

2023

# Smart Farm Impact Report

**CELEBRATING  
5 YEARS**  
ON THE SMART FARM  
EST. 2018

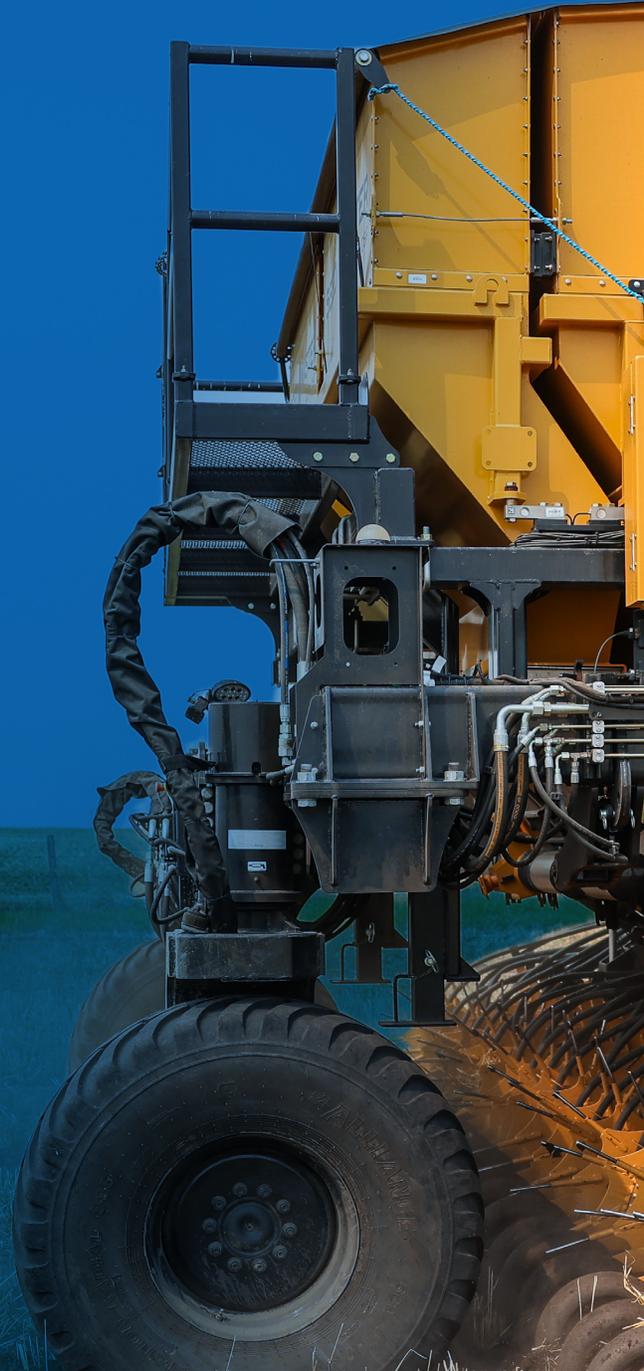


**OLDS COLLEGE**  
OF AGRICULTURE & TECHNOLOGY

**SMART  
Farm**

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## ADVANCING Canada's Agriculture Industry

As technology continues to influence the way we live, work and farm, smart farms and technology development have a critical role to play in the *global grand challenge* of feeding a growing population with fewer resources while minimizing the negative environmental impact of food production.

Olds College of Agriculture & Technology – one of Canada's Top 10 Research Colleges – is known for high-tech, hands-on agriculture education and innovative applied research that lays the foundation for solving real-world problems in farming, food and land.

The Olds College Smart Ag Ecosystem is accelerating the progress and innovation needed to grow Canada's ag industry – **and the Olds College Smart Farm is at the heart of it all.**



## MESSAGE

# From the President

Agriculture is evolving at an ever-increasing pace. At Olds College of Agriculture & Technology, we want to ensure our graduates have the skills and knowledge to help Alberta be a leader in agriculture. We want our experts at the College to continue exploring leading-edge solutions to challenges the agriculture sector is facing. We want to share learnings and knowledge with our communities and the entire agriculture industry. The Olds College Smart Farm helps us achieve these goals.

The Smart Farm supports teaching and learning across many of our academic programs in addition to being a world class smart ag applied research environment. At 3,600 acres, we're the largest educational facility in the country. We're also one of Canada's top 10 research colleges. So much of what we do at Olds College is focused on agriculture and technology – and having that focus brings clarity, commitment, energy and a sense of community.

Having the Smart Farm connected to campus allows our students to gain hands-on work experience with leading-edge technologies, data compilation, livestock and farm infrastructure so they are prepared for work in the future. Work-integrated learning on the Smart Farm is extremely valuable, and helps our students apply what they've learned in the classroom to real-world environments. We're educating the next generation of thought leaders who can continue innovative work in agriculture and technology.

Through applied research activities on the Smart Farm, we are evaluating advanced technologies, working to improve crop and production yields, collecting an abundance of data to make evidence-based decisions, and finding innovative ways to be effective stewards of the land.

I look forward to continuing to advance the College's role in research, industry support and knowledge sharing. With the resources of the College, the knowledge of our employees, and an eager group of students willing to apply their hands-on learning into real-world environments, Olds College is at the heart of delivering innovative solutions.

This year, we're happy to celebrate five years on the Smart Farm. I'd like to thank every donor, industry partner, producer, company and institution we have collaborated with to advance and transform the agriculture industry together – with stewardship and sustainability.

I'm pleased to present the 2023 Smart Farm Impact Report to showcase our industry-driven applied research, education and training – and the positive impact we're making in Canada's ag industry and beyond. I'm excited to be a part of the next five years on the Smart Farm as we continue *transforming agriculture for a better world*.

**Ben Cecil**

President, Olds College of Agriculture & Technology



## From the Vice President, Research

We're happy to celebrate five years on the Smart Farm by highlighting the impact Olds College of Agriculture & Technology has made in the agriculture industry – along with proudly being one of Canada's top 10 research colleges.

This year, we used surveys, data and feedback from the partners and stakeholders we engaged with to compile the 2023 Smart Farm Impact Report. The results and feedback indicate that the expertise, infrastructure, and capacity available through the Smart Farm is accelerating the development and adoption of ag technologies and practices. In addition to supporting the ag tech innovation ecosystem, the Smart Farm is a 3,600 acre learning environment for Olds College students to get hands-on experience and ensure the next generation of innovators and technology users is well positioned to succeed.

I'm so proud of what our team has accomplished since launching the Smart Farm, and I want to thank everyone that has reached out to our research team and partnered with us over the past five years. I look forward to continuing to build on the Smart Farm ecosystem and sharing the positive impact it is having on the ag industry.

### **Joy Agnew**

Vice President, Research,  
Olds College of Agriculture & Technology

**EST. 2018**

## CELEBRATING 5 Years on the Smart Farm

In June 2018, Olds College officially launched the Smart Farm on 110 acres. Five years later, the Smart Farm has grown to 3,600 acres in six different geographic locations across two provinces – focused on accelerating the progress and innovation needed to grow Canada's ag industry. The College is implementing some of the world's best digital and smart ag technologies and practices on the Smart Farm such as autonomous agriculture equipment, drones, soil sensors, weather stations, floating island technology, livestock management technologies, animal health studies and data utilization.

The Smart Farm is also integrated into College programming and students get hands-on learning opportunities to apply their classroom knowledge on the Smart Farm.

Olds College and the Smart Farm would like to thank government, industry, partners, donors and investors for their support over the last five years to the advancement of technology in agriculture. We look forward to the next five years!

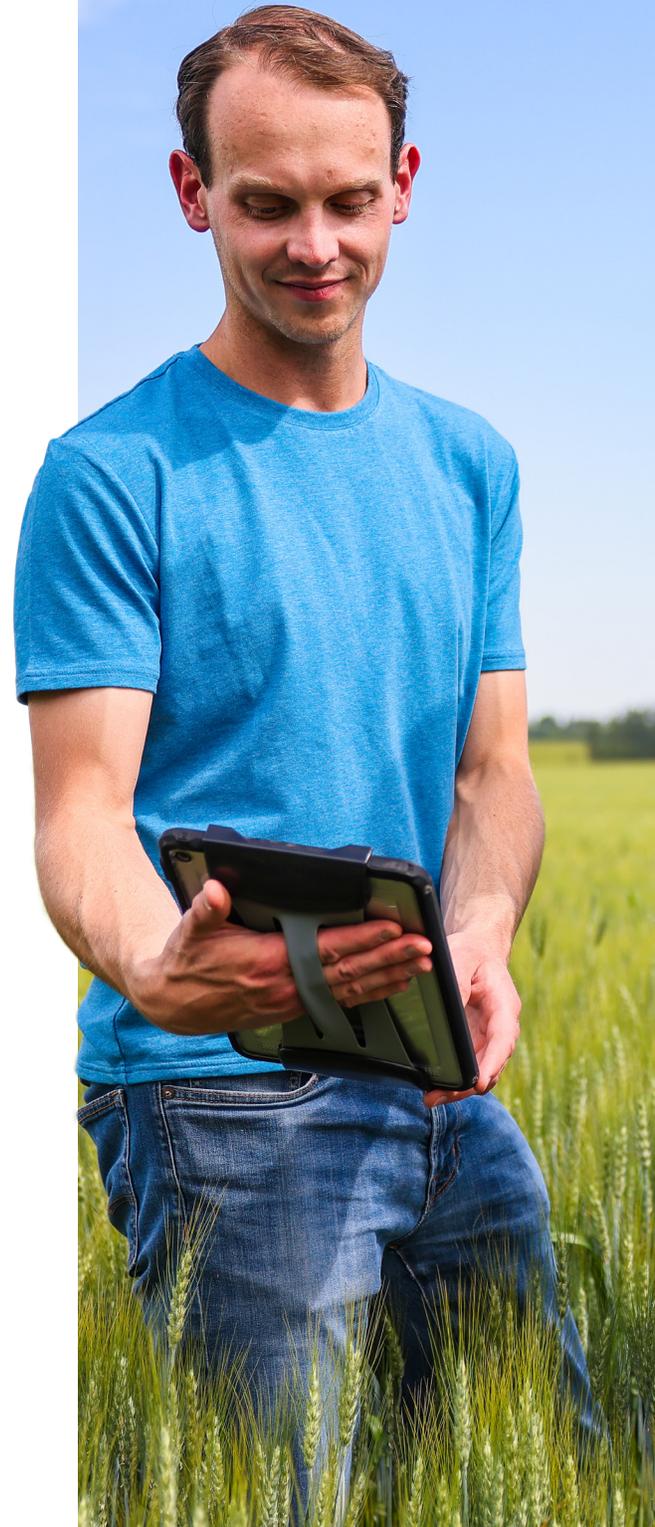
# OLDS COLLEGE Smart Farm

The Olds College Smart Farm is made up of 3,600 acres of land for crop and forage production including state-of-the-art equipment and technology, 1,000-head capacity feedlot, commercial cow/calf herd, Purebred Red Angus herd and sheep flock – as well as expertise and leadership in ag tech research and development. The Smart Farm also has access to greenhouses, labs, incubator space, a brewery, the National Meat Training Centre, plus additional infrastructure at Olds College of Agriculture & Technology.

The purpose of the Olds College Smart Farm is to implement the world's best digital agriculture technologies for crop and livestock production; improve farming operations and efficiencies through smart technologies and practices; and utilize technologies for world class education, demonstration, and applied research.

New technologies for agriculture require in-field testing and validation in the setting of an operating farm to move through the innovation chain, and into the hands of farmers and producers. Since the Smart Farm is connected to a post-secondary institution, it has the space and flexibility to incorporate projects, activities and initiatives into day-to-day farming operations.

The ability to develop, validate and test products using technology and applied research in real agriculture settings continues to bring new projects to the Smart Farm.





The Smart Farm creates a place for producers, industry partners, students and faculty to look at the opportunities and challenges facing the agriculture industry and investigate solutions to evolve agriculture practices.

Work-integrated learning is fundamental to the Olds College student experience. The 3,600-acre Smart Farm is integrated into programming to provide students hands-on learning opportunities with land, livestock, applied research activities, leading-edge technology, and extensive amounts of agriculture-focused data to analyze and learn from in the classroom.

As Canada's Smart Agriculture College, Olds College is proud to be working to achieve its social purpose of **transforming agriculture for a better world.**

## AREAS OF FOCUS

Primary research areas on the Smart Farm are focused on crop production, livestock production, environmental stewardship, cereal breeding, technology integration and data utilization.



### LIVESTOCK PRODUCTION

The Technology Access Centre for Livestock Production (TACLPL) uses its resources – including a 1,000-head capacity feedlot, commercial cow/calf herd, Purebred Red Angus herd, sheep flock, and broadacre native and tame pasture – to demonstrate and optimize technologies with potential to improve animal health and welfare, increase production efficiency, and enhance environmental sustainability.

### ENVIRONMENTAL STEWARDSHIP

Environmental stewardship applied research focuses on five main areas of innovation which include surface water quality remediation, agricultural climate change management practices, by-product development and utilization, co-production of agricultural commodities and renewable energy, and agriculture land stewardship.



### CROP PRODUCTION

With 3,600 acres of farmland to work with, the crop research team at Olds College of Agriculture & Technology is able to perform small plot, strip plot or full-field commercial scale crop production trials.





## CEREAL BREEDING

In collaboration with the Smart Farm, the Field Crop Development Centre (FCDC) aims to streamline the plant breeding process to develop better barley and triticale varieties faster. Developing varieties specifically suited for the Western Canadian growing environment is the primary goal for the breeding program.



## DIGITAL AGRICULTURE

Smart and precision agriculture are heavily reliant on data, and the Smart Farm prioritizes the collection, integration and utilization of agricultural data for evidence-based decision making to enhance farming decisions.

## SMART AGRICULTURE

Smart Ag applied research is focused on evaluating, demonstrating and validating agriculture technologies, tools and practices in order to provide manufacturers and users with information on their functionality, accuracy and value – particularly for broadacre, dryland farming in Alberta soil and climate conditions.

## AUTONOMOUS AGRICULTURE EQUIPMENT

Olds College is conducting future-focused research on the evaluation and improvement of economic, environmental, and logistical benefits of autonomous agricultural equipment for broadacre crop production.



# OLDS COLLEGE Centre for Innovation

**Olds College Centre for Innovation (OCCI) is the applied research division of Olds College of Agriculture & Technology, and focuses on practical, industry-driven applied research that can be easily implemented by the agriculture industry.**

Industry partners connect with OCCI for support in the development and testing of innovative products in the core areas of crop production, livestock production, environmental stewardship, cereal breeding and technology integration.

These focus areas align with infrastructure at the College, available expertise and gaps identified by the agriculture sector.

The Smart Farm was built to support start-up development, validation, scaling and demonstration of smart agriculture technologies and practices.

Olds College is connected with Alberta Innovates, the Central Alberta Regional Innovation Network (CARIN), SVG Thrive and UCEED with the goals of:

- Encouraging innovation, creating and sustaining a healthy economy, and solving problems within the agriculture industry.

- Supporting businesses by guiding them to the right partners through Olds College networks of businesses and organizations throughout Alberta and Canada.
- Providing training and resources to developers to help them market their products effectively.

Since 2018, OCCI has had discussions with over 260 organizations looking to engage with the College – resulting in very high success rates. To date, more than 140 organizations have engaged on a project with OCCI, and a large percentage of those include small and medium-sized enterprises (SMEs). Many of these projects are Alberta-based and have significant relevance and value to local and regional producers.

OCCI also incorporates its applied research activities into work-integrated learning opportunities for students.

# OLDS COLLEGE CENTRE FOR INNOVATION PROJECT ENGAGEMENT

**263** COMPANIES & ORGANIZATIONS CONNECTED WITH OCCI TO DISCUSS OPPORTUNITIES

**219** (83%) SMALL & MEDIUM-SIZED ENTERPRISES (SMEs)

**127** (58%) ENGAGED ON A PROJECT

**114** (52%) ALBERTA-BASED

**70** ACTIVELY ENGAGED ON A PROJECT IN 2023

**142** (54%) ENGAGED ON A PROJECT

**130** (49%) ALBERTA-BASED



# APPLIED RESEARCH: PROJECT DEVELOPMENT

Applied research at Olds College Centre for Innovation (OCCI) focuses on practical, industry-driven applied research that can be easily implemented by the agriculture industry.

In January 2023, Olds College of Agriculture & Technology was recognized as one of Canada's top 10 research colleges by Research Infosource. The Smart Farm supports research at OCCI, and was built to support start-up development, validation, scaling and demonstration of smart agriculture technologies and practices.

Industry partners connect with OCCI for support in the development and testing of innovative products in the core areas of research which align with infrastructure at the College, available expertise and gaps identified by the agriculture sector.

OCCI strives to share the knowledge and learnings generated on the Smart Farm with people and organizations who will continue to spur the adoption of ag technologies which benefit producers, innovators and industry stakeholders.

On average, OCCI works on 80 to 100 projects per year – with over 106 projects happening throughout 2022 and 2023.

This research includes both public-facing projects that are promoted externally as well as confidential projects where the privacy of all work and results are protected.

Intellectual property (IP) gained throughout the duration of all projects stays with the industry partner.

## **PROJECT FUNDING**

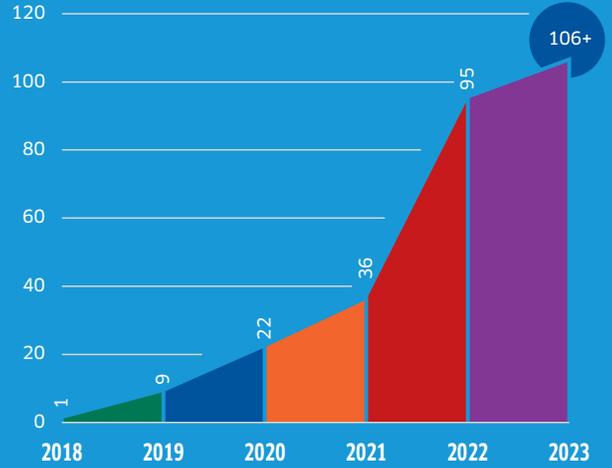
- 70% - Public funding
- 30% - Industry & partner funding

## **PROJECT TYPE**

- 75% - Grant-based research
- 25% - Fee-for-service contracts



## ANNUAL PROJECT GROWTH



# ONE OF CANADA'S Top 10 Research Colleges

Olds College of Agriculture & Technology was named in the top 10 of Canada's Top 50 Research Colleges by Research Infosource Inc. The continued growth of the Smart Ag Ecosystem and applied research activities on the Smart Farm launched the College into the top 10 this year.

In addition to being ranked number 10 overall, Olds College was listed as number three in the country for College Research Income Growth and number seven for College Research Intensity (dollar per researcher). In the small tier college category, Olds College made the top 10 for number of research partnerships, completed research projects, paid student researchers and industry research income.

Research Infosource Inc. also featured a three-year spotlight on granting council research income performance from 2019 to 2021 which highlights Olds College's continued research success. Olds College ranked in the top ten for research income from the Canada Foundation for Innovation (CFI) and in the top 15 for research income from the Natural Sciences and Engineering Research Council of Canada (NSERC).



CANADA'S TOP  
**50**  
RESEARCH  
COLLEGES  
2022 RESEARCH  
Infosource Inc.

# MEASURING THE SMART FARM'S IMPACT

Based on internal tracking for OCCI & Smart Farm since 2018



## ENGAGED WITH



## JOBS CREATED WITHIN OLDS COLLEGE



## AUDIENCE REACH



PLUS A LARGE AUDIENCE – IMPOSSIBLE TO MEASURE – ACROSS CANADA DUE TO EARNED MEDIA, SOCIAL MEDIA, INTERVIEWS, EXTERNAL EVENTS, FIELD DAYS, CONFERENCES & MORE

# Pillars for Success

There are seven pillars of the Smart Ag Ecosystem at Olds College of Agriculture & Technology that are fundamental to the success of the Smart Farm – a true ecosystem where producers, industry partners, small and medium-sized enterprises (SMEs), students, and faculty can collaborate and work towards advancing agriculture.



View our interactive Smart Farm map with this QR code or go to [oldscollege.ca/smartfarm](https://oldscollege.ca/smartfarm)



## SMART FARM & SMART FARM OPERATIONS

At the heart of the Smart Ag Ecosystem is the **Smart Farm and Smart Farm Operations**. This leading-edge learning environment has grown to include 3,600 acres of farmland, infrastructure and staff who are experienced in ag tech research and development.





## APPLIED RESEARCH

Practical and industry-driven **Applied Research** is key to accelerating the development and adoption of technologies and practices. The research experts on the Smart Farm work with innovators and SMEs to move their ideas and products through the innovation chain – and into the hands of farmers and producers.



## STRATEGIC PARTNERSHIPS

**Strategic Partnerships** and investors allow Olds College to build and operate the Smart Farm with the flexibility needed to support innovation and development.



## ACADEMIC PROGRAMMING

**Academic Programming** in a post-secondary institution that provides training, skills and work-integrated learning for the next generation of users and developers of ag technology is at the core of Olds College.



## PHYSICAL INFRASTRUCTURE

The **Physical Infrastructure** at Olds College – including a national meat training centre, brewery, greenhouses, wetlands and more – provides endless opportunities for students and everyone in the ag sector to learn and grow.



## DIGITAL AG INFRASTRUCTURE

The **Digital Ag Infrastructure** is a growing piece of the ecosystem and critical component that allows Olds College to launch and execute Smart Ag research. The world of agriculture is becoming reliant on the 'internet of things', and this infrastructure is essential for the ag tech evolution.



## KNOWLEDGE MOBILIZATION PLATFORM

The **Knowledge Mobilization Platform** ensures the information generated on the Smart Farm gets into the hands of producers, researchers and industry stakeholders who can accelerate the progress and innovation needed to grow Canada's agriculture industry.

# PARTNERSHIPS

Partnerships are truly the foundation of the work at Olds College of Agriculture & Technology. Whether financial, academic or experiential, these partnerships raise the bar for what can be delivered throughout the year.

The strategic intent of Olds College and the Smart Farm is to advance the agricultural industry. This happens by educating students, performing research, testing products and services, and communicating the benefits of those products and services in the marketplace.

The Smart Farm and Olds College Centre for Innovation (OCCI) provide partners with a unique means of gaining boots-on-the-ground testing and learnings for their technologies and practices. This includes support in disseminating results to producers and other industry stakeholders through communications and events, such as the College's annual educational expo – AgSmart.

The Smart Farm provides researchers and partners with the ability to take things that are new and novel, and may still require development, and apply them to a real-world environment. This gives strategic partners the opportunity to truly see their technology in action.

The work continues and Olds College welcomes strategic partners who are looking to invest in building solutions, who are looking to test solutions, or who are still developing solutions. The Smart Farm is a place that can bring everyone together to **transform agriculture for a better world.**

## A **Memorandum of Understanding (MOU)**

connects two organizations who agree to work together to develop a meaningful working relationship. Two recent MOUs include:

- Olds College and Agriculture Financial Services Corporation (AFSC) signed a MOU to collaborate on applied research activities on the Smart Farm that will drive innovation in agriculture.
- Another MOU was signed between Olds College and SaskTel to leverage the Olds College Saskatchewan Smart Farm – 800 acres near Craik, Sask. – and collaborate on challenges currently facing agriculture technology including rural connectivity.

The **Producer Panel** at Olds College is a critical partnership that connects academics, research and innovation back to the farmers, ranchers and producers they are ultimately serving. Producers from crop and livestock backgrounds in Alberta and Saskatchewan began meeting in 2021 to discuss and provide feedback on the applied research being done at OCCI to ensure it's applicable and useful for producers, and to ensure academic programming is developing the skills that industry needs.



# PAN-CANADIAN Smart Farm Network

The Pan-Canadian Smart Farm Network – led by Olds College of Agriculture & Technology – is a network of Smart Farms supporting Canada’s agriculture sector to enhance efficiency, sustainability and resilience in response to emerging opportunities and challenges. The network fosters collaboration among researchers, producers, industry partners and other stakeholders nationwide to drive innovative projects that address critical issues in ag tech development and adoption. The network facilitates knowledge exchange and capacity building, and serves as a platform for real-world testing and validation of new technologies.

With funding from the Canadian Agri-Food Automation and Intelligence Network (CAAIN), the network also includes Discovery Farm Langham located just north of Saskatoon, Sask.; Lakeland College located at Vermilion, Alta.; University of Saskatchewan (USask) Livestock and Forage Centre of Excellence (LFCE) located near Saskatoon, Sask.; Manitoba Beef & Forage Initiatives Inc. (MBFI) located near Brandon, Man.; Enterprise Machine Intelligence & Learning Initiative (EMILI) located near Winnipeg, Man.; Lethbridge College located in Lethbridge, Alta.; and Discovery Farm Woodstock located in Southwestern Ontario.

The continued expansion and collaboration in different agricultural zones and land bases across Canada brings more depth to the projects and technology evaluations conducted at Canada’s smart farms, which benefits farmers and developers.





The Pan-Canadian Smart Farm Network initiative will accelerate the development and adoption of ag technologies and systems, helping producers manage their risk of production to improve the productivity and sustainability of their farms.



# THE Research Team

Olds College of Agriculture & Technology is proud of the research teams, instructors and staff that drive applied research in the areas of crop production, livestock production, environmental stewardship, cereal breeding and technology integration.

Expertise on the Smart Farm continues to grow with research team members, managers, scientists and technicians as well as students, interns and seasonal staff running the various applied research projects throughout the year. The notable designations of the professionals and experts at Olds College include: Ph.D., M.Sc., B.Sc., Diploma, P.Ag., P.Eng., MBA, and a combined total of decades of practical science and agricultural experience.

In addition to the 3,600 acre Smart Farm, Olds College has extensive assets and infrastructure to provide the testing ground and lab space for applied research, training and education. Combined with world-class talent and subject matter experts, these assets create an unparalleled opportunity for technological innovation and development. Additional assets and infrastructure include:

- Smart Ag Innovation Centre
- Short-term drop down office space
- Field Crop Development Centre
- Technology Access Centre for Livestock Production
- Labs & 1,000-head capacity feedlot
- Beef & Livestock Centre
- National Meat Training Centre
- Smart Farm Operations Centre & Equipment
- Brewery
- Greenhouses
- Soils, Plants & Chemistry Labs
- Incubator Space
- Equine & Rodeo Centre
- Conference Services
- Continuing Education Services

Olds College is always open to new projects and partnerships, and has top facilities to deliver real-world results.





Expertise on the Smart Farm continues to grow with research team members, managers, scientists and technicians as well as students, interns and seasonal staff running the various applied research projects throughout the year.

## **AREAS OF AGRICULTURAL EXPERIENCE AND EXPERTISE AT OLDS COLLEGE OF AGRICULTURE & TECHNOLOGY**

Agricultural Engineering

Agriculture Business  
Management

Animal Health, Science  
& Welfare

Crop Production

Data Science & Agronomy

Instrumentation

Land & Water Reclamation

Livestock – Genetics,  
Reproduction, Nutrition,  
Production & Management

Machine Automation

Molecular & Environmental  
Plant Science

Plant Pathology,  
Entomology & Nematology

Precision & Digital  
Agriculture

Project & Ag Business  
Management

Rangeland Health

Remote Sensing Technology

Soil Science

Technology Development

Telematics & GIS/GPS

# Crop Production





**With 3,600 acres of farmland to work with, the crop research team at Olds College of Agriculture & Technology is able to perform small plot, strip plot or full-field commercial scale crop production trials.**

The key goals for crop research are to develop and test ways to improve agronomic practices – including nutrient application or pest management – in order to enhance crop yield while consuming fewer resources.

Ultimately, the intent is to transition the food production sector to a climate-resilient, agricultural, circular economy. In 2022, the crops research team worked on over 25 projects to meet these goals.

Services include conducting regional variety trials (RVTs) as well as fertility, herbicide, fungicide and insecticide trials. Field, greenhouse and laboratory studies focus on chemical and biological integrated pest management, soil health, crop rotation, nitrogen use efficiency, new crop evaluation and crop variety testing programs.

A precision sprayer technology is being tested at the farm level on the Smart Farm – in replicated field trials – and is achieving strong results with significant reductions in chemical application. In 2023, researchers aim to continue exploring the merits of green-on-brown precision spraying towards the identification of viable weed management options for barley, canola and pulse growers.

A project on enhanced yields in winter wheat versus spring wheat looked at profitability and suitability under the unique growing conditions in central Alberta.

The team has also been testing winter rye versus spring rye with great success over the last three years, along with examining winter survivability, winter kill, disease resistance and yield. The findings are encouraging and should provide a good option for cereal growers – especially during drought prone years.

A pest-related project is exploring the prevalence of insect pests in cereal fields. For the coming year, the focus will be on root lesion nematodes and investigating possible spatial correlation with wire worm infestations. A second project is underway exploring the effectiveness of beneficial nematode species as a biological control measure for mitigating damage to canola crops caused by black cutworms and root maggots.

The crop research team delivers results that can be applied to real farms to meet the goals of efficiency, profitability and sustainability.

# Livestock Production





**The Technology Access Centre for Livestock Production (TACLP) uses its resources – which include a 1,000-head capacity feedlot, commercial cow/calf herd, Purebred Red Angus herd, sheep flock, and broadacre native and tame pasture – to demonstrate and optimize technologies with potential to improve animal health and welfare, increase production efficiency, and enhance environmental sustainability.**

Livestock producers, innovators, and small and medium-sized enterprises (SMEs) collaborate with the TACLP to develop, validate, and showcase new practices and technologies.

Leveraging the funding support from the Natural Sciences and Engineering Research Council of Canada (NSERC), the TACLP provides access to every stage of the production cycle – from seedstock to feedlot. Recent project highlights show the team's dedication to animal welfare, efficiency and environmental sustainability.

A pre-conditioning study in collaboration with the University of Calgary looked at the impacts of various weaning techniques to better prepare calves for the feedlot – reducing preventative treatments and antimicrobial use overall.

The TACLP conducts off-campus projects and fee-for-service work with collaborating producers – specifically Neilson Cattle Development with six projects completed at its operation since 2020. These include investigating the impact of handling acclimation to reduce stress and improve reproductive performance in beef heifers. Acclimated heifers had lower salivary cortisol concentration (meaning less fearful/stressful), an increment on pregnancy rate of 10.84% when compared to the control group and 7.5 times increased chances of becoming pregnant.

Another collaboration was a study investigating different calf weaning methods combined (or not) to an adoption of a novel handling procedure on newborn calves known as tactile stimulation. This technique mimics natural cow behavior by gently rubbing the body of newborn calves for one minute and has demonstrated notable health and growth performance advantages. The TACLP is currently in the third year of testing this procedure at Neilson Cattle Development.

Each year, the TACLP evaluates approximately 500 non-college animals during the feeding trial season through a variety of performance evaluations and research projects. These include ongoing residual feed intake testing via Vytelle feeding systems, basic growth and feed conversion tests, and behavioural assessments.

With additional funding from NSERC through the Applied Research and Technology Partnership (ARTP) grant, the TACLP is supporting numerous industry partners and SMEs by validating remote monitoring technologies. This has potential to improve soil health and increase rancher access to carbon credit programs, thereby improving environmental sustainability and climate change resiliency in Western Canada.

Alberta Innovates funded a study on benefits of rotational grazing management compared to conventional grazing. Smart technologies were employed to monitor pasture productivity, animal health and performance, and remotely manage fence lines and watering systems.

The TACLP is also integrated into Olds College academics supporting knowledge transfer, in-field training and volunteer experiences for students.

RESEARCH AREA

# Environmental Stewardship





**Environmental stewardship applied research at Olds College of Agriculture & Technology focuses on five main areas of innovation:**

- **Surface water quality remediation.**
- **Agricultural climate change management practices (mitigation and adaptation).**
- **By-product development and utilization (zero waste agricultural sustainability strategy).**
- **Co-production of agricultural commodities and renewable energy in the same space.**
- **Agriculture land stewardship considerations such as re-establishing shelterbelts and eco-buffers (green infrastructure).**

Olds College is most active in water quality remediation applied research due to fresh water fast-becoming a limited resource across the prairies and around the world. Researchers are specifically assessing low-cost, but highly effective, water treatment technologies.

With investments from provincial and federal grant funding agencies, private industry, producers, and agricultural and non-agricultural organizations, the College has been working on industrial and agricultural water quality remediation research.

Olds College Centre for Innovation (OCCI) is focused on finding natural and sustainable ways to produce high-quality recycled water.

The Floating Island Technology for Livestock Water Remediation project is a multi-year study that uses native wetland plants and floating island technology to treat feedlot runoff water.

After the successful completion of insightful and controlled greenhouse trials, OCCI researchers have progressed to the implementation of a real-world, four-year environmental study.

This research study aims to provide producers with a sustainable, low-cost, water treatment technology that can improve feedlot runoff water quality for subsequent use as uncontaminated livestock drinking water, or for irrigation of fresh agricultural produce.

Environmental stewardship comes in many forms and plays a pivotal role in almost every applied research project implemented on the Smart Farm.

RESEARCH AREA

# Cereal Breeding: Field Crop Development Centre





**In collaboration with the Smart Farm, the Field Crop Development Centre (FCDC) aims to streamline the plant breeding process to develop better barley and triticale varieties faster. Developing varieties specifically suited for the Western Canadian growing environment is the primary goal for the breeding program. Feed and forage barley, malting barley, and triticale breeding pipelines are supported by biotechnology, pathology, quality and field laboratories.**

The world-class research centre boasts 27 dedicated researchers and technicians, along with 600 acres and equipment for plot scale trials. Every year, 40,000 plots are planted, analyzed and harvested. FCDC also collaborates with research institutes in over 30 countries, and has released nearly 60 barley and triticale varieties.

The research centre is based in Lacombe, Alta.; however, FCDC also farms and maintains off-station sites at Olds, Trochu and Morrin. FCDC sends several thousand breeding lines for screening across Western Canada and internationally every year, and continues to use a winter nursery in southern California as well as an indoor growth facility in Lacombe to speed up the advancement of genetic material.

Along with yield, agronomic traits such as lodging resistance and disease resistance are primary goals for all three breeding pipelines. In addition, FCDC aims to improve the nutritional profile for the feed and forage cereals with higher digestibility, feed conversion and efficiency. In malting barley – along with the improved agronomic traits – FCDC is seeking enhanced quality traits to meet the demand of the malting, brewing and distilling industry.

## **Five-Year Strategic Plan**

The FCDC is focused on developing enhanced cereal varieties for feed, forage, malt, food and bio-industrial uses. To accomplish this, the FCDC team will work towards being an industry leader in research and development with six strategic drivers:

1. Be externally facing with a measurable impact on the sector.
2. Be market responsive.
3. Expand service delivery.
4. Increase funding through diversification of revenue sources.
5. Create a high-performance organizational culture.
6. Be recognized for scientific expertise and outcomes.

FCDC is also finalizing an internal Science Plan which will guide research and development work to 2030, and outlines the actions and resources required to reach objectives. This Science Plan ensures that FCDC's research activities are aligned with industry needs and priorities, and will position FCDC to make greater breeding progress resulting in barley and triticale as more competitive options for farmers. This Science Plan follows and supports FCDC's recently completed Strategic Plan and Business Plan.

# Smart Agriculture





**Smart Ag applied research is focused on evaluating, demonstrating and validating agriculture technologies, tools and practices in order to provide manufacturers and users with information on their functionality, accuracy and value – particularly for broadacre, dryland farming in Alberta soil and climate conditions.**

Researchers collaborate on industry-driven applied research related to smart ag technologies with goals of saving producers time or money, and improving efficiency and environmental sustainability. These technologies include prescription maps, trace gas analyzers, drone and satellite imagery, soil moisture probes, soil nutrient sensors, disease and pest monitoring systems, weather stations, rural connectivity solutions and data utilization. The Smart Ag team is also contracted by companies who need support in validating a recently developed innovative product, technology or process.

In 2022, several projects provided interesting results and the continued opportunity to build new partnerships and programs.

Work continues with Agriculture Financial Services Corporation (AFSC) to see if drone imagery of hail damaged fields can assist the adjustment process. Additional projects with AFSC include using soil moisture measurements to estimate forage yield potential, and a historical data analysis to learn what variables contribute most to forage growth.

Researchers conduct weather station comparisons to help producers identify equipment that would work best for their farms. The team evaluates and audits the stations based on the data collected, add-on options, user platforms and pricing. The team also worked with several different disease models learning about functionality and ease of interpreting the information.

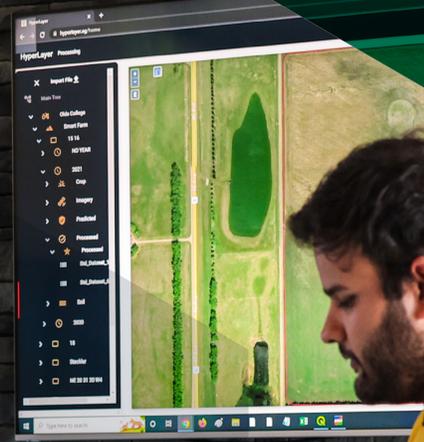
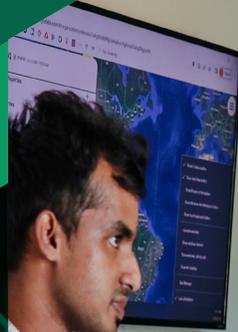
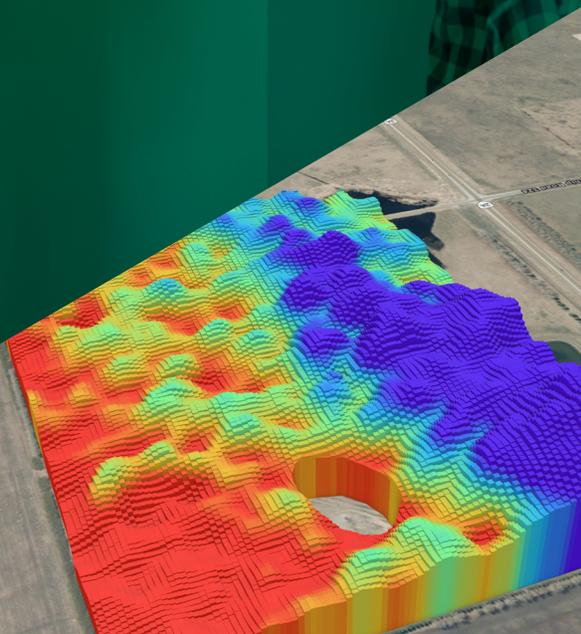
The team is exploring variable rate technology alongside TELUS Agriculture with savings, improved yield and reduced environmental footprint as key variables impacting the return on investment. Another project includes monitoring nitrous oxide (N<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>) and water vapour (H<sub>2</sub>O) this growing season with LI-COR chambers. N<sub>2</sub>O is a greenhouse gas and researchers are using the chambers to measure emissions from the soil. The technology will help collect high quality (and high resolution) data on how 4R nutrient stewardship practices impact N<sub>2</sub>O emissions – a highly relevant topic for the ag industry.

The Smart Ag applied research team worked with Spornado to evaluate how its innovative wind trap, the Spornado Sampler, can assist producers in making informed fungicide application decisions. Researchers also worked with ChrysaLabs to provide them with a large quantity of soil sampling data for calibration of the ChrysaLabs soil nutrient probe for Western Canada, in addition to evaluating the probe for its usability.

Other technologies being tested include equipment to determine carbon content in soil to help farmers access carbon credits, an on-combine near infrared analyzer for real-time grain constituent analysis, in-bin drying sensors and algorithms to optimize the process and cost of drying, and optical spot-spray technology for reduced input cost and improved environmental sustainability. Connectivity, data collection and communications on the Smart Farm includes extensive 5G, Wi-Fi, LoRaWan and cellular networks to work towards better data integration.

Data and information collection methods have advanced and are allowing researchers to draw informed conclusions faster to provide better guidance to the agriculture industry.

# Digital Agriculture





**Smart and precision agriculture are heavily reliant on data, and the Smart Farm prioritizes the collection, integration and utilization of agricultural data for evidence-based decision making to enhance farming decisions.**

Ag digitalization represents one of the greatest opportunities – and one of the largest challenges – for agriculture producers. Gathering the right amount of the right information, and then having a way to use it to enhance farming decisions, requires technology that producers can easily understand and manage.

Olds College of Agriculture & Technology has been developing a Digital Ag Strategy that provides guidance for the collection, integration and utilization of agricultural data for evidence-based decision making. This strategy supports the research and work on the Smart Farm, along with industry partners and the College as a whole. Digital Ag has also become an integrated part of new academic courses at the College.

The College uses advanced digital technologies and tools to enable the collection of millions of data points from individual fields on the Smart Farm. More information helps to understand fields and variability better. These provide training for students, and are used for applied research and the development of new, next-generation technologies.

The HyperLayer Data Concept project is being used to build an extensive look at the Smart Farm. It centers around compiling multiple layers of geospatial information – including topographical data, detailed soil organic matter, nutrient and moisture mapping, multispectral and hyperspectral imagery, yield data, and other layers of information

– to assist in machine learning for easy analysis, data extraction and the building of next-generation analytical algorithms.

The predictive algorithms developed with this information will be used on-farm to create significant environmental benefits – such as reduced fertilizer and input use, as well as water and other environmental benefits.

The team is building a web-based platform to organize, store, manage and process data, as well as machine learning algorithms for predicting plant available soil nutrients, soil organic matter and other field characteristics. Numerous partner organizations see the opportunities of a robust digital agriculture program. The College also collaborates with other post-secondary institutions in the area of data collection and analysis.

In addition, Olds College is working with Edmonton-based Wyvern, a space data company, to see what cutting-edge satellite technology could mean for the next chapter in digital innovation in agriculture, and expect the data collected from the Smart Farm to provide solutions related to crop input efficiencies and improved yields.

RESEARCH AREA

# Autonomous Agriculture Equipment





**Olds College of Agriculture & Technology is conducting future-focused research on the evaluation and improvement of economic, environmental, and logistical benefits of autonomous agricultural equipment for broadacre crop production.**

The Smart Farm is on its fourth consecutive growing season using the Raven OMNiPOWER™ platform for seeding, spreading and spraying. The Smart Ag research team also started the 2023 growing season with a brand new OMNiPOWER 3200 platform – a gift-in-kind from Raven Industries, Inc. – utilizing technology and equipment to farm more efficiently.

Using the OMNiPOWER 3200, researchers are planning to get an increased amount of acreage coverage, expand data collection to further improve efficiencies with autonomous equipment and map cellular connectivity in real time. While OMNiPOWER operates on its own after a mission is programmed, it requires supervised autonomy which means it must stay within line-of-sight of the team.

Raven also loaned Olds College a 2020 OMNiPOWER with a Seedmaster 30-foot air seeder implement for the 2023 seeding season. Having two platforms on the Smart Farm allowed researchers to operate both the OMNiPOWER 3200 and the 2020 OMNiPOWER at the same time in the same field. The learnings and data collection from this opportunity is game-changing for autonomous operations.

As team members continue to gather more and more data during research activities, they gain more insights into the performance of autonomous equipment on the farm.

One recent project milestone was comparing autonomous equipment operations to conventional equipment in terms of cost, labour and efficiencies. Team members working with OMNiPOWER perform comparable autonomous data collection with an electronic data collection system called a Somat-eDAQ. The device electronically collects location specific data (GPS) and equipment data (CAN bus) at a rate of two times a second and includes starts, stops, and field and fuel efficiency.

The College owns two Somat-eDAQ devices: one is installed on OMNiPOWER and the second is housed in a carrying case and used to collect data in conventional equipment. This provides the team with robust datasets used to evaluate autonomous versus conventional equipment.

The team also tested the OMNiPOWER-ready coulter toolbar for liquid sectional control from Pattison Liquid Systems to reduce on-farm input costs. Learnings from operating this equipment in a new region and soil zone on the Smart Farm were passed on to Pattison after the trial period.

OMNiPOWER is used to perform significant seeding, spraying and spreading duties on the Smart Farm. Over three years of research with autonomous farming equipment has helped the team run the equipment more efficiently, get more acreage coverage, and improve field efficiencies and uninterrupted hands-off operation.

Olds College students also receive hands-on learning opportunities by operating, studying and using data from OMNiPOWER on the Smart Farm and in the classroom. The precision agriculture programs at the College, and the inclusion of OMNiPOWER and autonomy in student learnings, is getting students ready to work in the ag tech industry.

# Work-Integrated Learning

## ON THE SMART FARM

Through applied research and work-integrated learning, Olds College of Agriculture & Technology provides a unique student experience with advanced learning environments where students connect with real-world opportunities and businesses.

The core mandate of the 3,600-acre Smart Farm is to provide a hands-on learning environment for lifelong learning, build the skill sets required to accelerate the development and adoption of ag technologies and practices, and train the next generation of agricultural leaders.

Over 80 academic courses are now integrated into Smart Farm-based learning activities. In 2022 to 2023, the Smart Farm recorded over 3,200 student participation experiences with more than 1,800 students with learning activities such as:

- Leveraging Smart Farm data and analysis.
- Working with Smart Farm equipment and livestock.
- Supporting land management.
- Leveraging Smart Farm tracking processes.
- Participating in Smart Farm applied research.

These opportunities help students leverage what they've learned in the classroom and apply it to challenges and opportunities in agriculture so they are better prepared for work in the future.

Every year, Olds College Centre for Innovation (OCCI) welcomes students working as summer research technicians and interns completing their eight-month directed field study at the Smart Farm. These students and interns work alongside researchers who are experts in their respective fields providing them with valuable opportunities to explore career paths and specializations. They also have the chance to network and build their resumes as they prepare to enter the workforce.

In this advanced learning environment, students get to apply their classroom knowledge on the Smart Farm, resulting in a unique educational experience. Olds College also benefits from a diverse range of student perspectives including those from around the globe, students who grew up in farming communities, and students without agriculture experience who come to the Smart Farm to gain industry knowledge.

Founded in 1913, Olds College has been offering quality hands-on education for over a century. As Canada's Smart Agriculture College, Olds College is working to achieve its social purpose of **transforming agriculture for a better world.**



# MEASURING THE SMART FARM'S IMPACT

Based on OCCl client feedback surveys during 2023

## CLIENT FEEDBACK



**25** SURVEYS COMPLETED BY SMALL & MEDIUM-SIZED ENTERPRISES (SMEs) WHO ENGAGED WITH THE SMART FARM SINCE 2018



**46** PRODUCTS/PROCESSES IMPROVED

**1.8** PER SME

**394**

ESTIMATED NUMBER OF PRODUCTS/PROCESSES IMPROVED BY EXTRAPOLATING THE 1.8/SME TO THE TOTAL NUMBER OF SMEs (219) WORKED WITH TO DATE



**\$159,770,000** TOTAL SME BUSINESS REVENUE

**\$6,390,800** PER SME

**\$811,631,600**

ESTIMATED BUSINESS REVENUE FOR SMEs WHO HAVE WORKED WITH THE SMART FARM



**143** JOBS CREATED BY SMEs

**5.7** PER SME

**724**

ESTIMATED NUMBER OF JOBS CREATED BY SMEs WHO HAVE WORKED WITH THE SMART FARM



*OCCI has been awesome for AFSC. As a crown insurance corporation, AFSC's goals and needs are quite different from the industry at large and OCCI has been an amazing partner. In addition to their wealth of knowledge, they have been responsive and accommodating to AFSC's unique research requirements.*

*OCCI is unique as a research institution in that there is a clear and determined focus to retain the commercial aspects of the Smart Farm. This means that any findings are immediately more applicable and implementable outside of the research setting, translating to shorter timelines between research and implementation. As a result, we see increased returns on research efforts.*

**- Russell Shuttleworth, Innovation Team Lead, Agriculture Financial Services Corporation**



*We have been working with the team at OCCI for several years now. We find not only are they enthusiastic and very well educated, they also have many great ideas and research plans to enhance our relationship even further. OCCI was one of OneCup's first supporters and partners, and we couldn't be more pleased to continue this relationship.*

*OCCI has such a wide variety of skilled individuals as well as access to real-world conditions for proof of concept work. I would fully recommend discussing with them how you envision your product development and go-to-market plan as they can be very helpful in helping you achieve success in your business endeavours.*

**- Mokah Shmigelsky, CEO, OneCup AI**

*First rate applied science and technology organization staffed by high-skilled competent people! Their ability to help move new scientific discovery into real-world application is unmatched in Western Canada and beyond. Real value is delivered. Carbon Asset Solutions looks forward to working with OCCI on many upcoming projects.*

**- Robin Woodward, Director, Carbon Asset Solutions**



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*I have been RFI testing my bulls at Olds College every winter since 2012. Folks at Olds College have been good to work with and I know my bulls are well looked after. They spend 5 months being developed on a proper ration, come out clean and well muscled, and are easy to sell.*

*Don't miss the chance to measure feed efficiency in your breeding stock. Feed efficient cattle eat less and are better for our environment. We all need to do our part to help the beef industry become more efficient and sustainable.*

**- Don Richardson, Rancher and Veterinarian, Richardson Ranch, Tlell Polled Herefords, Century Farm located on Haida Gwaii**

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*I have participated several times in the beef residual feed intake trials. Very positive experience. Try it yourself.*

**- Donna Beutler, Purebred Breeder, Lord and Lady Polled Herefords**

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*I was thoroughly impressed with the OCCI team. Their infectious enthusiasm and unwavering professionalism in evaluating our technology played a pivotal role in the success of our project. Their proficiency in project management and their collaborative nature made the entire experience a pleasure. The team went above and beyond in providing us with timely updates and resolving any issues that arose during the project. I am grateful for their hard work and dedication to our shared goals. Working with such an outstanding team has undoubtedly elevated our technology and positioned us for continued success.*

*The data collected by the OCCI team has been instrumental in enabling Zetifi to plan for cold weather performance in Canada. With their in-depth understanding of the Canadian farming systems and telecommunication systems, the team was able to provide us with valuable insights into the challenges and opportunities that exist in the Canadian market. Their knowledge of the local climate conditions and weather patterns has helped us build solar systems that can operate efficiently in extreme cold temperatures, which is crucial for driving our equipment in Canada.*

**- Dan Winson, CEO, Zetifi**



*The past four years working with OCCI has been instrumental to the advancement of the Top Grade Ag (TGA) In-Bin Drying monitor.*

*It was a “privilege” to be part of the Smart Farm and I highly recommend it. The partnership was a huge benefit for me as an innovator and, at the same time, it is important for the farmers to see this third-party validation.*

**- Glenn Wilde, Founder, Top Grade Ag**



*The people we worked with at Olds College were great collaborators. They are clearly curious and hold a passion for innovation. There was an excellent channel of communication from the planning phase through project completion. We would encourage anyone striving for advancements in agriculture to collaborate with the Olds College Smart Farm.*

**- Cailyn Wolberg, Customer Success Specialist, ChrysaLabs**



*We had an excellent experience working with OCCI. They led the development of the study plan, and were very knowledgeable and thorough. From a project administration point of view, they were very efficient. OCCI took care of everything. I would highly recommend working with OCCI if you have a research question that you would like studied. The end report was high quality and will be very useful.*

*We were able to confirm that our newer product, a solar-powered unit with a fan, performed even better than our original unit. We also better understood how agronomists would use the data we provided.*

**- Kristine White, CEO, Spornado**



*Working alongside the OCCI team was an absolute pleasure. Their dedication to open communication and a shared vision created an environment that fostered productive collaboration. The seamless coordination and synergy within the team ensured that projects progressed smoothly and efficiently. Deadlines were consistently met, and the quality of work remained consistently high.*

*I am grateful for the opportunity to be a partner of such a dynamic and capable team, and I highly recommend OCCI to anyone seeking a partner who values collaboration and achieves outstanding results.*

**- Dr. Abdallah Manasrah, CEO, Carbon OxyTech Inc.**





**OLDS COLLEGE**  
OF AGRICULTURE & TECHNOLOGY

**SMART**  
**Farm**



Stay up-to-date on the latest activities,  
research and results on the  
Olds College Smart Farm by:

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