

**OMAFRA's Research Priorities for
the Ontario Agri-Food Innovation Alliance
Research Program
2024-2025**

Ontario Ministry of Agriculture, Food and Agribusiness

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Introduction

Ontario Agri-Food Innovation Alliance

The Ontario Agri-Food Innovation Alliance (the “Alliance Agreement”) is a collaboration between the Ontario Ministry of Agriculture, Food and Rural Affairs (now the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFRA), the University of Guelph (UofG), and Agricultural Research and Innovation Ontario (ARIO). The Alliance Agreement looks to advance impactful research and innovation that contributes to the success of the province’s agri-food sector and promotes rural economic development.

Alliance programming supports the intellectual capacity, infrastructure and networks that produce, synthesize, transfer, and invest in world-class research, innovation, laboratory testing and veterinary capacity.

The Program for Research and Innovation is a main component of the Alliance Agreement and provides funds for research projects that support the following strategic outcomes:

- achieving assurance in food safety.
- protecting animal, plant and public health and the environment.
- growing Ontario's capacity to produce food.
- supporting a globally and domestically competitive agri-food sector.

The University of Guelph administers the Alliance Program for Research and Innovation and makes recommendations on funding awards to OMAFA.

Full details on the Alliance Agreement can be found [here](#).

Overview: OMAFA’s Research Priorities

OMAFRA’s Research Agenda is guided by two key strategic frameworks: the [Grow Ontario Strategy](#) and the focus areas of Science, Research, and Innovation under the [Sustainable Canadian Agricultural Partnership \(Sustainable CAP\)](#). The Grow Ontario Strategy aims to enhance the competitiveness, productivity, and sustainability of Ontario’s agri-food sector, with key priorities and targets including the development and adoption of agri-food innovation, ensuring sector resilience and adaptability, and promoting economic growth both locally and globally.

The purpose of this document is to outline OMAFA's Research (Agenda) priorities for the agri-food sector that will be used to solicit and evaluate proposals received through the Alliance Research Program's 2024-2025 call for proposals. The Research (Agenda) priorities comprising eleven high-level Research Priority Areas (supported by a number of Research Focus Areas and specific Research Questions) align with the Ministry's core businesses area objectives: Protection and Risk Resilience, Environmental Stewardship and Productivity and Growth.

The eleven high-level Research Priority Areas defined by a set of goals. Specific Research Questions under each Research Focus Area for the 2024-25 Alliance Research Program together with the research knowledge gap and desired outcomes of the research are identified in the [Appendix](#) to this document.

The applicants must clearly demonstrate that their proposal is within scope of OMAFA's research priorities and fits with **one** (1) of the Research Questions in the Appendix. The Research Questions are reviewed and updated (if needed) each year to reflect agri-food stakeholder's research needs and new questions are added as appropriate. The RIB IDs attached to each Research Question reflects the year that the question was created first and as such, new questions for the 2024-25 Tier 1 research call will start with 2024.xxx.

Proposals that involve the development of a product or service must include a Value Assessment Plan (VAP). Information about this will be included in the application.

Protection and Risk Resilience

Ensuring Protection and Risk Resilience in the Agri-Food Sector

Food Safety

Goals

- Enhance public confidence in the sector to deliver on food safety, animal health, plant health, emergency management, and animal welfare expectations and demands.
- Anticipate, detect, mitigate and/or reduce food safety hazards along the supply chain.

Research Focus Areas (refer to Appendix for detailed research questions)

Climate Change Resiliency: Understand risks and mitigation strategies to support an agriculture and food sector that is resilient and adaptive to climate change.

Detection and Surveillance: Baseline data.

Innovative and Disruptive Technologies and Practices: Identification verification, validation, demonstration and adoption of new, innovative, and disruptive technologies and practices to support a resilient and sustainable agriculture and food sector.

Multi-disciplinary Research to Address Integrated Priorities: Multi-disciplinary collaborations to address complex needs: Research that includes multiple disciplines where goals are set under one thematic umbrella.

Performance Measurement: Measure performance through baseline information, trend and gap analysis, impact assessment, and BMP adoption to quantify and benchmark performance.

Animal Health and Welfare

Goals

- Enhance public confidence in the sector to deliver on food safety, animal health, plant health, emergency management, and animal welfare expectations and demands.
- Anticipate, detect, mitigate and/or reduce animal health hazards and antimicrobial use along the supply chain.

Research Focus Areas (refer to Appendix for detailed research questions)

Development of BMPs: Development of best management practices to improve farmed animal welfare (e.g., housing, equipment, pain management).

Emergency Management: Developing and implementing strategies and protocols to enhance preparedness, response, and resilience to emergencies in the sector. This includes managing risks associated with issues such as disease outbreaks, natural disasters, agribusiness, and supply chain disruptions to ensure the safety and stability of the production system.

Innovative and Disruptive Technologies and Practices: Identification verification, validation, demonstration and adoption of new, innovative, and disruptive technologies and practices to support a resilient and sustainable agriculture and food sector.

Plant Health and Protection

Goals

- Enhance public confidence in the sector to deliver on food safety, animal health, plant health, emergency management, and animal welfare expectations and demands.
- Help strengthen the agri-food sector's sustainability and social license through increased utilization of integrated pest management (IPM) and other pest mitigation strategies.
- Anticipate, detect, mitigate and/or reduce plant hazards along the supply chain, and improve plant resilience and resistance.

Research Focus Areas (refer to Appendix for detailed research questions)

Biology of Current and Emerging Pests: Understanding of the biology, climate resilience, ecology and management of current and emerging pests, and resistance management. Includes identification, tracking, monitoring, biosecurity practices and protocols, diagnostics, and surveillance.

Innovative and Disruptive Technologies and Practices: Identification verification, validation, demonstration and adoption of new, innovative, and disruptive technologies and practices to support a resilient and sustainable agriculture and food sector.

Integrated Pest Management: Improved integrated pest management strategies through efficacy studies; alternative control options; development of management strategies.

Pathway Analysis: Pathway analysis is a systematic assessment of the pathways along which a pathogen or pest might enter or move within and between Ontario farms resulting in an outbreak in plants, animals, or humans.

Environmental Stewardship

Providing Environmental Stewardship of Ontario's Capacity to Produce Food

Soil Health

Goals

- Protect and enhance soil health and water quality, supporting improved public confidence in the sector to deliver on sustainability expectations.
- Improve soil health and conservation to support agricultural productivity.

Research Focus Areas (refer to Appendix for detailed research questions)

Baseline Soil Health Information: Baseline soil health information (i.e., relationship between physical, chemical, and biological components) and development of robust and measurable soil health indicators.

BMP Development: Develop, validate, and continuously improve practices and technologies to support water quality and quantity, soil health, and sustainable agri-food production and processing systems (environmental, economic, social).

Environmental Impact of Management Practices: Environmental impacts of fertilizer use, nutrient management, and integrated pest management.

Water Quality and Quantity

Goals

- Protect and enhance soil health and water quality, supporting improved public confidence in the sector to deliver on sustainability expectations.
- Strengthen the agri-food sector's sustainability and social licence through improved water use and water quality.

Research Focus Areas (refer to Appendix for detailed research questions)

Analysis of BMP Adoption: Understand the behavioural, social, and economic barriers or incentives to BMP adoption by the agri-food sector.

BMP Development: Develop, validate, and continuously improve practices and technologies to support water quality and quantity, soil health, and sustainable agri-food production and processing systems (environmental, economic, social).

Climate Change Resiliency: Understand risks and mitigation strategies to support an agriculture and food sector that is resilient and adaptive to climate change.

Environmental Impact of Management Practices: Environmental impacts of fertilizer use, nutrient management, and integrated pest management.

Sustainable Production Systems

Goal

- Strengthen the sustainability of the agri-food sector through (1) Soil health and conservation, (2) Improved water quality (e.g., reduced phosphorus runoff and pesticides), (3) Increased water/waste/energy efficiency and reduced greenhouse gas (GHG) emissions, and (4) Increased utilization of 4R Nutrient Stewardship (Right Source @ Right Rate, Right Time, Right Place ®).

Research Focus Areas (refer to Appendix for detailed research questions)

Analysis of BMP Adoption: Understand the behavioural, social, and economic barriers or incentives to BMP adoption by the agri-food sector.

BMP Development: Develop, validate, and continuously improve practices and technologies to support water quality and quantity, soil health, and sustainable agri-food production and processing systems (environmental, economic, social).

Climate Change Resiliency: Understand risks and mitigation strategies to support an agriculture and food sector that is resilient and adaptive to climate change.

Environmental Impacts of Management Practices: Environmental impacts of fertilizer use, nutrient management, and integrated pest management.

Innovative and Disruptive Technologies and Practices: Identification verification, validation, demonstration and adoption of new, innovative, and disruptive technologies and practices to support a resilient and sustainable agriculture and food sector.

Multi-disciplinary research to address integrated priorities: Multi-disciplinary collaborations to address complex needs: research that includes multiple disciplines where goals are set under one thematic umbrella.

Productive Land Capacity

Goal

- Land use policies contribute to a secure land base that allows the agri-food sector to thrive and reach its full potential.

Research Focus Areas (refer to Appendix for detailed research questions)

Evidence to Support Land Use Policies: Document evidence to inform land use policies that support the long-term success of the agri-food and agribusiness sectors.

Productivity and Growth

Fostering the Productivity and Growth of the Agri-Food Sector and Rural Ontario

Competitive Production Systems

Goal

- Improve production efficiency, productivity, competitiveness and public trust efforts through technology adoption and innovation and technology development such a labour-saving technology or practices, automation, waste reduction, recycling, and increased water/waste/energy efficiency and reduced GHG emissions.

Research Focus Areas (refer to Appendix for detailed research questions)

Climate Change Resiliency: Understand risks and mitigation strategies to support an agriculture and food sector that is resilient and adaptive to climate change.

Improved Management and Processes: Improved management and processes (e.g., crop and livestock productions systems that improve yields and quality through agronomy, production practices, genetic methods, efficient fertilizer use).

Innovative and Disruptive Technologies and Practices: Identification verification, validation, demonstration and adoption of new, innovative, and disruptive technologies and practices to support a resilient and sustainable agriculture and food sector.

Input Use Efficiency: Input use efficiency (e.g., alternative feeds, feed efficiency, automation in horticulture; irrigation efficiency in greenhouse, reproductive performance, food processing resource efficiency).

Labour Access/Efficiencies: Research and evidence to support the development of strategies to ensure that the economic growth and sustainability of the agribusiness and agri-food sector is supported by adequate access to labour and/or labour efficiencies.

Innovative Products and Product Improvement

Goal

- Enhance competitiveness, profitability, and growth of the agri-food sector through new or improved products.

Research Focus Areas (refer to Appendix for detailed research questions)

Innovative and Disruptive Technologies and Practices: Identification verification, validation, demonstration and adoption of new, innovative, and disruptive technologies and practices to support a resilient and sustainable agriculture and food sector.

New Product Development: Investigate new products (physical products, services, or processes) to improve marketability and profitability, meet consumer demands, and enhance productivity in the sector, from concept to prototype (e.g., alternative proteins, foods of the future, new crops, bioproducts).

Trade, Market and Targeted Sector Growth Opportunities

Goals

- Growth of the overall agri-food sector through expansion of existing and access to new domestic and international markets.
- Improve economic performance of identified priority sub-sectors and increased production of niche and/or value-add products.

Research Focus Area (refer to Appendix for detailed research questions)

Domestic Market Analysis: Research, data, and analysis to support Ontario's agribusiness and the agri-food sector to remain competitive in domestic markets in response to change and challenges.

Global Market Analysis: Research, data, and analysis to support Ontario's agribusiness and the agri-food sector to remain competitive in global markets in response to change and challenges.

Targeted Sector Growth: Identify (in partnership with industry stakeholders), investigate and research opportunities to address targeted sector growth opportunities

that will remove key barriers and improve competitiveness of sectors that are strategically identified for growth in the agriculture and food sectors.

Strong Rural Communities

Goal

- Enhance competitiveness, profitability, and growth of rural communities.

Research Focus Area (refer to Appendix for detailed research questions)

Labour/Access Efficiencies: Research and evidence to support the development of strategies to ensure that the economic growth and sustainability of the agri-food and agribusiness sectors are supported by adequate access to labour and/or labour efficiencies.

Multi-disciplinary Research to Address Integrated Priorities: Multi-disciplinary collaborations to address complex needs: Research that includes multiple disciplines where goals are set under one thematic umbrella.

Rural Community Development: Research that strengthens municipal, agri-food and agribusiness sectors' capacity to identify and successfully implement provincial and other initiatives that are economically sound, environmentally sustainable and support rural community development.

OMAF's Research Priority Area Contacts

Priority Area	Research Analyst	Email
Plant Health and Protection	Anna Formusiak	Anna.Formusiak@ontario.ca
Food Safety	Hilary Graydon	Hilary.Graydon@ontario.ca
Animal Health and Welfare	Robin Smart	Robin.Smart@ontario.ca
Competitive Production Systems	Robin Smart	Robin.Smart@ontario.ca
Innovative Products and Product Improvement	Kelly Jackson	Kelly.Jackson@ontario.ca
Trade, Market Targeted Sector Growth Opportunities	Robin Smart	Robin.Smart@ontario.ca
Strong Rural Communities/ Productive Land Capacity	Robin Smart	Robin.Smart@ontario.ca
Soil Health	Dave McLeod	Dave.McLeod@ontario.ca
Water Quality and Quantity	Dave McLeod	Dave.McLeod@ontario.ca
Sustainable Production Systems	Dave McLeod	Dave.McLeod@ontario.ca

Additional Contacts

Focus	Research Analyst	Email
Indigenous Agri-food Systems	Elin Gwyn	Elin.Gwyn@ontario.ca
Equity, Diversity, and Inclusion	Robin Smart	Robin.Smart@ontario.ca
Knowledge Translation and Transfer	Tieghan Hunt	Tieghan.Hunt@ontario.ca

APPENDIX: OMAFA's Research Questions

Food Safety

Focus Area	Research Question	LEAD RA	RIB ID
Climate Change Resiliency	Foodborne human pathogens and toxins are moving into areas where they were not previously an issue due to several factors including changing weather. What are the food safety risks associated with this, and how can these risks be mitigated?	Hilary Graydon	2020.009
Detection & Surveillance	What are the residual levels and data required to establish better usage guidelines and withdrawal times in livestock for drugs that have no current documented withdrawal period and no established maximum residual limit (MRL)?	Hilary Graydon	2019.066
Detection & Surveillance	How can practical and feasible interventions or technological developments be applied throughout the value chain to effectively reduce or mitigate the pathogen burden in minimally processed or ready-to-eat (RTE) fruits and vegetables produced in Ontario, particularly for small scale producers and processors?	Hilary Graydon	2024.006
Detection & Surveillance	What effect do traditional and/or modern processing methods for non-thermally treated, dried ready-to-eat meat products (both whole and comminuted) have on foodborne pathogens? How can foodborne pathogens be controlled?	Hilary Graydon	2024.007
Detection & Surveillance	How prevalent is Highly Pathogenic Avian Influenza (HPAI) in dairy products in Ontario, and what is the virus's survivability in both raw and temperature-treated dairy products such as milk and cheese?	Hilary Graydon	2024.023
Innovative and Disruptive Technologies and Practices	<p>What innovative research projects can be developed to improve the safety of the Ontario food system, specifically addressing food safety issues related to food grown and/or processed in Ontario?</p> <p>**Note: Proposals must clearly indicate the challenge or opportunity being addressed, stakeholders who would benefit.</p>	Hilary Graydon	2023.015
Multi-disciplinary research to address integrated priorities	What are the science and policy gaps related to emerging food safety hazards and what mitigation strategies, including public policy solutions, could be investigated, and implemented across the agri-food supply chain to manage the associated risks	Robin Smart	2024.005
Performance Measurement	What innovative solutions and practical applications would be most effective to support behavioural change to increase adoption of food safety best practices along the value chain?	Hilary Graydon	2020.010

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Animal Health and Welfare

Focus Area	Research Question	LEAD RA	RIB ID
Development of BMPs	What best management practices can be employed in the livestock industries to mitigate the risk of zoonotic diseases or livestock diseases where animals are models for human disease, to improve animal welfare while also informing, or, minimizing the impact of disease on, the health of people working in those industries from a one health perspective? What are the potential risks or benefits of these BMPs to the immediate environment shared by both livestock and humans (e.g., barn, farm premises) and/or to the broader environment (including feed production, impacts on wildlife, etc.)?	Robin Smart	2022.011
Development of BMPs	How can we promote the prudent use of medications or chemotherapeutics, including antibiotics, in food animal minor species (including aquatic species) through drug depletion studies to obtain appropriate milk and meat withdrawal information?	Robin Smart	2022.012
Emergency Management	What are the most effective strategies and protocols for enhancing emergency preparedness and response capabilities across various types of livestock farms in Ontario, considering factors such as disease outbreaks, natural disasters, and supply chain disruptions, to ensure the safety and resilience of livestock production?	Robin Smart	2024.002
Innovative and Disruptive Technologies and Practices	What are the most effective methods and practices for improving animal welfare across various types of livestock farms in Ontario, considering factors such as housing, nutrition, health management, and humane handling, to ensure ethical and sustainable livestock production?	Robin Smart	2024.001

Plant Health and Protection

Focus Area	Research Question	LEAD RA	RIB ID
Biology of Current & Emerging Pests	What strategies, including agronomic, in-field, and post-harvest practices, are most efficacious in reducing the impact of mycotoxins/DON, and provide the most value to the entire value chain, while also identifying or developing commercial corn hybrids, wheat, and barley varieties that are resistant and/or tolerant to DON? Projects must include economic analysis and aim to provide more transparent information on the DON risk of these varieties/hybrids to drive future research direction.	Anna Formusiak	2020.087
Biology of Current & Emerging Pests	How do we improve our understanding of the development, life cycle, spread, economic impact, and management of new and emerging pests that threaten Ontario crops (including pests with expanding ranges, pesticide resistant pests, invasive pests)? How can this research improve the resiliency of crop sectors?	Anna Formusiak	2020.102
Innovative and Disruptive Technologies and Practices	Which new potato varieties can provide a 12-month supply of high-quality potatoes to the Ontario fresh and chip processing industries including important traits like early maturity, long term storage-ability and nutritional potential?	Anna Formusiak	2022.010

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Focus Area	Research Question	LEAD RA	RIB ID
Innovative and Disruptive Technologies and Practices	How can we manage and mitigate the environmental impacts of controlled environment agriculture (greenhouses, warehouses, and vertical farms), such as reducing greenhouse gas emissions and managing night-time light emissions, without negatively affecting production?	Anna Formusiak	2023.006
Integrated Pest Management	What are some integrated pest management (IPM) technologies or strategies that improve labour efficiencies, incorporate pesticides, alternative control measures, host resistance and/or take a systems approach to controlling pests? What are the economics of these technologies?	Anna Formusiak	2020.063
Integrated Pest Management	What are the barriers to developing a clean plant (e.g., disease, insect, and/or virus free) supply chain and what techniques or methodologies are needed for creating clean/true to type plant material for existing or new cultivars for the supply chain of that crop species?	Anna Formusiak	2020.068
Integrated Pest Management	How can robotic and artificial intelligence systems supplement existing agronomic practices such as planting of seeds or transplants (e.g., horticulture crops, corn, soybeans, etc.), weeding of row crops (grain, oilseed, and horticulture crops), surveillance of pests/diseases, identification/rouging of male flowers (e.g., hemp), pollination (e.g., hazelnut) and debudding/berry harvesting (e.g., ginseng)? How will new robotic technology in field work be integrated into current production systems? How can these systems help with effective sharing of pest and disease information among plant agriculture sector members/ partners? Projects must include cost benefit analyses and efficiency assessments.	Anna Formusiak	2020.074
<u>**Note: Proposals may require a Value Assessment Plan (VAP).</u>			
Integrated Pest Management	What strategies can be developed and implemented to enable horticulture crop growers to effectively detect viruses in their crops, understand the impact of these viruses on yield and quality, and make informed management decisions?	Anna Formusiak	2021.048
Integrated Pest Management	Can effective controls be identified for vertebrate pests in horticultural crops? For example: squirrels and jays, birds, deer, and voles.	Anna Formusiak	2021.049
Integrated Pest Management	Corn rootworm and Bt resistance: <ol style="list-style-type: none"> 1. What are new effective rootworm management tools to reduce risk of resistance development to Bt traits and soil applied insecticides? 2. What methods, tools and resources are needed to help influence behavioural change to encourage crop rotation options away from continuous corn? Why do these methods work? Determine the most sustainable approach to corn rootworm management in areas with Bt resistance. 3. How can predictive tools for key corn pests be improved and what influence and impact climate change will have on the phenology, impact, and management of corn rootworm? 	Anna Formusiak	2021.058
Pathway Analysis	How can new disinfection and sanitation technologies and/or processes minimize biosecurity risks from pests throughout the production cycle and through distribution channels for horticultural production?	Anna Formusiak	2019.084

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Focus Area	Research Question	LEAD RA	RIB ID
Pathway Analysis	What are the impacts of abiotic factors and stresses (e.g., fertility, weather, moisture, mechanical injury, pesticide injury, allelopathy, and crop metabolites etc.) on plant health and/or plant pests, how do we distinguish the causes of complexes that involve multiple potential abiotic and/or biotic stresses (e.g., replant diseases, sudden decline, early dying syndromes etc.), and how can these effects be mitigated?	Anna Formusiak	2022.017

Soil Health

Focus Area	Research Question	LEAD RA	RIB ID
Baseline Soil Health Information	How do the interactions between cover crops and other components of the crop production system (e.g., tillage, fertility, crop protection) influence the economic and environmental effects of including cover crops in the system? How would this contribute to furthering the understanding of the economic and environmental role of cover crops alone and in combination with tillage and other components of the overall crop production system.	Dave McLeod	2021.059
Baseline Soil Health Information	What novel processes, methods or tools can assist in quantifying soil properties and productivity across spatial (e.g., field to provincial) and temporal (e.g., seasonal to interannual) scales? How do management decisions (e.g., tillage methods and timing, rotations, and cover cropping) influence our ability to measure and understand soil property and production changes?	Dave McLeod	2023.005
Baseline Soil Health Information	How can producers evaluate soil health tests for accuracy, saliency, and interpretability, determine the minimum dataset (MDS) for cost-effective assessments, and identify the best indicators for assessing soil nutrient supply, carbon cycling, soil structure, water dynamics, and plant health across different production systems?	Dave McLeod	2024.013
BMP Development	What are the tools and methods (e.g., soil and plant tissue/sap testing, use of optical/digital sensors, etc.) to develop and/or update soil fertility recommendations and plant tissue nutrition guidelines in horticultural crops (existing crops as well as newly introduced crops and cultivars) in Ontario?	Dave McLeod	2022.019
Environmental Impact of Management Practices	Consolidate and synthesize existing BMP effectiveness data to help determine: What is the current amount of soil erosion and nutrients leaching occurring with current agronomic and tillage practices? Are erosion and leaching rates with changing practices still aligning with our current expectations of soil health improvements, losses in organic matter, and transport of nutrients from fields?	Dave McLeod	2023.009

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Focus Area	Research Question	LEAD RA	RIB ID
Environmental Impact of Management Practices	How do we determine the actual economic and environmental impact of soil compaction? Are there scientific methods and/or sensors already available or that can be developed and validated to measure i) the on-the-go stress applied by rolling equipment, ii) the ROI of compaction, and iii) the environmental impact of soil compaction across variable soils? What are the immediate and longer-term economic and environmental effects?	Dave McLeod	2020.080

Water Quality and Quantity

Focus Area	Research Question	LEAD RA	RIB ID
Analysis of BMP Adoption	What are the environmental and economic opportunities for farmers for planting switchgrass, miscanthus perennial biomass crops as filter media for capture of phosphorus and as farmable vegetative buffers and or riparian area from harvest sale?	Dave McLeod	2021.064
BMP Development	What opportunities exist to collect and manage stormwater on-farm?	Dave McLeod	2019.045
Climate Change Resiliency	What are the potential pathways that pesticides may be transported to surface water and what are the potential impacts to aquatic life? What are some cost-effective mitigation measures/management practices that growers can adopt to reduce the movement of pesticides to surface water from the agricultural application area?	Dave McLeod	2020.084
Environmental Impact of Management Practices	What are the differences in phosphorus losses in different cropping production systems? How are different forms of phosphorus transported from fields with highly erodible soils to rivers (e.g., dissolved phosphorus, vs. organically bound phosphorus vs. clay-bound phosphorus)?	Dave McLeod	2019.006
Environmental Impact of Management Practices	How can phosphorus losses from cropland research sites in the Great Lakes region over the last decade be quantified?	Dave McLeod	2019.007

Sustainable Production Systems

Focus Area	Research Question	LEAD RA	RIB ID
Analysis of BMP Adoption	What are the economic and environmental benefits, barriers, and management options for incorporating more perennial crops in Southern Ontario (i.e., forages, pastures, biomass crops, annual grasses) in corn and soybean rotations?	Dave McLeod	2019.014
Analysis of BMP Adoption	Determine what are the BMP adoption rates through the collection of baseline data on BMP adoption at the provincial, Lake Erie Basin and sub-watershed scales and via conducting ongoing monitoring to further understand BMP adoption ceilings, set adoption targets, monitor progress towards targets and provide data for input to models.	Dave McLeod	2019.016

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Focus Area	Research Question	LEAD RA	RIB ID
Analysis of BMP Adoption	How can landowners, who do not participate in Environmental Stewardship programs, be engaged to improve the environmental stewardship of their lands?	Dave McLeod	2019.019
Analysis of BMP Adoption	Increasing demands for sustainably produced food coupled with a focus on reducing plastic pollution are increasing demands for alternatives to plastics in Ontario's food production systems. How can the agri-food sector adopt better practices, products, and alternatives to reduce plastic waste and potential impacts on the environment and human health?	Robin Smart	2024.019
BMP Development	How do Ontario crop fertility recommendations meet the needs of modern production practices and modern crop varieties, cultivars, hybrids of all crop types?	Dave McLeod	2019.029
BMP Development	How does nutrient stewardship practices (4R) apply to horticulture crop production?	Dave McLeod	2019.030
BMP Development	What is the baseline of cover crop adoption in Ontario? What are the costs and benefits of harvestable crops that provide soil cover (wheat, rye, oats, etc.)? Which private sector partners are effective in increasing adoption of cover crops? What changes in the equipment industry are needed to increase the adoption of cover crops?	Anna Formusiak	2020.003
BMP Development	What novel crop management systems can be developed which enhance economic and environmental benefits in field crop production, for example, multi or relay cropping, including forages, canola, cover crops, and/or other fall seeded crops in rotation? How do these systems affect the economic, agronomic, and environmental impact of the whole cropping system?	Anna Formusiak	2020.040
BMP Development	What best management practices are funded as part of stewardship programs in other provinces and the United States? How do these compare with Ontario? The research should also consider how land prices vary in the different jurisdictions examined.	Dave McLeod	2021.025
Climate Change Resiliency	Building on the results of the Provincial Climate Change Impact Assessment (PCCIA) and conducting finer-scale assessment of impacts, and targeting specific critical regions and/or commodities (e.g., tender fruit in southwestern Ontario) what are the adaptation options/practices required to help build region and/or commodity-specific resiliency and adaptive capacity?	Robin Smart	2019.010
Climate Change Resiliency	What are the market trends with respect to use of sustainability standards in Ontario and other jurisdictions? How are agri-food companies and retailers responding to these trends, which standards are emerging as leaders, and what are the advantages/disadvantages/challenges and opportunities of Ontario's agri-food sector aligning its sustainability efforts with those that are already leading the way nationally and internationally, or where are we seeing common themes?	Robin Smart	2019.041
Climate Change Resiliency	What are the effects of climate change on the yield, resilience, pest complex, biomass accumulation, and overall health of tree-based and other perennial crops?	Anna Formusiak	2022.022

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Focus Area	Research Question	LEAD RA	RIB ID
Climate Change Resiliency	What adaptive strategies and resilient practices can be developed and implemented across various livestock farming systems in Ontario to mitigate the impacts of climate change on livestock health and productivity, reduce the environmental impact of livestock on climate change, enhance animal welfare, and ensure the sustainability and economic viability of livestock production?	Robin Smart	2024.018
Environmental Impacts of Management Practices	How can agricultural-based RNG be incented in the province? What are the economic, regulatory, feasibility and/or program-based barriers to broader RNG production? How can the changes in Ontario's Emissions Performance Standards to allow off-site production of RNG as a compliance tool for emitters be leveraged by the agriculture sector to up-cycle organic waste materials into RNG? What implications would increasing RNG production in Ontario have on other organic waste diversion or processing such as composting or direct land application?	Dave McLeod	2019.023
Environmental Impacts of Management Practices	What is the extent, presence, and concentration of environmental chemicals (agrochemicals and agrochemical residues) in beehive products (honey, wax, pollen, propolis, etc.)? What are the adverse effects of these chemicals, including synergistic effects, on bee health, bee reproduction and the environment?	Robin Smart	2021.069
Environmental Impacts of Management Practices	How do management practices (including inputs) impact the carbon sequestration potential of tree-based and other perennial crops?	Anna Formusiak	2022.023
Innovative and Disruptive Technologies and Practices	How can we validate precision agriculture protocols and equipment for Ontario agricultural systems and identify opportunities for economic gain and environmental protection? An assessment of the differences between precision agriculture and precision conservation and how producers understand these terms is also needed.	Anna Formusiak	2019.043
Innovative and Disruptive Technologies and Practices	How effective are agricultural biologicals from plant and soil microbiomes for plant protection, for increasing crop productivity and for substitution of synthetic fertilizers and pesticides? What measures (e.g., environmental, economic, plant health) can be used to verify the effectiveness of these biologicals?	Dave McLeod	2020.081
<u>**Note: Proposals may require a Value Assessment Plan (VAP).</u>			
Multi-disciplinary research to address integrated priorities	In what ways could the Ontario agricultural sector access market opportunities through sustainability measurement, reporting, and verification? What is the sector's readiness to meet these requirements, and is government or other support needed? If yes, identify the opportunities. How can environmental data collected by industry or government programs support the sector across more markets as well as on-farm decision-making?	Robin Smart	2024.020

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Productive Land Capacity

Focus Area	Research Question	LEAD RA	RIB ID
Evidence to Support Land Use Policies	What are the most effective methods to quantify the value of farmland in Ontario? Consider economic value, (including prior public and private investment/infrastructure value) environmental services, and social benefits (considering any costs as well). Is this value impacted by class of land, location within the province, existing systems, and networks (e.g., ag system)? What is the best way to communicate these figures to make the implications of farmland loss understood?	Robin Smart	2024.012

Competitive Production Systems

Focus Area	Research Question	LEAD RA	RIB ID
Climate Change Resiliency	How can a new apple, tender fruit or grape cultivar be developed so that they are: 1) suitable for Ontario's climate, 2) fit current and emerging consumer preferences and 3) disease tolerant?	Kelly Jackson	2020.052
Improved Management Processes	What are management methods and techniques that result in the production of sustainable, high quality (genetics and/or production) and high efficiency honeybees (queens and/or nucleus/colony production)?	Robin Smart	2021.067
Improved Management Processes	How to manage crop residue challenges and optimize crop production, profitability, and sustainability under minimal till/no-till cropping systems?	Anna Formusiak	2023.008
Improved Management Processes	What are the most effective strategies for improving livestock production efficiency across various types of farms in Ontario, considering factors such as feed optimization, breeding practices, animal health, resource management, and technological advancements, to achieve sustainable and economically viable outcomes?	Robin Smart	2024.004
Improved Management Processes	How can production and post-harvest information for new or emerging crops (e.g., industrial crops, specialty fruit, specialty vegetables, specialty grains, tree nuts, culinary and medicinal herbs, hops, biomass crops, hemp) be evaluated and adapted for field production in Ontario (e.g., agronomy, cultivar evaluations, maximizing yield and quality under Ontario growing conditions, storage technology, packaging)?	Anna Formusiak	2020.033
Improved Management Processes	What are potential techniques and tools to increase post-harvest quality for horticulture crops (i.e., optimal harvest timing for new major cultivars, packing and cold chain management systems, and practices to increase quality and storage/shelf life)?	Anna Formusiak	2020.036

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Focus Area	Research Question	LEAD RA	RIB ID
Improved Management Processes	Can new high yielding and high-quality crop varieties/hybrids/germplasm be developed through advanced crop breeding, new technologies and testing methods for field crops (e.g., corn, soybeans, dry beans, canola, winter wheat, spring wheat, oats, barley, forage crops)? This includes new varieties for value-added and identity preserved markets.	Anna Formusiak	2020.047
**Note: Proposals must include a Value Assessment Plan (VAP).			
Improved Management Processes	How can we grow a greater diversity of suitable edible and non-edible crops in Ontario's controlled environment agriculture facilities (greenhouses, warehouses, and vertical farms) in a commercially sustainable manner, while also improving the quality and health of propagation material and finished product through advanced lighting, heating/cooling technologies, and/or integrated pest management (IPM) strategies?	Anna Formusiak	2020.092
Improved Management Processes	What are the optimal production practices for adzuki beans in Ontario and by soil type, e.g., practices could include reduced tillage, crop fertility management?	Anna Formusiak	2021.032
Innovative and Disruptive Technologies and Practices	How can the identification of new technologies and strategies to mitigate weather risks in horticulture crops help with climate change adaptation?	Anna Formusiak	2020.037
Innovative and Disruptive Technologies and Practices	What new tools and techniques can be developed to improve production and reduce energy and labour requirements in horticultural crops (e.g., a litmus test to detect maple buddy sap before it's made into syrup, sap testing for nitrogen nitrate content used to adjust in-season nitrogen rates (e.g., in hops), adding ash to calcium-deficient maple sugar bushes)?	Anna Formusiak	2021.036
**Note: Proposals must include a Value Assessment Plan (VAP).			
Innovative and Disruptive Technologies and Practices	What new tools and techniques (e.g., automated sensors) can be accessed and developed to improve nutrient decision making in horticultural crops and field crops? How can nutrient deficiency and/or excess in soil, plant tissue, recirculated fertigation, and substrates be determined?	Anna Formusiak	2022.018
Innovative and Disruptive Technologies and Practices	How can alternative growing mediums reduce the dependence on peat-based soilless media, to help support Ontario's ornamental sector going forward?	Anna Formusiak	2022.024

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Focus Area	Research Question	LEAD RA	RIB ID
Innovative and Disruptive Technologies and Practices	<p>What new technologies (e.g., AI) and/or processes can advance Ontario's digital and technology ecosystems in agribusiness and agri-food sector value chains to enhance competitiveness, new products development, grow market opportunities, and strengthen Ontario's agribusiness and agri-food sector?</p> <p>**Note: Proposals must clearly indicate the challenge or opportunity being addressed, stakeholders who would benefit.</p>	Robin Smart	2023.011
Innovative and Disruptive Technologies and Practices	How can innovative management practices and technologies be integrated into diverse livestock farming systems across Ontario to enhance competitiveness, productivity, and sustainability at the farm level, while ensuring economic viability and environmental stewardship?	Robin Smart	2024.003
Innovative and Disruptive Technologies and Practices	How can we improve strategies for production and IPM through energy efficient and novel lighting technologies for floriculture, ornamental, fruit, and vegetable crops grown in controlled environments (greenhouses, warehouses, and vertical farms)?	Anna Formusiak	2024.022
Input Use Efficiency	How can we develop and implement new or improved technologies and strategies for controlled environment agriculture (floriculture and vegetable greenhouses, warehouses, and vertical farms) to enhance energy efficiency and resource management sustainably? This includes exploring alternative energy sources, efficient lighting, improving electricity generation and storage, optimizing water usage, and capturing and utilizing carbon dioxide for enrichment.	Anna Formusiak	2019.089
Input Use Efficiency	What production practices and management recommendations can be developed to improve the yields, berry quality, season extension and competitiveness of berries produced in soilless/substrate culture?	Anna Formusiak	2020.035
Input Use Efficiency	<p>What are the optimal 4R nutrient stewardship practices (right source, rate, time, and place) for applying macronutrients (N, P, K, S) and micronutrients (e.g., copper, boron) to field crops to maximize economic crop response and minimize environmental losses, while improving tools for making nitrogen, phosphorus, and potassium rate decisions?</p> <p>Key Areas of Interest:</p> <ol style="list-style-type: none"> 1. Nitrogen Loss Risk: Evaluate the general risk and relative loss of nitrogen due to product type, application timing, placement, use of inhibitors, soil texture, drainage, and weather conditions post-application. 2. In-Season Loss Risk Estimates: Assess the risk of nitrogen loss from volatilization, denitrification, and leaching following pre-plant applications. 3. Optimal In-Crop Practices: Determine the best in-crop nutrient application methods for fertilizers and organic amendments. 4. Decision-Making Tools: Enhance tools for making accurate nitrogen, phosphorus, and potassium rate decisions. 	Anna Formusiak	2020.042

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Focus Area	Research Question	LEAD RA	RIB ID
Input Use Efficiency	What are the best tillage practices to optimize crop production, profitability and sustainable soil functioning (e.g., soil structure stability, erosion resistance, water dynamics) while minimizing nutrient losses? - comparisons of modern (e.g., strip-till, high speed disk, vertical tillage, bio-strips) and traditional tillage equipment -considering tillage timing, intensity, tillage depth, equipment setup and speed -across soil types, soil conditions, and across the crop rotation/multiple years -including livestock operations with manure in the system	Anna Formusiak	2020.043
Labour Access/Efficiencies	What labour saving technologies and management practices can improve efficiencies in horticultural crops? Additionally, what cost-efficient technologies can reduce manual labour shortages in the agribusiness and agri-food sector, and how do they compare in productivity and cost/benefit to manual labour?	Anna Formusiak	2021.006

Innovative Products and Product Improvements

Focus Area	Research Question	LEAD RA	RIB ID
Innovative and Disruptive Technologies and Practices	What new automation tools and techniques can be developed to improve production efficiency and/or reduce energy, labour, and pesticide use, and improve plant health decision-making and pest detection in greenhouse, warehouse, and vertical farm production of edibles (vegetables and fruits), and ornamentals (flowers, landscape)? (e.g., autonomous growing, sensor technology for climate and irrigation, packaging alternatives, vision systems and scouting software for integrated pest management (IPM), etc.) **Note: Proposals must require a Value Assessment Plan (VAP).	Anna Formusiak	2020.050
Innovative and Disruptive Technologies and Practices	What are some technologies (existing or potential) that could be used to enhance the food safety inspection process and/or food safety?	Hilary Graydon	2022.029
Innovative and Disruptive Technologies and Practices	What new innovative opportunities (technologies, products, practices) address challenges facing Ontario's agri-food sector and/or capitalize on prospects to enhance competitiveness, grow market opportunities, and strengthen Ontario's agri-food sector? **Note: Proposals must clearly indicate the challenge or opportunity being addressed, stakeholders who would benefit. **Note: Proposals must include a Value Assessment Plan (VAP).	Kelly Jackson	2023.001
Innovative and Disruptive Technologies and Practices	What are the most promising agrivoltaic racking solutions for farmers in Ontario?	Kelly Jackson	2024.008

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Focus Area	Research Question	LEAD RA	RIB ID
Innovative and Disruptive Technologies and Practices	What are the benefits and risks of incorporating photovoltaic modules (thin film, crystal silicon) into Ontario's field and horticultural production systems? Do these benefits and risk change based on the types of field / horticulture crops and/or geographic area? Are these benefits and risks likely to change based on predicted climate changes in the next 25 + years?	Kelly Jackson	2024.010
Innovative and Disruptive Technologies and Practices	What are the market opportunities and costs, including labor, resources, and government/industry funding, for expanding the market for aesthetically imperfect produce and reducing food waste? How can AI be used in processing and manufacturing such produce, and what are the implementation costs? What are the policies, systems, and/or processes required to enable and/or support food processors to contribute to addressing Ontario's food waste problem?	Robin Smart	2024.011
New Product Development	What are the processes to profitably develop value-added products for locally grown hops, including extracts for brewing and natural health products?	Kelly Jackson	2021.039
	<u>**Note: Proposals must include a Value Assessment Plan (VAP).</u>		
New Product Development	How can biomass crops (miscanthus, switchgrass, big blue stem), hemp and other agricultural crop fibres be suitably used in the construction/ building materials and for potential carbon storage and Greenhouse Gas (GHG) emission reduction?	Kelly Jackson	2022.007
	<u>**Note: Proposals must include a Value Assessment Plan (VAP).</u>		
New Product Development	How can next-generation, sustainable, and biodegradable plastic alternatives be developed with superior properties to assure food safety along the supply chain?	Kelly Jackson	2023.003
	<u>**Note: Proposals must include a Value Assessment Plan (VAP).</u>		

Trade, Market and Targeted Sector Growth Opportunities

Focus Area	Research Question	LEAD RA	RIB ID
Domestic Market Analysis	How can we increase market uptake and consumer education on how to use new and underutilized crops (e.g., haskap, ginseng, Jerusalem artichoke, pawpaw)?	Robin Smart	2021.063
Domestic Market Analysis	What are the direct shipping lanes between Ontario and North American market areas, including the carriers for those markets by mode (truck, port, or rail) and class (dry van, refrigerated or less than truckload, etc.)?	Robin Smart	2021.065
Global Market Analysis	Among the secondary group of Ontario's U.S. state trading partners, which ones (i.e., Missouri, Kentucky, Tennessee, West Virginia, Virginia, North Carolina, South Carolina), present the best regional opportunities for market diversification for Ontario's agribusiness and agri-food sector to seek realistic success in the next 2-5 years considering changing consumer preferences and shifting consumer trends?	Robin Smart	2019.080

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Global Market Analysis	How can Ontario effectively collaborate with the Canadian federal government and other provinces and learn from international examples to address non-tariff trade barriers and improve market access? How do other sub-national jurisdictions influence the advancement of market access issues?	Robin Smart	2019.081
Global Market Analysis	What are the international market opportunities for specialty crops and what are the regulatory and non-regulatory barriers/challenges with serving these markets?	Robin Smart	2019.092
Targeted Sector Growth	What are the key challenges and growth opportunities for Ontario's agribusiness and agri-food sector in key global hubs? Which global hubs (i.e., Dubai, Ethiopia, Singapore, Netherlands) present the best opportunities for Ontario's agribusiness and agri-food sector to seek realistic success in the next 2-5 years? Which subsectors of Ontario's agribusiness and agri-food sector might be most compatible with each market's needs? What are the potential barriers to overcome? How can these barriers be addressed?	Robin Smart	2019.082
Targeted Sector Growth	What are the most promising economic end use market opportunities for biomass crops (switchgrass, miscanthus), hemp, crop and food processing residues and by-products and for potential industrial bioproducts manufacture and value chains in Ontario?	Robin Smart	2019.093

Strong Rural Communities

Focus Area	Research Question	LEAD RA	RIB ID
Labour Access/Efficiencies	What are the incentives and disincentives that influence domestic local workers (unemployed, under-employed or employed) to pursue or dismiss potential pathways into employment in the agriculture sector in Ontario? How is does this vary for immigrants and equity deserving groups? What are the barriers for employers to incentivize workers, including immigrants and equity deserving groups, to pursue employment in the agriculture sector in Ontario? What models, supports, interventions, best practices and other levers can be applied within Ontario by governments and industry to attract local workers to the sector, including immigrants and equity deserving groups?	Robin Smart	2022.002
Labour Access/Efficiencies	What are the barriers faced by under-represented groups in entering and/or succeeding in the agri-food/business sector, and what are the potential solutions? What actions can governments take to support individuals from under-represented groups, including Indigenous peoples, racialized groups, women, youth, and 2SLGBTQIA+ individuals, to start and/or grow their businesses?	Robin Smart	2024.014
Multi-disciplinary research to address integrated priorities	Develop a research project to address key needs, challenges, or emerging opportunities in support of Indigenous agriculture and food production systems in Ontario. **Note: Proposals must clearly indicate the challenge or opportunity being addressed, and the communities and people who would benefit.	Elin Gwyn	2023.012

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Focus Area	Research Question	LEAD RA	RIB ID
Rural Community Development	What are suitable business, funding, and financing models for various scales of Indigenous agri-food farms and or farming systems, aquaculture, and other related businesses along the supply chain? These models will help to support start-ups, improvements to existing businesses and business expansions.	Elin Gwyn	2022.009
Rural Community Development	What are the potential costs of drainage and maintenance for municipalities with federal rail line crossings, and how will these costs impact property tax rates and property owners? How will evolving climate patterns influence future drainage needs, and what are the opportunity costs of not upgrading or maintaining drainage projects considering these changes?	Robin Smart	2023.007
Rural Community Development	<p>How are rural communities meeting current and planning for future demographic challenges (i.e., growing percentage of seniors, fewer working age residents and youth out-migration) to thrive and remain resilient?</p> <p>Develop a research project that addresses one or more of the following issues: How are rural communities and partners:</p> <ol style="list-style-type: none"> 1. Addressing business transitions (e.g., retiring business owners), labour force attraction and retention challenges, and the impact of remote workers? 2. Ensuring availability of a wide spectrum of affordable housing options (rental and purchase) for youth, families, and seniors? How is this growth impacting infrastructure? 3. Addressing/creating service delivery ecosystems that serve residents closer to home, including but not limited to services, such as health care, long-term care, and education and training? 4. What are the innovative solutions that small Ontario communities and those in other jurisdictions are using to address these challenges? 5. What success stories can be shared? 	Robin Smart	2023.010
Rural Community Development	To what degree are recently developed provincial agricultural land use policies (e.g., adopting an Agricultural System approach, completing Agricultural Impact Assessments, permitting additional residential unit in prime agricultural areas, etc.) being effectively implemented? What performance measures or key indicators can be used to evaluate policy outcomes in Ontario's prime agricultural areas and are there barriers, tools or strategies that can be profiled to improve policy implementation by municipalities or consultants?	Robin Smart	2024.015
Rural Community Development	<p>A jurisdictional scan of mega manufacturing investments located in small communities in other provinces, states, or countries.</p> <p>What were the economic/social impacts of such large investments on small communities? What are lessons learned (successes and challenges) and what recommendations could be made that would be applicable to the Ontario context that would help small Ontario communities prepare for such investments?</p>	Robin Smart	2024.016

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Focus Area	Research Question	LEAD RA	RIB ID
Rural Community Development	Develop a research project to address key needs, challenges, or emerging opportunities in support of agriculture and food systems in Northern Ontario.	Robin Smart	2024.017

**Note: Proposals must clearly indicate the challenge or opportunity being addressed, and the communities and people who would benefit.