USASK COLLEGE OF AGRICULTURE AND BIORESOURCES MAGAZINE 2020

AGKNOWLEDGE

Producing food in sustainable ways:

Meeting the demands of a hungry and growing world while preserving natural systems that sustain agriculture—and everything else.

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INTERNATIONAL YEAR OF PLANT HEALTH 2020

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DEAN'S REPORT

Dr. Angela Bedard-Haughn (PhD)

As I write this message, harvest is in full swing, leaves are just starting to turn, and students everywhere are returning to school in a way that is very different from anything any of us has experienced before.

As the new dean of the College of Agriculture and Bioresources, I find myself filled with a combination of excitement and trepidation. I must confess, I have some trepidation over how to effectively advance our mission in the current COVID-19 milieu: the university campus is eerily quiet, with most faculty and staff working remotely and the vast majority of classes going online for the fall term.

That being said, my trepidation is largely tempered by knowing that behind that quiet facade, the faculty and staff in AgBio have been working hard throughout the spring and summer, at home or in socially-distanced field plots or labs. They have been keeping their critical research moving forward, training the graduate students who will be our future leaders, and doing everything they can to ensure that our undergraduates this fall are learning the skills they need to prepare for successful careers, wherever their paths take them.

When I see the effort and passion of our faculty, staff and students, I am incredibly excited about the potential for our college to have an even greater impact in a world that is recognizing anew the value of food production systems and the importance of environmental integrity in the face of a changing climate.

And so, focusing on the excitement, I am looking ahead. I look forward to growing the AgBio research ecosystem, ensuring our faculty, staff and students have access to the collaborative networks, facilities and supports they need to do transformative work.

I look forward to renewing our curriculum and growing our enrolment. We will revise our programming to better reflect the rapidly-changing needs of the agriculture and bioresource community, and ensure that our graduates are not only fully prepared to meet those needs, but able

to adapt to the unanticipated.

I look forward to growing engagement with our many stakeholders (government, NGO, and private sectors, ag commodity and livestock groups) and with the broader community. This will allow us to stay relevant and responsive to societal needs and to deliver the research, knowledge, and training opportunities necessary to tackle shared challenges.

We also have an important role to play in building public understanding and trust in food safety, security and sustainability, at home and around the world.

Finally, I look forward to growing the diversity of our community to ensure it reflects those we serve. By intentionally committing to reconciliation, equity, diversity and inclusion, we are recognizing the value of many voices and the value of learning from each other about new and different ways of knowing and doing. Many hands may make light work, but many diverse voices make innovation.

Please join me in taking a moment to pause and celebrate the successes of our AgBio community (like the ones you'll read about in this issue). Then let's turn to the future and continue to grow.

AGBIO AT A GLANCE

1,702 students

1,363 undergraduate

339 graduate

$45.8 M
New awarded research funding

$1,492,082
Scholarships, bursaries, awards

Undergraduate students by program

704
Bachelor of Science, Agriculture

237
Bachelor of Science, Agribusiness

227
Bachelor of Science, Animal Bioscience

48
Bachelor of Science, Renewable Resource Management

59
Diploma in Agribusiness

55
Diploma in Agronomy

33
Kanawayihetaytan Askiy (KA) Program

327 staff

80 faculty

Bachelor of Science, Agriculture students by major

18
Agriculture Biology

12
Agriculture Economics

203
Agronomy

139
Animal Science

9
Applied Plant Ecology

34
Crop Science

63
Environmental Science

32
Food and Bioproduct Sciences

40
Horticulture

14
Soil Science

140
Undeclared

704 total

Expandin

Undergraduate brings an international viewpoint to local agriculture

✎ ASHLEIGH MATTERN

Amy Carruthers (BSc'20) says camel milk tastes like "a slightly saltier version of Dairyland cow milk."

Trying the milk at a camel dairy farm was one of the more unique experiences Carruthers had while on her study abroad semester in 2019. The farm is the only camel dairy in Europe, located not far from where she was living in 's-Hertogenbosch, Netherlands.

She also had a chance to visit a dairy farm, beef farm and pig farm, experiencing firsthand how Dutch farming practices vary from Canada.

"My favourite part was meeting the people behind the farms and watching them do what they love," she said. "The people I met really were the ones who made it possible for me to see so many different aspects of Dutch agriculture."

She was overseas for five months, and in addition to those farm tours and her studies at HAS University of Applied Sciences, she managed to squeeze in visits to more than 10 countries, including Norway, Morocco, Scotland, Denmark, Croatia, Spain and France.

It was an unforgettable experience, and even more precious once travel restrictions for COVID-19 came into effect the following year. While it may be some time now before other students get the opportunity to study abroad, Carruthers said she would encourage any student interested to go for it.

"I highly recommend getting that experience and getting outside your comfort zone, learning to be comfortable with being uncomfortable," she said.

A different perspective

Her interest in the study abroad program developed over time during her studies at the College of Agriculture and Bioresources. The more Carruthers learned about the world of agriculture, the more she became interested in international agriculture practices.

Carruthers said the experience gave her

Photography by Shannon Bickley

Amy Carruthers visiting Darmstadt, Germany during her study abroad experience.

g her horizons

an entirely new perspective of the global agriculture industry.

"Learning about what happens outside Canada, where's all my food coming from that isn't grown here? Getting a different perspective," she said. "It allowed me to be interested in different areas of agriculture that I wouldn't have been interested in if I'd stayed in Canada."

She said the Canadian agriculture schooling is generally very technical, "you learn the details and go into a process or theory and get into the roots then apply it." In Europe, education was broader.

"I took a class called circular economy, which focused on efficient use of resources, food and residuals, to provide students with the whole picture of an agricultural process."

Sparking an entrepreneurial flame

Carruthers has long been acquainted with the world of agriculture. Her grandparents were farmers and her parents still farm, working full-time while managing a small purebred Angus herd and running stocker cattle.

Growing up in Paradise Hill, Sask., she was involved with 4H and said she always loved working with cattle.

In high school, she sold farm fresh frozen lamb, sparking her initial interest in the economics of agriculture.

"The sheep were my own, which started the entrepreneurial flame in me," she said. "I raised them in high school and sold them to different people in the summertime when they were finished. That little lamb business of mine … led me into the agribusiness degree."

Carruthers graduated in spring 2020 with her degree in agribusiness and is continuing on to graduate studies in agricultural economics.

Her long-term goal is to run her own business, and while she's not exactly sure what direction that might take right now, she is interested in direct marketing, like she did selling finished lamb directly to consumers.

"We're seeing a lot more of that now become popular with COVID-19. The shelves are more empty now and where is that food coming from? That's an opportunity," she said. "I'm interested in closing that gap between consumer and producer."

Practical education

When Carruthers does strike out on her own, she knows her agriculture education will serve her well—in part because it already has.

Participating in clubs like the USask Stockman's Club Beef Team and Rangeland Team not only helped her get to know her fellow classmates better, it deepened her agriculture knowledge.

Through her participation in the Beef Team, Carruthers took a course on how to artificially inseminate cattle—a course her sister has also since completed. She and her sister brought what they had learned back to their parents' farm and worked together as a family to use the process on the herd.

"That was a great learning experience," Carruthers said. "The whole university experience, these clubs, opened up opportunities that if I wasn't involved in the College of Agriculture and Bioresources, I wouldn't know they existed."

She also said making connections with members of the Saskatchewan Agriculture Grads Association has been a highlight of her AgBio experience. Even simply running into other people who have attended the college opens a door to conversation.

That sense of community is what Carruthers loves most of all about being an Agro.

"There are people I've met that I'll always be in contact with," she said.

GRADUATE STUDENT

Digital eyes

Digital eyes in the sky offer—finally—a practical way to measure crop biomass

MICHAEL ROBIN

Photography by Christina Weese

When Karsten Nielsen was exploring a topic for his master's thesis, he discovered no shortage of notions for using unmanned aerial vehicles (UAVs) in agriculture. But one idea stood out.

"I often found myself going down wormholes when reviewing literature," he said. "There is an enormous amount of information that we know we could collect in research programs that just simply take such a large amount of time and effort that often they simply are not considered. Biomass is an example."

Nielsen recently completed his thesis project for his master's degree in the University of Saskatchewan (USask) College of Agriculture and Bioresources, using UAVs and associated computer image manipulation to tackle this hard-to-measure metric in crop development. The work supported his successful thesis defence and is the basis for an article he is preparing for a research journal.

"Biomass is an excellent indicator of plant growth rate and a tremendously important factor in determining yield," he said. "It's not the only factor, though. If a crop puts too much effort into biomass, it may put less energy into seed yield. There is a fine line."

For farmers, how big and lush a plant is growing is a good indicator of crop health. For plant breeders, biomass can be used to answer important questions about plant growth and seed development.

To measure biomass, researchers must grow enough plants so some can be sacrificed to be regularly cut, dried, and weighed. It's work that requires a lot of time and skilled hands.

"Biomass is almost never conventionally measured because it is a destructive measurement," Nielsen said.

But what if biomass could be accurately measured, throughout the season, without destroying any plants? Nielsen wondered if UAVs and high-resolution digital photography could offer an answer.

He drew on the expertise of his co-supervisor Dr. Steve Shirtliffe (PhD), a field crop agronomist with the Department of Plant Sciences and senior researcher with the Plant Phenotyping and Imaging Research Centre (P2IRC). Shirtliffe is an expert in phenotyping using UAVs (phenotype refers to plants' physical characteristics). For the plants themselves, Nielsen was guided by his co-supervisor, pulse

in the sky

crop geneticist Dr. Kirstin Bett (PhD) from the Department of Plant Sciences, who is also embracing UAV-generated data to further her own work.

Nielsen's research meant becoming personally acquainted with some of the challenges that make researchers reluctant to measure biomass.

"By the end of the season, I needed a lot of space in the vehicle to move all of the material back to the lab to be weighed," he said. "Keeping everything labelled appropriately became very important and the chance of losing data seemed high."

Nielsen grew several varieties of lentil in five different Saskatchewan locations in 2017 and 2018, flying a UAV over the plots every two weeks, from when the lentil seedlings emerged to crop maturity. The advantages were immediately obvious.

"Flying the drone only took a small proportion of the time I allotted to data collection and took minimal effort," he said. "If the field was muddy, I did not even need to enter it to fly the drone."

The resulting images were combined into orthomosaics, that is, aerial photographs digitally stitched together and geometrically corrected so their scale is uniform, like a map.

Since the UAV images were taken from many different angles, it was also possible to create "3D point clouds." For example, a single plant may show up in 20 different images, but from different angles. Using specialized software, these images can be combined and processed into a kind of virtual three-dimensional computer model for future analysis.

This is another powerful advantage of UAV-based imaging. Data can be gathered both for a specific project and to be set aside for future work. It also remains easily accessible.

"For example, while the purpose of one of my flights may have been to collect plot volume, I would have also been very easily able to get normalized difference vegetation index (NDVI), groundcover, and height information," he said. "Even better, those images now serve as a record of the crop trial at that moment in time. If novel data extraction methods are developed in the future, they may be applied to the image set from an experiment that is no longer even in the field."

Since it's non-destructive, UAV-based imaging also allows researchers to look at the same plants as they develop over the growing season.

"Rather than just measuring the biomass at a key moment in the crop's lifecycle, we could evaluate the rate of growth throughout the entire season," Nielsen said.

UAV-based imaging does have limitations. Clouds, smoke from forest fires, and anything that throws a shadow can impair image quality. Plants themselves can block each other from the camera eye, distorting the data. On the operational side, high winds or rain can ground UAVs, and areas with high air traffic may need special permission from Transport Canada to operate. UAV operators in Canada also need to be licensed.

Back in the lab, data need to be analyzed, which requires highly skilled staff and specialized software, some of which is being developed at USask.

"The group at P2IRC has already made fantastic headway on that, so for a large number of traits, it is literally as simple as uploading and pushing 'start,'" Nielsen said. "I expect the list of traits that this applies to will steadily continue to increase."

Beyond adding a powerful tool to plant breeders' toolkits, Nielsen speculates his project may even be immediately useful to producers for crops that are harvested for biomass, such as silage, forage, fibre for textiles, and bioenergy.

"I expect the indirect benefit to farmers through improved breeding efficiency will also be significant," he said. "UAVs may allow varieties to be developed more rapidly producing higher, easier to grow crops. Desirable traits may be identified earlier, allowing them to be advanced more quickly.

"From a very large perspective, this will help to feed a growing global population."

"UAVs may allow varieties to be developed more rapidly producing higher, easier to grow crops. Desirable traits may be identified earlier, allowing them to be advanced more quickly."

KARSTEN NIELSEN (MSc IN PLANT SCIENCES)

ALUMNI

Dream big

Gurcharn Brar's grad school experience set him up for career success

COLLEEN MACPHERSON

One of the newest faculty members at the University of British Columbia (UBC) keeps a photo of the College of Agriculture and Bioresources on his desk where he can see it at all times, a reminder for Dr. Gurcharn S. Brar (PhD) of hard work, supportive grad school supervisors, the dream of a professorship and his passion for one of the most important cereal crops in the world—wheat.

Arriving at the University of Saskatchewan (USask) in the fall of 2012 as a master's student, Brar had the goal of finding a spot for himself in academia.

"There was no confusion in my mind at all about doing my PhD. I wanted to dedicate 30-35 years of my life to my career … (and) I channelled myself to have everything on my CV to help me land a professorship."

Photography by Eric Skalji

"I just loved it. I saw wheat everywhere, even on the Saskatchewan logo. My Wi-Fi network in Saskatoon was called 'wheat' and my password was 'the king of cereals.' I tell people that I'm in a long-term relationship with wheat and wheat stripe rust."

DR. GURCHARN S. BRAR (PHD)

Brar grew up in Punjab, the northwestern state in India where his father grew wheat and rice on 15 acres, an average-sized farm for the area, he said. He considered medicine as a career but the competition for those spots is extraordinarily tough. So instead, he opted to attend Punjab Agricultural University (PAU).

While still in high school, Brar recalls seeing wheat that looked like it had been dusted with turmeric.

"It looked very beautiful but what I came to know in university was that it was a fungal disease, stripe rust, also known as yellow rust, a massive problem in India."

By his third year at PAU, he had made a number of important decisions—to dedicate himself to studying this devastating disease, to earn both a master's and PhD in the field, and to study abroad. Choosing to leave his home country was significant.

"PAU is a world-renowned institution but in developing countries like India, getting funding for research is often a problem, and I also didn't want to do all of my degrees at one university."

His world-wide search for opportunities led him to Dr. Randy Kutcher (PhD), pathology professor in plant sciences at USask and Ministry of Agriculture Strategic Research Program Chair in Cereal and Flax Crop Pathology. It so happened there was an epidemic of stripe rust in Western Canada when Brar contacted Kutcher and, after a long telephone interview, the 22-year-old student was on his way to Saskatoon.

"I was really homesick for the first few months," Brar admitted. "I cried almost every night for the first month, but Randy was not only a good supervisor but also a great human being. He helped me like a father, supported me in every possible way. I enjoyed every single day of grad school."

Brar worked hard, focusing on two main diseases of wheat—Fusarium head blight and stripe rust. By this time, his commitment to wheat was undeniable; in his first year of grad school, he traveled the province doing crop surveys "and I just loved it. I saw wheat everywhere, even on the Saskatchewan logo. My Wi-Fi network in Saskatoon was called 'wheat' and my password was 'the king of cereals.' I tell people that I'm in a long-term relationship with wheat and wheat stripe rust."

Even though he was a master's student in plant pathology, Brar appreciated being challenged regularly from a breeder's perspective by Dr. Curtis Pozniak (PhD), professor and director of USask's Crop Development Centre.

"It was from those discussions that I decided to do my PhD in wheat breeding and genetics, and Dr. Pierre Hucl (PhD) agreed to supervise me with Randy as a co-supervisor. Curtis was also on my committee so it was a terrific combination."

Casual conversation with his mentors in the college illuminated for him how to be a good researcher but also how to be a good supervisor and teacher.

"These were wonderful conversations," he said.

As his PhD work concluded, Brar sought academic opportunities and found a UBC "cluster hire" of three new positions for either plant or soil scientists. Brar applied there, as well as at McGill University and a university in the U.S., and was shortlisted at all three institutions.

The selection process at UBC unfolded more quickly than the others, while Brar admitted he harboured self-doubt, his supervisors exuded optimism.

"Randy and Pierre were more confident about my success than I was but after the in-person interview, something in my heart was saying, 'Gurcharn, you will make it.'"

A call from the dean of the UBC Faculty of Land and Food Systems on Aug. 1, 2019 confirmed Brar's appointment and his Jan. 8, 2020 start date as assistant professor, plant science. He left Saskatoon for Vancouver on Jan. 7 "and I cried so much I couldn't speak a word."

In his new position, Brar said he has total freedom to pursue research on "any crop, any disease, any problem as long as it's plant science. In return, I need to bring in grants, teach and supervise grad students."

He has a year to prepare to teach a senior-level plant pathology course and has already submitted a number of research proposals in cereal pathology, genetics, resistance breeding, and plant imaging using the Canadian Light Source.

Looking forward to the academic career that lies ahead of him, Brar described farming as "the most noble profession I can think of. There's no cheating, no politics, no harm, and I'm proud to be serving—through my research—the needs of this great profession.

Producing food in sustainable ways

Dr. Kate Congreves (PhD)

MICHAEL ROBIN

As populations grow, so do demands on farmers to produce more food while somehow preserving the natural systems that sustain agriculture—and everything else.

"We need to provide sufficient nutritious food to a growing population, but we must do so in a way that is environmentally friendly," said Dr. Kate Congreves (PhD). "That means optimizing crop production while simultaneously minimizing soil health degradation and nutrient loss to the environment."

Congreves describes her work as environmental agronomy. An assistant professor in the Department of Plant Sciences in the College of Agriculture and Bioresources at the University of Saskatchewan (USask), her research group is devoted to studying farming practices that can meet producer goals while reducing environmental impacts. In doing so, she focuses on two elements—nitrogen and carbon. Her work encompasses horticultural crops as well as field crops.

Congreves explains that a healthy soil is one that functions in three ways: to sustain biological productivity, to support environmental quality, and to sustain the health of plants and animals—including humans. The soil's capacity to function determines the extent to which it can provide ecosystem services, either on its own or indirectly through plants.

"Ecosystem services are what support life on Earth," said Congreves, listing examples including biomass production (food, fuel, fibre), greenhouse gas sequestration, provisioning of nutrients, and preserving water quality.

"All things wouldn't be able to live without these services."

"Improving the efficiency of the monocultural practices has been a key focus of production," Congreves said. "But we can still learn from nature, and from older or alternative practices such as intercropping or cover cropping, thereby realizing the ecological benefits that arise from diversification."

For example, one of her research projects is looking at intercropping, a practice famously used by Indigenous peoples in North America with corn, squash and beans. Her project uses a "service crop" or "undercrop," in this case red clover, seeded together with a main crop such as wheat. Bacteria housed in the clover's roots fix nitrogen from the air to fertilize both the clover and the wheat. She has other projects exploring the use of cover crops in vegetable crop rotations, for example, broccoli—sweet corn—root crops.

Many of the concepts Congreves speaks of would be well known to those familiar with organic production or in regenerative agriculture. Environmental agronomy is a broader term that encompasses all production systems.

"It is not a matter of organic versus conventional production; I don't think there's a line drawn in the sand," she said. "It's a blend between the two ideologies that will take us forward. It's being mindful of managing the soil as well as managing the crop."

An example of this is minimum and no-till seeding and leaving crop residues on the field, which have become standard practices that help build healthy soils, retain moisture, and prevent erosion.

Congreves explained there are two components at play. One, of course, is to produce healthy food. The other is to maximize carbon inputs and minimize losses. Carbon-rich soils have better structure for plant growth, promoting aeration and water retention. They also store carbon that would otherwise end up in the atmosphere as carbon dioxide, a greenhouse gas that contributes to climate change.

"In doing both, you're getting closer towards regenerative agriculture—whether you do it conventionally or organically," she said.

Managing nutrients is also an important part of Congreves' work. She is currently looking at nitrogen use efficacy in potato production and also in spring wheat. Identifying how different management and varieties affect nitrogen use efficiency can help inform how best to produce food in a way that capitalizes on nutrient cycling and minimizes the amount of nitrogen lost to the environment.

On the greenhouse gas side of things, she is involved in setting up a micrometeorological station in Saskatoon that measures greenhouse gas fluxes from cropping systems, year-round. This will help provide the carbon footprint data needed to better understand carbon and nitrous oxide dynamics in cropping systems.

Mitigating the environmental impact of farming while maintaining and increasing food production is a global challenge. By the end of this year, there will be 82 million more mouths to feed on a planet already home to more than 7.8 billion. By mid-century, this is expected to top 9.7 billion. Humanity cultivates more than 4.6 billion acres, an area nearly twice the size of Canada.

Congreves' fascination for soil and the plants that grow in it began on her parents' 100-acre hobby farm outside of Ottawa. There, she and her siblings would take their toy trucks and build elaborate networks of roads through the family's extensive garden, circling around the plant roots. Their mini roadworks extended right out to the lush vines and leaves of the pumpkin patch, thriving in the carbon-rich compost pile.

"I would do lots of home gardening even as a child," she said. "We grew such a diversity of vegetables each year.

"It is not a matter of organic versus conventional production; I don't think there's a line drawn in the sand. It's a blend between the two ideologies that will take us forward. It's being mindful of managing the soil as well as managing the crop."

DR. KATE CONGREVES (PHD)

"I think that's what got me into it (soil and plant science), because we were always outside, just being close to nature."

Congreves did her undergraduate studies in biology and chemistry at Queen's University in Kingston and went on to earn her PhD in land resource science at the University of Guelph's Ridgetown campus. There, she worked on nitrogen cycling in vegetable crops, soil health, and long-term crop rotations. She joined USask in early 2017.

Striking at the roots of leafy spurge

JEFF MELCHIOR

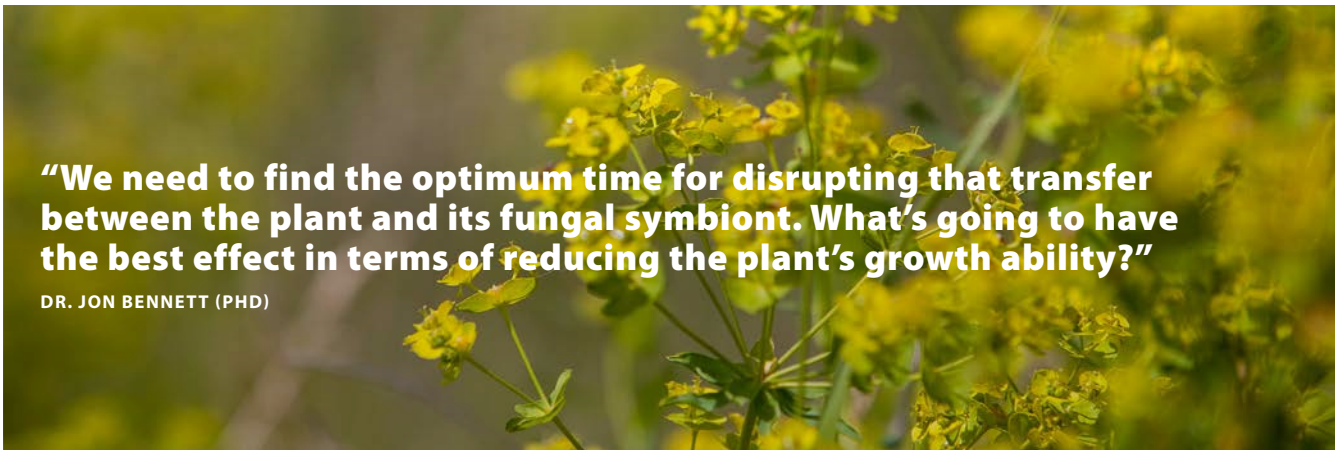
If leafy spurge isn't the biggest weed-related threat to rangeland cattle grazing operations in Saskatchewan, it's almost certainly up there. Not only will cattle not eat it, but it can cause them bodily harm when they do. The result is whole tracts of valuable grazing land being taken over by the noxious weed.

Making matters worse is the fact that it takes more than herbicide to combat leafy spurge. The real battleground against leafy spurge is underground, where its roots can extend as much as 30 feet. Estimates of the total cost to producers vary but are universally high.

A plant sciences researcher with the College of Agriculture and Bioresources at the University of Saskatchewan (USask) has identified some practices which may strike leafy spurge at its roots. Dr. Jon Bennett (PhD) is finishing a project that studied the possibility of using the combination of a herbicide and select fungicide to suppress the weed.

Dr. Jon Bennett (PhD)

Photo credit: Christina Weese



"We need to find the optimum time for disrupting that transfer between the plant and its fungal symbiont. What's going to have the best effect in terms of reducing the plant's growth ability?"

DR. JON BENNETT (PHD)

"The takeaway is that Senator fungicide can reduce the abundance of spurge," said Bennett. "It seems to increase the abundance of grass and it also might allow the recovery of the native grass species."

"We don't have the protocols set up to the point where we could recommend that somebody use it on their own land for this purpose, but we do think it's promising."

Leafy spurge is a perennial weed which contains a milky substance in its sap that can be harmful to cattle. And because it is easily spread by farm equipment, it's on the move.

"It's really expanding in Saskatchewan and the Canadian Prairies in general. All of our climate models suggest it will become more and more abundant up here, while it kind of retracts in the southern part of the range in the U.S."

Leafy spurge has a partner in crime: mycorrhizal fungi which live in the plant and fuel its growth through a symbiotic relationship with the weed. Bennett's goal was to attack the underground fungi with Senator (a broad spectrum systemic fungicide with the active ingredient thiophanate-methyl) while simultaneously using 2,4-D herbicide to kill leafy spurge above ground.

"The fungicide reduced the abundance of leafy spurge about 30 per cent on average over the course of the year-and-a-half we studied it, a little bit less than the 2,4-D herbicide we used as the top growth suppression of the spurge," he said. "Between the two, the spurge was reduced by about 65 to 70 per cent."

Bennett was surprised to find that the fungicide appeared to facilitate desirable plant growth.

"One of the things that happens when you use an herbicide is you lose a lot of plant species so you lose biodiversity," he said. "One of the things I found interesting is that the fungicide prevented a little bit of that species loss or at least allowed some of those native plant species to either recover more quickly or just persist within those systems."

More research is still needed to discover the best time to apply the herbicide/fungicide combination, said Bennett.

"We need to find the optimum time for disrupting that transfer between the plant and its fungal symbiont. What's going to have the best effect in terms of reducing the plant's growth ability?"

And then there's the question of whether an herbicide is effective on leafy spurge at a broad scale due to the costs involved.

"We have infested pastures here in the province that are 16,000 acres. You're not going to go out and spray 16,000 acres worth of herbicide that kills all broadleaf plants. That would be pretty disastrous for the system and very expensive."

Most herbicides are incapable of suppressing leafy spurge at its roots. However, Navius (active ingredient: aminocyclopyrachlor) is a relatively new product that has been recommended by the Province of Saskatchewan for use on leafy spurge.

"One of the benefits of Navius is that it has a soil residual, meaning that it doesn't readily degrade," Bennett said. "It can sit in the soil for two to three years and kill any regrowing plants. After it does degrade, however, we see the plants regrow at that point. The drawback to Navius is that it is very expensive relative to a lot of other herbicides."

Aside from minimizing costs by finding efficiencies, there are still some questions around the use of Navius. Bennett and USask soil science researcher Dr. Bobbi Helgason (PhD) recently launched a project to answer some of them. The project is being run by student Erin Malis.

"Does a single herbicide application provide long-lasting control of leafy spurge? Can you get away with just one or do you need to come back later? How does it affect other plants? Can we minimize non-target effects?"

The broader aim of the study is to find out how Navius affects the soil.

"Grasslands are incredible carbon stores and a lot of—if not almost all—of the carbon storage systems are below ground. If we change, for example, how carbon is processed in these systems, are we losing more carbon to the atmosphere than we would otherwise?" said Bennett.

"Maybe we need to consider what the minimum application (of Navius) would need to be to keep the leafy spurge under control so it's not affecting the use of the land while still being able to maintain some of these other important functions."

GIVING TO AGBIO: VERN RACZ

Scholarship commemorates a Saskatchewan bridge builder

NIYA HURLEY

A new scholarship has been established in honour of Vern Racz.

Racz (BSA '68, MSc'71) was a man whose definition of 'retirement' was to volunteer his time and expertise to causes and initiatives that made Saskatchewan a leader in agricultural innovation.

In addition to farming with his wife Charlene, he was engaged in serving on multiple boards and consulting for homegrown Saskatchewan enterprises, where his wealth of experience in animal and poultry feed and post-harvest technologies helped these businesses grow and reach new markets.

One such success story is Milligan Bio, a Foam Lake, Sask., biodiesel manufacturer. After rebuilding its crush plant, Milligan Bio turned to Racz to help prove the superior qualities of its meal product (Bio Meal). Racz had done similar work decades ago when he helped the company gather analytical data on the quality of its cold pressed canola meal.

"Vern spent countless hours meeting with animal nutritionists and our marketing manager to get the quality aspects of our meal and cold pressed canola oil (Bio Oil) to the feed sector," said Glenn Helgason, PAg, Racz's neighbour and friend, who was responsible for Milligan Bio's reinvention. "This included feed mills, hog barns and the dairy industry. He was really enjoying this work."

For his contributions to Saskatchewan agriculture Racz earned a reputation as a bridge builder. His roles with the Ministry of Agriculture and the University of Saskatchewan's (USask) Feed Testing Laboratory and Prairie Feeds Resource Centre, enabled him to build connections between the crops and livestock sectors, between researchers and producers, and between Canadian agriculture and the rest of the world.

At USask, Racz embraced research and teaching both in the College of AgBio, and the Western College of Veterinary Medicine, and served on over a dozen graduate student committees. He developed an unofficial "finishing school" for graduate students: while completing their theses, many worked part-time in the feed testing lab learning advanced nutrition, dealing with clients, and interpreting and explaining results.

David Christensen (PhD), Racz's long-time friend and colleague, recalls that Racz gave students the opportunity to work on a variety of applied projects, many of which presented business opportunities for enterprising farmers.

"A famously 'fragrant' project dealt with odour control in poultry slurry," remembers Christensen, professor emeritus at the College of AgBio. "They found that peat moss worked very well."

Innately understanding people's goals and motivations, Racz made connections the way puzzle pieces connect to create a complex picture.

"He went the extra mile to ensure his students were set up for success," said Christensen, recalling when a student found her role in feed sales after graduation was not the right fit. Racz connected her to a lab position at USask. This influenced her decision to pursue graduate studies and today she runs her own successful company.

Racz's dedication to sharing expertise and his adventurous spirit also led to international development endeavors with USask. By the time he retired, he had amassed experience in close to 30 countries promoting alfalfa, canola and grain legumes.

"One highlight may have been designing rations for racing camels in Saudi Arabia," mused Christensen.

Racz's sudden passing in 2019 left a void for Milligan Bio and for countless friends and colleagues.

"We really miss his readily available knowledge," said Helgason. "Because Vern would never have taken any wage for his hours of work, the management team at Milligan Bio decided to kickstart the Vern Racz Memorial Scholarship administered though the U of S where he taught."

Many have since added to the fund in the hope that the award will help support AgBio students for many years to come. It will recognize fourth-year students majoring in animal science who have a demonstrated interest in animal nutrition.

Vern Racz knew the value of higher education, the opportunities it afforded to students and the financial struggles it brought to many. One of his last projects was the establishment of the Saskatchewan Agriculture Graduates Association (SAGA) scholarship. His generous spirit will live on through the Vern Racz Memorial Scholarship, a fitting tribute to a Saskatchewan bridge builder.

To support the Vern Racz Memorial Scholarship, please visit donate.usask.ca/online/agbio.php or contact hamish.tulloch@usask.ca.

After the mines are gone

A tundra restoration that puts community first

Students surveying and sampling arctic soils.

Photography by Alexandra Conway, Katherine Stewart and Ian Hnatowich.

CLARE STANFIELD

Dr. Katherine Stewart (PhD) didn't set out to fall in love with Canada's North but it happened anyway.

An assistant professor in the College of Agriculture and Bioresources, Department of Soil Science, at the University of Saskatchewan (USask), Stewart got her first taste of the Arctic while doing her doctoral work at the University of Northern British Columbia.

"I did some work north of Yellowknife in the low tundra area, then ended up going to the high Arctic," she said. "I just got the Arctic bug!"

There is something about the North that draws people—the vastness, the beauty, the fragility and the power of the place all have a pull. For Stewart, it's that and more—the deceptively complex plant and soil ecology, the need to better understand that ecology and restore it in ways that make sense not just for the planet, but for the people who live there.

Extractive industries operate right across Canada and most employ land restoration techniques once the mine or rig leaves. In southern regions where plant diversity is much greater and the growing season much longer than in the North, how to do this effectively is well understood. Not so for the Arctic.

"We're still really just starting to understand tundra systems," said Stewart, adding that effective ecological restoration protocols are still being worked out. Plant and seed propagation, for instance, isn't as practical for a region governed by permafrost and a short growing season.

"It's very hard to break dormancy," she said. "A plant could be in a greenhouse for two years, making it a very expensive plant."

So what can we do to reclaim and restore mine sites in Canada's North? That's what Stewart and her team is starting to find out.

The restorative power of biological soil crusts

One avenue for restoration that Stewart is investigating is biological soil crusts (BSCs). These are the lichens, bacteria, fungi and other organisms that live on the surface layer of tundra. BSCs are important for carbon and nitrogen cycling as well as soil stabilization, and it should be noted that while they form in the spaces between vascular plants, they are not comprised of these plants.

"I'm really interested in how soil crust communities assemble," said Stewart.

She got a good chance to see this in action in 2018, when Canadian mining company Agnico Eagle Mining Ltd asked her to do some restoration work at Meliadine, a gold mine site in Nunavut.

Specifically, the company wanted Stewart and her team to look at a number of drilling waste sites (small dumps of mud and clay) created during mine exploration.

"We went out and surveyed 25 waste sites created across a 20-year time span," she said.

What they found was surprising and heartening—natural re-vegetation was occurring at all of the sites, with the older ones completely recovered and younger ones well on their way.

"We usually think of biological soil crusts as slow growing but what we saw here was surprising and it made me really happy!"

How does the tundra grow?

Realizing that Mother Nature was able to handle the waste sites, Stewart and Agnico Eagle shifted focus to tundra restoration work in some of Meliadine's quarried areas. She said that these exposed gravel and rock substrates are more indicative of the landscape when a mine departs than drilling waste sites are.

In July 2019, Stewart and her team set up a trial comprised of four 15-metre-long rows that were dug out to approximate the natural tundra microtopography of the surrounding area, a topography known as hummock-hollow. Ten plots per row were given one of four treatments: intact tundra plugs, shredded tundra material, a combination of plugs and shredded material, and the control, which was no added material at all.

"Restoration is a science but it's also really connected to people. We need to develop better processes of working collaboratively with local Indigenous people, from mining through to restoration."

DR. KATHERINE STEWART (PHD)

What's a tundra plug? Imagine digging up a solid block of sod on your lawn about 16 inches square and about five inches deep—that's a plug of sod.

"With those plugs, the whole soil ecosystem is there," said Stewart. "We want to know if we move plugs of that size, do they maintain nitrogen cycling, their root systems and so on."

To create the shredded material, tundra plugs were broken up and pushed through a metal sieve.

The goal is to see which plants survive the transplant best, survival rates by treatment type, which plants are effective colonizers and more. The plan was to revisit the site this summer (2020) and again in 2021 to survey and assess the trial. Sadly, COVID-19 travel restrictions have made that impossible, but all is not lost.

"We have a matching growth chamber trial at USask," said Stewart. "We brought back some of those plugs, split them in half with one half in a substrate with no fertilizer and the other with fertilizer. They matured over a three to four month period then we broke them apart to see what happens when those plugs colonize outward—how do roots extend, for example."

Restoration that works for people

At the heart of Stewart's work is building bridges between community, landscape and industry.

"A lot of the research I do is working with industry and community," she said. "I'm in an odd place, sitting outside of both, but being able to see the needs of both at the same time.

"Restoration is a science, yes, but it's also really connected to people," said Stewart. "We need to develop better processes of working collaboratively with local Indigenous people, from mining through to restoration."

For Stewart, that means developing tundra restoration techniques that can be replicated by local communities once researchers like her are gone.

"I want to develop techniques that can be done with limited technology by local people," she said.

In other words, restoration that can be done with what's on hand without having to ship in specialized equipment, as well as teaching local people how to properly sample an area, do surveys, assessments and more.

As part of that effort, Indigenous youth are employed at the Meliadine restoration project as field assistants, and Stewart's team has also developed education programs about the work for local school children.

"I truly believe in finding ways forward to help the land, ensure that it gets maintained and restored, and my interest in working with Indigenous communities comes from that place," said Stewart.

"We need to think more about how we handle our land in Canada better and how we involve the people better—people who will be there when the mine moves away. They're the ones who have to live with the fallout and if that land is going to provide what they want when the extraction is over."

Un-springing the poverty [trap]

How understanding attitudes toward risk and risk mitigation among the poor can lead to a better world.

✎ CLARE STANFIELD

We all hear stories about how a single moment can completely change the trajectory of a life. They can seem a bit apocryphal, but that's exactly what happened to Dr. Sabine Liebenehm (PhD) when she was a second-year economics student in Hanover, Germany.

Today, Liebenehm is an assistant professor at the College of Agricultural and Bioresources in the Department of Agricultural and Resource Economics at the University of Saskatchewan (USask). So if economics is clearly a through line, what happened to change her life's course and bring her to the Canadian prairie?

Believe it or not, it was a pamphlet left in a classroom.

"When I started with economics, the first two years was business administration and management, marketing and so on," said Liebenehm.

As with many degree programs, the first couple of years have a general focus, then students are asked to choose a specialization. Liebenehm found much of her early coursework to be uninspiring and was restless.

"I had a friend in veterinarian studies who didn't enjoy her first two years either, and we decided to take a break before choosing our specialization," she said.

That's when they saw it. "There was a flyer left in a classroom—one of those 'backpack around the world on a thousand euros', something like that," said Liebenehm.

They decided that a budget travel adventure was just what they needed. First stop: Thailand.

"When I went to Thailand I had my first shock," said Liebenehm, recounting her initial experience witnessing poverty, environmental degradation and air pollution on a scale she had not experienced before. The friends visited other developing countries during their travels and, as Liebenehm spent time with rural communities, she began to see a new direction for herself.

"I thought—I study economics, there must be something more sensible for me to study than marketing," she said. "I saw development economics and agricultural economics as the way for me."

And just like that, Liebenehm had identified her specialization.

Mitigating risk when you're poor

When we think of economics, most of us think about things like supply and demand, production and consumption, and markets. But it's worth remembering that economics is a social science and human behaviour in the face of economic realities is at the heart of Liebenehm's work.

"In development economics, we try to understand why people are poor," she said. "Personally, I'm trying to connect it to behavioural economics. When people are surrounded by an environment that doesn't protect them, they don't have safety nets at hand, such as functioning government institutions or NGOs. They may have no insurance and limited access to credit markets to help them find solutions. So how are they managing those risks?"

Liebenehm has lived and worked in agricultural communities in developing

"Development economics can also touch on macroeconomic issues, international trade, foreign aid, environmental economics and sustainability—everything is connected to natural resources."

SABINE LIEBENEHM (PHD)

countries around the world, including Thailand, Togo, Burkina Faso, Vietnam and Mali. She looks at how local economics work, how people in these communities assess various risks to their livelihoods and families, and what actions they take to mitigate those risks—like building an irrigation system in a drought-prone area, or diversifying crops to spread market risk, or have a family member take an off-farm job to diversify income risk, or send a child to school to improve future prospects.

She wants to know what people are willing to do to alleviate the problems associated with a known risk, and what they are not willing to do in order to protect societal integrity. Liebenehm outlines her work with cattle farmers in Burkina Faso and Mali, to illustrate the point.

"They had maybe 10 animals, no access to liquidity and were at risk of livestock disease," she said.

Common practice was to treat individual animals if they become sick, usually with special drugs from professional (but also unprofessional) sources, or traditional remedies that were not very effective, but this practice was culturally accepted and expected.

"Economic theory tells us that those who are poorer are more risk averse and impatient than wealthier people," said Liebenehm. "What we actually found was that, while they were risk averse, these farmers were overly optimistic that their animals would be just fine, and that they were relatively patient about that."

She explained that the farmers' willingness to invest what little means they had in individual animals rather than herd management and tsetse fly control (the disease vector) demonstrated loss aversion.

"They were willing to sacrifice their limited liquidity to save an asset."

Working with local vets and community leaders who could help to lead behavioural change, Liebenehm and her team were able to provide simple solutions that could be easily executed by local people with local materials. In this case, it was regular prophylactic treatments for whole herds and fencing tsetse flies couldn't easily fly over.

Development economics in Canada

But what is Liebenehm focused on in Canada—a developed economy with a modern agricultural industry?

"Development economics can also touch on macroeconomic issues, international trade, foreign aid, environmental economics and sustainability—everything is connected to natural resources," she said.

And Canada is nothing if not rich in natural resources.

In March, Liebenehm had just begun to work with northern Cree communities in Alberta.

"I'm working with the Little Red River Cree Nation in Fox Lake and Garden River," she said.

The two communities have a winter access road, but in the summer, they are fly-in only.

"Economic theory tells you a road is so important to connect isolated islands," said Liebenehm. "We would like to understand what the Nation thinks about getting connected by an all-season access road."

On the surface, connection seems like a great thing—access to more stores and businesses, greater employment opportunities and the chance to connect with other people more easily. But the risks are there too—economic leakage as people spend their money elsewhere, the influx of disease, heavy industry (oilsands and forestry), environmental damage, and the potential loss of cultural and societal customs.

"We want to know how these communities perceive the risks and benefits of a road to their economies and way of life," said Liebenehm.

Unfortunately, with the current pandemic, she is unable to do her favourite thing and work directly in these communities.

"I really enjoy when I go to the field and work with people and get to know how they manage their life and make decisions."

But with the help of Dr. David Natcher (PhD), professor in the Department of Agricultural and Resource Economics, this work is proceeding remotely.

Why the poor matter

If you're wondering whether Liebenehm's work among the world's poorer economies impacts you, wonder no longer—it does.

"We are all connected with each other," said Liebenehm. "We are all in one boat, there's only one planet. Because of our interconnectedness, there should be a big interest from the developed world to make sure people in the developing world are doing all right."

She points to the massive migrations of people from poor, war-torn and politically unstable regions toward more stable regions because, in the end, migration is a decision made to mitigate risk.

"My focus is very narrowed on risk management and risk behaviours," said Liebenehm, adding that this is information policy makers can use to improve the economic and environmental well-being of people in developing economies.

Of all the risks developing communities face, Liebenehm said the greatest one is climate change. Indeed, it's a risk faced by everyone on the planet and the challenges of mitigation and adaptation will require bold economic thinking. She said the idea of the circular economy—a system of economics built on the idea reducing gratuitous waste through continual reuse of resources—is key.

"It really has to pop up and be in everybody's mind, especially the policy makers."

Infrared camera tech measured as a tool for swine health

✎ JEFF MELCHIOR

Depending on the results of a nearly-completed research project, infrared cameras could soon become a key tool in the fight for swine herd health and the protection of Canada's swine export market.


Prairie Swine Centre

The project—a collaboration between the Prairie Swine Centre (PSC) in Saskatoon and the University of Saskatchewan's (USask) Department of Food and Bioproduct Sciences—seeks answers to two questions. First, can infrared cameras be used to identify sick or stressed pigs before they're taken to the packing plant? Second, to what extent can they be used to predict a pig's tendency for poor meat quality?

"If producers can easily identify sick animals, then they can determine whether it's better to treat or euthanize them on-farm rather than send them to a processor where they could pose a food safety risk," said Dr. Jennifer Brown (PhD), a researcher with the PSC and the project's primary investigator.

"Having a simple tool like this could improve the welfare of animals and reduce waste by not transporting animals that are not suitable for food, all while improving food safety," said Brown.

The potential for reducing disease in the supply chain cannot be underestimated, she said.

"Certainly, the one disease we are very wary of in North America is African Swine Fever, which decimated pig herds in China last year. If it ever came to North America, there would be a lot of concern that it would spread in our swine herds. It would be totally devastating for pig producers because our borders would be closed and we wouldn't be exporting any animals."

When combined with specialized software, infrared cameras can be used to identify high body temperature, which—just like with humans—can be an indicator of sickness or stress.

"We are looking at pigs' body temperature in two regions," said Brown, an adjunct professor with the College of Agriculture and Bioresources, who teaches half an undergraduate course in animal and poultry science.

"We are looking at the back of the pigs, which is a large area we can get the average temperature from. We are also looking at the eye region because it has been shown to be one of the more

"If producers can easily identify sick animals, then they can determine whether it's better to treat or euthanize them on-farm rather than send them to a processor where they could pose a food safety risk."

DR. JENNIFER BROWN (PHD)

sensitive areas in terms of responding to disease and changes in temperature."

Brown is collaborating with Dr. Phyllis Shand (PhD) with the Department of Food and Bioproduct Sciences, on the meat quality side of the project. This component looks at the potential of infrared tech in predicting a given pig's likelihood for winding up as substandard meat.

"It typically relates to a problem that is pretty common in pork meat which is known as pale, soft and exudative (PSE) pork," said Brown. "That's the main meat quality problem you might find in pork and it's usually related to transport and handling at high temperatures. PSE pork has a poor appearance and is not marketable as a fresh product.

"If we can identify pigs that are more prone to having that PSE trait, they can be rested longer in pens. That's going to improve their meat quality."

Ultimately, infrared camera-based temperature detection will have to work at scale in order to be a true asset to the swine industry. Brown said the next step will be attempting to automate the image collection and analysis process (it's currently being done manually) so data can be gathered in real time.

"The hope is that we can automate procedures to collect infrared data so producers or packing plants would get a flag if an animal was to show a temperature over a certain threshold."

Although the project's goal isn't primarily related to animal welfare, there's no doubt that using infrared cameras to assess pig health is less invasive than alternative methods, said Brown.

"Infrared is a beautiful technology because you can assess an animal's temperature, whether it be the whole body or specific parts of the body, totally non-invasively," she said. "A lot of our stress assessments involve respiration rate, heart rate or blood pressure which all require some kind of contact or interference with the animals. With infrared, the animals aren't aware of the process or subjected to any stress."

A good piece of news—especially for producers— is that suitable infrared cameras have come down in price significantly in recent years. A sub-test of the project involved comparing the efficacy of a research-grade infrared camera (costing more than $10,000) to a handheld counterpart that is available for around $1,000.

"We compared those two cameras to see if we were able to get data that was as reliable on the cheap camera as on the expensive one and it did very well in that comparison. That was not surprising since the technology is the same, with the main difference being the image resolution," said Brown.

This research is an example of USask's frequent collaborations with the PSC, an institution dedicated to swine research. Originally conceived as the university's swine research unit, since 1991 it

has acted as an arm's length, non-profit research corporation associated with the university but operating as a distinct entity.

"We have our own board of directors, our own governance and are responsible for our own financial viability," said CEO Dr. Murray Pettitt (PhD).

The hub of the PSC is its 300-sow farrow-to-finish swine unit where most of its research takes place, the bulk of which focuses on nutrition, engineering, welfare and behaviour.

"We carry out public research in those areas," said Pettitt, adding that grants are procured in much the same way they are at universities.

"The scientists go out and compete for and receive research grants to carry out projects that they wish to do."

The PSC also conducts client-focused work through its contract research program. The public and contract research streams do not cross with one another, said Pettitt.

"The contract research program does confidential private research on behalf of clients which pay for that service," he said.

The PSC's contract program has ventured outside of the organization's traditional mandate, with one example being regulatory and product development studies. It has also completed contracted studies which have provided data for companies wishing to register swine-related products in Canada, the U.S. and the EU.

The PSC has its own extension arm—knowledge, transfer and translation—which brings its research to the world through print and electronic newsletters, annual reports and appearances at trade shows and conferences.

"We put it into a format the swine industry prefers and can access rather than just publishing it in a scientific journal where it may not get much attention or practical application," said Pettitt.

Project puts new policies on antibiotic resistance to the test

Not long ago, livestock producers were free to buy common antibiotics "off the shelf" and include them in animal feed as growth promotants.

That came to an end in 2018 when the federal government introduced policies making veterinarians the gate-keepers of designated medically-important antimicrobials. The move was viewed as a tool in the ongoing battle against antibiotic resistance.

But are these practices achieving those goals, particularly in swine? That's what Dr. Darren Korber (PhD)—a microbial ecologist researcher with the College of Agriculture and Bioresources at the University of Saskatchewan (USask)—and principal investigator Dr. Bernardo Predicala (PhD) with the Prairie Swine Centre, intend to find out through a collaborative research project.

"It's a longitudinal monitoring study where we're comparing the difference between barns that adopted new production practices called Raised Without Antibiotics—or RWA barns—to conventional (non-RWA) barns which are only now starting to implement the new veterinary directives," said Korber, whose research is being conducted by Dr. Samuel Chekabab (PhD), a post-doctoral fellow at USask.

"We want to see if over a three-year monitoring period we can detect any difference in the abundance of antibiotic-resistant genes and other markers that we're following."

The researchers are using "shotgun" whole genome sequencing to rapidly sequence pathogen and antibiotic-resistance genes in fecal matter, manure and surrounding environments associated with RWA and non-RWA barns.

In addition to bacteria—where most antibiotic resistance is found—the results also capture the presence of other potential health concerns to the hog industry, including parasites, fungi and viruses.

This shotgun sequencing process has a potential side-benefit as an early warning system for livestock producers on the lookout for disease in their herds, said Korber.

"We can communicate with the barns and their operators if we find something like a respiratory virus. They could then communicate this to the managers of the barn, who could then take the necessary steps and precautions."

Although it's still too early for the researchers to make any sweeping statements about antibiotic resistance in RWA barns, Korber said some researchers in Europe have reported the benefits of limiting antibiotic use in livestock.

"European countries—which have been monitoring longer than we have—have made observations that changing from raised-with to raised-without antibiotics can result in a decline in the abundance of antibiotic-resistant genes."

COVID-19 response from the college

Faculty, students and staff take on the challenges and opportunities of the global pandemic

✎ COLLEEN MACPHERSON

"The university was asking us to do the impossible, and we had five days to figure it out."

That's how Dr. Fran Walley (PhD), associate dean (academic) in the College of Agriculture and Bioresources at the University of Saskatchewan (USask), remembers mid-March when classes went from in-person to remote delivery in response to the COVID-19 pandemic. It was a seismic shift "but the university moved extraordinarily quickly, and the transition faculty made was the most amazing thing I've ever seen in my entire career."

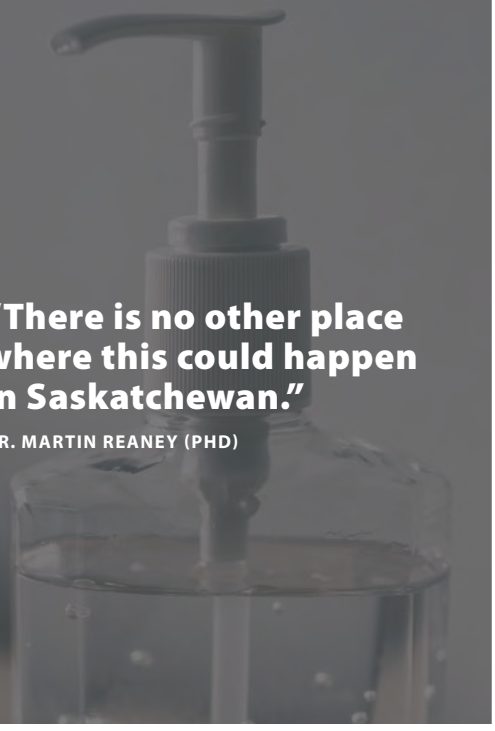
Walley herself was teaching a second-year soil science class. On the last day she was allowed to be in the building, she recorded a lecture to an empty classroom "while I was trying to figure out how to do the rest of the course." Forced to adapt to the online environment, "I learned more technology over that weekend than I'd learned in the past 10 years."

Unique production

When the Saskatchewan Health Authority put out a call early in the pandemic for supplies to protect front-line workers, Plant Science Professor Dr. Martin Reaney (PhD) teamed up with three local companies to formulate and produce hand sanitizer right on campus.

Reaney and his colleagues used the College of Agriculture and Bioresource's Bioprocessing Pilot Plant to produce up to 400 bottles of sanitizer a day until the process was transferred to a local firm for large-scale production in early April.

The process was exacting and required the expertise of researchers, specialized equipment and analytic capabilities all available at the university. Reaney's team and campus collaborators plan to undertake related research on Saskatchewan-grown natural products to make better hand sanitizers.



"There is no other place where this could happen in Saskatchewan."

DR. MARTIN REANEY (PHD)

The technical skills required to deliver courses remotely varied, she said, but colleagues helped colleagues, and both the college and university mobilized tech support for instructors very quickly.

"I'm glad I was teaching. Otherwise, I wouldn't have appreciated what my colleagues were going through," she said. "What we realized is that when you're recording a lecture or a voice-over on a PowerPoint presentation, every word you say has to be worth the effort of listening for students."

There is no way to recreate the energy of a full classroom when recording lectures from, literally, the kitchen table, Walley said, so it took extra thought and effort to create online lessons that kept students engaged. And missing the last in-person lecture was the most difficult.

"We all felt weirdly cheated at not having closure with our students because we still had important things to say. I thought I'd see these 120 students through to the end of the term, so it was a bit of a heartbreak. There's something so important about that final lecture."

In addition to completing courses and assessments, Walley and her colleagues also had to consider research. No new research projects were started after the college went remote, but very careful management of building access ensured plants were watered, animals and poultry were tended and microbial specimens were maintained.

"We had to find the balance between ensuring the research engine continues to run and students get an education without putting anyone at risk. Everything requires careful thought but we also had to move quickly."

The college did a survey at the end of the term to capture the remote learning experiences of students. It revealed one stark reality: "Their issues with online delivery often came back to rural internet service, and I'm not sure any of us fully appreciated what students were up against."

From his parent's farm outside Lacombe, Alta., 2020 college graduate David MacTaggart agreed access was a problem.

"The internet here is not what it is in Saskatoon. Live-feed videos often didn't work very well," he said, adding that instructors were very accommodating working with individual students to find solutions.

Deep into the final year of his bachelor's degree when the pandemic hit and classes went remote, MacTaggart, who described himself as "someone who enjoys moments of being under pressure," said he quickly vacated his USask residence room and returned to Alberta. There, he set up a "very cozy" work environment on a folding work table next to his bed.

"My family gave me the space I needed to work but, talking to other students, many were really struggling living in apartments and working in common areas. Life as a student is generally pretty regimented by class schedules but all of that was taken away, so I tried to think in small blocks of time. That kept me grounded."

MacTaggart set up a schedule for course work but also enjoyed little breaks to scratch the dogs' ears or help with farm work.

Agriculture, food and COVID-19

The global COVID-19 pandemic has had consequences that reach far beyond human health.

On April 29, the Canadian Journal of Agricultural Economics published a special issue to take a preliminary look at how the situation has affected Canada's agriculture and food sectors, and what the long-term implications might be.

Three faculty members from the Department of Agricultural and Resource Economics in the College of Agriculture and Bioresources contributed papers to the journal. In her article "Food supply chains during the COVID-19 pandemic," Dr. Jill Hobbs (PhD) did an early assessment of the implications of the situation for food supply chains and supply chain resilience.

"Agriculture, transportation and the COVID-19 crisis" by Dr. Richard Gray (PhD) assessed disruptions in, and new demands for, transportation services, and how they might affect agricultural supply chains.

Also, Dr. William A. Kerr (PhD) looked at how governments reassess food supply chains that stretch across international borders in his paper, "The COVID-19 pandemic and agriculture: Short- and long-run implications for international trade relations."

"I don't think I was more efficient doing online courses but they always talk about being balanced as a student and this is the first time I feel like I've lived that out."

Through the end of classes and final exams, MacTaggart said it was obvious "instructors and administrators really cared about the well-being of students. I tried to spread that message, that they were doing everything possible to make the experience the best it could be for students."

He has now returned to Saskatoon part time to do field work for his master's program, which began in May with the forage breeding team. Thinking about the coming year, "you have to be OK with uncertainty, and I've struggled with that."

"My advice for students going into the fall is to reach out to students and instructors in your program," he said. "With no social events for students, building your own bubble will be key to managing living away from home, but also for your emotional, mental and academic success."

With the fall term going online and the winter term uncertain, Walley is seeing enormous effort and creativity as her colleagues work to prepare courses "that are as good as but different from the regular classroom experience.

"I think we'll come out of this better educators," she said. "This has forced us to think about what's important, what students need to know, and how we'll know students get it when we don't have that in-person connection. It's opening us up to new opportunities and new thoughts about our own practice."

Answering the call

With USask shut down in response to the COVID-19 pandemic, there was an effort made to provide support where it could to the community, in particular the health-care sector.

Across campus, store rooms and labs were searched for personal protective equipment (PPE) that could be used by those on the front lines of the pandemic.

The College of Agriculture and Bioresources alone donated:

39 cases of gloves

600 N95 respirators

+1,400 surgical masks

as well as

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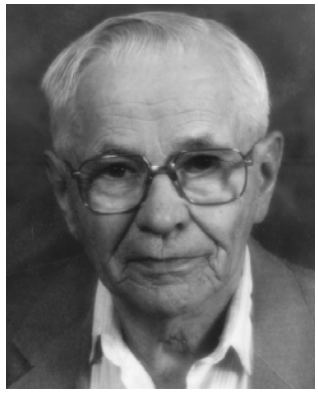
We also acknowledge and celebrate those who have established planned gifts for the College of Agriculture and Bioresources. These arrangements help shape and secure our college's future.

CDC Lewochko in bloom

Farmer's legacy will grow and flourish



Lifelong Saskatchewan farmer Peter Lewochko made a significant gift to the University of Saskatchewan before his passing which established the Peter Lewochko Bursary fund for undergraduate students in the College of Agriculture and Bioresources, College of Engineering and the College of Education. He later enhanced the endowment through a generous bequest.

With a passion for knowledge and discovery but having lacked the opportunity to attend university himself, Peter wanted to give the gift of education to students who do not have the financial means to pursue higher learning. He didn't want limited financial resources to be a barrier that curbs young peoples' potential.

Peter's legacy will live on and flourish across Saskatchewan and beyond. To recognize Peter's truly transformational contribution, the College of Agriculture and Bioresources and the Crop Development Centre named a recently developed yellow pea variety after him.

CDC Lewochko is a semi-leafless yellow field pea cultivar with very good seed characteristics. Developed at the Crop Development Centre, it was released to seed growers in 2018 by our partner Saskatchewan Pulse Growers. CDC Lewochko is a promising new variety with high grain yield, good lodging resistance and moderately high protein concentration. It has been taken up quite widely by seed growers and will be at the production stage by commercial farmers in 2021 or 2022.

BEAN FEED AWARDS CELEBRATION

Bean Feed is the annual gala celebrating achievement and excellence in the College of Agriculture and Bioresources. The tradition of Bean Feed started in 1938 as a small gathering of students and faculty, over beans and wieners, to celebrate the beginning of the academic year. Now in its 82nd year, Bean Feed has grown into a formal gala where several hundred students, families, industry partners, donors, faculty, staff and friends gather to recognize scholarship recipients and outstanding faculty and staff.

Due to COVID-19, an in-person gala will not be held in 2020. However, we will still be celebrating our student, faculty and staff award winners on our new Bean Feed webpage. Please visit agbio.usask.ca/beanfeed for videos and a list of award winners!

The Saskatchewan Agriculture Graduates Association (SAGA) proudly represents the interests and accomplishments of graduates from the college and school. This past year was another year of notable accomplishments and contributions.

SAGA
SASKATCHEWAN AGRICULTURAL GRADUATES' ASSOCIATION INC.

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Honorary life members for 2020

Harold Chapman ('43 C) grew up on farms near Saskatoon and Meskanaw, Sask. He earned his MSc in Co-operative Extension Education from the University of Wisconsin in 1972. Harold married Mary Bonnett in 1943, then enlisted in the military. From 1944 to 1952, Harold worked as an extension specialist and director of the provincial dept. of Co-operation and Co-operative Development, to help World War II veterans establish co-operative farms. One was the Matador Co-op Farm, the first of its kind in Canada. In 1953, he joined the Royal Commission on Agriculture and Rural Life, established to report on the social and economic structure in Saskatchewan. Harold was the first director of the Co-operative Institute in Saskatoon in 1955, which provided week-long courses on all aspects of co-operatives. Catering primarily to managers, it taught bookkeeping and efficient business practices. In 1973, Harold became member and public relations director with the Federated Co-op for nine years until retiring in 1982.

Harold contributed chapters to two books: *The Contemporary Director and Dignity and Growth: Citizen Participation in Social Change*. In 2012, he wrote the book *Sharing My Life: Building the Co-operative Movement*. Among his many accolades, Harold received the Order of Canada in 2016, and most recently, the 2019 Saskatoon Citizen of the Year award. His wife, Mary passed away in 2005 after 61 years of marriage. Harold has two children, three granddaughters and three great-grandchildren.

Vern Racz ('68 C) was raised on the family farm near Kipling, Sask. Vern began working for the Department of Municipal Affairs in Regina in 1968 but returned to the University of Saskatchewan (USask) for his MSc in 1971. Vern worked as a livestock specialist with Sask Ag in Yorkton until 1980, when he transferred to Saskatoon to work as the provincial swine specialist. In 1984, Vern became director of the Saskatchewan Feed Testing Laboratory at USask, initiating the use of advanced analytical technologies, such as near-infrared analysis and atomic absorption spectroscopy. Under his leadership, submissions to the lab doubled to more than 10,000 samples per year. In 1998, with feed resource utilization and development his primary interest, Vern became the executive director of the Prairie Feed Resource Centre (now the Feeds Innovation Institute), providing production and research information to livestock producers and the feed industry, in Canada and abroad. Vern retired in 2011 but continued to work as a forensic agrologist.

Vern served in an advisory capacity on many national and international committees, including Canadian feed commodity groups and companies in Southeast Asia, the Middle East, Europe, and South America. In 2018, he was inducted into the Saskatchewan Agriculture Hall of Fame for recognition of his contributions to the industry. In 2018, Vern received the Prime of Life Achievement Award from USask. Vern was an active member of SAGA, serving on the executive numerous times, and was the membership chair from 2008 to 2019. With his wife, Charlene, they have three children and seven grandchildren. Vern passed away on Oct. 19, 2019.

Ewald Lammerding ('88 S) ventured west from a dairy farm outside Grand Vally, Ont. at age 17, with stops in Vancouver, Calgary and Banff. He met and married a woman from Moose Jaw, Traci, in 1981. While a VocAg, Ewald initiated the Wheat for Flour program in conjunction with the Saskatoon Food Bank, which the Saskatchewan Vocational Agriculture Association continued for many years. He worked at the Western College of Veterinary Medicine's Goodale Research Farm cow/calf operation, and with a research herd of muskoxen, a unique experience for his three children to grow up with. Each of his children attended USask. Ewald spent several years as a herdsman with the USask Greenbrae Dairy.

Ewald has made 265 donations to Canadian Blood Services, plus a bone marrow donation. He is a four-time Big Brother and has been part of the SAGA Executive for more than 20 years with involvement in the bonspiel, *The SAGA* in 2008 (editor in 2012) and banquet chair since 2017.

2020 highlights

Congratulations to SAGA members, Bryan Harvey (1960 C, 2015 SAGA HLM) and Jim Halford (1963 C, 2019 SAGA HLM) who were inducted into the Canadian Agriculture Hall of Fame.

SAGA Undergraduate Award Scholarships

Our first two scholarships valued at $3,000 each were awarded at the college's Bean Feed awards ceremony last fall. The recipients were Amanda Loeffen and Brooklyn Bourgeois, both fourth year Animal Bioscience majors.

Details on how to contribute to the scholarship fund can be found at saskaggrads.com.

86th Annual Reunion Weekend

Due to the ongoing COVID-19 pandemic, the SAGA executive has cancelled all January 2021 reunion activities. The executive will continue to explore options to safely reschedule the event and will coordinate with the reunion chairs as new plans take shape.

For information and updates follow us on Facebook, Twitter and our website at: www.saskaggrads.com.

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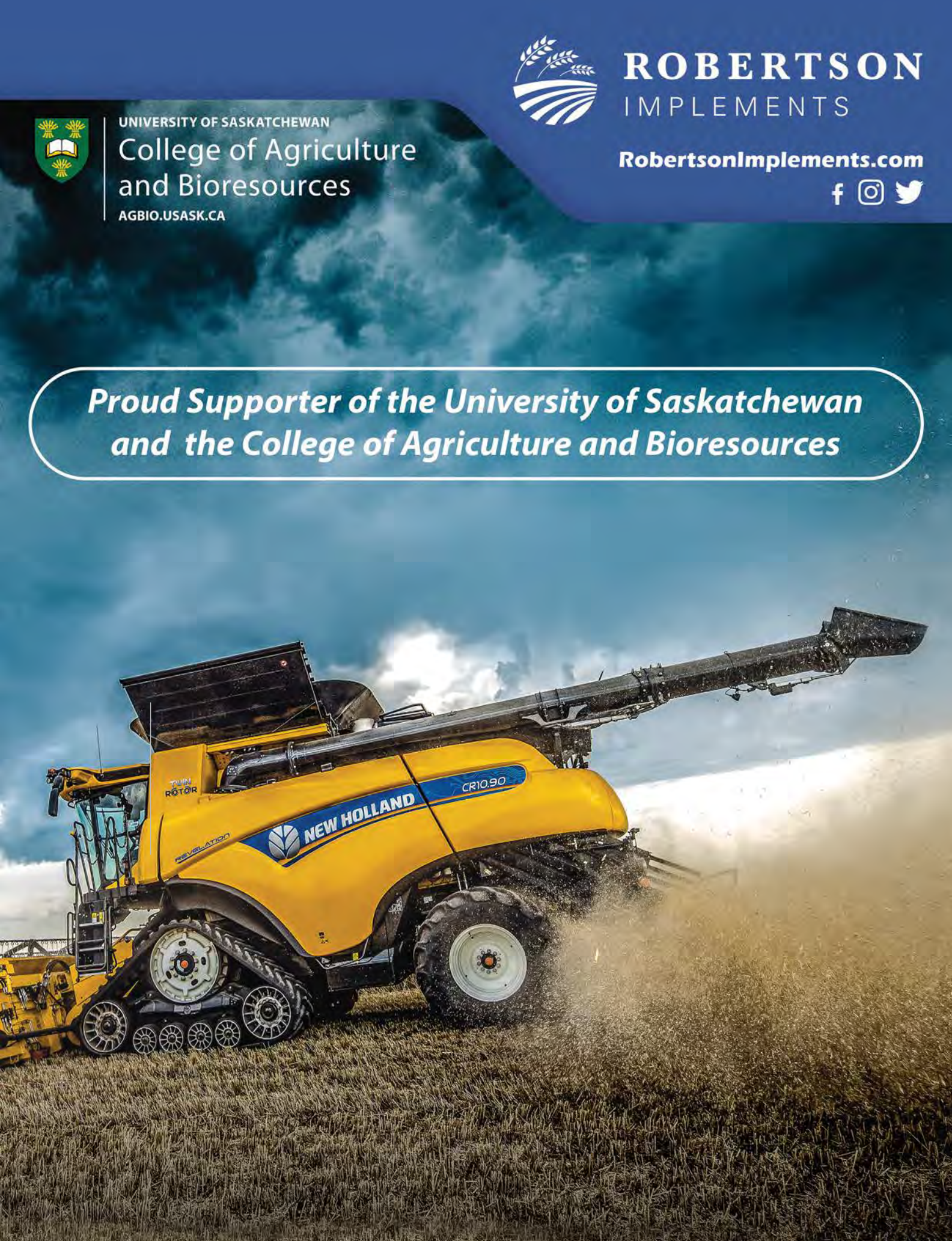

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