

# School of Agriculture and Environment 2020 Applied Research Report



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## 2020 Highlights

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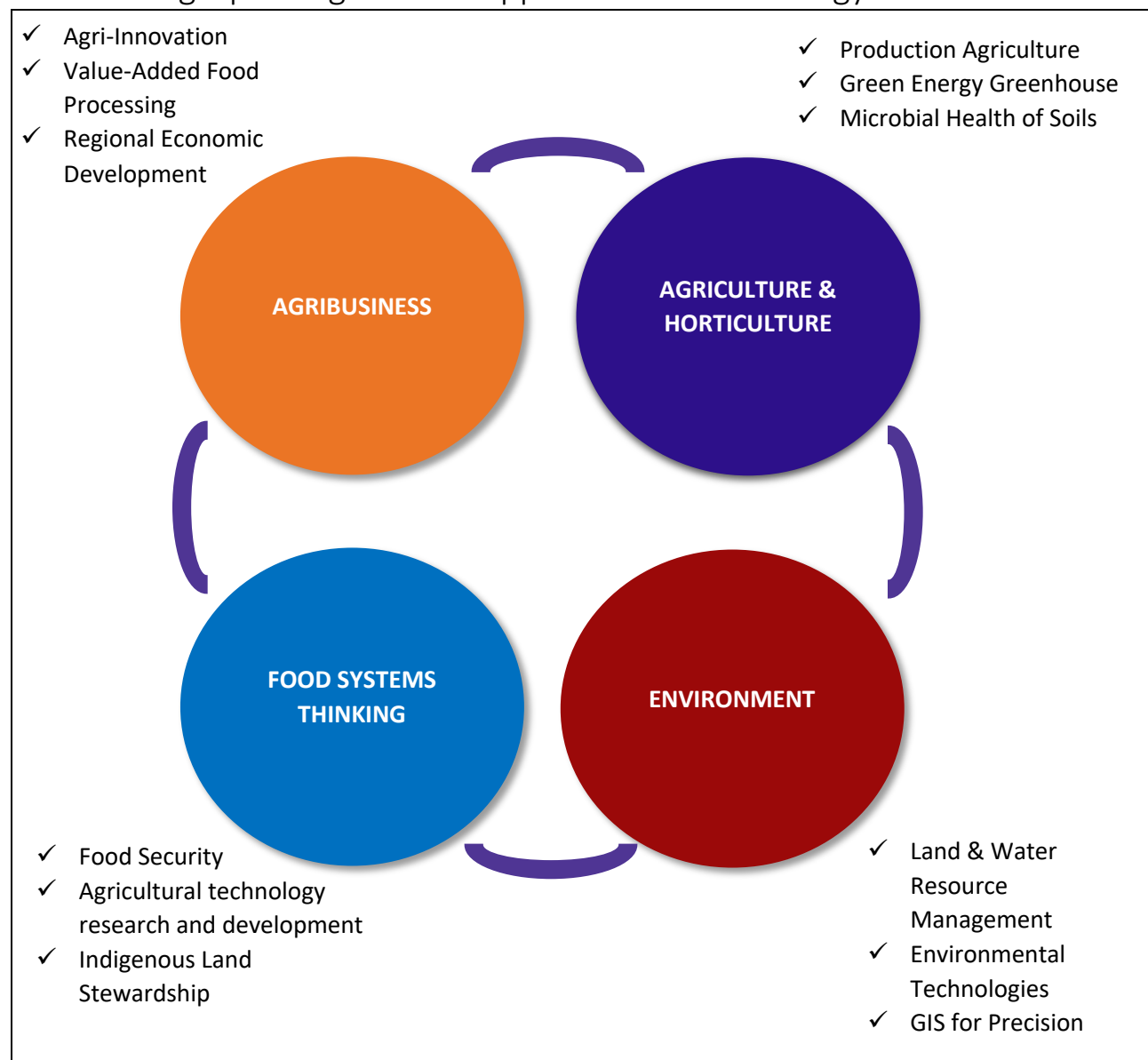
- \$280,580 awarded to four new projects.
- Nine new industry partnerships.
- Eight extension events.
- Twenty-five students involved in applied research.
- Two papers published in peer reviewed journals.
- One paper under review, four papers submitted.
- Two media publications.



## Applied Research Strategy: Agriculture & Environment

**Vision:** To have growers, industry and other external partners turn to the expertise, facilities and talent available within Assiniboine to solve problems, develop products, innovate with new technologies, or improve services and business processes.

Four strategic pillars guide our applied research strategy:



Applied research is about partner-driven collaboration and responding to sector challenges and industry need. ACC's ability to be nimble in responding to research problems, and openness in adapting current scholarship to real-world issues gives ACC an edge over traditional research institutions.



In 2020, ACC Agriculture and Environment applied research continued to build on existing strengths in Agribusiness, crop production, agri-innovation and integrated pest management. Their work is detailed in the following pages, and reflects ACC's ability to meet new and arising needs of our partners as their industries continue to evolve and experience new challenges.

## Applied Research Committee

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Tim Hore	Dean	School of Agriculture & Environment
Chris Budiwski	Chairperson	School of Agriculture & Environment
Dr. Ryan Whibbs	Chairperson	MICA Field to Fork
Jane De Pauw	Coordinator	School of Agriculture & Environment
Grant Nichol	Faculty	Communications Engineering Technology (CET)
Dr. Sajjad Rao	Faculty	Horticultural Production, Sustainable Food Systems
Dr. Baljeet Singh	Faculty	School of Agriculture & Environment
Dr. Poonam Singh	Faculty	Horticultural Production, Sustainable Food Systems



Collecting field samples from Mayfair Farms near Portage La Prairie, Manitoba for molecular laboratory testing.  
Photo credit: Dr. Poonam Singh



# Milestones

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## Funding Applications

- In February 2020 an NSERC Entry Innovation Enhancement grant was awarded to the School of Agriculture & Environment for two Years for a funding total of \$190,880. Titled “*Building applied research capacity to support Manitoba agriculture, innovation, and sustainability*”, the project supports Manitoba agriculture innovation and sustainability in the horticulture, potato, pulse, and soybean sectors. The research is designed to enhance regional innovation, competitiveness, and productivity through: (1) precise diagnosis of horticulture crop diseases and pests; (2) addressing these with sustainable solutions; and (3) validating the efficacy of new natural and biological products for horticultural end users, and companies that are developing these products.
- Dr. Baljeet Singh received funding through the CAP-Ag Action Manitoba Program-Research and Innovation (Grain Innovation and Crop Production) in partnership with the Manitoba Pulse & Soybean Growers for the project titled “*Weather Based Fungicide Application Decision Support Tool (FADST) for Managing White Mould in Dry Beans in Manitoba.*” Funding of \$83,700 was awarded for the two year project to start February 2021. The current study will develop a real-time weather-based fungicide application decision support tool (FADST) for producers using the ArcGIS platform, based on the integration of daily weather data collected from 105 weather stations across the province and a disease severity model adopted from the University of Nebraska-Lincoln.
- In spring 2020, MICA was earned a \$5,000 grant from CiCan, to support development of sodium-reduced nutritional curriculum for culinary arts programs. This project resulted in the *Don’t Get Salty!* sodium-reduced lesson plan, for use in Canadian postsecondary institutions. This lesson plan featured interactive activities that encouraged students to guess how much sodium is in a selection of prepared foods before the answer is revealed by the teacher, and also teaches students how to use herbs to build flavour.

- The School of Agriculture & Environment participated in AIMDay™ Digital Agriculture 2020 event hosted by the Manitoba Industry-Academia Partnership (MI-AP) of which ACC is a partner. Dr. Baljeet Singh was successful in partnering with Enns Brothers, a farm equipment supplier, to extend discussions initiated at the event, AIMDay™ on a project titled “*Cost-effective collection and utilization of soil data to automate variable rate applications of nutrients and pesticides.*” This project will design an equipment dashboard to sample grower fields for fertilizer needs and provide the grower with real time recommendations to meet those needs while working in the field. The project was awarded \$1000 to support the development of a research plan.

## Publications

Rao, S.A., Mintenko, A., Abbey, L. and Singh, P. (2020). *Wintering index and yield traits for early, mid and late season strawberry for colder climates.* Int. J. of Fruit Science. 20:2, 151-158. DOI: 10.1080/15538362.2020.1774471

Gillis, L., Whibbs, R., & Li, A. (2020). Future Chefs’ Beliefs on the Role of Nutrition, Diet, and Healthy Cooking Techniques in Culinary Arts Training for Foodservice: A Cross-Cultural and Gender Perspective. *Journal of Culinary Science & Technology*, 18.4, 1-15. DOI: 10.1080/15428052.2020.1808138

### Under Review

Whibbs, Ryan. “An Apple Pie for Col. Sam: The Kitchen, Cooks, and Food of Parkwood Estate, Oshawa, Ontario, 1917-1974,” Submitted to *Cuizine: The Journal of Canadian Food Culture* submitted 24 October, 2019; accepted for review 23 May 2020; under review, 8 January 2021.

### Submitted but not yet under review:

Singh, P. and Nykolyshyn, T. “Biocontrol in practice in northern floricultural greenhouses.” Full length paper communicated to *Ornamental Horticulture Journal*, November, 2020

Singh, P. “Propagation of prairie native plants by sexual and asexual methods.” Full length paper communicated to *Native Plants Journal*, January, 2021.



Singh, P. "Response of cucumber plants to oxygen-enriched nutrient solution under different greenhouse environments." Full length paper communicated to *Acta Horticulturae*, February, 2021.

Whibbs, R., "That was Domestic Science. This is Culinary Arts: The Gendered Evolution of Vocational Cookery Education in Toronto, 1870-1980," Submitted to *Cuizine: The Journal of Canadian Food Culture*, submitted 21 February, 2020; current status: submitted.

Currently being written:

Megan Bourns, MSc, Agronomist - On-Farm Network and Baljeet Singh, PhD, Assiniboine Community College. "Findings from the On-Farm Network: Soybean Row Spacing Trials: Tighten the row and watch yield grow?"; to be published in pulsebeat by the Manitoba Pulse and Soybean Growers.

Rao, S.A. and Gonsalves, T. (2021) "Effect of planting dates on yield and pod traits of snap beans (*Phaseolus vulgaris* L.) under short season climates". Current status: manuscript under writing and plan to submit to *American Journal of Agriculture and Forestry* in summer 2021.

Rao, S.A. (2021) "Sweet Potato (*Ipomoea batatas* L.) production feasibility using black mulch in Canadian Prairies growing conditions." Current status: data analysis in process and plan to submit to *Horticulture International Journal* in Fall 2021.

Rao, S. A. (2021). Sustainable Passive Solar Greenhouses: A viable option for propagating sweet potato (*Ipomoea batatas* L.) slips for colder climate regions. Current status: data analysis in process, plan to submit to *HortTechnology* in Fall 2021

Singh, P. and Whibbs, R. "In the Garden of the Ancestors: Preserving Knowledge of Traditional Indigenous Medicines and Culinary Plants In a College Garden." Current status: being written (c.6 months away from submission). Plan to submit to *Canadian Food Studies / La Revue canadienne des études sur l'alimentation* in summer 2021.

Singh, P., Ahmad, F., Bisht, V., Thakkar, N., Sajjad, S. "Early detection of neck rot disease in onion fields: A report from Canadian prairies." Full length paper at final stage, to be communicated to *Plant Disease* in March, 2021

Singh, P., Bisht, V., and Gonsalves, T. "Comparison of direct seeding and transplanting methods for onions." Full length paper will be communicated to *Scientia Horticultuae* in June, 2021 (waiting for final storage data on onions in April)

## Media:

[Agricultural Research Gets a Leg Up-ACC awarded \\$190k NSERC grant for applied research in agriculture](#)

[Vermillion Growers and Assiniboine Community College Sign Memorandum of Understanding](#)

## **Extension**

An important aspect of applied research is sharing the results with industry to have evidence based results, information and new technologies passed to growers, processors and other industry stakeholders.

- Dr. Sajjad Rao and Dr. Poonam Singh both presented at the Direct Farm Marketing Conference in Brandon, Manitoba in February 2020.
  - Dr. Rao communicated his work in *“Sustainable Strategies for Integrated Pest Management”*.
  - Dr. Singh updated the industry on *“Early detections of onion neck rot disease in Manitoba-research updates”*
- Dr. Poonam Singh presented to the Westman Gardeners Club on *“Significance of plant/seed diversity”* in February 2020.
- Also in February 2020, Dr. Poonam Singh attended the Vegetable Growers Association of Manitoba Annual General Meeting and presented *“Early detections of onion neck rot disease in Manitoba-research updates”*
- Dr. Rao participated in the Manitoba Horticulture School Webinar Series hosted by Manitoba Agriculture and Resource Development. His June 18<sup>th</sup>, 2020 webinar was titled *“Sweet Potato Production in Manitoba”* [Dr. Sajjad Rao-Sweet Potato Production in Manitoba](#)
- Dr. Rao spoke to the Northern Healthy Foods Initiative (NHFI) in August 2020 on *“Greenhouses for Northern Manitoba”* and again in November 2020 on *“Gardening Without Soil-Hydroponics for Northern Manitoba.”*
- Dr. Poonam Singh and Dr. Ryan Whibbs presented their paper *“In the Garden on the Ancestors: Preserving Traditional Indigenous Medicines and Culinary Plants in a College Garden”* at the 22<sup>nd</sup> Annual Indigenous Knowledge Symposium: Indigenous Plant Sovereignty, Queens University November 6<sup>th</sup> & 7<sup>th</sup>, 2020.
- Dr. Poonam Singh presented 'Mentoring Artists for Women's Art' on 'Art and Science: A converging world' on November 17, 2020 for mentoring artists for women's art (mawa). [Art and Science: A converging world](#)

- During the Prairie Fruit Growers Association (PFGA) Annual General Meeting and Berry Conference on November 21<sup>st</sup> 2020, Dr. Rao presented “*Assiniboine Community College Research Updates.*”
- Singh, P. “*Response of cucumber plants to oxygen-enriched nutrient solution under different greenhouse environments*”. Abstract accepted for oral presentation at the International Symposium on Growing Media, Soilless Cultivation, and Compost Utilization in Horticulture, to be held in Belgium, August, 2021.



Traditional Indigenous Medicinal and Culinary Plants Garden at ACC, summer 2020. This photograph was used in Dr. Poonam Singh & Dr. Ryan Whibbs’ paper “In the Garden on the Ancestors: Preserving Traditional Indigenous Medicines and Culinary Plants in a College Garden” at the *22nd Annual Indigenous Knowledge Symposium: Indigenous Plant Sovereignty*, Queens University, Ontario, November 6<sup>th</sup>, 2020. Photo credit: Dr. Poonam Singh.

## New Partnerships and Projects

The School of Agriculture & Environment had a very busy 2020, forging applied research relationships with nine new industry partners:

### Agribusiness Strategic Pillar

***Atom-Jet Industries; Contact Mr. Terry Dorratt, Vice-President Sales and Mfg. Operations, Brandon Manitoba***

- ACC and Atom Jet Industries have initiated discussions exploring improving seed furrow openers through precision agriculture and providing student training opportunities

***Enterprise Machine Intelligence & Learning Initiative (EMILI); Contact Monika Franz-Lien, Director, Skills and Talent, Oak Bluff, MB.***

- Teaming up in a funding application to Protein Industries Canada Capacity Building Program to 1) build industry partnerships in Work Integrated Learning to increase student interest in careers in plant protein, agri-food and digital agriculture, and 2) direct development and delivery of reskilling/upskilling programs in agricultural data analysis and digital agriculture technology.

***Enns Brothers; Contact Mr. Martin P White, General Sales Manager, Winnipeg, Manitoba***

- Working with Dr. Baljeet Singh and other ACC faculty involved in communications technology and communications installation/design for Phase 1 of the development of a model for cost-effectively collecting and utilizing soil data to automate variable rate application of nutrients during spring field preparation.

***Manitoba Horticulture Productivity Enhancement Centre (MHPEC); Contact Dr. Zack Frederick, Potato Research Agronomist, Carberry, Manitoba.***

- Drs. Sajjad Rao and Baljeet Singh are working with MHPEC to finalize project proposal titled *“Development of a Decision Support Tool (DST) for Potato Irrigation Scheduling Using Soil and Weather Data Modelling”*

**Manitoba Industry-Academia Partnership (MI-AP); Contact Ms. Minli Huang, Marketing Associate, Winnipeg, Manitoba.**

- ACC participated in the AIMDay™ event-1 question, 1 hour meeting, and a group of experts-hosted by MI-AP. Enns Brothers and Dr. Baljeet Singh discussed the question: *“How can we cost-effectively collect and utilize soil data to automate variable rate applications of nutrients, pesticides, etc.”* This partnership resulted in a \$1000 AIMDay™ award to support project planning. MacDon Industries and Mr. Grant Nicol discussed the question: *“What technologies could determine the relative position of 2 objects in the horizontal plane, with ~5cm<sup>2</sup> accuracy up to a range of 10m, without the use of GPS?”*

### Agriculture and Horticulture Strategic Pillar

**T&T Seeds Ltd.; Contact Mr. Kevin Twomey, General Manager, Winnipeg, Manitoba**

- Dr. Sajjad Rao partnered with Mr. Twomey and Ms. Danielle Modor, Assistant Operations Manager of T&T Seeds Ltd along with Ms. Tiffany Grekow of Winnipeg Sweet Potato to develop an NSERC Engage funding application titled *“Enhancing local production capacity for propagating commercial sweet potato planting material through improved greenhouse systems”* which will contrast slip propagation methods, in a controlled environment growth room versus a modified passive solar greenhouse systems.

**Vermillion Growers; Contact Ms. Maria Deschauer, Managing Director, Dauphin, Manitoba**

- Dr. Poonam Singh and Vermillion Growers have joined together to explore 2 projects in hydroponic crop production to support the future greenhouse operation focus of Vermillion Growers.
  - *“Investigate use of flowering plants as banker system for biocontrol agent in greenhouse”*
  - *“Study effects of the dissolved oxygen in root zone of cucumber plants”*

### Food Systems Thinking Strategic Pillar

**International Peace Garden; Contact Mr. Tim Chapman, CEO, Boissevain, MB.**

- Exploration of opportunities to partner in horticultural crop production, traditional food and medicinal plants of Indigenous cultures and student training opportunities.



## Environment Strategic Pillar

**Minto Bio-Products; Contact Ms. Haylee Hargreaves, Executive Assistant, Minto, Manitoba.**

- Drs. Sajjad Rao and Baljeet Singh partnered on the successful funding application *“Using fungal endophytes for enhanced production of agricultural crops in saline areas in Manitoba”* which will assist in the recovery of unproductive annual cropping acres affected by salinity through the research and development of seed amendments or plant growth promoters.

## Initiated and Ongoing Research

**Dr. Sajjad Rao:**

Funded by Canadian Agricultural Partnership AG Action Manitoba-Program for Strategic Investments.

1. *“Estimate energy cost for passive greenhouse for crop production and develop economically advantageous comparison over each greenhouse technology efficiency and effectiveness”*. 2020-2023
2. *“Evaluate crop production parameters and variables, including PAR and in-floor heating, for differently design technology and energy capturing feature greenhouses”*. 2020-2021
3. *“Capacity building in northern and remote communities and deliver Information to relevant stakeholders.”* 2018-2023
4. In partnership with Prairie Fruit Growers Association; *“Effect of foliar calcium and soil biological simulator on strawberry yield and quality.”* 2020-2023
5. In partnership with Vegetable Growers Association of Manitoba; *“Sensory evaluation of sweet potato varieties for production, processing and culinary use.”* 2021-2023 and *“Sweet potato slips production in greenhouse and high tunnel setting.”* 2019-2021



**Dr. Baljeet Singh:**

1. In partnership with Manitoba Pulse & Soybean Growers and Brandon University; *“Development of Improved Diagnostics Tools for Pathogens of Soybean”*. 2020-2022. Funded by Canadian Agricultural Partnership AG Action Manitoba-Program for Strategic Investments.
2. In partnership with the Canadian Forage and Grassland Association (CFGAs) and McGill University; *“AI driven decision support tool (DST) for alfalfa winter survival and persistency CASPP-040”* 2021-2023. Funded by Agriculture and Agri-Food Canada.
3. In partnership with Manitoba Pulse & Soybean Growers; *“Wireworm Monitoring Trial”* 2021. Research trial led by Manitoba Pulse & Soybean Growers.

**Dr. Poonam Singh:**

Funded by Canadian Agricultural Partnership AG Action Manitoba-Program for Strategic Investments in partnership with Manitoba Agriculture, Vegetable Growers Association of Manitoba, and Direct Farm Marketing.

1. *“Management of Onion Neck Rot Disease”* projects
  - Effect of methods of planting on growth, yield and quality of onions. 2018-2021
  - Effect of curing methods on incidence of onion neck rot. 2020-2022
  - Testing the efficacy of fungicides on onion neck rot disease. 2020-2023
  - Early detection of latent infection of onion neck rot. 2019-2022
  - Comparison of commercial cold storage units for prevalence of neck rot disease. 2021-2022
2. *“Establishment of Indigenous Food and Medicine Garden”* under the guidance of local Indigenous communities. 2018-2023

## Moving Forward 2021

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The School of Agriculture & Environment has plans to build on the current research funding we have earned.

In early 2021, an NSERC Engage application titled *“Enhancing local production capacity for propagating commercial sweet potato planting material through improved greenhouse systems”* will be submitted by Dr. Sajjad Rao with T&T Seeds Ltd. as industry partner. Engage Grants are designed to give innovative Canadian companies access to the knowledge, expertise and capabilities available at Canadian universities and colleges. These grants are intended to foster the development of new research partnerships by supporting short-term (6 months) research and development projects aimed at addressing a company-specific problem. There is a need for a Canadian supply of sweet potato slips for commercial production of the crop in order to help meet the increasing consumer demand for sweet potato tubers. T&T Seeds Ltd. has been producing and selling a small number of sweet potato slips and will become a licensed commercial producer of sweet potato slips. Efficient and economical technical growing methodology must be developed in order to successfully producing slips under suitable greenhouse settings due to the Canadian climate. Dr. Rao has research results growing sweet potato in greenhouse conditions and will share his expertise with T&T Seeds Ltd. This study will contrast slip propagation methods, in a controlled environment growth room versus a modified passive solar greenhouse system to determine the most efficient way to commercially produce slips. The slips produced will then be field tested in field growing conditions for commercial production.



NSERC Innovation Enhancement grant project *Study effects of dissolved oxygen in the root zone of cucumber plants*. Industry Partner: Vermillion Growers. Photo credits: Dr. Poonam Singh

As a result of the AIMDay™ success, Dr. Baljeet Singh will be preparing and submitting an NSERC College and Community Innovation program-Applied Research and Development (ARD) grant in partnership with Enns Brothers. A research plan has been

drafted for Phase 1 of the development of a model for cost-effectively collecting and utilizing soil data to automate variable rate application of nutrients during spring field preparation. The ARD supports well-defined college applied research and development projects with private-sector partners. Direct project costs are shared by the company partner(s) and NSERC. Projects may range from one year to three years in duration.

The School plans to prepare and submit an application for a five-year NSERC Build Innovation Enhancement grant which literally will further “build” the School’s established applied research program. This application will be partnered with a Canada Foundation for Innovation (CFI) College-Industry Innovation Fund (CIIF) application for research infrastructure. The Build grant supports the college in establishing novel and innovative applied research capacities and expertise in industry sectors active in the region. This funding program is an introductory support to launch a new applied research direction in order to increase the applied research capacity of the college. The Build application is intended to increase the applied research capacity of the college and for facilitating its transfer to business by addressing gaps in applied research capacity that need to be filled.

## Applied Research Partners

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AGRICULTURE



Canadian Forage & Grassland Association  
Association Canadienne pour les Plantes Fourragères



## Applied Research Funders

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