

IMPROVE LIFE.

Ontario Agri-Food Innovation Alliance Research Impact Case Study

## Innovation





## **Enabling innovation**

Innovation fuels Ontario's agri-food sector.

Through the Ontario Agri-Food Innovation Alliance, the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) invests in research and innovation that foster creativity and that lead from idea to impact.

The people, places, programs and partners of the Alliance work together to transform research into action through programs, policies, practices and products that benefit the Ontario agri-food sector and rural communities.

Look for these symbols to learn how Alliance investments return value to Ontario.



## **O** People

Our people are innovators, researchers, thought leaders and problem solvers. We work with partners from rural communities and across the agri-food sector to meet challenges and address emerging opportunities for the benefit of Ontario.

## **O** Places

Our places enable research, innovation and laboratory testing. Alliance investment in research centres provides Ontario's researchers with a state-of-the-art platform for innovation.

## Programs

Our programs support discovery, learning and outreach for the benefit of all Ontarians. Programs provide project operating funds to researchers who in turn deliver quality, impactful results, all while training the next generation of agri-food innovators.

## Partners

Our investment in people, places and programs attracts partnerships from across the agri-food sector. Industry, government and academic partners collaborate with U of G researchers to deliver benefits to the entire agri-food sector.

## **Innovating for Ontario**

# From idea to impact

Innovation is the road from idea to impact. This case study explores the impact of innovations enabled in part by OMAFRA investment through the Ontario Agri-Food Innovation Alliance.

Innovation is defined as the transformation or development of Alliance-supported research into a program, policy, practice or product with a commercial or societal impact.

### **Ontario's agri-food industry**

Innovation is critical to the success of farmers and agri-businesses and to the economic and social well-being of Ontario's rural and urban communities.

All numbers are from 2020.

## Making an impact

Biomaterials to the rescue

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Local yeasts and specialty apples advance craft beverage industry

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## **Biomaterials to the rescue**



"In our research, we see waste as a valuable resource for creating new industrial products. Alliance projects have enabled us to partner with industry to enable innovations that matter to consumers and society."

— Dr. Amar Mohanty, professor and OAC Distinguished Research Chair in Sustainable Biomaterials, Department of Plant Agriculture, and Bioproducts Discovery & Development Centre director Bioproducts offer an effective and innovative way to reduce agricultural waste and reliance on single-use plastics and petroleum-based materials. Bioproducts offer a "greener" product derived wholly or partly from a renewable resource. Making these products from agri-food residues and other waste helps divert waste from landfills, which reduces the production of methane, a potent greenhouse gas.

The Alliance has invested in a greener economy in Ontario through research and innovation. Between 2008 and 2020, more than \$11M was invested in bioeconomy research and bioproducts development at the University of Guelph. U of G researchers have developed several bio-based resins used in the world's first certified fully compostable coffee pod, in a durable and lightweight biocarbon-based sustainable composite for car manufacturing and in many other applications, all positioning Ontario as a world leader in bio-based material development.

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## **Biomaterials to the rescue**



**O** U of G

Tier I, KTT, Gryphon's LAAIR, HQP

Club Coffee, Competitive Green Technologies, Ford Motor Company, Natural Sciences and Engineering Research Council, Agriculture and Agri-Food Canada, Ontario Ministry of Economic Development, Job Creation and Trade, Ontario Agri-Food Technologies and U of G alumni





Submitted to the Research Innovation Office to be patented "Club Coffee has been very fortunate to have started working with the BDDC in 2014, when they were working on practical solutions years ahead of others. They are always willing to consider the consumer's unmet needs when developing their inventions."

-John Pigott, chief executive officer, Club Coffee



100% certified-compostable coffee pod

First of its kind, PurPod100<sup>™</sup> uses fully compostable resin for the ring that holds the pod in place in the coffee machine

**1B** PurPod100<sup>™</sup> sold

Marketed by retailers including Loblaw, McDonald's, Walmart and Costco, the product helps divert waste and reduce greenhouse gases



BDDC has worked with 60 partners and funding agencies in the past 13 years



Combined contributions by Dr. Amar Mohanty and Dr. Manju Misra

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## **Biomaterials to the rescue**



#### **Biocarbon resin**

**Biocarbon made** from agri-food residues and other biomass is used to make sustainable bio-composites with many material applications-all thanks to technology developed at the BDDC. BDDC holds five approved patents and two patent applications on biocarbon technology.



## 20% lighter automotive parts

The biocarbon resin used to make the car headlight housing part is lighter and less energy-intensive to make, and meets industry standards while remaining cost-competitive with alternative materials

"The most positive impact has been to convince the world and industry at large that green technologies can be adopted at a reasonable cost and do not need to be a niche application."

-Atul Bali, chief executive officer, Competitive Green Technologies

"Professors Mohanty and Misra demonstrate to the world that these plantbased/sustainable materials are not compromising in any way. If they meet the rigorous durability and performance standards of the automotive industry, then they can be used most anywhere else."

 Deborah Mielewski, technical fellow of sustainability, Ford Motor Company

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# Getting research off the shelf and into the marketplace



Small and medium-size enterprises (SMEs) make significant contributions to the Canadian economy. Between 2005 and 2015, SMEs accounted for 95 per cent of net new jobs across Canada, making them a pillar of the economy. However, the first five years of start-up are difficult for new businesses due to challenges with market validation and product development.

The Research Innovation Office (RIO) and Alliance-funded Gryphon's LAAIR (Leading to the Accelerated Adoption of Innovative Research) program support commercialization and business development, providing market validation and product development grants.

Since Gryphon's LAAIR began in 2014, the program has invested \$3.9M in 78 projects, supporting 50 faculty project leads, 60 industry partners and 10 start-up companies. The following stories focus on three SMEs—FloNergia, We Vitro and Clēan Works—to show how the Alliance has contributed to vibrant research and innovation and helped move research results into the marketplace.

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## FloNergia Inc.

IMPACT

Developed by Dr. Wael Ahmed, the FloNergia airlift pump was engineered and prototyped in U of G's Multiphase Flow and Energy Lab. With support from the Gryphon's LAAIR program, the FloNergia pump was commercialized for the agriculture, aquaculture, aquaponics, hydroponics, vertical farming and water/wastewater industries.

U of G researchers, Research Innovation Office technology transfer staff

Ontario Aquaculture Research Centre

U of G

Tier I, Gryphon's LAAIR

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Paul Subject (Angel One investor and CEO), Canadian Aquaculture Systems, Cole-Munro, Aquamarine, McMillen Pit, Aqua Cage Farm, Aquaculture Association of Canada, Ontario Ministry of Natural Resources and Forestry, and the Interprovincial Partnership for Sustainable Freshwater Aquaculture Development



Intellectual property protected and licensed by U of G supports business development and future innovation

"Gryphon's LAAIR has been invaluable in helping FloNergia during its start-up phase and, in particular, with the trial phase of our product launch. The impact of the program has already been felt with expansion into our Ontario supply chain as we continue to build our sales around the world."

-Paul Subject, CEO, FloNergia

#### Acclaim for FloNergia

- FloMov<sup>™</sup> pumps chosen by CBC as one of the top 5 designs that might change the world
- · Listed as a Canadian Clean Tech Company to Watch in 2019 by *The Globe and Mail*
- One of 15 finalists in the energy category in *Fast Company*'s 2018 World-Changing Ideas Award competition



# **50–70**% energy savings

FloMov<sup>™</sup> pumps perform as well as or better than conventional pumps while reducing operating costs and energy consumption

40% higher aeration efficiency

40% improved water quality

#### Locally manufactured

With two Ontario locations making the product, FloNergia contributes to the local economy

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O U of G

Tier I, Gryphon's LAAIR

VRE Systems, Harster Greenhouse

## We Vitro

U of G graduate Kevin Piunno founded We Vitro and commercialized a modular system for propagating plant tissue cultures to produce exact clones of the original plant. The innovation is less expensive and more versatile than traditional systems, allowing researchers to do experiments that are not possible using conventional equipment.



"We have been extremely impressed with the We Vitro product line. The boxes and light sources can be conveniently stacked so we can culture and store more than five times the number of plants in our lab compared to traditional containers."

—Thomas Leharne, laboratory specialist, Dynamic Daylilies





Photos courtesy of We Vitro

Long Box

Patent-protected technology licensed by U of G that is less expensive and more versatile than traditional plant propagation systems

"We purchased We Vitro vessels and gravity wells to use instead of semi-solid medium for mature citrus tissue culture, and we increased our productivity significantly with better results and less labour."

-Janice Zale, plant scientist, Citrus Research and Education Centre, University of Florida

#### **Reduced labour costs**

We Vitro modular system enables sub-culturing of hundreds of plants much faster than traditional methods and enhances ergonomic experience

#### Enhanced profitability and efficiency

We Vitro system improves productivity and product consistency, critical for high-value crops including cannabis, orchid and banana

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## **Clēan Works**

Clēan Works is an agri-food innovation company that has commercialized a novel waterless process called Clēan Verification for decontaminating fresh and frozen produce, proteins, dried goods and shipping containers. The company is a result of the partnership between U of G researcher Dr. Keith Warriner and fruit farmer Paul Moyer.





Tier I, Gryphon's LAAIR

Moyer's Apple Products





Located in St. Catharines, Ont., with 12 employees providing product to clients around the globe



#### **Clēan Flow technology**

A portable, waterless decontamination unit with a chemical-free process that kills 99 per cent of pathogens, increases shelf life of produce by up to 25 per cent and reduces pesticide residue by 25–50 per cent



#### **COVID-19 recovery**

Clēan Flow technology was adapted to decontaminate PPE during the COVID-19 pandemic, resulting in a new business line called Clēan Works Medical

#### National and international recognition

- Premier's Award for Agri-Food Innovation Excellence (2017)
- Food Safety Innovation Award (2019) from the International Association for Food Protection

#### **Expanded export potential**

Clēan Flow technology reduces pesticide residue, making specific North American products eligible for shipping to Europe

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Case Study

# Local yeasts and specialty apples advance craft beverage industry

The Ontario craft beverage sector is a highly competitive and rapidly expanding niche market that has become an important pillar in the agri-food economy. Within recent decades, the popularity of craft beer and cider in Ontario has boomed. University of Guelph researchers, in collaboration with industry partners keen to use science to support the development of successful products, have made great strides to help the craft beverage sector thrive.

Alliance funding supports the craft beverage value chain by improving the quality and effectiveness of ingredients used in craft beer and cider production. Escarpment Laboratories, the first Canadian supplier of liquid yeast for beer production, was started by U of G graduates and continues to partner in research projects. Providence, a red-fleshed crabapple, is improving quality and providing options for Ontario growers to tap into the growing local cider market.

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# Local yeasts and specialty apples advance craft beverage industry



Ontario Crops Research Centre – Simcoe

Tier I, Tier II, Gryphon's LAAIR, HQP

Escarpment Laboratories, Wellington Brewery, Royal City Brewery, Ontario Craft Brewers, Twin Pines Orchards, Schuyler Farms, Revel Cider, Ontario Craft Cider Association, County Cider, Spirit Tree Estate Cidery, Apple Top Farm



"The future of the cider industry is dependent on research conducted with cider apples, both traditional and newly developed. Prof. Cline is a leader in this field. The research gives us a better understanding of the growth habits of cider apples, as well as the opportunity to experiment with flavour characteristics of the different varietals."

- Mark and Mike Vansteenkiste, cider makers, Twin Pines Orchards & Cider House







#### Ontario-grown cider apples for the first time

More than 25 European apple varieties were tested for their ability to grow in Ontario. Two varieties now grow in the province—the first Ontario-grown cider apples



#### New Providence crabapple variety

Ontario's first redfleshed crabapple intended for cider production bred by Dr. John Cline at the Ontario Crops Research Centre – Simcoe

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# Local yeasts and specialty apples advance craft beverage industry



"Being able to support our local industry is a pretty important thing on an ideological level to the company. Having that industry in our province definitely helps support us. It keeps a lot of the cost of shipping down. It keeps a lot of the storage down. It keeps a lot of the overall quality concerns down as well."

-Cameron Fryer, co-founder, Royal City Brewing



## **90** yeast cultures

Locally available yeasts replace imported sources and diversify sector offerings, backed by strong science and technical support



#### Escarpment Labs

Canada's first liquid yeast supplier was founded by U of G graduates who continue to partner with researchers to advance innovation

### 200+ breweries per month

Breweries across Canada, the U.S., U.K. and Europe purchase liquid yeast from Ontario-based Escarpment Laboratories, enhancing economic development in Ontario



Since 2016, Escarpment Laboratories and Dr. George van der Merwe have provided students with real-world experience in the sector







New businesses mean new jobs; Escarpment Labs employs 26 people

**Ontario Agri-Food Innovation Alliance Research Impact** 

Case Study

## **Transforming rural communities** through research

Photo courtesv of Dr. Andria Jones-Bittor

Rural communities across Ontario share a unique and dynamic balance of opportunities and challenges. Shifting demographics, complex infrastructure, land use and the impact of climate change are some of the challenges creating an ever-increasing need for innovative tools to build stronger, more sustainable rural communities.

With Alliance support, two researchers-Dr. Andria Jones-Bitton and Dr. Wayne Caldwell-have conducted primary research, built collaborations, expanded rural capacity, mobilized knowledge and informed decision-making. Their work, and the work of many U of G researchers, equips Ontario's rural agricultural communities with evidence to develop innovative, prosperous and healthy solutions that support the agri-food sector.

"We created the 'In the Know' training program to teach mental health literacy to people working in agriculture. Numerous agricultural and mental health stakeholders were involved in its development. It was very much created with farmers, for farmers."

-Dr. Andria Jones-Bitton, Department of Population Medicine

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## Transforming rural communities through research Supporting farmer mental health



Rural communities across Ontario



Ontario Federation of Agriculture, Canadian Mental Health Association's Ontario Division, Ontario Pork, Egg Farmers of Ontario, Ontario Sheep Farmers, Canadian Animal Health Coalition, York University and Wilfrid Laurier University



"The program will give the agricultural community the opportunity to discuss mental health openly and safely. We strongly believe that *In The Know*, with its farming-specific scenarios that put mental health into perspective for agriculture workers, will resonate well with this community and improve lives as a result,"

-Camille Quenneville, CEO, Canadian Mental Health Association, Ontario



#### Farmer mental health mandate

Success of *In the Know* led the Ontario Federation of Agriculture to include farmer mental health throughout its mandate, not just a single project

#### In the Know

This farmer mental health literacy training program is delivered in Ontario by the Canadian Mental Health Association and the Ontario Federation of Agriculture and is licensed in five provinces across Canada

#### **Emergency response model**

Developed to support farmers' mental health during agricultural crises and distributed to more than 150 organizations in Canada and internationally

#### **Additional funding**

The *In the Know* program has been so successful that the Government of Ontario is committing more than \$385,000 to extend this mental health program to more communities

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U of G; U of G researchers; HQP

Rural communities across Ontario

Tier I, KTT, HQP

OMAFRA agricultural land use staff, Ontario Federation of Agriculture, Ontario Farmland Trust, municipalities, provincial and local public health agencies, Greenbelt Foundation, Community Futures, Ontario Rural Council, Ontario Professional Planning Institute

## Transforming rural communities through research Preserving farmland



#### Ontario Farmland Trust

Canada's first province-wide agricultural land trust emerged from U of G research to protect and preserve Ontario's farmland

#### Healthy Rural Community Toolkit

Developed through Alliance-funded research, this valuable repository of resources for rural communities improves quality of life and health outcomes "Dr. Caldwell's research has greatly informed efforts to preserve Ontario's finite agricultural resources and provided valuable guidance with respect to strategies and land use policies for the provincial and municipal governments to support agriculture."

-Jason Bent, director of policy research, Ontario Federation of Agriculture



## **30** years of land use data

Informing and impacting policy changes to support farmland preservation through knowledge transfer, collaborations and strengthened sector leadership "Research and innovation are critical in rural communities because of the unique challenges. limited resources and competing priorities. This type of project builds people's capacity and spotlights the built environment. which enhances rural community resiliency."

-Karen Loney, former health educator, Chatham-Kent Public Health

Ontario Agri-Food Innovation Alliance Research Impact Case Study The Ontario Agri-Food Innovation Alliance is a collaboration between the Ontario Ministry of Agriculture, Food and Rural Affairs and the University of Guelph.

PUBLISHER Office of Research University of Guelph Guelph, ON N1G 2W1

Vice-President Research: Dr. Malcolm Campbell

Associate Vice-President Research (Agri-Food Partnership): Dr. Beverley Hale Address correspondence to: OMAFRA Agreement Governance Officer University of Guelph

omafrago@uoguelph.ca

uoguelph.ca/alliance

Publication date: January 2022