now is very little establishment and very little biomass production in southern Alberta. It's important from a scientific point of view to document that. But if we are successful in getting more funding, we're going to have to pivot our agronomic approach."

Given southern Alberta's challenging dryland conditions, next steps must include figuring out intercropping, she says. Too, she'd like to look more closely at increased integration of animal agriculture, either directly through grazing or more diversely through annual forage production.

She also hopes to define a clear equation for cover crop's impact on soil moisture. On the one hand, cover crops improve soil structure and water infiltration, allowing soil to retain more moisture. On the other hand, however, they use up soil moisture. "At what point do we cross the threshold of using too much water? I don't know where that line will be," she says. "We need to figure that out."

The many unknowns don't phase Lawley. In fact, she expected and welcomes them.

"This [project] is not like dialing in a nitrogen recommendation or choosing the right crop. It's not about fine-tuning. What we're doing and what farmers are doing is redesigning an entire cropping system. We're not going to have the system figured out in four years, but we're working towards understanding what the real questions are that will move this system forward."

Tillage radish emerging in a Farming Smarter plot.

Go Deep with Immobile Nutrients

BY MADELEINE BAERG

A few years back, a question emerged around the way farmers apply nutrients in zero tillage operations. Zero tillage tends to mean all the added nutrients land within the top two inches or so of the soil. People became curious about whether or not this promoted a loss of the more immobile nutrients and, perhaps, even a lessening of root depth in some crops or years.

4R nutrient optimization — applying nutrients at the right source, timing, rate and placement — is a central topic in agricultural management. Generally, discussion focuses on mobile nutrients, especially nitrogen. Less discussion and, until now, less research considered the 4Rs of immobile nutrients like copper, phosphorus and potassium.

SARDA Ag Research in Falher, AB wanted to investigate a better way to apply immobile nutrients than our current system of annual shallow banding. It began a three-year research study with Farming Smarter providing a southern location for trials. While it's still too early to be certain — results have not been tabulated for 2020 data — findings from 2018 and 2019 suggest periodic deep banding (banding every three years) may offer operational benefit.

"Immobile nutrients are currently shallow banded annually. Some research in the past said farmers should deep band immobile nutrients to increase availability for plants. However, when you deep band, you have higher power requirements for equipment, you use more fuel and you create more soil disturbance. [The researchers] wondered if you could get the benefits of deep banding but decrease those costs by only applying every three years," says Shelleen Gerbig, SARDA's extension co-ordinator.

> **"We did a lot of soil testing and the stratification of nutrients was really apparent. You can see right off the bat that most of the phosphorus is in the 0-3" layer"**
>
> MIKE GRETZINGER

The study included three sites to replicate a cross-section of Alberta's diverse growing conditions. SARDA managed the site in Falher; which offered dark grey soil and the shortest growing season. InnoTech Alberta managed a site in Vegreville with black soil and a mid-length growing season; and Farming Smarter managed the Lethbridge site in brown soil and the longest length growing season.

At each site, technicians applied a variety of treatments into fields planted to a canola, wheat and pea rotation. Treatments included no P, K or Cu; one- to three-inch depth shallow banded P, K and Cu (both individually and together) at an annual rate; and five- to six-inch depth deep banded P, K and Cu (again individually and together) applied at three times the annual rate in only the first year of three.

The first question researchers hoped to determine was how much nutrient stratification exists in Alberta's long-term crop soils. The short answer? A lot says Mike Gretzinger Farming Smarter's Research Co-ordinator.

"We did a lot of soil testing and the stratification of nutrients was really apparent. You can see right off the bat that most of the phosphorus is in the zero to three-inch layer. The three- to six-inch layer didn't have nearly as much."

The second question researchers asked was whether, in fact, periodic deep banding improves nutrient availability and uptake in each of a three-year period. Their thought was that, whereas shallow banding limits nutrient availability to the very top layers of the soil, deep banding places key nutrients in the soil layer where the roots grow of

Fertilizer deep banded in plots before seeding in 2018. Notice the disturbance of the hoe opener, deep banding into our rainfed, typically no-till site.

most prairie annual crops. Gretzinger says the southern Alberta fields treated with deep banded phosphorus visually showed improved vigour. Most of the other fields showed no visual differences.

"The hope was that we'd see improved nutrient uptake in the form of a measurable difference in yield. It's not tending to show that at this point, though we can only say 'tend' because we don't yet have final results," says Gerbig.

That said, she adds, "So far, it seems deep banding isn't showing any detrimental effects either. What doesn't happen can be just as important as what does happen."

If the study ultimately shows that there is no production downside to periodic deep banding, producers might find ways to capture a range of economic and operational benefits by shifting away from annual application. In addition to less equipment wear-and-tear, less fuel cost, and less soil disturbance, applying nutrients every three years would lighten producers' workload in two out of three years and potentially allow for application to occur at non-peak work times (and at non-peak pricing). Also, savvy producers might translate a three-year investment to tax-planning advantage.

Gerbig cautions against making operational conclusions from incomplete research. For example, if crops with access to three years' worth of nutrients used more than a one-year allocation in either or both of years one and two, detrimental yield impact might only appear in year three.

If it turns out crops use the nutrients more quickly than expected, "maybe a farmer could put down a little more — say 3.25 years worth — at once and it might still be cheaper than putting down three annual amounts. That will depend on the individual producer," says Gerbig.

One thing is already certain: questions will remain even after this study wraps up. The three-year term of the study won't answer long-term questions about nutrient stratification, a key factor in plant uptake and rate calculations. For example, deep banding could translate over time to seedlings facing starvation if soil's upper layers become depleted of key nutrients and aren't renewed via shallow banding.

"I like research that has a different element. This one is a totally right-field idea," says Gretzinger. "We may not get all the answers, but it's a starting place.

Toby Mandel checking the banding depth in year one at Farming Smarter - target 6" deep.

Beauty and the Yield

BY MADELEINE BAERG

Over the last handful of years, there's been growing interest in seeding canola with a vacuum-based, precision corn planter. There's no question planters do a better job of placing seed than traditional air drills, producing measurably better seed placement precision both horizontally and vertically. Better placement can require lower seeding rates and can produce faster, more even emergence and more consistent crop staging. However, the planter is an expensive piece of equipment. Investing in a machine and then only using it to plant canola doesn't make business sense for most producers. Farming Smarter asked: could precision placement prove successful in other crops too?

"If a producer is going to spend the money on a new planter, they don't want to use it for just one crop. It would be like having one car you only drive to the grocery store and another you only drive to work," says Mike Gretzinger, Farming Smarter's Research Co-ordinator. "There are a lot of benefits to a planter. Whether that pans out to yield in various crops, that's what we wanted to figure out."

Farming Smarter bought a precision planter in 2016 and began experimenting with various crops including high yielding durum, hemp, pulses, a strip-tilled corn, and a field scale canola. In the past three years, its Perfectly Placed research project compared a low (50 per cent of recommended) seeding rate to a high (100 per cent of recommended) seeding rate, seeded via a traditional air drill or a corn planter on 12-inch row spacing.

One can tell at a glance which equipment seeded which rows, regardless of crop. In virtually every trial, the vacuum planter seeded crops come up evenly, consistently and in perfectly spaced rows. In comparison, the air-seeded crops look haphazard and spotty.

That said, Farming Smarter's priority in the Perfectly Placed trials wasn't beauty; it was yield. Based on six site years of data, there was an obvious advantage to the planter at emergence for all pulses except lentils. However, that advantage didn't necessarily carry through to yield. Though there was some advantage in yield in some crops, it wasn't a huge amount and — it should be noted — could be within the range of research error.

	Low Rate		High Rate	
	Air Drill	Planter	Air Drill	Planter
Peas (50 seeds vs 100 seeds/m2)	38.1 bu/ac	42.4 bu/ac	44.3 bu/ac	46.4 bu/ac
Chickpeas (50 seeds vs 100 seeds/m2)	17.3 bu/ac	23.0 bu/ac	19.6 bu/ac	26.0 bu/ac
Fababeans (25 seeds vs 50 seeds/m2)	26.8 bu/ac	29.8 bu/ac	30.6 bu/ac	28.6 bu/ac
Lentils (50 seeds vs 100 seeds/m2)	18.9 bu/ac	18.8 bu/ac	20.5 bu/ac	25.5 bu/ac

"The moral of the story is the way things look in the spring — how pretty they look and how even they are — doesn't always translate to a yield advantage. That's pretty important to remember because [yield] is what pays the bills," says Ken Coles, Farming Smarter Executive Director.

Of course, sometimes no difference is a positive finding in and of itself.

"If I can do something in a totally different way and get the same results, it might be worth it," says Gretzinger.

And, while the evenly spaced, consistent pulse rows didn't produce a notable yield advantage in Farming Smarter trials, even emergence can contribute to yield in some situations. For example, a producer with a Fusarium graminearum-infected crop might get better control if they spray fungicide on an evenly flowering crop. Applying a growth regulator also depends on consistent crop staging.

"To me, an even crop just allows much better opportunity to fine tune your agronomic practices," says Coles.

For the purposes of the durum trial, Farming Smarter added extra treatments: fertilizing various strips with either normal fertilizer rates (100 per cent) or max fertilizer (150 per cent), and either growth regulator, fungicide, or both.

Average yield across the durum trial sites varied from a low of 103 bu./ac. (low seeding rate, normal fertilizer, no growth regulator or fungicide, planted via seeder) to a high of 127 bu./ac. (high seeding rate, max fertilizer, both growth regulator and fungicide, planted via a planter).

"This has got me a little excited; I'm not going to lie," says Coles. "As an industry, we've been saying we can't get an improvement in agronomy in durum in the last 20 years, and what we're showing is we can."

Ken Coles showcases precision planted pulses at a Plot Hop in 2020.

In terms of ranking of impact, he says the results showed that the planter versus seeder comparison made the biggest impact, followed by the higher seeding rate, then the addition of growth regulator plus fungicide, and finally the max fertility.

Though results varied on differing treatments, the planter showed a five bu./ac. advantage over the seeder at all locations.

"Five bushels is five bushels," says Coles. "It actually does add up and it's a statistically significant interaction."

There was also some seed cost savings in the spring using the planter over the seeder, though how much an individual farmer would gain depends on their preferred seeding rate.

Farming Smarter plans to continue exploring precision planter use and crunching data from various trials and projects. Stay tuned.

Facing Challenges With Hard Work, Collaboration, and Innovation

SUBMITTED BY ECONOMIC DEVELOPMENT LETHBRIDGE

In 2020, the resilience and innovation shown by people involved the agriculture and agri-food sector illustrates the enduring strength it brings to our region.

With many businesses and industries dealing with all that the COVID-19 pandemic brought, some of the biggest success stories in Alberta are a result of the work in southern Alberta.

The collaboration in our region is evident as organizations like Economic Development Lethbridge, Southgrow Regional Initiative and other regional economic development partners align with our post-secondary institutions, industry associations and organizations like Farming Smarter to offer advice, learning opportunities and access to a wide array of connections worldwide. This collaboration directly benefits the agriculture sector. Agriculture accounts for nearly 20 per cent of the Lethbridge economy and it is an even bigger number if you consider the broader southern Alberta region.

One of the projects that gained not just provincial, but national recognition is the work on Canada's Premier Food Corridor (CPFC). A consortium of five organizations working together to help promote the farms and businesses along the Taber to Lethbridge stretch of Highway 3. The 55 km corridor is home to nearly 4,500 farms and over 11,000 businesses.

With the success of the food corridor and other agri-food initiatives, investment came to the region throughout the past year. In summer, the expansion of Exhibition Park received both municipal and provincial funding to highlight it as an Agri-Food hub.

Another help for regional producers is initial work on Canada's Western Gateway Trade and Logistics Corridor (CWG). Lethbridge serves as a hub for the CWG with Highway 3 and 4 as part of the CANAMEX corridor and it intersects through the city. Lethbridge and its location make it a key destination for supply chain, logistics, manufacturing, and warehousing operations as it sits approximately 100 kms from Coutts, the only 24/7 commercial border crossing in Alberta between Canada and the United States. Railways running through the city and around the region give local producers another option for shipping and receiving. Investments in the modernization of the Lethbridge airport in the coming years will further enhance options for current and future trade.

As well, both Lethbridge College and University of Lethbridge work with industry to tackle issues and barriers facing the sector.

Initiatives such as Tecconnect, a local technology business incubator, harness the knowledge and innovation of local entrepreneurs and forward thinkers. It helps incorporate emerging to keep this sector on the leading edge of innovation through AI, machine learning and blockchain.

Farming and agriculture are always going to be a huge piece of the regional economic puzzle. While it fared better than some other sectors, we can't sit idly by and keep doing the same thing. If the pandemic showed us anything over the past year, it is that adaptation, innovation and modernization are the best way forward for all sectors of our economy.

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