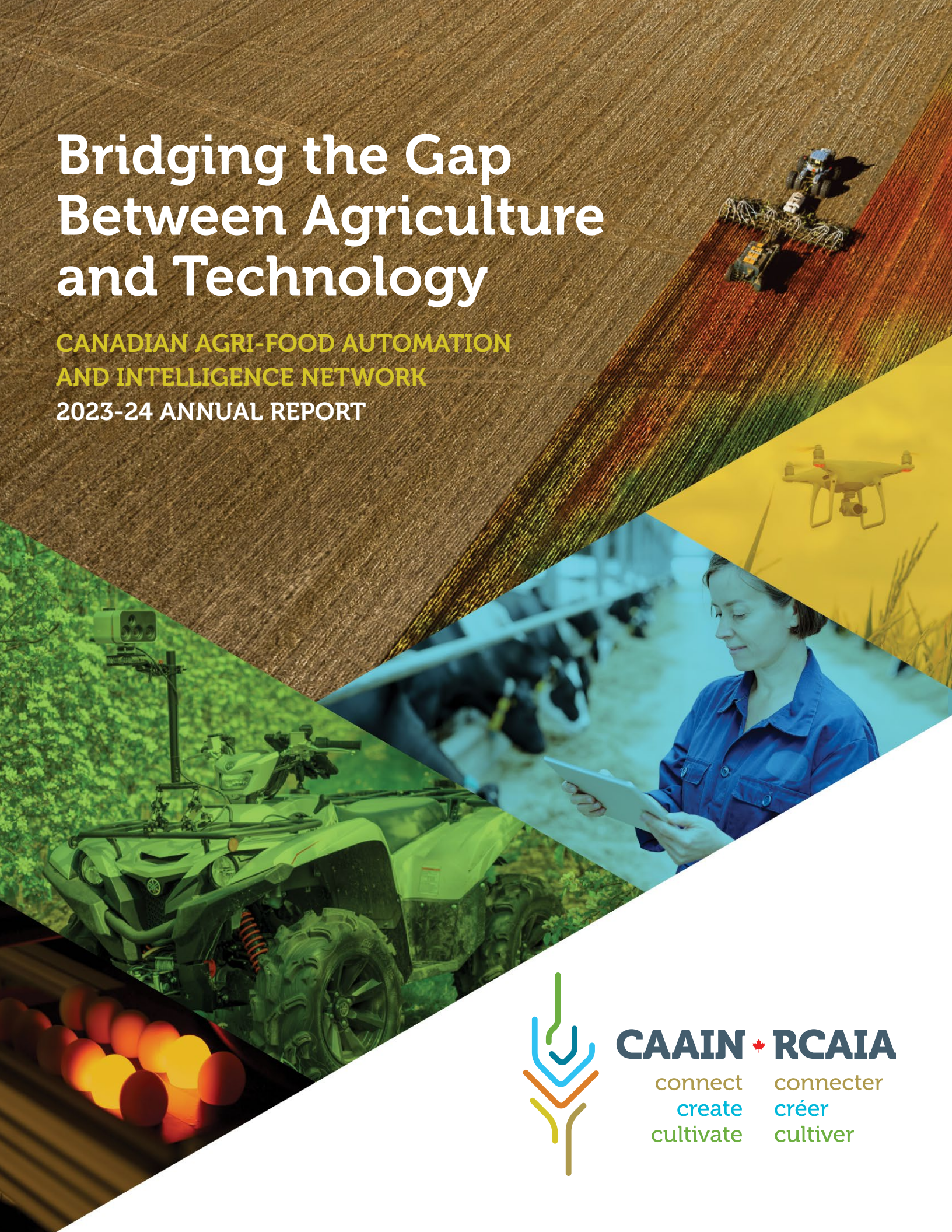


# Bridging the Gap Between Agriculture and Technology

CANADIAN AGRI-FOOD AUTOMATION  
AND INTELLIGENCE NETWORK  
2023-24 ANNUAL REPORT



**CAAIN**  **RCAIA**

connect  
create  
cultivate

connecter  
créer  
cultiver



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CANADIAN AGRI-FOOD AUTOMATION AND INTELLIGENCE NETWORK  
2023-2024 ANNUAL REPORT

## Our Vision

We are Canada's leading AgTech innovation network.

## Our Values

- Community
- Accountability
- Respect
- Excellence

## SHAREHOLDERS

- Marco Coppola
- Rollie Dykstra
- Hubert Lau
- Patrick Machacek
- Ian Potter

## BOARD OF DIRECTORS

- Laura Kilcrease (Chair)
- Stuart Cullum (Co-chair)
- Micheline Ayoub
- David Bailey
- JoAnne Buth
- Bethany Deshpande
- Cornelia Kreplin
- Chris Paterson
- Robert Saik
- Deb Stark
- Fred Wall
- Rickey Yada

## TEAM CAAIN

- Darrell Petras  
CEO
- Tracy Bowers  
Executive Assistant
- Garson Law  
Program Manager
- Patience Palmer  
Program Manager
- Julie Thibeault  
Finance Manager
- Eric Morin  
MarComm Manager
- Ryan Furtas  
Knowledge & Networks
- Preeti Choudhary  
Accounting Coordinator
- Lakota Bowers  
Administrative Assistant

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## Message From the Chair

Agriculture may be the oldest industry in human history. We've always sourced or produced food to sustain our life and community. It's also a sector that sees continual change and evolution and technology has been a major factor. Multi-million-dollar farm equipment, drones that monitor growing conditions, and AI-powered cameras that document animal health show how far the agriculture sector has come.

Be thankful that our agri-food sector continues to evolve in lockstep with the need to feed our country and the world.

The Canadian Agri-Food Automation and Intelligence Network (CAAIN) exists to support such progress, extending beyond our nation's farmers and encompassing Canada's entire agri-food industry. And just like the sector, CAAIN is transitioning. We are approaching our fourth year of funding the development of emerging agtech with a clear focus on the future of food production.

Across Canada and beyond, agriculture is facing multiple challenges. Climate change is impacting soil and related growing conditions from coast-to-coast. Rising input costs and supply chain disruptions challenge profitability and create additional logistic concerns. In the face of these issues, bringing innovative technologies to market in this vital industry remains as important as when we launched CAAIN.

The global population is forecast to reach more than nine billion people by 2050. Canada has 14 trade agreements with 51 countries related to agriculture, providing access to markets that are home to billions of people.

With its tri-part focus on automation and robotics, data-driven decision-making and the validation and demonstration of emerging knowledge and technology, CAAIN is bridging the divide between agri-food companies and technology firms. Agri-food producers and primary processors are seeking proven technologies to modernize operations during these uncertain economic times. But they need trusted facts and data. This is why CAAIN is engaged in development of smart farm networks that can validate and demonstrate innovative products destined for domestic and international markets. This work will continue in the next year.

On behalf of the board of directors, I want to thank Cornelia Kreplin for putting her retirement on hold and agreeing to serve as interim CEO this past year. This prepared the organization for the arrival of our new CEO, Darrell Petras, who joined us in August 2023. He brings a stellar background in the technology and innovation sector, anchored by deep agricultural roots and passion for the sector. Through Darrell's leadership, we look forward to continued funding from the Government of Canada and evolving our mandate of research and innovation that drives increased precision, productivity, and value for agricultural producers and primary food processors.

In 2024 we will be working with the Government of Canada on the next evolution of CAAIN. Our board looks forward to these discussions and to providing guidance and direction for the future. We will continue to connect, create, and cultivate support for innovators, agri-food producers and entrepreneurs who are helping Canada's agri-food sector advance its global standing.

**Laura J. Kilcrease, C.M.A., MBA**  
**Board Chair, Canadian Agri-Food Automation and Intelligence Network**



## Message From the CEO

Joining CAAIN in August 2023, I knew I would be working with agricultural innovation leaders—within CAAIN and through its network and partners. The reality has far exceeded my expectations. My team is a critical element of our current success, and several of our 35 funded projects have concluded successfully, while the rest show great promise. Our approach to building a community, supporting technologies while activating private capital, and driving the adoption of innovation through smart farms, advances innovation from prototype to the cusp of commercialization. In short, we are a necessary part of the agtech ecosystem.

In my first six months as CEO, CAAIN's brand has grown significantly as we continue gaining recognition for leadership in the digital agriculture space.

Our accomplishments over the past year include finalising agreements with our 2023 Open Competition and Livestock Innovation Program recipients. We will invest more than \$5.8M in 11 new initiatives with footprints in seven provinces. What's particularly important is the range of agricultural areas they touch on, everything from smart barns to beekeeping. As a result, CAAIN's support will continue its broad-based relevance, effectively impacting the lives of Canadians from coast to coast to coast.

The 2023-24 fiscal year also saw us host our first solo in-person event, launching a new series we call CAAIN Presents. This inaugural session, The Future of Agriculture: An Evening with McKinney and McConnell, sold out, attracting over 250 of Canada's leading agri-food professionals and leaders. The fireside chat and reception that followed drew rave reviews, and overnight our reputation grew more than we could have hoped.

Also of note in 2023-24 are the eight projects that wrapped up their funded activities, joining three projects that were completed in fiscal 2022-23, and a fourth that ended in 2021-22::

- The Olds College-led *Evaluation and Improvement of Economic, Environmental and Logistical Benefits of Autonomous Agricultural Equipment Operation for Broad Acre Crop Production*
- JCA Industries' *Agricultural Autonomous Controls Framework*

- MatrixSpec Solutions'
  - *Optimizing Hyper-Eye: An Integrated Solution for Assessment of Fertility and Gender of Pre-incubated Eggs*
  - *Development of Automated Smart Device for Pork Marbling Assessment*
- VeriGrain's™ *Development, Validation, and Commercialization*
- Farm Health Guardian's *Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture*
- Grain Discovery's *Field to Glass - The Next Generation of Barley Traceability*
- SoilOptix: *Advancing Processes to Predicting Soil Organic Carbon*

The completion of their excellent work was balanced by the addition of the 11 2023 projects noted above, meaning we continue to push the agricultural innovation envelope.

I believe 2024 will see us take even greater strides, as we build a stronger CAAIN program offering and develop new collaborations with public- and private-sector organisations. Success breeds success, and we look forward to building on our excellent track record by growing our network, funding more projects, and fine-tuning our smart farm program. I hope you'll join us as we continue to advance agricultural technology in Canada.

**Darrell Petras, P.Ag.**  
**CEO, Canadian Agri-Food Automation and Intelligence Network**

# CAAIN's Core Functions

**CAAIN has become the necessary nationwide agtech hub connecting the agri-food and technology sectors.**

Many farmers have brilliant ideas of how to improve primary agriculture but lack the technological know-how to take their ideas from concept to reality.

Similarly, Canada is home to extraordinary technical professionals—software and app developers; mechanical, electrical, electronics, and civil engineers—who are unaware that the technology they are creating might have relevance to the agri-food sector.

By providing farmers and tech professionals the means and opportunity to connect and collaborate, CAAIN is facilitating the growth of a robust agtech sector that will improve outcomes for farmers in Canada and around the world. And never has there been a greater need for global agricultural innovation.

We also fund research into technological solutions to the agri-food sector's most important challenges, as well as supporting innovation that takes advantage of sectoral opportunities to improve profitability and productivity and enhance environmental sustainability.



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**Our efforts make possible the development of extraordinary innovation with the potential to impact the nation economically, environmentally, and socially.**

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## Growing CAAIN's Network

**CAAIN's network portal membership stood at 490 as of March 31, 2024.**

In early February, we hosted a sold-out in-person event that served as a lead-in to the popular annual FCC-led Future of Food conference. CAAIN Presents: The Future of Food—An Evening with McKinney and McConnell, attracted over 250 of Canada's leading agri-food sector professionals. Planning is already underway for a 2025 CAAIN Presents event.

CAAIN's social media footprint continued to expand, with LinkedIn followers surpassing 2,300 and the Twitter/X feed connecting with 750 individuals and organizations.

CAAIN's weekly summary of the latest agri-food stories, "News Vine," is sent to a weekly audience of over 1,000 agtech sector stakeholders.

# COMPLETED PROJECTS

One of our two core functions is to support the development of promising agtech that shows the ability either to solve a Canadian agri-food challenge or to improve the sector by seizing an opportunity.

Over the past three-and-a-half years, we have run seven funding competitions, and distilled hundreds of funding applications into 35 outstanding projects to which we have committed over \$32M of Government of Canada money, while activating almost \$70M in private-sector funding, bringing the aggregated total value of our portfolio to roughly \$100M.

Of these 35 projects, 12 have run their course, and the results have been nothing short of spectacular.

# Automation & Robotics

## COMPLETED PROJECTS

### Artificial Intelligence (AI) Development for Autonomous Agriculture Application

COMPLETED IN 2022-23

Led by **Raven Industries**, the project team advanced the OMNiPOWER™ Platform by researching and creating various software and AI functions to advance the performance of an autonomous platform designed to carry traditional farm equipment such as seeders and sprayers.

### Agricultural Autonomous Controls Framework

COMPLETED IN 2023-24

Led by **JCA Technologies**, this project applied an autonomous framework on which to build customized machines, thereby helping OEMs overcome the innovation barrier impeding the development and adoption of their technology.



### Development of Automated Smart Device for Pork Marbling Assessment

COMPLETED IN 2023-24

Led by **MatrixSpec Solutions**, this project developed an upgraded prototype of Marbling Meter, a proprietary automated loin chop marbling assessment tool.

### Optimizing Hyper-Eye: An Integrated Solution for Assessment of Fertility and Gender of Pre-Incubated Eggs

COMPLETED IN 2023-24

Led by Montreal-based **MatrixSpec Solutions Inc.**, the Hyper-Eye project uses a non-invasive blend of hyperspectral imaging, artificial intelligence, and machine learning to determine the fertility and gender of pre-incubated eggs.



### Evaluation and Improvement of Economic, Environmental and Logistical Benefits of Autonomous Agricultural Equipment Operation for Broad-Acre Crop Production

COMPLETED IN 2023-24

**Olds College** tested the Raven Industries' OMNiPOWER™ Platform in real-world conditions to demonstrate and validate its viability in Western Canadian agronomic conditions.



# Artificial Intelligence (AI) Development for Autonomous Agriculture Application



## Major Benefits

### Economic

Reduced costs (labour, inputs, fuel, damaged equipment and property), enhanced productivity, increased profitability

### Environmental

Decreased fuel use, thereby reducing GHG emissions

### Social

Created skilled jobs in the agriculture and technology sectors



## Top Ecosystem Impacts

Developed new technologies for machine learning, computer vision, and autonomous navigation

Filed of two provisional patents

- Multi-machine co-ordination in autonomous agricultural operations
- Augmented human interaction with autonomous agricultural vehicles

Created of 12 commercialization agreements



## HQP Positions

- 6 maintained
- 3 created



## Work Integrated Learning (WIL) Opportunities

- 20 months of student internships



## Academic Collaboration

- University of Regina
- Olds College

**\$1,507,408**  
CAAIN  
Investment

**\$4,152,732**  
Total Project  
Value



CAAIN supported our business and our project from its humble beginnings, straight through material changes to our business in the form of multiple acquisitions. Having a partner like CAAIN, one willing to adapt alongside us to changing environments, allowed us to grow and evolve without introducing further obstacles or disruptions to our projects. While our CAAIN project has concluded, we will always value their contributions to our business and their continued efforts to support other businesses and academic institutions in their journeys to maintain Canada's position as a global leader in agriculture and agtech.



**Marco Coppola, Project Lead, Artificial Intelligence (AI) Development for Autonomous Agriculture Application**



# Data-Driven Decision-Making

## COMPLETED PROJECTS

### Automating Traceability, Creating a Digital Manifest, and Providing Transport Assurance Via Generic Data Enablers

COMPLETED IN 2021-22

Led by **Transport Genie**, this project will introduce accessible, scalable technology offering simple, integrated tracking and reporting to the Canadian live-haul transportation industry.



### GeoAI Framework for Automating Manual Observation Associated with Wheat Production (Phase 1)

COMPLETED IN 2022-23

Led by **Super GeoAI Technologies**, a team of agri-food companies and academic institutions employed diverse technologies to develop a geospatial artificial intelligence (GeoAI) platform proof-of-concept that automates manual wheat-production observations. The ultimate project goal is to create and market a scaled-up, all-in-one cloud platform that automates grain grading, increasing the productivity, profitability, sustainability, and competitiveness of Canadian grain producers.

“

VeriGrain's products are based on leading-edge technologies and require a substantial amount of product development and customer field testing. The CAAIN funding allowed us to accelerate the development process and expand the scope of the development, which resulted in a product with broader capabilities.



**Ken Jackson, Project Lead, VeriGrain™**  
Development, Validation, and Commercialization

”

### VeriGrain™ Development, Validation, and Commercialization

COMPLETED IN 2023-24

Led by **Alpha Phenomics**, this project evaluated and validated the use of various new technologies to provide accurate, real-time assessment of cattle growth, body fat, carcass composition, and industry-specific information on the health and wellbeing of cattle. Advancing the beef industry's development, value, and use of automation, blockchain, and artificial intelligence should increase and improve sector-wide data collection and sharing, which will optimize production and minimize waste and loss.

### Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture

COMPLETED IN 2023-24

Led by **Farm Health Guardian**, this project will compare features and capabilities of existing technologies to identify a cost-effective sector-wide technological solution capable of generating real-time track-and-trace data to mitigate the effects of disease outbreaks in the livestock and poultry industries.

### The Utilisation of 3-D Real-Time Multispectral Cameras to Identify the Liveweight, Optimal Slaughter Weight and Carcass Weight in Pre-Slaughter Cattle

COMPLETED IN 2022-23

Led by **Farm Health Guardian**, this project will compare features and capabilities of existing technologies to identify a cost-effective sector-wide technological solution capable of generating real-time track-and-trace data to mitigate the effects of disease outbreaks in the livestock and poultry industries.

### Field to Glass - The Next Generation of Barley Traceability

COMPLETED IN 2023-24

Led by **Grain Discovery**, this project seeks to build an end-to-end digital system that uses blockchain technology to trace Canadian-grown malt barley through every stage of the value chain.

“

CAAIN's support of Grain Discovery marked a pivotal moment in the company's trajectory, serving as the cornerstone of our success. This infusion of capital not only enabled the crucial development of our innovative platform but also laid the groundwork for scaling our operations and reaching a broader market. The funding's significance cannot be overstated; it was a catalyst that propelled us from a concept to a competitive force in the agricultural technology sector.



**Rory O'Sullivan, Project Lead, Field to Glass –**  
The Next Generation of Barley Traceability

”

“

Thanks to the invaluable support from CAAIN, **SoilOptix®** has been able to pioneer groundbreaking advancements in high-resolution carbon mapping, harness the power of soil sensor data across diverse soil types, and develop cutting-edge automated systems and infrastructure. This funding has not only propelled our research forward but has also paved the way for transformative solutions in agriculture and environmental sustainability. Together, we're cultivating a brighter, more data-driven future for our planet.



**Zach Harmer, Project Lead, SoilOptix®:**  
Advancing Processes to Predicting Soil Organic Carbon

”

### SoilOptix, Advancing Processes to Predicting Soil Organic Carbon

COMPLETED IN 2023-24

This project will quantify Soil Organic Carbon (SOC) by using topsoil mapping technology that uses the natural emission of gamma radiation from the ground along with standard soil sampling practices within agriculture to build high resolution soil nutrient, texture and other property maps.





COMPLETED DATA-DRIVE DECISION-MAKING  
PROJECT SPOTLIGHT

# Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture



## Major Benefits

### Economic

Farm animal diseases take significant financial tolls that this project will mitigate. For example:

- Porcine reproductive and respiratory syndrome costs +/- \$184M per year in Canada
- Porcine circovirus associated disease cost Canada \$562M over 5 years, including \$150M in lost farm revenue, and \$268M in increased veterinary and recovery expenditures
- Foot and mouth disease outbreak would cost Canadian producers \$38B to \$5B
- The current outbreaks of highly pathogenic avian influenza have cost the US government roughly \$661M with the slaughter or more than 58 million birds; poultry farmers have lost more than \$1B

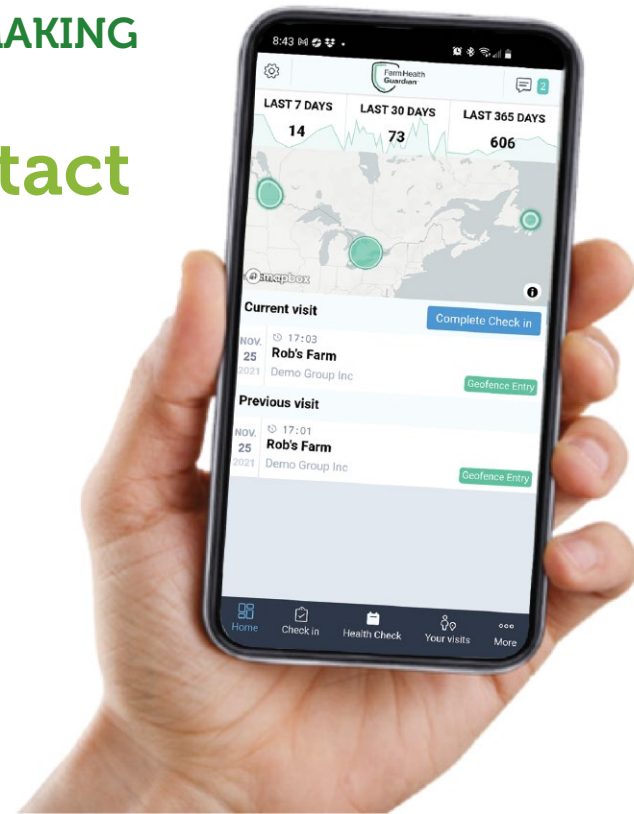
### Social

The stress felt by producers and processors is significant, as is the decreased consumer confidence associated with challenges affecting the agri-food value chain



## Academic Collaboration

- University of Guelph



The support from CAAIN made it possible for Farm Health Guardian to test and develop our biosecurity technology with farmers and food companies across Canada. The software and hardware technologies we developed during this project are applicable for both boosting biosecurity to prevent disease, and for a much faster response when it does occur.

**Rob Hannam, Project Lead, Digitizing Fomite Contact Tracing to Mitigate Pathogen Spread in Agriculture**



**\$136,545**  
CAAIN  
Contribution

**\$393,794**  
Total Project  
Value



# Smart Farm Network Update

CAAIN continues to develop a system of diverse smart farm networks that will demonstrate the latest agtech in a range of agroclimatic regions, effectively allowing farmers from across Canada to determine that value of adopting the innovations. The farms will be linked by an online application CAAIN has commissioned, and which we will seek to commercialise as a means of collecting and synthesising data.

In December 2023, CAAIN launched a competition inviting interested organisations to join the smart farm network of networks. CAAIN is using the Pan-Canadian Smart Farm Network as a template for its own smart farm network development. Final decisions will be rendered in June 2024.



We are so grateful for CAAIN's financial support towards the development of the Pan-Canadian Smart Farm Network. The network connects smart farms in Canada, all with different operational models and expertise, but all with the same goal: accelerate the development and adoption of ag tech and best practices to improve productivity and sustainability of crop and livestock production in Canada. CAAIN helped us build a connection among smart farms, researchers, producers, industry partners, and stakeholders across four provinces in Canada – and we are just getting started.

**Dr. Joy Agnew, Vice-President of Research at Olds College of Agriculture & Technology & Principal Investigator for the Pan-Canadian Smart Farm Network**



# Results

## BY THE NUMBERS



**35**

Projects  
Funded



**\$32M**

Committed



**\$100M**

Total  
Project Value



**\$15M**

Partner  
Cap Ex



**\$26M**

Partner R&I  
Investment



**100+**

Project  
Partners



**500**

Network  
Members



**3,200+**

Social Media  
Followers



**7**

Funding  
Competitions



**\$1.2M**

Commercialization  
Revenue



**156**

HQP Jobs  
Created /  
Maintained



**29**

Work Integrated  
Learning  
Positions



## Looking Forward

In the fall of 2023, CAAIN staff reached out to ISED to look at how to build on the momentum we have created in our first four years of operation. Our hope is to continue building our network while increasing the support we provide to the brilliant Canadian innovators and entrepreneurs developing much needed agricultural technology.

In addition to leveraging the momentum we have generated, we are proposing to add additional services, making us a provider of comprehensive tools used to drive technology development and adoption in Canada. These include:

- Offer our project management services to third parties
- Develop and market an online communications platform
- Advisory services
  - Use our project track record to attract even more private-sector investment
- Deliver a software solution that will address a data aggregation gap in the agtech marketplace
- Take a greater role in smart farm activity while reaching more commercial farmers

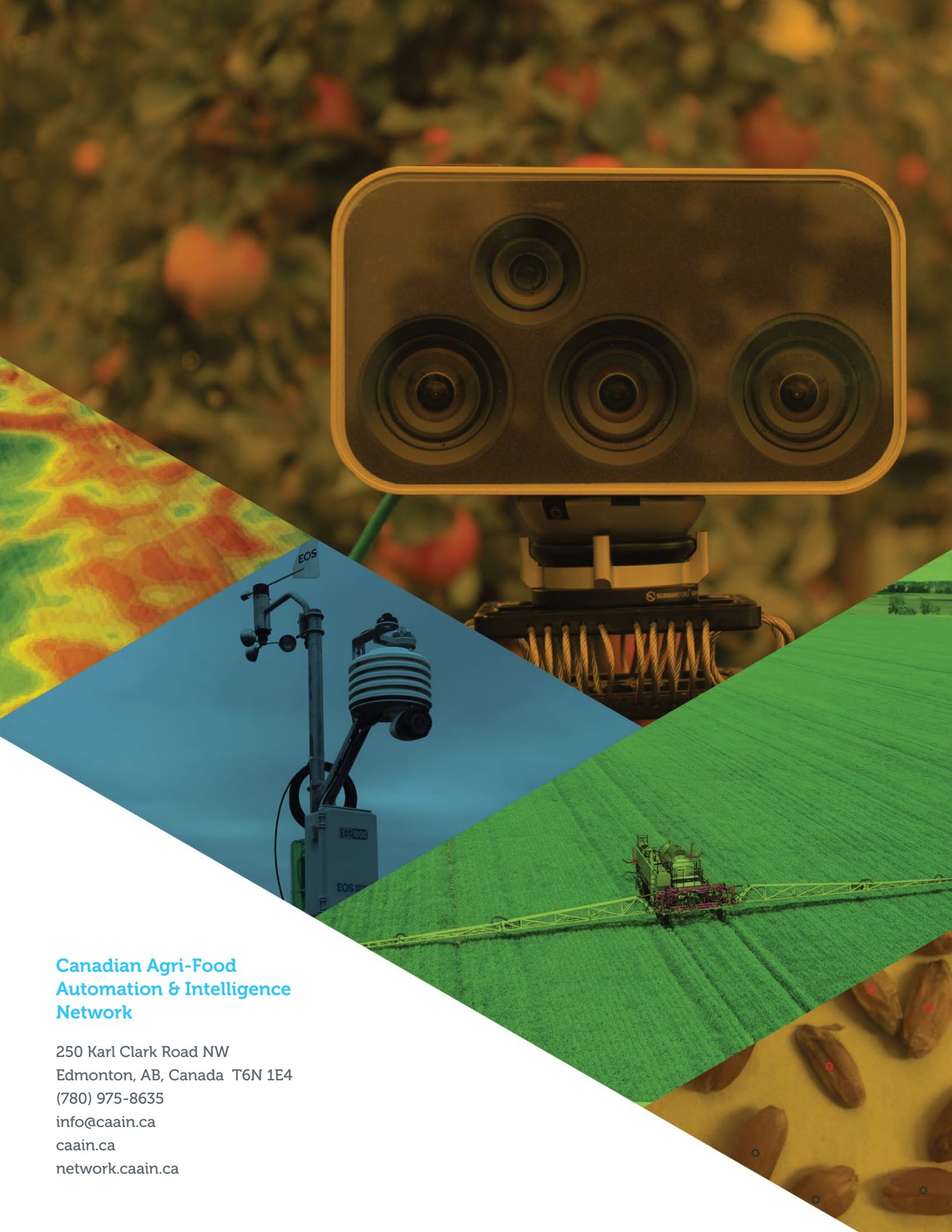
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## Photos courtesy of:

CATTLEytics Incorporated  
Centre de développement du porc du Québec  
Croptimistic Technology Inc.  
ecoation Innovative Solutions Inc.  
Farm Health Guardian  
Grain Discovery Corp.  
Haggerty AgRobotics  
JCA Industries  
Lakeland College  
MacDon Industries Ltd.  
MatrixSpec Solutions Inc.  
mode40 Ltd.  
Mojow Autonomous Solution Inc.  
Nectar Technologies Inc.  
Olds College  
P&P Optica  
PIP Lethbridge Inc.  
Raven Industries, Inc.  
SoilOptix Inc.  
Super GeoAI Technology Inc. Transport Genie Ltd.  
VeriGrain Sampling Inc.  
Vivid Machines Inc.

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