Spotlight on AWC-funded Research

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FHB resistance is far from futile

When it comes to a farmer’s favorite things, fusarium head blight (FHB) is right up there with death, taxes and early frost. FHB is a devastating fungal disease which causes significant yield loss and damages grain quality. Given that genetic resistance is the most effective and environmentally friendly strategy to control the disease, it was the focus of the project “Genetics and Improvement of Fusarium Head Blight Resistance in Canadian Spring Wheat”.

“FHB has become a major disease affecting Canadian exports, as it directly affects food consumption,” said Dr. Dean Spaner, professor and wheat breeder in the Department of Agricultural, Food & Nutritional Science (AFNS) at the University of Alberta. “FHB produces mycotoxins that are harmful to both humans and animals, rendering infected grain unsellable.”

Spaner points to a recent incident when over a million tonnes of Canadian durum was thrown away due to FHB infection.

THE HEAT IS ON

“FHB first became an issue in Western Canada a few decades ago, in hotter regions of Manitoba; it has since evolved to be one of the five priority diseases considered in the registration of new wheat cultivars. This means that wheat cultivars need to have, at minimum, an intermediate level of resistance to be recommended for registration in Western Canada.”
Though FHB can be controlled through the use of fungicides, there is significant downside in the short window for application, environmental footprint of the chemicals, and increased production costs for growers. As a result, the best option to minimize financial losses and environmental damage is to develop and grow resistant cultivars.

To support those breeding efforts, this project aims to develop wheat germplasm with improved FHB resistance and conduct genome-wide association mapping for FHB resistance in Canadian spring wheat. This will enhance the understanding of the genetics of FHB resistance; the developed germplasm will be available to all wheat breeders in Canada for use in breeding programs.

If it sounds like a daunting task, there’s a good reason for that. “Since FHB has a strong environmental component, teasing out the genetics of it is challenging. In a cool, dry year, we get fewer instances of the disease so finding resistance at those times has been problematic. We have lines that show some tolerance or resistance, though not at as high level as there is for more controllable diseases.”

The need for FHB resistance has increased over the years, as the disease spread from hot, humid areas and came to be endemic across the Prairies. In response, researchers are leaving no stone unturned in their quest for answers.

EXERCISING THEIR OPTIONS

“As part of our project, we are trying to map genes or pool genes, though pooling genes into germplasm can require another 10 years of breeding, so that’s a long-term effort.”

In pursuing this study, Spaner and his colleagues were mindful of the numbers that underline the need to address FHB. Wheat is the largest crop grown in Alberta, and wheat (including durum) accounted for over $2.3 billion in farm cash receipts in 2020 in the province.

In 1993, an FHB epidemic in Manitoba and the American states of Minnesota, North Dakota and South Dakota, cost the grain industry an estimated $1 billion USD due to both yield and quality losses. Additionally, FHB epidemics during 1996, 2000 and 2004 caused $200 million CAD losses to the winter wheat industry in Ontario.

Against that backdrop, farmers are anxious for progress on FHB. The knowledge and wheat material generated during the project will be useful for western Canadian wheat breeders, who will use information regarding FHB resistance sources and the improved germplasm in their breeding programs for developing new cultivars for Western Canada.

SPREADING THE WORD

That knowledge should also benefit wheat producers as they employ the findings to select improved resistant cultivars that minimize yield losses caused by FHB.

Furthermore, results from the project will be made available to stakeholders through annual field days, reports and articles in the popular farm press.

“Our ultimate goal is to provide farmers with the ability to lessen chemical use and produce a saleable crop in years when disease pressure is especially intense,” said Spaner. “That would be a welcome solution to a very serious problem for growers and industry.”

Given where the planet is headed these days, that solution can’t come soon enough.

“As climate change becomes more of a problem, you get a lot of oscillation from cold to hot, which is ideal for FHB to flourish.”

Did you know?

- FHB, also known as scab or tombstone, is a serious fungal disease of wheat (including durum), barley, oats and other small cereal grains and corn. While FHB can also affect wild and tame grass species, the crops most affected are wheat, barley and corn.

- Mycotoxins produced by FHB can be fatal to both humans and animals, increase health care and veterinary care costs, and reduce livestock production.

- Mycotoxins can also pose a significant threat to the health and reproductive efficiency of swine.

DR. DEAN SPANER

Dr. Dean Spaner currently serves as professor and wheat breeder in the Department of Agricultural, Food & Nutritional Science (AFNS) at the University of Alberta. Studying at McGill University in Montreal, he obtained a Masters in corn breeding and agronomy and a Ph.D. in tropical corn breeding and agronomy in association with the University of the West Indies in Trinidad. He had been the principal wheat breeder at the University of Alberta for the last 20 years.
Does early fungicide application make dollars and sense?

While some consider mushrooms a delicacy, other fungi like rust, smut and mildew are far less appealing. In fact, fungal diseases have a major impact on wheat crops, prompting the regular use of fungicides to combat them. Yet many wonder if fungicides are being applied too liberally resulting in wasted expense and increased resistance. “Revisiting the value of early fungicide applications in wheat” sought to shed some light on the issue and arm growers with the facts needed to make informed decisions.

“Many cereal growers apply a sub-lethal rate of fungicide, tank mixed with herbicide at early growth stages,” said Dr. Sheri Strydhorst, agronomy research specialist with Alberta Wheat and Barley Commissions. “This practice is considered a low cost, convenient, one-pass operation for weed and disease management. Previous studies, however, generally support the finding that fungicide applications at herbicide timings do not result in a yield benefit.”

As the use of plant growth regulators (PGRs) becomes more common in western Canadian cereal production, growers will be looking to tank mix PGRs and fungicides to reduce the number of passes they make over the field. Since the newly registered PGRs should be applied at GS 30-32 (beginning of stem elongation) to be most effective, the value of fungicide applications at this time warrants further scrutiny.

As well, with fusarium becoming a bigger problem in Alberta, this project offers insight into the most effective fungicide application timings for reducing FDK (fusarium damaged kernels) and DON (Vomitoxin).

“Our main goal was to provide updated information to growers on the economic value of yield and quality advantages of early fungicide applications versus GS 39 (flag leaf) and/or GS 61-63 (FHB timing, beginning of flowering to 30 per cent of heads in full flower) application.”

Researchers also aimed to promote fungicide use recommendations for growers that ensure good stewardship principals to prevent the development of fungicide resistance.

TESTING TIME

All evaluations were performed on newly registered Canadian Western Red Spring (CWRS) wheat cultivars grown under high input agronomic management. To determine the optimum time for a single fungicide application, six fungicide treatments were tested at eight site-years across Alberta in 2018 and 2019. The responsible application of fungicides compared 12 fungicide treatments across eight site-years. The goal here was to determine the yield, quality and economic benefits associated with multiple fungicide modes of action (MOA), higher (above product label) application rates, and multiple applications per season.
With numerous treatments at multiple site-years, it amounted to considerable time and effort on the part of researchers and produced some valuable findings.

“This project provided research-based evidence and a strong extension component to educate growers and agronomists about the importance of good fungicide stewardship principles which will delay the development of fungicide resistance in Western Canada. The study demonstrated the following good stewardship principles: yield and economic benefits associated with proper fungicide timing; eliminating early fungicide applications; economic value of single versus dual fungicide applications; and guidance on when fungicide applications were unnecessary.”

WHEN LESS IS MORE

Based on the findings, unnecessary fungicide applications are economically unwise and may contribute to fungicide resistance. This study provided evidence that there was no yield advantage associated with early fungicide applications, and that the practice provides no economic benefit. Fungicide applications at “traditional” timing (flag leaf) and fusarium head blight (FHB) timing yielded significantly more than the non-treated control and resulted in 9.3 per cent higher yields than earlier applications.

“This data indicates that fungicide applications can be beneficial even on new CWRS wheat varieties with improved genetic resistance to cereal diseases. This suggests that under responsive environmental conditions, fungicide applications at flag leaf and FHB timing provide a clear economic benefit when condition are right for disease development.”

While dual and triple fungicide applications often provided a superior reduction in leaf spot disease severity, they are not recommended due to the lack of a significant yield increase and neutral return on investment.

Site-years where environmental conditions were not favorable for disease development, and thus fungicide applications were unnecessary, were characterized by low relative humidity (57.7 to 63.7 per cent) and an average observed precipitation of 175 mm.

Since knowledge is only powerful when it’s shared, the study’s findings have been disseminated to an audience of over 1,749 producers and agronomists at field days and producer meetings.

NUMBERS TELL THE TALE

When you crunch the numbers, it’s easy to see the impact of the project on growers and industry.

“Though we are not aware of any data on the actual fungicide use in Alberta wheat crops, anecdotal evidence suggests that 60 to 80 per cent of wheat fields receive at least one fungicide application annually. Wheat was seeded on 21.18 million acres (8.57 million hectares) in the prairie provinces in 2017.”

Of course, fungicide needs vary year-by-year based on environmental conditions, but this study suggested that single fungicide applications were unnecessary 50 to 63 per cent of the time. This means that fungicide use would be needed on a maximum of 10.59 million acres (4.29 million hectares).

“These are very general estimates that will vary year-to-year, and predicting the need for fungicide use in-season is incredibly difficult. But this crude calculation paints a picture of the unnecessary economic inputs in western Canadian wheat production.”

DR. SHERI STRYDHORST

Formerly a cereal agronomic research scientist with Alberta Agriculture and Forestry (AF) and the University of Alberta (U of A), Sheri Strydhorst recently joined Alberta Wheat and Barley Commissions as an agronomy research specialist.

Her AF and U of A research program centered on maximizing the genetic potential of cultivars by using cultivar specific agronomic management. Sheri Strydhorst was raised in St. Albert, Alberta, but now farms with her husband, Shane in Neerlandia, Alberta. Sheri focuses on extension of applied research so that it can be implemented on-farm, and she has strong partnerships with industry.

Fun facts about Sheri!

- Sheri dislikes tractor driving or lab work in the summer. Although critical parts of crop research, she prefers collecting lodging ratings and maturity ratings. One of the most rewarding parts of her research is coming home after a day in the field and immediately entering the data she collected. This confirms that she is seeing similar trends in different replicates and at different locations to ensure she is gathering high quality data.

- Sheri loves seeing visual differences in small plot research and being able to share the stories behind them with farmers and agronomists. In doing so, she gains multiple perspectives on what might be occurring in the field or what solutions these visual differences might offer on farm.
The low-down on dry down

Though growers are loath to offend Mother Nature, they must admit she has a twisted sense of humor, holding back water when they need it most and failing to remove it when required. The latter becomes an issue when damp grain and straw at harvest is extremely difficult to combine in a timely manner and it also increases the grower’s production costs and mental stress. On the other hand, a timely harvest generates positive returns for producers in the form of production cost savings, peace of mind and more hours to spend on their canola harvest or field preparation for next season. To address this issue of timely harvesting of durum wheat via plant physiology and breeding, researchers embarked on the project “Identification of durum wheat germplasm with fast dry down characteristics for early harvest durum breeding”.

ADVERSE WEATHER ISSUES AT HARVEST

“Global marketing of Canadian wheat relies on excellent grain quality,” said Dr. Jatinder Sangha, research scientist with Agriculture and Agri-Food Canada (AAFC) at the Swift Current Research and Development Centre. “Canadian growers, researchers and industry are committed to grain purity, in addition to maintaining high grain protein concentration, gluten strength, and end-use functional traits that provide a competitive edge.”

Unpredictable weather conditions at harvest pose a real risk to farmers by delaying dry down. For crop physiologists and plant breeders, the rate of water loss is of utmost importance in identifying germplasm with short dry down potential. “If timed improperly, the benefits of a high yielding crop are diminished, as low grade grain could be a problem for a major durum marketing country like Canada,” said Dr. Sangha.

“The value of Canadian wheat, including durum, is susceptible to harvest precipitation and the related negative effect on crop quality,” said Geoff Backman, manager of business development and markets for the Alberta Wheat and Barley Commissions. “The 2019 ‘Harvest from Hell’ was a reminder of how poor harvest weather can have a significant impact on Canadian farm profits. Farmers faced reduced revenues due to grain deliveries being downgraded from precipitation-related quality concerns, while also grappling with higher storage costs related to the additional drying that their grain required.”

In 2018, a durum summit in Swift Current, Saskatchewan addressed several issues in durum production and marketing. These included dry down, quality and the fact that in corn, breeders have identified varieties based on their short dry down potential. That prompted Dr. Sangha and his colleagues to wonder if there is similar potential in durum, which could help breeders develop new varieties with short dry down potential and enable farmers to produce high market value grains.

“The dry down period is the duration between physiological maturity and harvest maturity,” said Dr. Sangha. “The shorter that period, the better, as grain will lose moisture faster and be ready for harvest sooner.”

At physiological maturity, most of the hard material (dry matter) like starch and protein are present in the grain, so its maximum yield potential has already been attained. After that, the plant begins losing moisture, going from around 37 per cent grain moisture at physiological maturity to about 18 per cent or less at harvest maturity.
GEARING UP TO DRY DOWN

As part of Dr. Sangha’s project, researchers used 235 durum wheat germplasm lines collected from around the world to screen for dry down potential and determine whether it differed from line to line.

“Once we find 10 to 15 lines that show variation for that potential, we want to know what physiological mechanisms are behind it. Both tasks are difficult, as it is hard to measure the moisture level in a variety – especially in a single developing kernel – until the grain matures, so it requires a lot of manpower and lab work.”

To address the moisture measuring issue, scientists secured funding for a project to develop a single kernel moisture meter. After buying commercial moisture meters online, they modified the sensor probe and produced a measuring tool that would suit their purpose.

“If we locate a few lines with short dry down ability, our breeders will use them in future durum development. Later, we also want to find genes that are linked to this trait, and determine if some of these lines could produce higher yield and protein versus lines that have a long dry down period.”

Starting in a Swift Current field and using both irrigated and dryland, researchers grew material for two years and identified 110 durum lines with a dry down period ranging from 2.5 to 11 days. They involved scientists from AAFC and the University of Saskatchewan, and also included an industry partner to gain feedback on what international buyers are looking for in Canadian grain.

Though pandemic restrictions have delayed their analysis of results, researchers have identified some preliminary outcomes that show potential, and are anxious to conduct further field experiments when that is permitted.

While the challenge of posing questions and finding answers is intriguing for Dr. Sangha, he is always mindful of the bottom line with such projects.

NEW AND IMPROVED

“We are totally focused on how we can provide benefits to industry and growers. If we are able to identify durum lines that have short dry down potential, those lines will be used in breeding new varieties that offer farmers an attractive option. If we can make those varieties commercially available, there’s a good chance that buyers will look at them and think ‘let’s buy from Canada, as it ensures that we will not be using any alternate/artificial drying processes when these lines are drying down rapidly on their own.’”

It’s also worth noting that the project fits in well with Keep it Clean. This joint initiative – involving Canola Council of Canada, Pulse Canada, Cereals Canada, Barley Council of Canada and Prairie Oat Growers Association – provides farmers with resources to grow market-ready crops.

Success with this study might not defuse Mother Nature and her wicked sense of humor, but it may mean that, for once, growers will have the last laugh.

DR. JATINDER SANGHA

Dr. Sangha is a research scientist with Agriculture and Agri-Food Canada at the Swift Current Research and Development Centre in Swift Current, Saskatchewan. In that role, he focuses on crop physiology (abiotic and biotic stresses), seed quality, high-throughput phenotyping (phenomics), marker assisted breeding and host plant resistance.

After earning a B.Sc. Agriculture (Hons.) at Guru Nanak Dev University, Amritsar, India, Dr. Sangha went on to complete an M.Sc. Agriculture at Punjab Agricultural University, India. He completed his Ph.D. Agriculture (Entomology/ Plant Pathology/Genetics) at the University of the Philippines, writing his thesis on protein expression profiling of rice mutants in response to brown planthopper infestation.

In addition to working under Atlantic Innovation Funding for Post-Doctoral research, he earned the NSERC- Industrial Research Development Fellowship Synergy award. He also won a scholarship from the Swiss Agency for Development and Cooperation for Ph.D. thesis research. He is a member of the Prairie Recommending Committee for Wheat, Rye and Triticale, and participates on the quality evaluation team.

Dr. Sangha has a number of current projects, such as physiological characterization of wheat genotypes for grain yield, grain protein and quality testing for selection of better performing wheat lines from breeding programs. His work on measuring DON toxin in wheat grains using a portable Near Infrared (NIR) spectrometer will be useful in lowering the cost of screening wheat lines for FHB resistance.

Success with this study might not defuse Mother Nature and her wicked sense of humor, but it may mean that, for once, growers will have the last laugh.

Did you know?

- Researchers are trying to identify wheat lines that have better nitrogen (N) uptake in order to develop varieties with improved N-use efficiency.
- Scientists are also conducting drone-based imaging phenotyping for breeders, drastically reducing the time needed to measure traits such as plant height, grain yield, grain protein and disease in the field.
Though the pandemic meant restrictions on lab entry and access to equipment, researchers will soon have a wealth of data on current crop varieties and yield potential in order to revise the guidelines.

Crop nutrients: the update on uptake

Raising your crops with outdated data is like driving with a blindfold: unless you get lucky, it won’t end well. As farming expenses continue to rise, growers must stay current to compete, and having the latest information on nutrients and how to use them efficiently is not optional; it’s essential. Researchers recognize that need, and have responded with the project “Revising the crop nutrient uptake and removal guidelines for Western Canada”.

The idea for the project was first floated where many great studies are born: over lunch.

“At the 2019 Soils and Crops Symposium in Saskatoon, there was considerable discussion regarding the widely varying values used to estimate nutrient uptake and removal in harvested crops,” said Dr. Fran Walley, associate dean (academic) and professor, College of Agriculture and Bioresources at the University of Saskatchewan. Walley is the principal investigator for this project, and Dr. Richard Farrell, associate professor in the Department of Soil Science at the University of Saskatchewan, is co-investigator.

IDEAS TO CHEW ON

“Over lunch, we started talking about one of my favourite pieces of paper, which is the crop nutrient uptake and removal guidelines. Every agronomist has it pinned to their bulletin board, but it is an old document, and even the yield targets are out of date.”

Yields for major crops in Western Canada continue to trend upwards, due in part to changes in management, but largely reflecting improved genetics. With the development of new crop varieties with enhanced yield potential and different genetics, the nutrient uptake demands have changed over time.

As they ate, Walley and her colleagues decided it was time to update this valuable resource. To do so, they needed to collect grain samples and yield data from Alberta, Saskatchewan and Manitoba. Armed with a plan and a purpose, they obtained funding from several agencies that shared their vision.

At that point, what could possibly go wrong?

COVID CONUNDRUM

“We were all set to start when COVID-19 struck. That was when John Heard, soil fertility extension specialist with the Government of Manitoba, and Lyle Cowell, manager of agronomic services at Nutrien, came through for us. They arranged for agronomists from across Western Canada to collect over a thousand samples this past summer.”

Though the pandemic meant restrictions on lab entry and access to equipment, researchers will soon have a wealth of data on current crop varieties and yield potential in order to revise the guidelines.
“We put together a list of crops we planned to focus on and how many samples we needed of each as a minimum. We didn’t want a thousand samples of wheat and only one for soybeans. The idea was to have a representative number for each crop, and we hit most of our targets. That’s amazing in a year where it was hard to get anything done, and it happened because people appreciate the importance of this information. Everyone was anxious to step up and help out in spite of COVID-19.”

Scientists will also include estimates for micronutrients that were part of the original version of the guidelines. Over the years, there has been increasing interest in this area and more evidence that micronutrient deficiencies are emerging in some areas.

“Especially with certain crops that we are growing now, farmers are seeing much higher yield potential than they saw when the estimates for uptake and removal were first produced. We want to ensure that there is value in these numbers, so growers can say ‘if I plant crop X, I can expect this amount of micronutrients to be removed and a certain crop yield to be attained. Based on those figures, what do I need to be replacing here?’”

NUMBERS GAME

Walley likens these nutrient choices to “detective work”, where growers combine soil test reports, yield figures from previous years, current yield targets and nutrient updates to dictate fertilizer input. That input decision is critical, as underuse of fertilizer may prevent you from hitting your target, while overuse results in wasted expense.

All told, this project will result in the production of new nutrient uptake and removal guidelines for 14 annual crops based on both literature values and measured values from seed and straw samples. Additionally, the existing values for forage dry matter production (alfalfa, clover, forage grass, barley silage, corn silage) will be updated based on values published in the scientific and grey literature (grey literature is material and research produced by organizations outside of the traditional commercial or academic publishing and distribution channels).

“Updated guidelines represent another tool in the toolbox for making the best possible choices for your crops. The idea is to eventually get the guidelines into a more user-friendly format than a piece of paper stuck on a bulletin board, so we are working towards an app that will contain the most current values.”

As with any project of this magnitude, multiple funders are vital to achieving the desired outcome.

“We are very grateful to the Alberta Wheat Commission, Prairie Oat Growers Association, Saskatchewan Canola Development Commission, Saskatchewan Flax Development Commission, Saskatchewan Wheat Development Commission and Western Grains Research Foundation.”

Like removing a blindfold from the driver, researchers hope that dispensing with outdated nutrient data will keep farmers out of the ditch and well on the road to success.

Fran Walley is a professor in the Department of Soil Science, University of Saskatchewan, and the associate dean (academic) in the College of Agriculture and Bioresources. She holds a Ph.D. in soil microbiology from the University of Saskatchewan, and a B.Sc. and M.Sc. in soil science from the University of Manitoba.

Much of Fran’s research focuses on sustaining our soil resource, from both agronomic and environmental perspectives, with a particular focus on soil organic matter and soil organic nitrogen (N), which ties into her work in the area of soil testing for improved nutrient fertilizer use efficiency. Fran also works in the area of pulse crop fertility and production, with an emphasis on N fixation and the development of effective inoculation strategies.

Fran is keenly interested in environmental sustainability, and both her research and teaching at the university reflect her interests in protecting the environment and sustaining our key resource – the soil.

Did you know?

- Fertilizers do not alter the DNA of crops. Instead, they improve the growth and quality of the crop by adding important nutrients.

- In nature, there are 17 critical plant nutrients: the macronutrients nitrogen, phosphorus, potassium, calcium, sulphur, magnesium, oxygen, hydrogen, carbon; and the micronutrients iron, boron, chlorine, manganese, zinc, copper, molybdenum and nickel.

- Approximately half of the world’s population today has food on the table due to fertilizers.
Though oxygen is considered a free input (at least for now), nitrogen (N) applied via fertilizer comes at a cost. In an industry where so many expenses are fixed, fertilizer is an area in which growers can find savings with a judicious approach. This makes it a fertile subject for research, spawning projects like “Revisiting nitrogen fertilizer recommendations for Saskatchewan: are we measuring the right soil nitrogen pool?”

“The study stemmed from fertilizer rate studies conducted over the past 10 years,” said Dr. Richard Farrell, associate professor, Saskatchewan Ministry of Agriculture Research Chair – Soils & Environment, Department of Soil Science at the University of Saskatchewan. “We found that often, applying no fertilizer achieved the same result as using twice the recommended amount.”

In part, that lack of fertilizer impact may be linked to testers not going deep enough in the soil, and also from crop residue being incorporated, mineralizing and releasing N, and reducing or possibly eliminating the need for additional N inputs.

“Is there a way to account for that absence of impact? We had a grad student a few years ago looking at glomalin, a protein that fungi produce to store carbon and nitrogen. This led to work on adapting a glomalin-related soil protein test to look at indicators of reserve N that could become available in the course of a growing season.”

“Can we get a longer-term view of what is available in the soil at the start of the season, and what could subsequently become available?”

To answer that question, researchers collected soil samples from across Saskatchewan to examine the range of potentially mineralizable N, how it varies and its relationship to other variables. Mineralization in soil science is the decomposition (i.e., oxidation) of the chemical compounds in organic matter, by which the nutrients in those compounds are released in forms that may be available to plants.

In the first year, they collected 55 soil cores to a depth of 60 cm (24 inches) at 23 sites to see what was happening province-wide in terms of available N levels, organic matter content and potentially mineralizable N. This included taking samples from seven sites chosen for a fertilizer response study, gathering yield and fertility data and looking at response curves.

TRIAL IS IN SESSION

The trials were conducted at seven Agri-ARM (Agriculture-Applied Research Management) sites: Prince Albert, Melfort, Outlook, Indian Head, Swift Current, Scott and Yorkton. Fertilizer was applied at a number of rates ranging from zero to twice the recommended amount.
“All the sites are producer-directed to conduct and demonstrate applied research. This meant that the varieties of wheat and canola crops we used, and the fertilizer recommendations, were based on producer practices in those areas. That allowed us to make the trials as practical as possible, which was our ultimate goal.”

“Oddly enough, we saw that last year the actual soil test recommendations would have given you the best results. At a few sites, the half rate would have been almost as good and perhaps better from an economic standpoint.”

Of course, 2020 was a challenging year due to the pandemic, but scientists are now analyzing that data as well. In spite of the hurdles they had to overcome last year, they are hopeful about the study’s potential impact for growers.

PUTTING THE N IN “SUSTAINABLE”

“These days, everything is about sustainability. The goal in agriculture is not only to be profitable, but also responsible from an environmental standpoint. The best way to do that is to use fertilizer as efficiently as you can.”

Given that researchers have been seeing some soil test recommendations that are a bit higher than needed, this project presents a possible response. By accounting for the N that becomes available from the mineralizing of residue and root material in the soil as the growing season progresses, industry may be able to reduce the fertilizer they add and save money for farmers in the process.

As for many people, scientists on the study could view 2020 as a glass half empty or half full, and they chose the latter.

“We hoped we would be further along with the results at this point, but everything is behind. We are optimistic that things will get better and have been lucky on campus that there are not many positive COVID-19 cases. People at the Agri-ARM sites were so good this past year, and the support from funders was phenomenal. Everyone understood that there were going to be delays and responded accordingly. The fact that we were able to pull all this field research together in 2020 demonstrates the cooperation and camaraderie within the research community.”

DR. RICHARD FARRELL

Dr. Richard Farrell is associate professor, Saskatchewan Ministry of Agriculture Research Chair - Soils & Environment, Department of Soil Science at the University of Saskatchewan.

He graduated from the University of Rhode Island with a B.Sc. (Resource Development), before earning an M.Sc. and Ph.D. in Soil Chemistry at Iowa State University. Though he grew up in the city, he has been interested in soil science since he was 13, when he won second prize in the local science fair for his project on “Soils and Soil Conservation”.

His research addresses the impacts of agricultural management on greenhouse gas emissions from integrated agricultural landscapes and the development of advanced fertilizer management strategies. The centerpiece of this research is the Prairie Environmental Agronomy Research Laboratory (PEARL), of which he is co-lead scientist. The PEARL supports research aimed at developing innovative solutions to the problems facing today’s producers. It does so by identifying strategies that enhance, maintain, or re-establish agroecosystem capacity and integrity while providing definable environmental benefits, such as mitigating nitrous oxide (N₂O) emissions and promoting carbon sequestration.

Did you know?

- A recent report found that only about half the farmers in Saskatchewan soil test at least once every one to three years, with about half of these testing every year. The one reason given for not soil testing (other than the expense) was that they don’t think soil tests are useful.

- The world loses 10 acres (or about four hectares) of farmland per minute, meaning less and less farmland will be available to feed more and more people, and increasing the need for fertilizer to improve productivity.