



CANADA'S DIGITAL  
TECHNOLOGY  
SUPERCLUSTER

# Digital Innovations in Agriculture

*Agri-Food Research and Innovation Summit*

[digitalsupercluster.ca](https://digitalsupercluster.ca)

*May 2021*



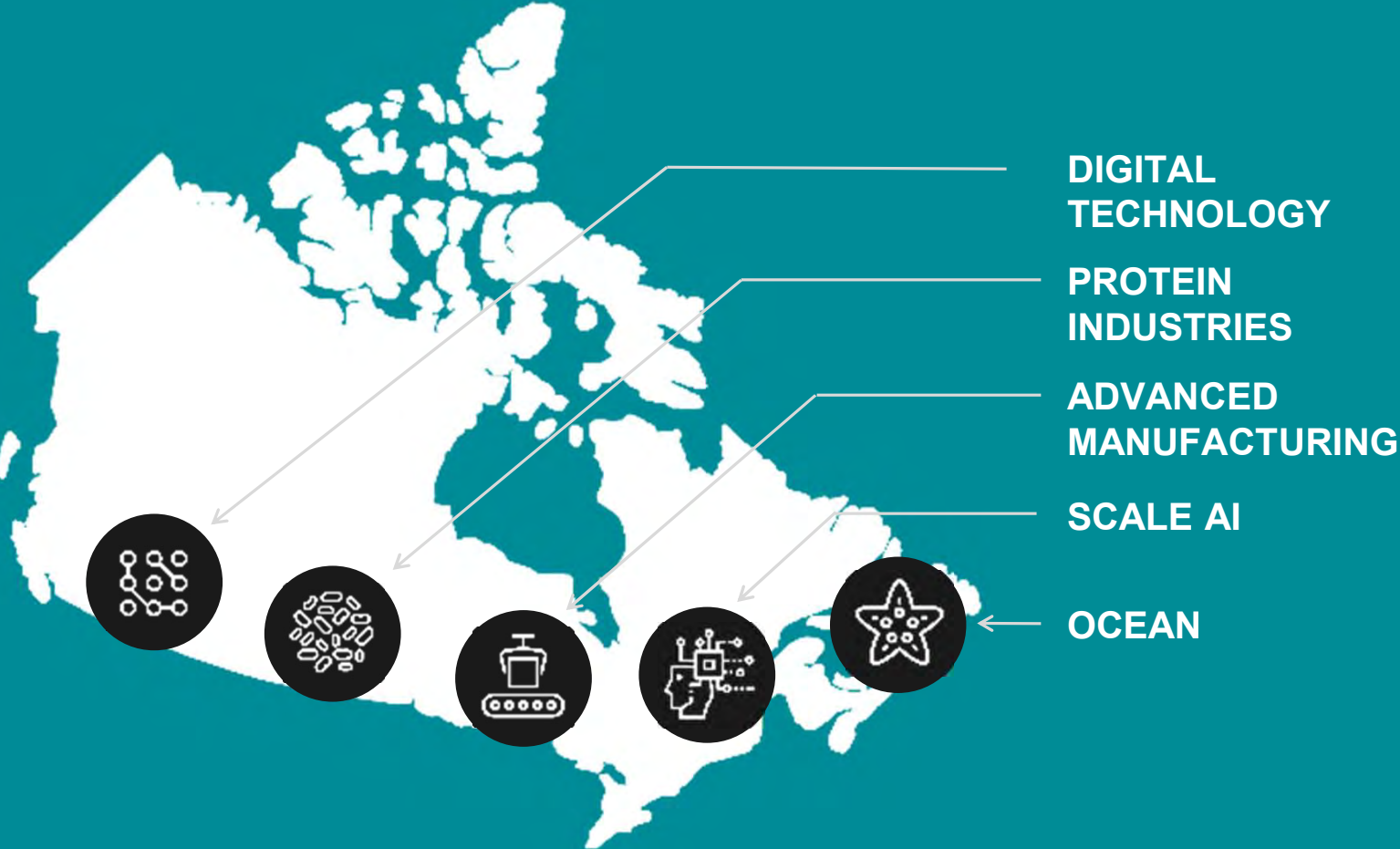


# Welcome

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Welcome to our Supercluster community of diverse organizations who have come together to develop world-leading products and capabilities that no single organization could achieve on its own. Guided by our core values that celebrate diversity and collaboration, we believe by bringing together the best, we will set Canada on the path to becoming a world leader in the digital economy.

# Canada's Superclusters





## We Are a New Model For Innovation

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- Harnessing the power of collaborative Canadian R&D
- Developing products and platforms to enable the digital transformation of strategic sectors in Canada's economy
- Unlocking Canada's global leadership through the development, deployment and scaling of Canadian-made technologies

# The Digital Imperative



Digital ecosystems will represent more than \$60 trillion in revenue by 2025, or more than 30% of global corporate revenue <sup>(24)</sup>



of new business value over the next decade will be through digitally enabled platforms <sup>(27)</sup>



of companies say they either are experiencing skills gaps now or expect them within a few years <sup>(42)</sup>



# THE GLOBAL DATA OPPORTUNITY

**Enterprises, globally, will spend over  
\$2 trillion on digital transformation \***

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\*IDC report

# A Diverse Pan-Canadian Community

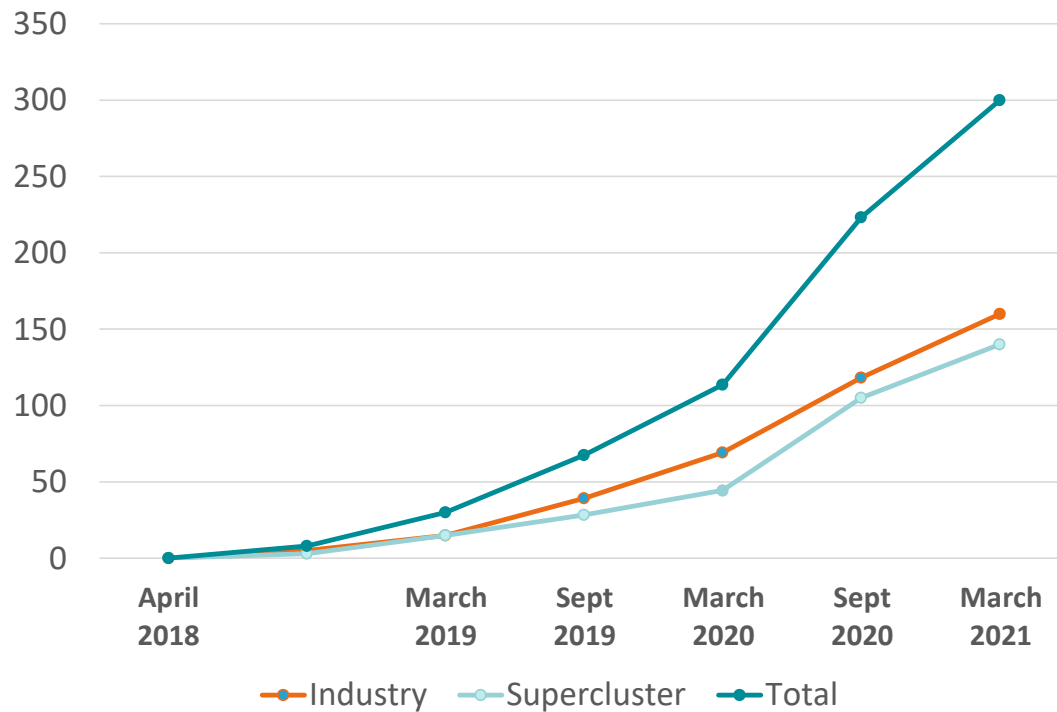
950+ organizations and growing, including:

- Startups
- Small, medium enterprises (SME's)
- Large companies
- Multi-nationals
- Universities
- Institutes
- Colleges
- Research Institutions
- Non-profits
- Government agencies



# Our Investment Portfolio

## Investment Profile



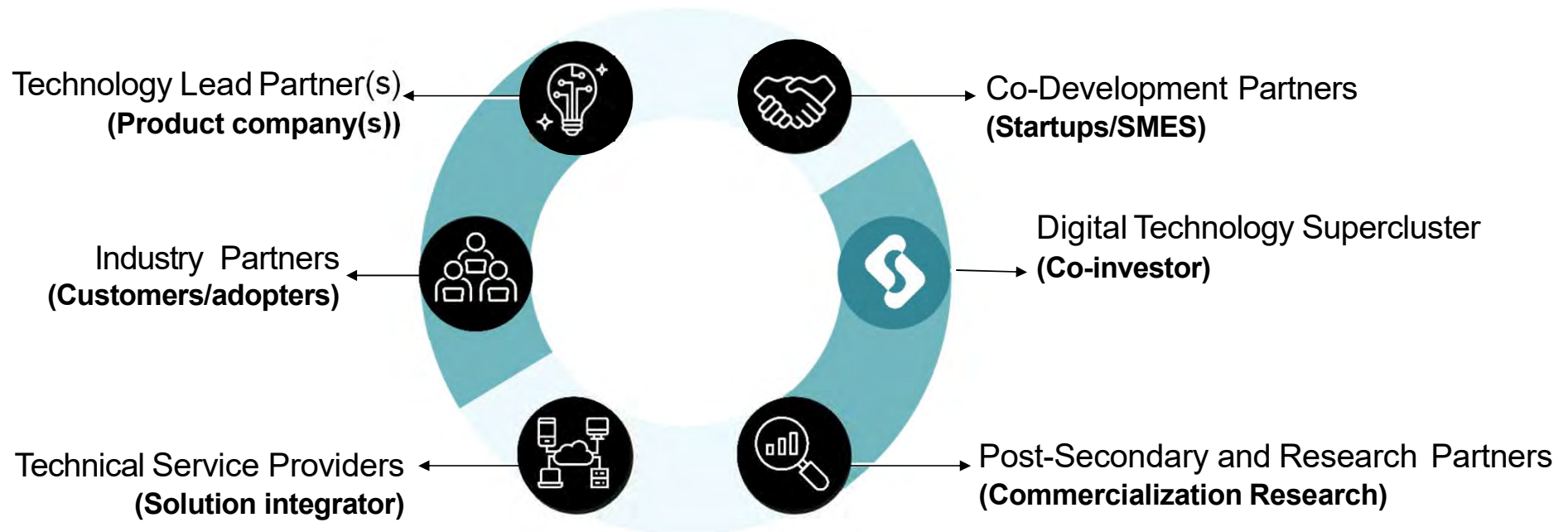
- Portfolio valued at close to **\$300M in 80+ projects**
- Attracted over **\$160M** from industry
- **Committed in full** by March 2021, two years ahead of plan

\*As of September 2020

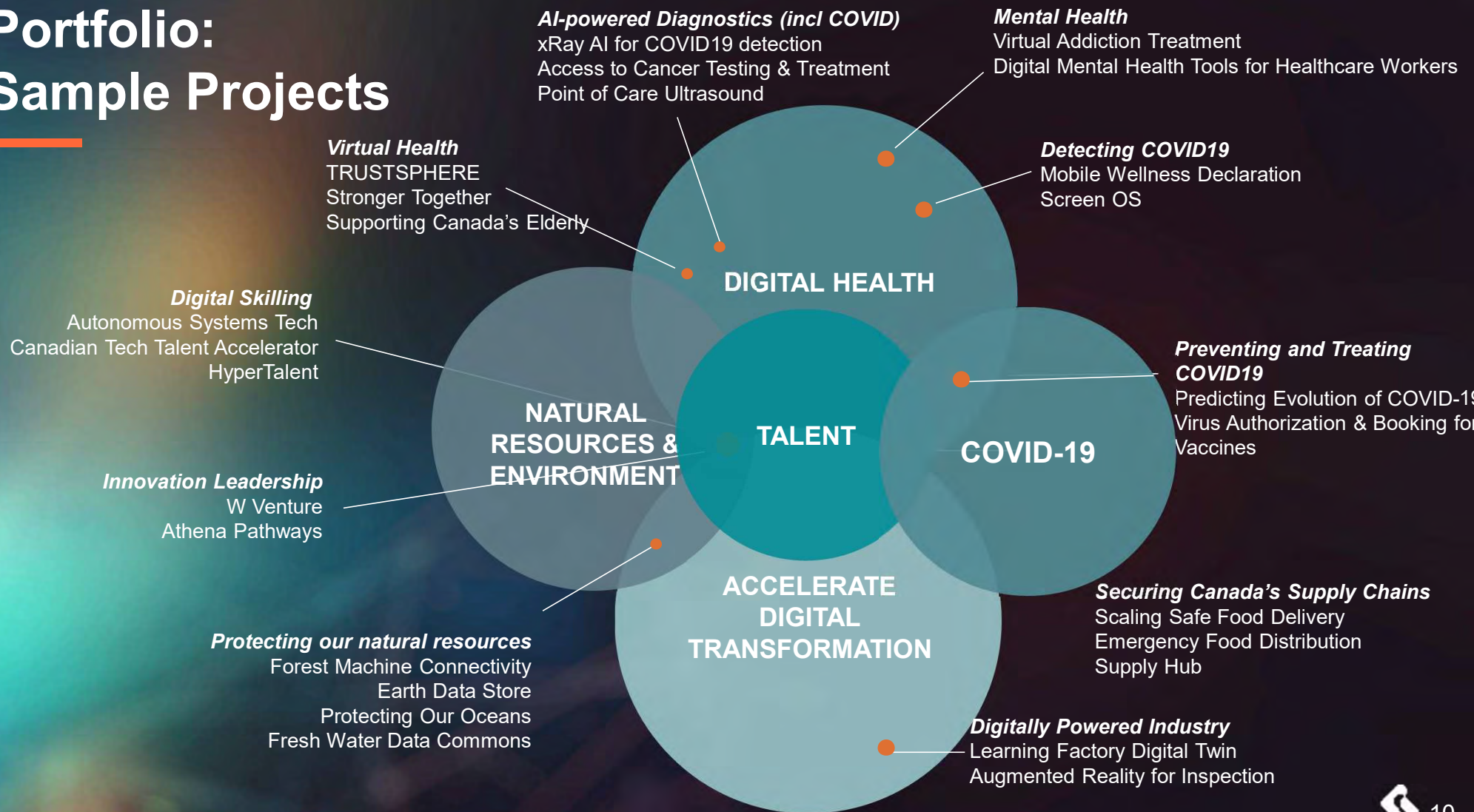


# Our Collaboration Model

We employ a new innovation model that is led by industry and connects innovators, academia and customers to commercialize research and create and keep Canadian-owned IP.



# Portfolio: Sample Projects







# Digital Innovation in Agriculture



# The Global Agriculture Opportunity

As the world approaches a total population of 8 billion people, it has become critical to re-define our approaches to agriculture for a sustainable future.



**Exploring complex challenges that can lead to big breakthroughs in Ag**



**Developing analytics-ready data and tools to correlate in-field activities, field terrain, crop and soil**

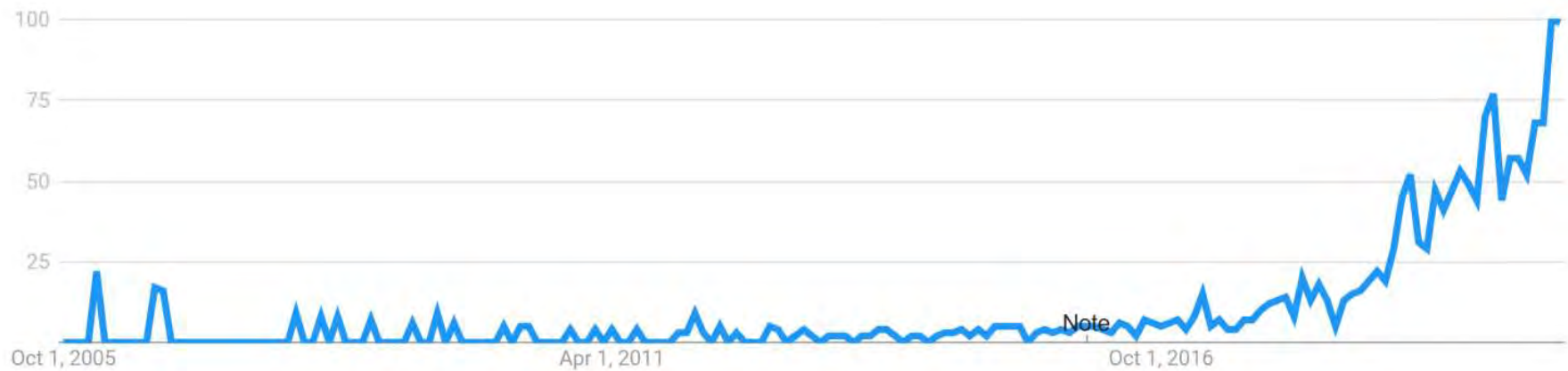


**Digital innovations that empower regenerative and sustainable agriculture**



# Regenerative Agriculture

Google trends since 2005





DATA COMMONS

SUPERCLUSTER PROJECTS

# Precision Agriculture to Improve Crop Health

Climate change is a threat to food security, with increasing challenges from pests and pathogens that destroy crops.

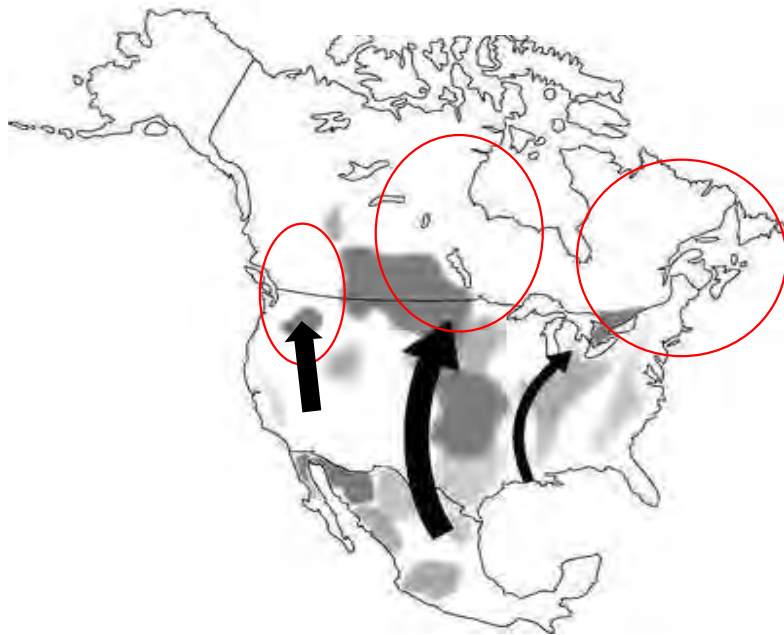
This project will use computational power to prevent pests and protect food crops.





# Climate Change Affects Crop Health

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Canada exports more than \$7 billion worth of wheat every year.

As the climate warms, diseases such as wheat rust spread further north and create an increasing threat to production.

At the same time, increasing the use of pesticides brings risks to the environment.

# Resulting in Crop Loss

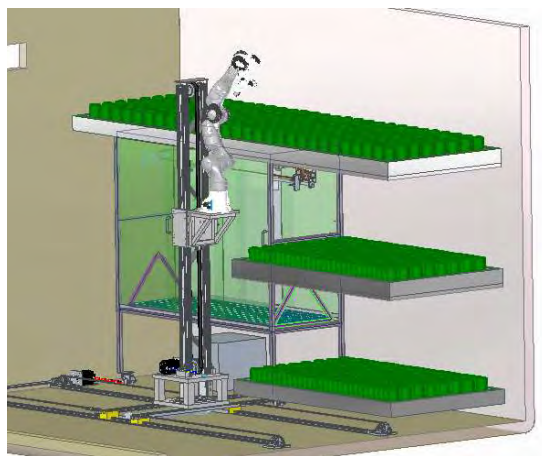
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Wheat Rust (*Puccinia triticina*) infection on susceptible wheat (0 to 7 days)



The project is initially focusing on leaf rust disease, which is caused by fungal infections and attacks some of Canada's most important crops, including wheat and barley.

# Solving through Precision Agriculture



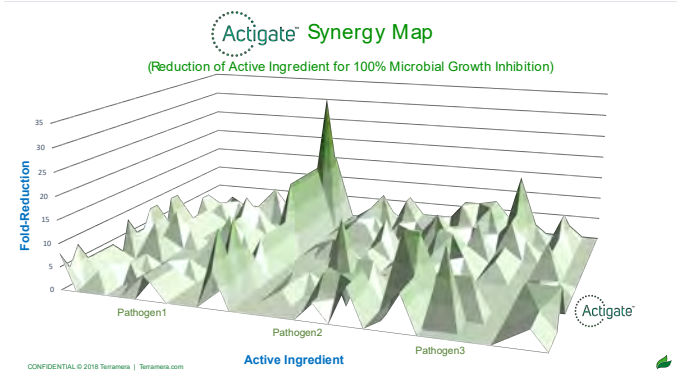
This collaborative project aims to develop new pest and pathogen controls through the use of **computational biochemistry, genomics, machine learning and robotics.**

Robotics and Machine Vision will be used to follow disease progression automatically

Genomics will follow changes in gene expression by host and pathogen

Machine Learning will interpret changes in crop health and recommend new formulations based on previous performance

In combination, this will quickly identify and test new pest management formulations and determine their ability to attack specific fungi on specific crops





# Solving through Precision Agriculture

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DATA COMMONS

# SUPERCLUSTER PROJECTS

## Standard Data Platform for Autonomous Agriculture *(In Development)*

This project will create the world's first interactive operational planning platform that will combine data about fields, farms, machinery, soil, water, terrain, and weather with a digital twin of a specific farm and a suite of interactive monitoring and planning tools.

verge

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Technologies

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QT  
QuantoTech

SFU  
SIMON FRASER  
UNIVERSITY



Coutts Agro (SK)



Fraser Berry Farms (BC)

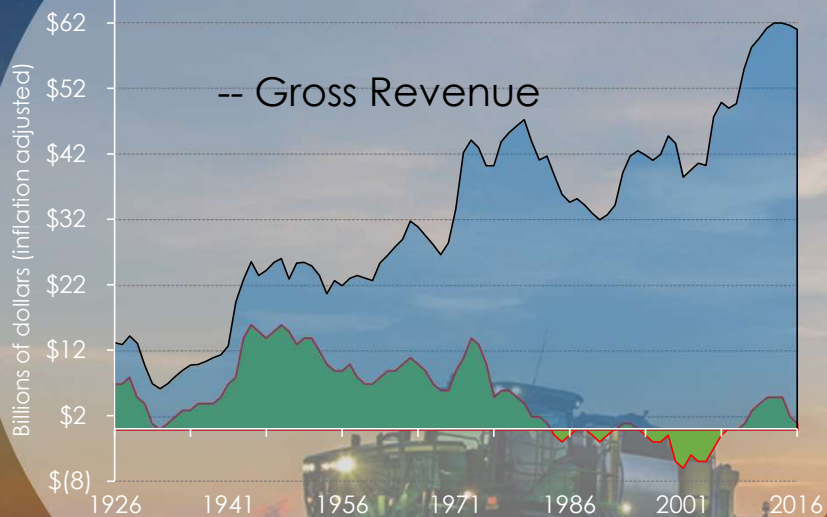




# The combination of advancing climate change and an already-declining net farm income is a perfect storm that threatens farmers' livelihoods and our food supply.

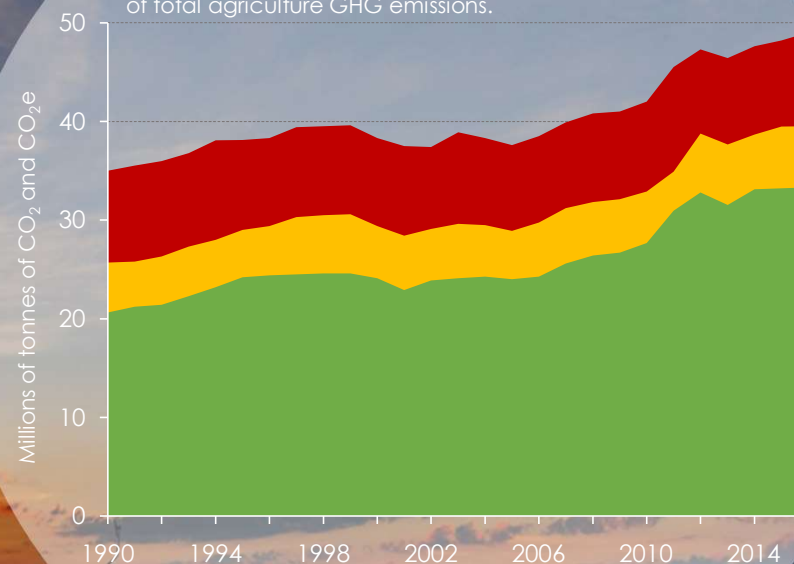
### Net Farm Income and Gross Revenues

Region in blue represents the difference between farmers' gross revenues and net incomes – their expenses.



### GHG Emissions in Agriculture

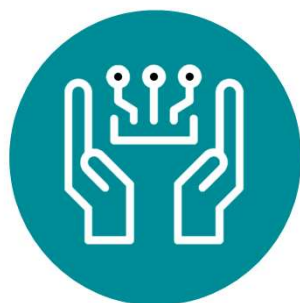
Fertilizer, machinery, and fuel accounts to more than 50% of total agriculture GHG emissions.





# Standard Data Platform for Autonomous Agriculture

This collaborative project aims to support growers to better plan farming operations by making data-driven decisions on economic and environmental factors using:



## **Digital Twin of the Farm**

by automating the characterization of the fields to fully digitize and define the closed course of the field



## **Data Commons Framework** that

fosters innovative data reuse, integration, and visualization to enable characterization of fields, farms, machinery, soil, water, terrain, and weather,



## **Farm Operations Planning Platform**

that simplifies operations planning to reduce in-field decision making.

By characterizing fields and machinery in a digital format, growers will be able to reduce in-field decision making, increase net income and reduce emissions

# Digital Supercluster – Standard Data Platform for Autonomous Agriculture

## URGENT NEED

The combination of advancing climate change and declining net farm income is a perfect storm that threatens farmers' livelihoods and our food supply. Reductions to agriculture productivity or sudden losses of crops will have ripple effects including increased food prices and greater food security. Growers need to better plan their farming operations, making data-driven decisions on economic and environmental factors. To help growers increase net income and reduce emissions, there is an urgent need to characterize fields and machinery in a digital format to aid planning.

## OPPORTUNITY

Besides self-driving capability, nearly the entire problem of autonomous is the digitization of the environment to reduce in-field decision making. How do you execute field operations when you aren't within physical proximity to the field?

### Digital Twin of the Farm

An AI-powered app that enables users to create a 3D model of the farm by automating characterization of fields, terrain, crop, weather, and soil.

### Equipment Fleet Management

Design equipment fleet size, composition, and allocation of units for a given field operation. Use multiple layers of data to manage equipment fleet.

### Farm Operations Planning

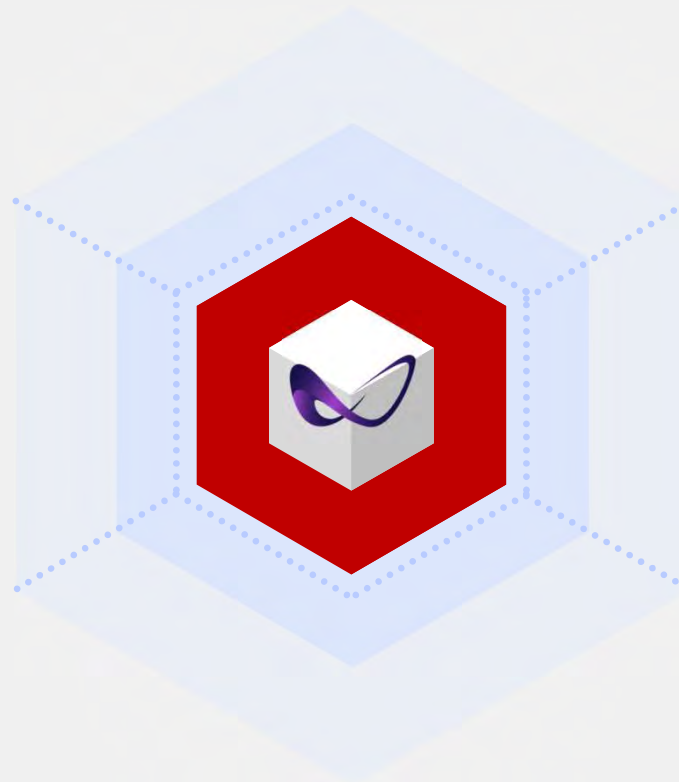
An interactive planning app that helps users plan field operations considering all economic and environmental factors to increase efficiency.

1. A data commons framework that fosters innovative data reuse, integration, and visualization to enable characterization of fields, farms, machinery, soil, water, terrain, and weather,
2. A Digital Twin of the farm by automating the characterization of the fields to fully digitize and define the closed course of the field, and
3. A planning platform that simplifies operations planning to reduce in-field decision making. This means, providing true performance insights that demonstrate a very clear ROI to users in a concise and easily accessible manner.

# Benefits and Impacts

## INCREASED EFFICIENCY

Increase operational efficiency broad acre, specialty crops, and controlled environment farming.



## AG DATA COMMONS

Foster innovative data reuse, integration, and visualization to characterize fields, crops, soil, machinery, and weather.

## SUSTAINABLE FARMING

Measure soil carbon, model waterflow accumulation & erosion, and create a plan to reduce GHG emissions.

## ECOSYSTEM BENEFITS

Scalable to verticals like Forestry and Mining, create jobs and support SME growth, and increase net farm income.





# CANADA-WIDE, GLOBAL IMPACT

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