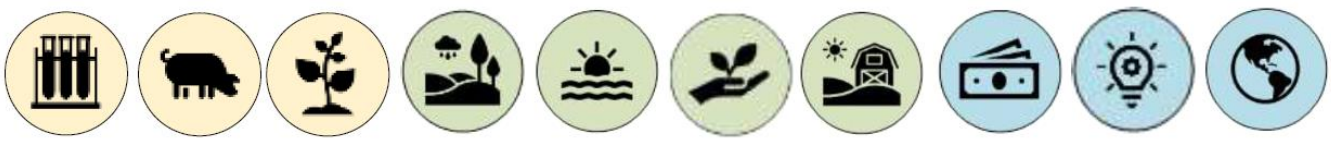
ONTARIO AGRI-FOOD INNOVATION ALLIANCE
SPECIAL INITIATIVES PROGRAM GUIDE

APRIL 3, 2020



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Special Initiatives Research Program Details

The priority-driven Ontario Agri-Food Innovation Alliance Research Program funds research to support strong rural communities, keep our food safe, and develop a prosperous, environmentally sustainable agri-food sector in Ontario.

Special Initiatives – Overview

Special Initiatives is a new program under the Ontario Agri-food Innovation Alliance. Projects funded under this program relate to an Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Research Priority (listed below) but further responds to a specific issue or need of the Ontario Agri-food sector that has been identified by OMAFRA. These science and research needs are important for the Ministry and agri-food stakeholders but, for various reasons, do not fit well into the annual Tier I call for proposals cycle or under another Alliance program. Special Initiatives include breeding research, medium-term trials, synthesis, modelling, and other priority research and science needs identified by OMAFRA.

> Breeding research: Research into new cultivars or traits in plant and animal production.
>
> Medium to long term trials: Projects that require a longer term for data collection. Perennial crops, including some grains and forage crops, do not produce any yield during the first growing season. Therefore, a three-year project only allows two years of data collection and provides limited scientific value.
>
> Synthesis: The exploration of available evidence on a given topic to analyze and summarize the current state of knowledge to inform the next steps and recommendations. Includes but not limited to literature reviews, scoping studies, jurisdictional scans, meta-analysis and systematic reviews.
>
> Modelling: The simulation of real-life situations with mathematical equations to forecast future behaviours. Modelling can span topics such as, but not limited to, watershed hydrology, trade economics/agreements, or the epidemiology of diseases.

While this guidance document is focused on program details and the application process for the Special Initiatives Program, the Special Initiatives (SI) Projects outline for each identified agri-food sector need/issue is detailed in the Appendix. A brief overview of each SI Project is provided including desired outcomes, project duration, and funding available. All proposals submitted to the Special Initiatives Program must be developed to specifically align with the project descriptions and outcomes described. Additionally, there are OMAFRA contacts listed to answer specific questions about a project. Please reach out to the OMAFRA specialist identified should you require further detail or clarity.

Ideally, one strong submission will be received for each SI Project identified in the Appendix. Collaborative submissions are highly encouraged so that the best expertise at UofG is brought to bear to address OMAFRA's Special Initiatives research needs.

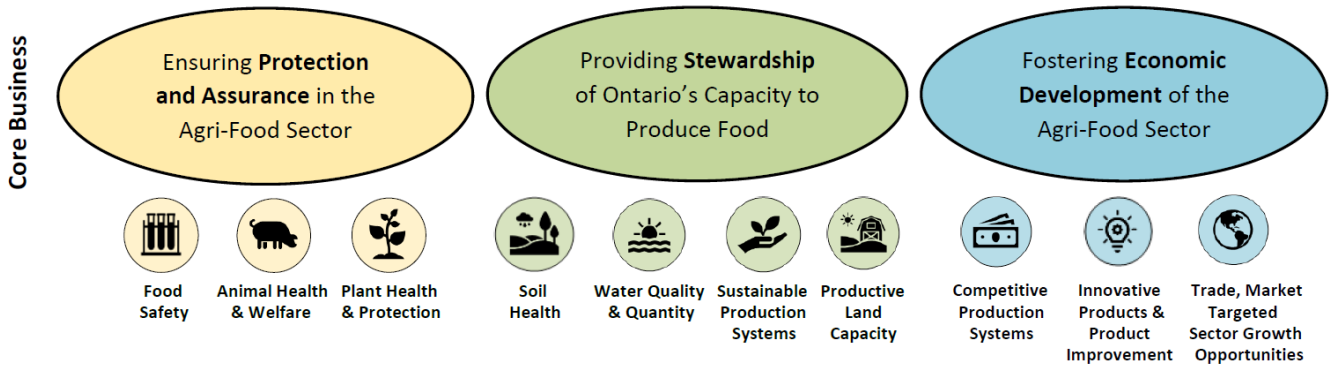
Timelines

- Program Launch: March 31, 2020
- Full Proposal submission deadline: May 1, 2020 at noon
- Anticipated award notification: May 29, 2020

OMAFRA Research Priorities

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) undertook a new approach to research priority setting in 2019. Research priorities for the Alliance Research Program are aligned within the Ministry's core businesses and objectives: Protection and Assurance, Stewardship, and Economic Development as illustrated below.

OMAFRA Research Priorities by Core Business



Each of these research priorities has a set of goals and research focus areas, in addition to five cross-cutting focus areas. The SI Projects have been developed within these research priority and focus areas.

Research Stations

Through the unique partnership between the University of Guelph and OMAFRA, 15 crop and livestock research stations located throughout Ontario drive research support for the agri-food industry. The stations are owned by the Agricultural Research Institute of Ontario (ARIO). The University of Guelph manages the stations with oversight from OMAFRA's Research and Innovation Branch.

Research Funding

Research is supported by funding project operating costs. Use of ARIO research stations will be subsidized at 100% of the cost for Special Initiatives Projects.

For a complete list of research stations, please visit our website.

Project duration and the maximum award vary depending on the project. Please see the SI Projects (Appendix to this document) for details. Project start dates must be on or after May 1, 2020.

Proposal Review Process

All proposals will be reviewed by OMAFRA staff and a UofG Research Program Director. Proposals will be reviewed against established criteria including:

- Alignment of the proposal with an SI Project (identified in the Appendix), including specifically addressing the research need outlined;
- Strength of the project lead(s) and research team in carrying out the experimental plan;
- Quality, level of detail, and clarity of the objectives, milestones, and experimental design;
- Deliverables that are clear, tangible, measurable, and achievable; and
- Strength of the Knowledge Translation and Transfer (KTT) plan.

Funding recommendations will be provided to the Ontario Agri-Food Innovation Alliance Research Program Management Committee. Final funding decisions are at the discretion of OMAFRA.

How to Apply

Online Application System – Research Management System

Special Initiatives applications will be prepared and submitted in the Research Management System (RMS). The Special Initiatives Program will be administered in a single stage (Full Proposal only). While the RMS has a new look and new functionality, the overall approach to applying to Alliance programs will be familiar. It is highly recommended that additional time be allocated for completion of the application in the RMS. Of particular note is the team member invitation process which requires action from the both the researcher and team members in advance of the submission deadline.

Registering in the RMS

RMS works in a variety of web browsers, but we **do not recommend that you use Internet Explorer** as some functionality does not work well.

Registering in the RMS will bring you to your Researcher Workbench where you can apply to open calls. A new RMS system was implemented in the fall 2019.

- If you have already registered or applied to a Program through the RMS since October 2019, simply log in at https://omafra2.smartsimple.ca/.
- If you have not applied to a Program since October 2019 but have used the previous system, you will need to create a new password, as UofG faculty contact records have been migrated from the previous RMS system, but for security reasons passwords have not. Therefore, you will need to enter your uoguelph.ca email address on the RMS login page (https://omafra2.smartsimple.ca/) and select "Forgot Password". Enter a new password at the prompts. Please be aware that faculty existing within the previous RMS system must follow the "Forgot Password" option in order to be properly affiliated with their previous projects once these projects have migrated to RMS.
- If you have never used the RMS select 'register' on the login page (https://omafra2.smartsimple.ca/).

Please contact rescoord@uoguelph.ca if you experience any difficulties logging in. To open an application, select the Special Initiatives Program and click on "Determine Eligibility'. Confirm your eligibility to apply for funding to access an application.

Eligibility

University of Guelph faculty members are eligible to be the lead applicant and/or a co-applicant on any Ontario Agri-Food Innovation Alliance Research Program project. Adjunct faculty members may also apply if they are eligible to hold research funding at the University of Guelph.

The Lead Applicant is the primary award holder and is accountable for project management and compliance with any reporting requirements

A Co-Applicant (optional) is a researcher or partner that plays an important and ongoing role in the development and implementation of the project. Co-applicants are identified and invited from the team member tab in RMS. There can be only one Co-applicant.

Please Note: Prior to being awarded any new project(s) under the OMAFRA/UofG Agreement, lead applicants and co-applicants must be fully compliant with all reporting requirements for existing projects under the Alliance Research Program.

The RMS Full Proposal Template

The Full Proposal application consists of several sections that are navigated via tabs across the top of the on-line application in the RMS. All tabs must be completed. Application instructions are provided in the RMS, but some additional guidance is provided below.

A validation process will take place upon submission to ensure all mandatory fields are complete.

Research Priority Selection

Special Initiatives (SI) Projects have been identified by OMAFRA and meet ministry research priorities. Select the Research Priority and Research Focus Area associated with the SI Project you have selected from the drop-down lists in the RMS.

Please ensure you clearly indicate which SI Project your proposal addresses in the 'Alignment with OMAFRA Priorities' field in the 'Proposal Details' tab of the RMS application.

Research Team and Invitation process

Team members and Highly Qualified Personnel (HQP) are identified in their respective tables in the Team tab in the RMS. **Inviting Research Team members** is a new process in RMS. This process is described in the application template and in the tip sheets (accessible under the 'Help' icon on the RMS home page). Co-applicants, Delegates (described below) and all Collaborators should confirm their participation in the project and be registered in RMS by the Full Proposal submission date. A Delegate (optional – limit of one) is an individual whose only role is to assist the Lead Applicant in the creation and editing of the application and progress reports (for awarded

projects). A Delegate must be part of your organization. A Delegate, while not formally a team member, is identified and invited from the team member tab in RMS. Delegates that play an active role in the research project must also be identified and invited as a Collaborator or identified in the HQP table in the RMS (this is important for performance measure reporting).

There is no limitation placed on the balance of the team composition, but all team members should play an active role as collaborators in the implementation of the SI Project (advisory, researcher or knowledge broker). The team may include individuals from:

- UofG (researchers and other support staff e.g. technicians, including research station technicians);
- Other University or research institutions in Canada or globally;
- Private businesses;
- Industry / commodity organizations;
- Non-governmental organizations; and
- Provincial, federal or municipal government departments (e.g., OMAFRA staff).

Do not include graduate students or post-docs working on the project in the team table, they should be listed in the Highly Qualified Personnel (HQP) table described below.

The project team composition should ensure that the appropriate research expertise is brought to bear on the research objective(s) to be addressed. **The FTE (full-time equivalent) you report in the team member table should reflect the total average annual time that each individual will contribute to the project.** Documenting FTE contributions are important to support performance indicator reporting. The involvement of all team members (including their estimated actual FTE contributions to the project) will be reported on in annual and final reports.

The specific role of each team member in the project should be described in the team table. Do not simply list their area of expertise.

Highly Qualified Personnel

Highly qualified personnel (HQP) are undergraduate and graduate students or post-doctoral fellows receiving training through the proposed research. These HQP are captured separately from team members in the RMS. Please provide details on all HQP that will be involved in the project, regardless of their stipend funding source. Highly Qualified Personnel do not need to be invited. Proposals can move forward without specific persons identified as HQP if the positions are not yet filled. If specific people are not identified, use TBD as the first and last name within the HQP table and complete all other fields except for e-mail address.

Knowledge Translation and Transfer (KTT)

The KTT tab in the application consists of two tables: KTT User Audiences and the KTT Plan. Instructions for completing these two tables are in RMS.

There are several resources available to assist you in creating your KTT plan. Visit the KTT Services and Resources page to access these resources.

- Growing Knowledge Translation and Transfer in Ontario: A Manual of Best Practices: This manual outlines a collection of best practices in agri-food and rural KTT that can help guide you through the development of your KTT plan.
- KTT Plan Checklist: A practical tool based on the Alliance KTT plan template. These guidelines, prepared by Alliance funding program reviewers, ensure your proposal covers key aspects of KTT planning.
- KTT Example Plans: Examples of complete KTT plans to help provide ideas of innovative KTT activities as well as questions to consider as you answer each section.

Contact kttadmin@uoguelph.ca if you have any questions about these resources or the KTT section of your proposal.

Supporting Documentation

Supporting documentation should be in PDF format and may include:

- Team Member Supporting Documentation
  - CV's of the Lead Applicant and Co-Applicant
- Proposal Details Supporting Documentation
  - References for your Literature Review
  - One-page diagram which illustrates the Methods described in the proposal (optional)
- Other Supporting Documentation
  - Letters of support (if applicable)
  - Confirmation of leveraged funding (if applicable)
  - Sub-Award/Collaborative Research Agreement (CRA) Budget Templates

OR-5

An OR-5 Form is **no longer required to be uploaded to the application.** OR-5 fields are completed on-line by the applicant on the OR-5 tab within the RMS. Department and College approval will be obtained electronically following proposal submission. No further action is needed by the applicants.

Additional Support for Applicants

The following additional supports are available to assist researchers in the application process:

- Instructions and tool tips (denoted by) in the RMS Application Template;
- Tip sheets available on the RMS Researcher Workbench Home page ('Help' icon);
- Microsoft Word version of the application template and an Excel version of the budget template are available as optional resources on the Tier I program website (Special Initiatives and Tier I applications are almost identical). Please note all project and budget content must be entered in the RMS prior to submission; and Microsoft Word version of the application template and an Excel version of the budget template are available as optional resources on the Tier I program website; and
- If you experience technical difficulties or need support with the RMS application template please contact our Research Program Coordinators at rescoord@uoguelph.ca or at x56863 (Kat Tisshaw) and x56877 (Zach Telfer).

THE RMS BUDGET AND LEVERAGE GUIDELINES

BUDGET LIMITS

Project duration and the maximum award are specified in the Special Initiatives (SI) Project details (see Appendix).

ELIGIBLE AND INELIGIBLE EXPENSES

The following provides a guideline of direct project expenses that are eligible under the Special Initiatives Research Program. It is not an exhaustive list. Please contact rescoord@uoguelph.ca with any questions regarding eligibility of budget items (either as direct project expenses or as matching contributions).

Eligible project expenses (can also be provided by funding partners):

- Salaries of scientific or technical staff employed on a contract basis or hired specifically for the purposes of this project (including those at UofG if not funded by the Alliance). Value should be based on their FTE contribution to the project;
- Graduate student stipends;
- Goods and services necessary for the project (e.g. supplies, disposables, sampling, lab testing, equipment up to $10,000, etc.);
- KTT and technology transfer related costs such as the organization of workshops (venue, meals etc.) and communication materials;
- Publication costs (e.g. page charges for academic journals);
- Travel necessary to carry out the project (e.g. to research stations and field plots); and
- Travel to conferences where project information is being presented.

Ineligible project expenses:

- OMAFRA staff time or resources;
- Salaries of permanent staff whose compensation is not specifically dependent on on-going research project funding;
- Support for meetings/events that would occur regardless of project funding; and
- Capital purchases exceeding $10,000 over the life of a project (i.e., equipment/infrastructure with a useful lifespan beyond the duration of the project).

RESEARCH STATION USE AND ACCESS FEES

Uof G faculty have access to 15 research stations, typically at highly subsidized rates. Please note: **Research Station use is subsidized at 100% for the Special Initiatives Program**, so third party (non-OMAFRA) funding is not required to cover any of the station fee.

If you intend to use a research station(s), please ensure this is identified in the 'General' Tab in RMS. This will create a section on the Budget tab where you identify the specific research station services you require. Full instructions are available in the RMS application. Language about partner funds for station fees can be ignored for the Special Initiatives Program.

Visit the Program website for a complete list of Research Stations.

LEVERAGE / PARTNER FUNDING

Funding partners are individuals or organizations that contribute cash and/or in-kind support to the project. **While leverage and partner funding is encouraged, it is not a requirement for the Special Initiatives Program**.

In-kind contributions are non-cash contributions providing a direct, tangible benefit to the project. The donated asset or contribution must be essential to the project's success and if not donated, would need to be purchased and paid for from approved project funds. In-kind contributions must be in lieu of eligible project expenses only.

All in-kind contributions must be fully explained in the budget notes. The value of the assets or services donated must reflect fair market value for the time period it is donated. The eligibility and value of in-kind contributions will be assessed by the review committee.

Funding partners can include:

- UofG (applicant organization);
- Federal (including tri-council), provincial (including non-Alliance OMAFRA funding), or municipal government sources;
- Other universities/ research Institutions;
- Business and Industry;
- Non-governmental organizations; and
- Individual donors.

Ineligible partner cash and in-kind:

- In-kind support from OMAFRA (time, resources, supplies, materials, etc.);
- Use or provision of existing supplies, materials, and equipment belonging to the Lead Applicant, Co-Applicant, or UofG collaborators;
- Salaries for individuals that are 'regular, base-funded' positions within the applying or donating organization. These individuals, if involved in the project, should identified on the 'Project Team Members' table and invited to participate in the project;
- Other Alliance funding, including graduate student stipends awarded under the HQP Scholarship Program (however these HQP must be identified the HQP table); and
- Alliance-funded Technician time (**however Alliance-funded Technicians must be identified on the team members table to support performance measure reporting**).

OVERHEAD/INDIRECT COSTS

UofG indirect costs are incorporated into the master OMAFRA/UofG Agreement. No additional indirect costs are required and/or eligible on a project-by-project basis on the amount requested from OMAFRA. The overhead percentage identified in the budget tab should remain at 0.

Partner Cash Contributions: Indirect costs must be included at the applicable rate (e.g. 25% or 40%) on partner cash contributions from government and industry sponsors when those contributions leverage OMAFRA funding. Identify these costs in the 'Operating-Other' category in the 'Cash from Partners' expenditure table and describe them in the budget notes.

Indirect costs levied by a collaborating institution receiving transfers of Alliance project funds are eligible and must be included in the budget under 'Operating-Other' in the 'Funds Requested from Program' expenditure table and described in the budget notes (see Collaborative Research Agreement section below).

Building a Project Budget

An Excel version of the budget template is available on the Alliance program website as an OPTIONAL tool to draft and plan your budget. This is for planning purposes only. Please ***DO NOT*** upload this Excel budget to your application. You are required to complete and submit the budget in the RMS.

1. **Sources of Project Funds** includes the funding requested from the program as well as cash and in-kind support from partners. If you have indicated there are other sources of funding for the project, click 'ADD Funding Source' under the 'Other Sources of Project Funding' section within the Budget tab and provide the details requested for each Funding Partner supporting the project.
2. **Uses of Project Funds -** There are three tables to be completed in the Budget tab (will appear in a pop-up window):
    - Funds Requested from the Program;
    - Cash Support from Partners (if applicable); and
    - In-kind Support from Partners (if applicable).

Use of program and partner funds should be allocated across budget categories and fiscal years. Each row in the budget corresponds to a UofG fiscal year (May 1 – April 30) that the project will take place. E.g., A 3-year project beginning October 1st would require 4 budget periods (fiscal years) – the first and last periods covering 6 months only.

Use of projects funds must be fully explained/justified in the text boxes provided. Your notes help us determine whether your expenses are a) eligible; b) commensurate with the nature of your proposed research; and c) are valued appropriately.

Budget for Collaborating Researchers

Sub-Awards (for UofG Collaborating Researchers)

If a significant part of the project budget will be managed by a collaborating UofG faculty team member(s) in a different department than the Lead Applicant, a sub-award with a separate FRS tracking account number can be set up upon request. UofG Researchers in the same Department are expected to manage their project spending collaboratively.

- A separate budget worksheet which provides the details of the sub-award must be uploaded with the proposal. The budget worksheet is available on the Alliance program website.
- In addition, a *Letter of Agreement for Internal Transfer of Funds* will be required at the time of award.
- It is the Lead Applicant's responsibility to report on all project activities, including the work of collaborating team members.

Collaborative Research Agreements (for non-UofG Collaborating Researchers)

Alliance project operating funding awarded for an approved project can be transferred to another institution for use by a team member via a Collaborative Research Agreement (CRA). CRAs are created post-award and require the same detailed reporting through the Lead Applicant's project.

- Any **overhead/indirect costs** levied by the receiving institution on such fund transfers of OMAFRA-UofG project support must be included in the amount identified and budgeted for transfer, as there is no other mechanism by which such indirect expenses can be paid. The maximum overhead rate allowed will be 25%.
- If a CRA is required, a separate budget worksheet which provides the details of the budget for the CRA must be uploaded with the proposal. The budget worksheet is available on the Alliance program website. It is the Lead Applicant's responsibility to report on all project activities, including the work of collaborating team members.

Application Checklist and Post Award Processes

Full Proposal Checklist

- ☐ Read the OMAFRA Special Initiatives (SI) Projects (Appendix to this document).
- ☐ Select an SI Project you wish to address with your proposal.
- ☐ Develop project concept to address the needs outlined in the SI Project.
- ☐ Assemble project team that includes your research capacity, advisors, stakeholders (including OMAFRA staff), and technicians. Team members must be confirmed through an invitation process. HQP are identified in a separate table.
- ☐ Connect with your Research Program Director, College Research Manager, Alliance Research Program Coordinators and program support staff such as OMAFRA Knowledge Mobilization Analysts for support in preparing a strong proposal.
- ☐ Develop proposal by completing all tabs in the RMS. Ensure the proposal is complete, well-written and clearly demonstrates how it addresses a specific SI Project.
- ☐ Append all required supporting documentation as described above.
- ☐ Submit your Full Proposal in the RMS by the **submission deadline (May 1st at noon).**

Full Proposal Decision Notification and Award Phase

- Researchers will be notified of the outcome of the review and approval process via the RMS.
- Conditionally approved applications must address any conditions of award described in the notification email (through the RMS).
- A Data Management Plan will be a post award requirement for all approved projects.
- Award Agreements are issued for projects approved with no conditions and projects with conditions of award which have been addressed and approved by the theme Research Program Director.

Project Monitoring Phase

- Annual Progress reports are due 30 days after the anniversary of the project start date (with budget reporting for each fiscal period), including reporting for sub-award and/or CRA related to the project.
- Annual reports will be reviewed and approved if acceptable or revisions may be requested.
  Final reports are due 60 days following the conclusion of the project. They are critical to the success of the Alliance. Some of the important summary fields will be published.

Appendix: Special Initiatives Projects

All proposals submitted to the Special Initiatives Program must be developed to specifically align with the project descriptions and outcomes described below. Please reach out to the OMAFRA specialist identified if you have any questions.

SI-2019-01: Investigating Noise Impacts of Grain Dryers on Neighbouring Land Uses

Contacts: Amadou Thiam Amadou.thiam@ontario.ca, James Dyck james.dyck@ontario.ca

Special Initiative Type: Other

Research Priority: Sustainable Production Systems

Research Focus Area: Nuisance Assessment

Maximum Funding Available: $90,000

Project Duration: 3 Years

DESCRIPTION OF SPECIAL INITIATIVE

Description and Outcomes

Grain handling facilities, and particularly grain dryers at these facilities, can produce significant dust and noise emissions. Most of these facilities are located in rural areas, nearby to rural population centres. Many of these facilities have grown quite large over time and the potential for dust and noise emissions is large. Some rural areas also continue to expand in population, increasing the potential for conflict between residential and agricultural land uses.

This project will characterize the intensity and variation in noise generated by grain dryers. Partners in the agricultural community will be identified who have grain dryers installed on their farm operations. Noise will be characterized at various frequencies and for various types and sizes of grain dryers located at partner facilities. The impacts of the characterized noise at various distances from the facility will be analyzed. Options for noise reduction will also be investigated and characterized where possible. Based on the characterization, the researchers will also identify and summarize potential Best Management Practices which may be able to reduce noise impacts on surrounding land uses. A survey of Ontario farms in partnership with organizations such as Grain Farmers of Ontario and various grain dryer suppliers will also be undertaken to gain comprehensive data on the grain drying landscape in Ontario today.

Gap or Problem Being Addressed

MECP is currently developing standards to address air emissions from grain dryers, specifically dryers which are not identified as “agricultural operations”. The proposed standards are not expected to provide any guidance related to noise.

Ontario farms have a total of 11,160,000 metric tonnes of permanent grain storage (Statistics Canada, March 2019) and this number has grown from 9,520,000 metric tonnes in March 2015 – an annualized growth rate of

over 4%. However, there is a lack of information on the grain drying piece; there are no comprehensive data sets which give information on the numbers, types, and/or capacities of grain dryers installed across Ontario today. It is assumed that as grain storage numbers have increased, the quantity and sizes of grain dryers have also increased, as have the potential for noise and dust issues from grain drying facilities.

Intended Use for the Project Outcomes/Output

The noise characterization of grain dryers and investigation of various Best Management Practice, will be used in the following ways:

- To identify the numbers, types and sizes of grain dryers currently in use on Ontario farms
- To characterise the noise produced by different type of grain dryers in Ontario
- To quantify the noise-related impacts of grain drying facilities at various distances in order to assess the impact on surrounding adjacent land uses.
- To analyze and quantify the benefits of potential noise-reducing technologies and options, where available, with the goal of developing a list of effective noise-reducing BMPs which could be implemented at both new and existing grain dryer facilities to reduce noise impacts on surrounding land uses.

Environmental Scan/Analysis

There has not been significant work done in the past on noise from grain drying facilities. Much of the work that has been done is 20+ years out of date. The grain drying landscape has changed significantly in recent years, with much larger equipment being installed and much higher drying capacities, which in turn create higher levels of both dust and noise. This project will build on previous work and highlight the current noise and dust considerations and impacts with modern equipment.

Previous work done in Ontario:

- Pinchin Environmental, “Acoustic Assessment Report: Country Elevator/Crop Input Facilities”, report prepared for Ontario Agri-Business Association, June 2014
- Pinchin Environmental “Environmental Compliance Pathways for the Ontario Agri Business Sector: Technical Report”, report prepared for Ontario Agri-Business Association, June 2014
- S. Clarke, M. Toombs, S. Rambié, R. Richardson, OMAFRA, “Quantifying Grain Dryer Noise to Prevent Hearing Loss and Nuisance Complaints”, paper presented to the Canadian Society of Agricultural Engineering, July 1998, Vancouver BC

Work done in other jurisdictions

- M. Reinvee, M. Luik, P. Kliimak, Estonia University of Life Sciences, “Noise Emissions from Grain Dryers and Potential Noise Pollution”, Agronomy Research 11 (2), 457-462, 2013
- Silsoe Research Institute, “Practical Solutions to Noise Problems in Agriculture”, report prepared for the Health and Safety Executive (United Kingdom), 2004
- M. McCullagh, “Preservation of Hearing Among Agricultural Workers: A Review of Literature and Recommendations for Future Research”, J. Agricultural Safety and Health 8(3): 297-318, Jan 2002
- D. Holger, “A Muffler for Agricultural Fans”, American Society of Agricultural Engineers, Transactions of the ASAE, 1978

- M. Ige, M. Finner, “Reduction of the Aerodynamic Noise Generated by Crop Drying Fans”, American Society of Agricultural Engineers, Transactions of the ASAE, 1974

SI-2019-02: Removing Zinc from Greenhouse Stormwater

Contacts: John Van de Vegte, John.VandeVegte@ontario.ca, Vicki Hilborn, Vicki.Hilborn@ontario.ca

Special Initiative Type: Other

Research Priority: Water Quality & Quantity

Research Focus Area: BMP Development

Maximum Funding Available: $150,000

Project Duration: 2 Years

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

Many large-scale greenhouses collect stormwater from their roofs via galvanized steel, which can result in higher concentrations of zinc in their stormwater. Currently several greenhouses are exceeding zinc concentrations in the stormwater being discharged to the natural environment under Environmental Compliance Approvals (ECAs). These greenhouses are seeking cost effective options to meet the compliance expectations under their ECAs. The focus of this research project is to determine the effectiveness of different products (including chitin) to reduce the zinc discharge from greenhouse stormwater ponds. This project will build upon existing work done by the University of Windsor to aid greenhouses in reducing the phosphorus and zinc concentrations being discharged from their ponds.

This project will assess the effectiveness of new products (including chitin) to remove zinc from stormwater and also provide practical solutions to reduce zinc discharges from greenhouse stormwater ponds, while considering final disposal options for the treatment material.

Gap or Problem Being Addressed

The amount of zinc entering watersheds in Ontario must be reduced. The greenhouse industry in Ontario, with 22,950,000 sq. meters of roof area reported in 2017 (Stats Canada) would be a significant contributor of zinc from their galvanized through their stormwater management systems. The greenhouse operators require support to identify cost effective methods to control the zinc levels in their stormwater discharge. The proposed research does provide a method which, if proven to be effective, can be quickly made available for use by the greenhouse operators.

Intended Use for the Project Outcomes/Output

This project will assess the effectiveness of new products (including chitin) to remove zinc from stormwater and also provide practical solutions to reduce zinc discharges from greenhouse stormwater ponds, while considering final disposal options for the treatment material.

Environmental Scan/Analysis

The University of Windsor (Dr. Chris Weisener) has been researching the impact of legacy phosphorus (i.e. phosphorus contained in the soil) on the quality of water being discharged from greenhouse stormwater ponds. This group has established relationships with operating greenhouses which could be expanded to pilot test this technology in practical applications.

The Ministry of Environment, Conservation and Parks (MECP) has some data on the quality of water being discharged from stormwater ponds from both greenhouses and municipal sources. MECP has completed some preliminary comparisons between the quality of discharges, but MECP has not compared the quality of greenhouse stormwater to other agricultural stormwater. The current analysis has focused on phosphorus and not on zinc. MECP also has data on the zinc concentration in Leamington watersheds as compared to other watersheds in Ontario.

Limited data outside of Ontario on greenhouse stormwater data, but some data appears to be available from the Netherlands. There is some limited data available for industrial buildings using galvanized steel as a roofing material.

SI-2019-03: Market Conditions for Small Scale On-Farm Anaerobic Digestion

Contacts: Peter Doris, peter.doris@ontario.ca, Jake DeBruyn, jake.debruyn@ontario.ca

Special Initiative Type: Synthesis

Research Priority: Innovative Products & Product Improvement

Research Focus Area: Product Enhancement

Maximum Funding Available: $60,000

Project Duration: 1 Year

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

Anaerobic digestion captures the methane and odours generated by farm wastes and converts them into electricity, heat or renewable natural gas. In a post Feed-In Tariff, non-cap and trade marketplace, what market drivers and economic value propositions are needed for the new generation of micro to small-scale anaerobic digesters to gain traction in Ontario? How can multiple revenue streams be achieved through the operation of small-scale digesters on-farm? Should the focus be "carbon neutral farms" or widely distributed renewable natural gas?
The outcomes will be:

- An understanding of market conditions to increase the adoption of this new and disruptive technology (small scale anaerobic digestion).
- Insight to the foreseeable disruptive technologies that may work in Ontario
- Information to guide industry investments in small on-farm digesters (and not just larger systems).
- Information to guide Ministry policies on reducing air emissions (odour, GHGs) and to satisfy objectives in the Made-in-Ontario Environment Plan for GHG reductions.

Gap or Problem Being Addressed

Small scale anaerobic digestion of manure on-farm provide new stable economic revenue, contributes to reduced manure odour, and enables farmers to reduce their farms' greenhouse gas emissions. Biogas production on farms is well understood, but new strategic markets are not. In addition, there are few other viable ways for medium to small sized farms to reduce their GHGs or participate in carbon markets.

There are new efficient small-scale anaerobic digesters now on the market, including several vendors attempting to gain a foothold in the Ontario marketplace. But in the current economic market there is not a single simple revenue stream to make projects economically viable. Potentially several moderate economic opportunities all need to be optimized in order to secure economic viability.

At the same time, the food waste sector, municipalities, businesses, and utilities are all seeking ways to reduce GHG emissions. Alternatives to fossil fuels are an obvious choice to reduce emissions, but the technology and strategies for farms to do this are not clear.

The current focus on anaerobic digestion and food and organic material management is primarily focussed on very large anaerobic digesters at very large farms. However RNG production today does not have a clear pathway for individual medium to small livestock operations.

Reducing GHG emissions from farms (and Ontario in general) is exceedingly difficult since many agricultural practices have negative impacts on emissions. New approaches are needed to replace fossil fuels and this is an area where Ontario farms could make significant, low-cost GHG emission reductions. If OMAFRA does not undertake this work the current pathway of seeing energy opportunities only applied at the largest farms will continue, further exacerbating the increasing gap between opportunities for the largest farms, while mid-sized farms get left behind. In addition, great opportunities for many farms to reduce greenhouse gas emissions and diversify revenue streams will be missed.

Intended Use for the Project Outcomes/Output

The outcomes will include:

Technical information that can support policy or program development. For instance, detailed information about a threshold price for compliance credits for energy replacement that could inform the Federal Clean Fuel Standard.

A user-friendly report that targets information to livestock operators with practical information like:

- an evaluation of actual revenue sources in Ontario;
- emerging small scale technology in Europe;
- details about actual heat use efficiency when using cogeneration heat on the farm;
- pros and cons of certain economic opportunities like replacement of purchased bedding with digestate solids bedding.
- an overview and analysis of successful market drivers from other jurisdictions that are not currently available in Ontario.

Environmental Scan/Analysis

The marketplace for greenhouse gas credits and environmental goods and services is evolving quickly. This study will provide a state of the art view of the current marketplace and potential technologies.

OMAFRA has not undertaken this kind of study, nor funded this kind of study in a long time. Work in the 2000's focussed on small-scale opportunities for mid-sized farms and contributed to the design of the Ontario Biogas Systems Financial Assistance Program, the Renewable Energy Standard Offer Program, the Feed-In Tariff Program, and the Nutrient Management Regulated Mixed Anaerobic Digestion Facility regulations.

The recent Climate Change Action Plan OMAFRA program 'Agrifood Renewable Natural Gas for Transportation Demonstration Program' undertook review of renewable natural gas funding programs which primarily focus on large scale anaerobic digestion. Similarly, the jurisdictional scan for the proposed changes to the Nutrient Management Regulated Mixed Anaerobic Digestion Facility (RMADF) regulations primarily focussed on increasing the size of digesters to achieve economies of scale needed for large RNG production.

The re-election of the federal Liberals likely means the continuation of the proposed federal Clean Fuel Standard, which will set increasingly stringent targets for the carbon intensity of all fuels, including natural gas. With Canada highly dependent on natural gas, and few alternative sources of low-carbon natural gas, every opportunity for Renewable Natural Gas production will face increased positive attention. Under current plans, the CFS for natural gas will begin in 2023, possibly within the 4 year term of this existing federal mandate. This has the potential to be a very significant market opportunity.

SI-2019-05: ONTARIO TOPSOIL SAMPLING PROGRAM

Contact: Daniel Saurette, daniel.saurette@ontario.ca

Special Initiative Type: Modelling

Research Priority: Sustainable Production Systems

Research Focus Area: Environmental Impacts of Management Practices

Maximum Funding Available: $103,000

Project Duration: 1 Year

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

The special initiative project will focus on development of a comprehensive soil properties information dataset for Ontario's agricultural soils. In 2016, OMAFRA staff initiated efforts to renew legacy soil maps and information in targeted areas of the province using predictive digital soil modelling (PDSM) methods. PDSM methods require a variety of soil and landscape data (covariates) to produce robust soil models and maps. As the PDSM efforts have been developed, OMAFRA staff have broadened their PDSM approach to examine ways to update soil maps and information on a regional scale, versus the traditional "County scale mapping," and also identify and gather critically needed soil and landscape data. In 2019, staff initiated a pilot regional "Topsoil Sampling Program" (Phase 1) to support data needs for predictive digital soil mapping models at the regional level.

The current Topsoil Sampling proposal would build on the pilot efforts started in 2019 to: 1) expand the collection of topsoil samples and other landscape information across the province, 2) develop collaboration with University of Guelph researchers to complete specialized, complementary soil analyses and 3) undertake specific soil analytical testing that, when consolidated with complementary research produced by the University of Guelph, would provide a robust soil properties information dataset for Ontario's diverse agricultural soils to support current and future Ministry efforts and initiatives in soil mapping, health and stewardship.

The Topsoil Sampling proposal consists of three components: soil sample collection, land management survey, and soil sample analysis. The soil sample collection portion involves collecting three topsoil samples from ~250 agricultural fields, selected by a computer algorithm, throughout Ontario. Samples are collected at different topographic locations (upper, mid, and lower slope positions) within each field and in-field soil information such as topsoil depth and soil structure are collected at the same time. The land management survey involves asking a series of agricultural management questions to the landowner or farmer of the field of interest to gather information that can help inform the state of soil health at each location. The soil sample analysis portion of this project involves processing (air-drying and sieving) the collected soil samples and subsampling a portion of the soil for laboratory analysis. Data collected in the field, along-side the corresponding analytical results can be used towards producing regional/provincial scale soil property maps. The remaining processed soil would be made available to researchers at the University of Guelph who have indicated support to conduct specialized

analyses and research (as follows) that would contribute to the overall soil information dataset and build our understanding of soil health:

- Dr Asim Biswas: spectral imaging, wet aggregate stability (physical soil properties)
- Dr Kari Dunfield: DNA extractions for identification of soil microorganism communities (biology of soil)
- Dr Laura van Eerd: Solvita and SLAN soil health tests (soil health testing methods and development)
- Dr Adam Gillespie: active carbon, carbon mineralization (soil biology, soil health)
- Dr Richard Heck: magnetic susceptibility, aggregate imaging (physical soil properties)
- Dr Paul Voroney: soil carbon stability (soil health)
- Dr John Lauzon: soil sulphur (soil health, fertility)

The expected outcome of this special initiative project is a comprehensive soil properties information dataset that includes (at a minimum): chemical (pH, cation exchange capacity, organic matter content), physical (soil texture, bulk density), biological insights, and land management (tillage practices, cover crop use, organic amendment application) information for agricultural soils throughout Ontario. This dataset can be used by RIBS Unit to map soil and properties at a broader provincial/regional scale. This project is expected to evolve: as resources become available in the future, the project can be further refined (sampling and mapping more intensively in a smaller area) to improve resolution of soil maps.

In addition, combining the soil information dataset with the results of the University of Guelph specialized analyses will form the only comprehensive soil health database in Ontario. This database will allow investigators to assess soil health in Ontario in relation to land management practices and provide a baseline for soil health monitoring. Also, analysis will allow us to identify trends between crops, management, and soil health with the expectation that recommendations can be made to improve soil health in Ontario.

Gap or Problem Being Addressed

A comprehensive soil information properties dataset does not exist for Ontario soils. Baseline soil information, including chemical, physical, biological and land management information, for the province is needed to:

- map soil properties at a regional/provincial scale and inform predictive digital soil mapping processes;
- evaluate metrics to determine the state of soil health across diverse soil types;
- generate site-specific soil health targets and recommendations that take agricultural/cropping system, management practices, and soil type into consideration;
- quantify trends in soil properties, management, and degradation;
- provide a benchmark from which to measure, compare, and monitor changes in soil properties through time (e.g. soil carbon);
- evaluate the success and adoption rate of Best Management Practices (BMP);
- inform programs, policies and decision-making; and
- better understand climate change impacts.

This project makes use of a pilot Topsoil Sampling Program initiated by Ministry soil staff in 2019. It also will complement current CAP Stewardship projects and outcomes including:

- SHAP – the pilot Topsoil Sampling Program has developed data collection formats that align with the needs of SHAP
- ONFARM – this project may help identify potential ONFARM sites, align data collection methods and the results of this project can help identify approaches to measure soil health and, research

- OASIS – builds soil and agronomic data to incorporate into OASIS, the information storage system currently under development

Additionally, The Soil Strategy outlines a long-term framework that sets goals and objectives for soil health and conservation in Ontario. This project directly addresses key themes in The Soil Strategy (Soil Data and Mapping, Soil Evaluation and Monitoring) and the Agri-Food Environment Plan. A provincial soil properties information dataset lays the groundwork for achieving many of the specific actions under these two and other initiatives.

Intended Use for the Project Outcomes/Output

The main outcome of this initiative will be a provincial soil properties baseline information dataset with accompanying management and analytical information. Potential uses of this dataset include:

1. Regional/Provincially-scaled soil maps and property maps (e.g. soil carbon) using modelling and predictive digital soil mapping techniques
2. Adoption of the data by researchers for soil health research and modelling purposes
3. Generation of specific soil health metrics applicable to Ontario conditions and to agricultural systems
4. Internal analysis to inform BMPs and monitor BMP adoption/success
5. Internal analysis to monitor the success of The Soil Strategy by creating a comprehensive dataset and providing accurate soil organic matter estimates
6. Establish baseline information to monitor soil health progress and trends

In addition, researchers at the University of Guelph are committed to completing specialized analyses related to soil health (refer to list in Section 2).

Environmental Scan/Analysis

European Soil Data Centre, Joint Research Centre of the European Commission

- Land Use and Cover Area Frame Survey (LUCAS) – comprehensive topsoil surveys (2009, 2015 and 2018) that built the first spatial database of soil information throughout the European Union to support soil related program and policy development

OMAFRA, Ministry of Natural Resources and Forestry

- MNRF led Land Use Carbon Inventory (LUCI) to inform national carbon stocks and GHG emissions as required by the Kyoto protocol – OMAFRA is supporting estimates of carbon storage/release in agricultural croplands

Agriculture and Agri-Food Canada

- Soil Organic Matter Indicator – Key soil health indicator reported every 5 years to monitor progress
- Soil Organic Carbon Change Indicator – Measures the rate of change in carbon levels in agricultural soils

Cornell University Soil Health Laboratory

- National Soil Health Database Analysis – Analysis of the national soil database indicates the need for investigations that evaluate impacts of site-specific factors (agricultural/cropping system, soil type) on soil health to create realistic soil health goals

The LUCAS project highlights the importance of having spatial soil information for Ontario. The current proposal will provide soil information from which to evaluate LUCI models and performance, establish realistic soil health goals and indicators, and identify areas for improvement.

SI-2019-06: Assessment of the State of Rural Drainage Infrastructure in Ontario

Contact: Timothy Brook, timothy.brook@ontario.ca and James Mitchell, james.mitchell@ontario.ca

Special Initiative Type: Synthesis

Research Priority: Sustainable Production Systems

Research Focus Area: BMP Development

Maximum Funding Available: $60,000

Duration: 1 Year

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

While not limiting any approaches and methodologies the may be suggested by the program lead, we would expect that the project would entail one or more the following:

- Review of ministry ADIP records and mapping
- Review of aerial imagery
- Literature review
- Survey of municipal drainage superintendents and engineers and public works managers
- Key informant survey (*e.g.,* academics, conservation authorities, provincial and federal officials)

The study will concentrate on works constructed under the authority of the Drainage Act but must also be cognizant of similar infrastructure such as road drainage and works authorized under other legislation.

The outcome would be a report that summarizes that state of rural infrastructure and its capacity to provide drainage services considering future development pressures, agricultural development in Northern Ontario, changing weather patterns and the need to address water quality and natural heritage priorities.

Gap or Problem Being Addressed

A broad overview of the rural drainage in Ontario has not been undertaken since the 1974 Select Committee. There has been a commitment to review rural stormwater management in the Lake Erie Action Plan as well as several significant flooding incidents in Essex and Leamington.

Intended Use for the Project Outcomes/Output

The outputs of this project will be used to inform the ministry on the need for investment in the rural drainage infrastructure and how that investment should be structured. It will be used to support the review of rural stormwater management under the Lake Erie Action Plan.

Environmental Scan/Analysis

Not aware of any similar work completed.

SI-2019-08: Garlic Germplasm and Clean Seed Production

Contact: Travis Cranmer, travis.cranmer@ontario.ca

Special Initiative Type: Breeding

Research Priority: Plant Health & Protection

Research Focus Area: Integrated Pest Management

Maximum Funding Available: $102,000

Project Duration: 4 Years

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

This funding would support a self-sustainable start-up of a garlic clean seed program. Growers are advocating for pathogen-free seed to improve plant health and reduce crop failure. Some vegetative crops, like potatoes, have a certified seed program which is federally regulated and has set limits on how much disease and virus can be tolerated. There are also seed classes based on age and disease/virus levels. Garlic as a smaller acreage crop, does not have the same regulations, so seed is often reused indefinitely.

Garlic production in Ontario is an estimated $30 million industry. There is a high consumer and processor demand for Ontario grown garlic year-round; however most Ontario growers have sold their garlic crop by December, when the market moves to importing garlic. Based on consumer preferences, with the current price per pound and shortage of supply, there is potential for the acreage of this crop to increase by a factor of 5 as current domestic supply is unable to meet demand.

Ontario garlic supply is currently limited by disease. Significant yield losses of 25–50% occur due to both virus and nematode infection. Based on an industry value of $30 million, this is equivalent to $7.5 to $15 million in yield losses annually. Currently there is no garlic clean seed program in Ontario or Canada. There are clean seed programs in Europe that growers have purchase seed from, however the cultivars are not fit for Ontario production, and there is a long wait time.

The urgency to start a clean seed program is to reduce further buildup of nematode and virus load occurring currently in Ontario grown garlic. With a reduced clean seed processing time and a reduced cost per seed, growers are more likely to incorporate clean seed into their practice on a yearly basis. The grower would re-plant the clean seed over a 3–5 year period, generally selling the original clean seed in years 4 and 5. This practice is similar to systems in Europe that are in place for garlic and other vegetative propagated crops. This will in return boost yield and bulb size as well as reduce the virus load and build-up of nematodes of Ontario-grown garlic.

This funding would greatly leverage the garlic sector by creating capacity for long term Ontario garlic clean seed. Development of an Ontario clean seed program would improve quality and quantity of clean seed. The expected

outcome of this special initiative is to increase accessibility of clean seed to growers, to improve the processing time of clean seed, and in turn improve the plant health of Ontario-grown garlic. The individual outcomes include:

- Creating a publicly available germplasm with garlic cultivars grown in Ontario
- Screening a large number of clones (200–1000) from each cultivar to identify clones with higher multiplication rates and in return decrease the cost per seed
- Removing the carrying cost of the public germplasm to growers until the program is established and roundels are available for a single growing season
- Reducing the time to test and index for known garlic viruses from 48+ months to less than 24 months

This project strongly aligns with the 'Protection and Assurance – Plant Health' core business outcome as it focuses on elimination of potentially contaminated plant material and the prevention of spreading pests and pathogens through pathogen-free seed production. The Ontario garlic industry acreage and yield is greatly limited by an adequate source of clean, pathogen-free planting stock at a reasonable price. Garlic is a vegetatively propagated crop and unlike true seed production, the offspring of clones have a much higher potential to accumulate viruses and other pathogens in each progressive generation. Adequate plant health is key in this crop as there is a high risk for the build-up of nematodes and viruses in Ontario garlic.

Gap or Problem Being Addressed

1. Being a longer-term trial, this project does not fit in a typical 3 year funding cycle
2. The project is considered out-of-cycle research because there is an urgency for a clean seed program. The sector is planting compromised seed, leading to 25–50% reduction in yield, and current clean seed options take too long to order (4 years). Current disease pressure is high since growers are planting with compromised seed
3. This breeding research is important to the Ontario Garlic Growers Association, who have concerns that there is not a publicly available germplasm available for a clean seed program. Clean seed programs are available in Europe and growers have tried to purchase seed however there are barriers facing growers since:
    - Cultivars are not fit for Ontario production;
    - The wait time for seed is over 2 years;
    - There is a language barrier (Spanish, French);
    - And the importation of garlic clones from another country is a burden for any individual grower on a yearly basis

The **first gap** is that there is no publicly-owned germplasm from which a grower can order seed. Unless a grower orders through a private germplasm owner, a grower must order four years in advance. Throughout these four years, the grower is responsible for paying for the labour of multiplication to produce the clean seed as well as the yearly maintenance cost of the germplasm. The current method of ordering clean seed is as follows:

- Submit plant material as scapes in June when they are about to flower
- 1st & 2nd year – Virus-indexed selections are created, propagation occurs, new germplasm (owned by submitter) is established and tested both in vitro and in vivo
- 2nd & 3rd year – Nuclear propagation of plants in laboratory to grow roundels in screenhouse
- 3rd Year – Isolated screenhouse bulb production

- 3rd & 4th year – Final product (roundels) are sold to grower

The first problem being addressed is establishing grower access to clean garlic seed. If OMAFRA funded this research, growers could order publicly available germplasm, receive the order in as little as 16 months and not carry the cost of *establishing* the virus indexed germplasm for their specific order.

The **second gap** is that the multiplication process for garlic seed production can be enhanced for each cultivar. Side trials to tweak the recipe for each cultivar would improve the multiplication process and reduce the end cost when an order is received from a grower. To establish each cultivar, there is screening of 50 mericlones from scapes, virus indexing and then screening up to 100 mericlones. This allows for 20 to 40 mericlones, for each cultivar, to be available in the public germplasm bank when screening for high production mericlones. Clones with a higher multiplication rate would be kept in the germplasm bank, while those that have a poor multiplication rate would be removed as a cost saving measure.

The second problem being addressed is selection for suitable cultivars for Ontario conditions and increased rate of garlic reproduction for increased yields to supply the Ontario market demand. If OMAFRA funded this research, growers would be ordering from a germplasm bank that was using the most efficient clones. This would allow for rapid multiplication and decrease the cost per seed to the grower.

OMAFRA needs to fund this work to support the growth of the Garlic sector to increase production to meet demand for local garlic in the Ontario market place.

This funding would leverage work conducted at the New Liskeard Agricultural Research Station (NLARS), University of Guelph in the early 2000s to determine a method to produce garlic seed free of the common garlic viruses in Ontario, including garlic latent virus, onion yellow dwarf virus and leek yellow stripe virus. Successful propagation methods for tissue culture and long term storage of garlic cultivars for seed production have been created.

This funding would help the Ontario garlic sector grow by efficiently offering clean seed to growers. The current protocol developed by NLARS is being used by a few large acreage growers, however the process requires additional funding to reduce the time to test and virus index selections (the indexing ensures that major garlic viruses have been removed), improve the multiplication rate, ordering time and overall efficiency of the program.

Intended Use for the Project Outcomes/Output

Funding for this project would start clean garlic seed program that would become self-sustainable as growers order and pay for clean Ontario seed. This project would create a public germplasm of highly efficient clones that can be used for the rapid multiplication for use in clean seed production. It is understood that the University of Guelph owns the IP, but the garlic growers would own the public germplasm. The formation of a public germplasm would reduce the processing time of orders by at least 50%. Ontario garlic growers could place an order from the public germplasm. Determining the best media at each stage of growth for the different cultivars and the screening of clones to determine multiplication rates would further lead to a decrease in future seed cost.

The projected timeline for this project is as follows:

- Spring 2020 – Plant material (scapes) are submitted for germplasm evaluation
- Fall 2021 – Germplasm created and evaluation for multiplication rate begins
- Spring 2022 – Growers place orders based on first year evaluate results
- Spring 2022 to Fall 2023 – Multiplication of grower orders
- Fall 2023 – Growers receive clean seed for Fall 2022 planting

The result of the work conducted through this special initiative would remove the financial hurdle and long term commitment that garlic growers currently face when ordering clean seed. Virus and pathogen-free seed would be more readily available to growers. The availability of clean seed to growers would increase the overall plant health of the Ontario garlic growing industry. This research project is also in alignment with the priorities of the National Plant and Animal Health Strategy with the long-term goal of creating a clean plant network. The garlic industry added $30 million to the provincial economy in 2017 and there is potential for acreage of this crop to increase by a factor of 5 as domestic supply is currently unable to meet demand.

Environmental Scan/Analysis

The Ontario Garlic Growers Association funded research in the early 2000s to create a clean seed program for garlic at the SPUD unit at the New Liskeard Agricultural Research Station (NLARS), University of Guelph. This work led to the standard operating procedure that is proprietary to the University of Guelph and is essential for the production of clean seed today. The research funded by this special initiative would build on and increase the efficiency of existing protocols. Clean seed programs for garlic exist in Europe (i.e. Spain), but little is known about the procedures as these are protected protocols. Several inquiries from external sources, who are in the formative stages of initiating similar programs, have been fielded by the NLARS staff to date.

SI-2019-09: Potential for Re-Introduction and Commercial Wild-Simulated Production of Ginseng in Ontario Forests

Contact: Sean Westerveld, sean.westerveld@ontario.ca

Special Initiative Type: Other

Research Priority: Trade, Market and Targeted Sector Growth Opportunities

Research Focus Area: Targeted Sector Growth

Maximum Funding Available: $250,000

Project Duration: 5 Years

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

A permit will be secured from the Ministry of the Environment, Conservation and Parks (MECP) to establish a wild-simulated ginseng production site in a commercial maple syrup production forest, which is currently illegal without a permit under the Endangered Species Act (ESA). Seeds will be collected from commercial ginseng growers and seeded into the leaf litter on the forest floor with minimal disturbance to simulate the spacing found in wild sites. Seeds will take 1 year to germinate and will be monitored annually to assess plant growth, seed production and pest pressures. A small portion of the site will be harvested each year to test for root growth and disease pressures. As ginseng requires several years (6 – 10 years) to reach a mature size, a project of this nature will require additional years to allow for crop establishment for the necessary comprehensive data collection and analysis; however, this project is only applying for the first five years at this time.

With the permission of MECP, a wild site will be identified for comparison. The plants will also be compared genetically within and between the sites. Pests and genetic differences have been raised as potential threats to wild populations posed by commercial wild-simulated production and reintroduction of ginseng to rehabilitate the species. The goal of this project is to provide data necessary to address those concerns and potentially allow for faster recovery of the species, commercial forest production, and eventual delisting of the species from the ESA and CITES.

Gap or Problem Being Addressed

Ginseng is the most valuable field-grown horticultural crop in Ontario with farm gate values ranging from $160,000,000 to $285,000,000 over the past 5 years. Over 95% of the crop is exported to Hong Kong, China and other Asian countries. Trade has been inhibited by the requirements for CITES permits for all shipments, including small amounts purchased by Asian tourists at retail outlets in Canada. Removal of the species from CITES requires complete rehabilitation of the species in the wild, which is a long-term goal. There is also the potential to establish a forest-grown ginseng industry in Ontario, which is currently illegal without a permit under the Endangered Species Act. Permits have not been issued for commercial production in the forest. The potential value of this industry based on activity in the US is around $25,000,000 per year. Part of the barrier to

establishing a forest-grown industry is the reluctance of MECP to accept that this industry is not a threat to the wild population but is a potential avenue to reintroduce the species to the forest. In order to satisfy the concerns of MECP, research is needed to compare the genetics of field-grown seed used in wild-simulated production to that of existing wild populations. Research is also needed to show that diseases that occur in the field are not a major threat when the same genotypes are planted in the forest, and therefore, not a threat to introduce pests to the wild populations. It is hoped that the research will lead to reduced barriers to trade of ginseng, reintroduction of the species in the forest, and the establishment of a forest-grown ginseng industry. In the long-term, it is hoped this work will lead to delisting of ginseng from the ESA and eventual delisting of the species from CITES.

Intended Use for the Project Outcomes/Output

The outcome of this initiative will be scientific data that can be provided to CITES Canada and MECP to reduce barriers to trade, reintroduction of the species to the forest, and commercial forest-grown production. If reintroduction and commercial forest-grown production are permitted, it will also provide information on best practices for establishing ginseng in the forest that can be distributed to MECP biologists, ecologists, woodlot owners and forest producers.

Environmental Scan/Analysis

Unfunded work has been conducted over a decade ago by OMAFRA staff to assist existing commercial woods-grown and wild-simulated ginseng producers, which were legal at the time. Minor research has been conducted by the Ministry of Natural Resources when they oversaw the ESA to monitor wild populations. Some research on wild populations has also been led by Environment Canada. There has been very little scientific research to compare wild-simulated ginseng to wild ginseng in terms of genetics and pest introduction potential.

SI-2019-10: Requirements for an Advanced Pasture-based Ruminant, (beef & sheep), Benchmarked Production System for Ontario.

Contact: James Byrne, james.byrne@ontario.ca

Special Initiative Type: Other

Research Priority: Competitive Production Systems

Research Focus Area: Improved Management and Processes

Maximum Funding Available: $410,000

Project Duration: 5 Years

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

High pasture utilisation rates increase output per hectare and drives economic performance for Ontario Cow-Calf, Backgrounder and Sheep producers. Ontario has no proper baseline data on actual pasture utilisation rates on cow-calf, backgrounder or sheep farms, (unlike other jurisdictions), although anecdotal information suggests that the utilisation rates are low, (i.e. less than 60% and more likely less than 50% on beef farms). As an example, increasing in pasture utilisation rate by 5%, (60 -65%), would potentially increase the number of cow-calf pairs available to graze from 0.85 cow-calf pair/Ha to 0.95 cow-calf pairs/Ha – for a 100-cow herd this would add 10 more cows producing 10 more calves without any increase in the area farmed. Increasing pasture utilisation rates has a direct effect on increasing gross farm output, farm profitability, economic sustainability and resilience.

This project would determine

(a) Provincial variations in pasture seasonal growth patterns and overall dry matter production
(b) Quantify the average pasture utilisation rates by Ontario cow-calf, backgrounder and sheep sectors with specific geographical regions
(c) Determine grazing methodologies that maximise pasture digestibility and animal intake simultaneously, (effective pasture DM utilisation requires an understanding of the dynamic relationship of the plant-animal interaction) under specific to Ontario climatic conditions and pasture species diversity.
(d) Determine the sward canopy structure that maximise intake by grazing animals under Ontario pasture conditions.
(e) Quantify and demonstrate the impact of increasing pasture utilisation rates on pasture stocking rate, individual animal performance and output per hectare, (kgs/ha)
(f) Quantity the economic impact, ($/Ha), of increasing pasture utilisation rates for Ontario cow-calf, backgrounder and sheep sectors within their specific geographical regions.

Outcomes:

(a) The development of a provincial target for pasture utilisation rates specific to the livestock sector and the geographical region involved.
(b) Such a target, provided it is verifiable and achievable, will act as a driver for economic growth through increased productivity and production efficiency.
(c) The underlying research behind such a target can become a roadmap/knowledge base for producers to implement and achieve similar results on their own farms
(d) This research will allow OMAFRA develop a suite of KTT tools to assist producers increase pasture utilisation to a producer/sector specific target.
(e) This research allows OMAFRA to develop a suite of economic tools to demonstrate the economic returns from increasing pasture utilisation rates
(f) This research can provide a roadmap to OMAFRA and producer organisations for increasing the provincial cow herd and sheep flock that is achievable, economically and environmentally sustainable.
(g) This research can become the basis for a roadmap to OMAFRA and producer organisations that the carbon footprint from livestock can be reduced through more efficient use of the forage dry matter available without the requirement to bring new land, (currently forested), into production.

Gap or Problem Being Addressed

For Ontario cow-calf, backgrounder and sheep producers the optimal use of grazed pasture is a key component of profitability in their respective production systems. In order to make the most efficient use of pasture, it is important to maximise utilisation of pasture consumed by the individual animal to drive economic performance and to drive profitability through output per unit area.

In Ontario there are significant gaps in our knowledge about our understanding on how to maximise pasture utilisation under Ontario's variable climatic conditions and Ontario's multispecies pastures – unlike other jurisdictions, (i.e. New Zealand, UK, Ireland, Northern & Western France), where a mono species pasture of perennial rye-grass is more typical.

Grazed pasture is the cheapest source of feed available to cow calf, backgrounder and sheep producers. We do not understand the maximum economic potential of grazed pasture under Ontario grazing and beef/sheep market conditions. Understanding such potential would allow the development of financial targets for producers to benchmark their own performance and act as a driver of innovation.

Extension services in the UK, Ireland and New Zealand have established national pasture utilisation targets, specific to livestock sectors. These targets, verifiable and proven achievable, act as benchmark targets for the respective livestock sectors to drive farm performance and profitability. Ontario lacks such a provincial target and benchmark for it's grazing livestock sector.

This project involves a significant cross section of disciplines, (i.e. animal nutrition, animal behaviour, plant agronomy, economics, pasture management, environmental science) and a significant post research KTT effort to engage the whole livestock community. Consequently, OMAFRAs extension expertise is critical to the success of the project.

The Beef Cattle Research Council, Beef Farmers of Ontario and Ontario sheep federation have all identified forage research as a priority in their calls for proposals. This project builds upon those calls for proposals by identifying the importance of grazing animals to quantify financially the true value of the economic output of forages.

This type of cross sector cross disciplined research in the beef and sheep sectors has not been undertaken before in Ontario. Similar research in other jurisdictions has been very successful in developing national benchmarks for economic performance which have become keystone for driving economic development in the beef and sheep sectors.

Intended Use for the Project Outcomes/Output

The development of a **provincial target** for pasture utilisation rates specific to the livestock sector and the geographical region involved will be developed.

Provided it is verifiable and achievable, will act as a driver for economic growth for the Ontario cow-calf, backgrounder and sheep sectors by identifying a clear method and benchmark to deliver increased productivity and production efficiency.

The underlying research can become a roadmap/knowledge base for producers to implement and benchmark their own farms performance.

This research will enable OMAFRA to develop a suite of KTT tools to assist producers increase pasture utilisation to a producer or sector specific target.

This research allows OMAFRA to develop a suite of economic tools to demonstrate the economic returns from increasing pasture utilisation rates

This research can provide a roadmap to OMAFRA and producer organisations for increasing the provincial cow herd and sheep flock that is achievable, economically and environmentally sustainable and economically and environmentally resilient.

This research can become the basis for a roadmap to OMAFRA and producer organisations that the carbon footprint from increased livestock production can be mitigated through more efficient use of the forage dry matter available without the requirement to bring new land, (currently forested), into production.

Environmental Scan/Analysis

Development of a benchmarking system to increase the sustainability of Irish Diary Farms, Shalloo et al, Teagasc Animal & Grassland Research and Innovation, Wallace M. Dr., University College Dublin

BETTER Farm Beef Program, (Phase 2), and BETTER Farm Beef Challenge (Phase 3), Dillon et al, Teagasc, Oakpark, Carlow, Ireland.

BETTER Farm Sheep Program, Disken, M. & Campion, F., Teagasc, Oakpark, Carlow, Ireland.

Cattle and Sheep Enterprise Profitability in Scotland, 2016, Quality Meat Scotland

Franks, Jeremy & Haverty, M.J.P. (2005). Benchmarking Farm Enterprises. Journal of Farm Management. 12. 143-158 (Newcastle University, UK)

The Characteristics of high performing beef and sheep farms in Great Britain, Redman et al, Agriculture and Horticulture Development Board, Quality Meat Scotland, Hybu Cig Cymru (Meat promotion Wales)

Requirements of future grass-based ruminant production systems in Ireland, Donovan et al, Irish Journal of Agricultural and Food Research: 50: 1 -21 2011

The establishment of pasture utilisation rates benchmarks is the foundation of whole farm benchmarking systems found in other jurisdictions. This project would build upon the current systems employed in other jurisdictions to develop a benchmark system specific to Ontario, which meets the needs of Ontario producers.

SI-2019-11: Assessing Cover Crop Herbicide Tolerance for Adverse Weather Response

Contact: Anne Verhallen, anne.verhallen@ontario.ca

Special Initiative Type: Other

Research Priority: Sustainable Production Systems

Research Focus Area: BMP Development

Maximum Funding Available: $60,000

Project Duration: 3 Years

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

This project proposes to screen a set of representative cover crop species against common corn herbicide programs under a timing situation similar to a delayed plant or unseeded acreage scenario on clay or clay loam soils.

Expected Outcomes:

- An easy to use chart will be created that details the response of at least 6 species (other than annual ryegrass and red clover) to common corn herbicide programs over time. This will help to better inform decisions when recommending or planting cover crops in adverse weather years.
- This screening process will also generate data rating the corn herbicide programs for cover crop control. This is important for those years with mild winters where there is extensive carryover of certain cover crop species.
- Reduced barriers to cover crop use particularly in years with adverse weather conditions. Cover crops are an important tool in the control/suppression of herbicide tolerant weeds, reduction of soil erosion and improvement of soil health.

Gap or Problem Being Addressed

Adverse spring weather in 2019 left acres of heavier soils unseeded. While cover crops were proposed as an option for summer cover, questions arose concerning corn and soybean herbicide programs that had been applied in anticipation of planting. There is limited Ontario information available about herbicide tolerance of common cover crop species particularly early in the season after application. Annual ryegrass and red clover herbicide tolerance has been assessed for intercropping in corn. Plant back cropping studies where the herbicide is applied and a year later the cover crops are planted have looked at a limited number of species.

Herbicide tolerance studies of the type proposed are unlikely to be funded by the typical funders, herbicide manufacturers as it is not crucial to efficacy data collection for registration or sale. OMAFRA's Soil Health and Conservation Strategy and the Ontario Cover Crop Strategy both target reducing barriers to cover crop adoption.

Greater knowledge of the herbicide impact on cover crops in the planting niche -unseeded acres would support better decision making and help to remove barriers.

Intended Use for the Project Outcomes/Output

The information developed through the project will be used to create extension materials to support better cover crop decision making on unseeded acres.

In addition, the information can be used to format a demonstration session at the various Diagnostic Day programs to share the information with Certified Crop Advisors and agribusiness personnel.

Environmental Scan/Analysis

There has been very little work done addressing the impact of corn or soybean herbicide programs on cover crop seeding in season. There has been selective research in Ontario, Ohio and Michigan to assess the impact of common herbicide programs on annual ryegrass and red clover when used as an interseeding in field corn or seed corn and planted at growth stage V6-8. In addition, Dr. Darren Robinson at the Ridgetown Campus of the University of Guelph has plant back or re-cropping studies with herbicides and cover crops where the cover crops are planted at the end of the cropping season or the next year. These studies have determined the impact of herbicide carryover in the long term on cover crop growth and effectiveness.

This project represents a niche application of cover crops and there has been very little research in this area under Ontario growing conditions.

SI-2019-12: Building a Comprehensive Approach to Evaluate the Productivity and Sustainability of Ontario's Agri-Food System

Contact: Michele Doncaster, michele.doncaster@ontario.ca**,** Joanne Moores, joanne.moores@ontario.ca

Special Initiative Type: Synthesis

Research Priority: Sustainable Production Systems

Research Focus Area: Environmental Impact of Ag Production

Maximum Funding Available: $90,000

Project Duration: 1.5 Years

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

To fully support evidence-based decision-making we need to understand how well Ontario's agri-food system is meeting the current and future needs of Ontarians in environmental, social, and economic terms. Research is needed to identify and test approaches that integrate the evaluation of sustainability, community and human health measures, as well as productivity, to provide a comprehensive assessment of the environmental, social, and economic performance of Ontario's agri-food system. Several approaches have been developed in the academic literature and in other sectors and jurisdictions that could be applied in Ontario to support integrated policy decision-making across several areas of agriculture and food policy. For example, a comprehensive evaluation framework has been designed by the United Nations Environment Program (UNEP) for evaluating the food security, environmental, and socio-economic outcomes and impacts of different agri-food systems at a variety of scales1. The goal of the UNEP approach is to move beyond measuring agri-food system performance through metrics of economic productivity alone (e.g. yield per hectare), toward longer-term, more holistic valuations.

OMAFRA has developed indicators of performance across its three core business areas, including environmental sustainability indicators, but these indicators provide a high-level, point-in-time snapshot of sector performance at the provincial level, rather than an integrated, holistic evaluation framework that can be adapted to different contexts and scales. Similarly, Agriculture and Agri-Food Canada (AAFC) also tracks national trends for a set of indicators drawn from the Census of Agriculture. Agri-food sustainability indicators tracked by AAFC are intended to provide a sense of whether Canadian agriculture is moving towards or away from sustainability over time and indicate areas where further efforts are needed.

Indicators tracked by OMAFRA and AAFC are not intended to provide landscape-specific valuations that would enable comparisons of the cost and benefits of trade-offs in land-use planning and farmland protection decisions. The application of comprehensive and inclusive evaluation frameworks at specific landscape scales

[1] Müller, Alexander and Pavan Sukhdev. 2018. The Economics of Ecosystems and Biodiversity (TEEB). Measuring What Matters in Agriculture and Food Systems. Geneva: UN Environment.

has the potential to provide critical cost and benefit information to support land-use planning and other agriculture and food policy decision-making.

A special research initiative is needed to develop an approach to the comprehensive evaluation of the agri-food system and to carry out one or more case studies on specific sub-systems to validate the approach (e.g. comprehensive assessment of the value of Ontario's specialty crop areas beyond just the value of the crops produced to include value-chain, environmental, and social costs and benefits). This initiative will also, therefore, involve outreach with internal and selected external stakeholders to collaborate in the application of the proposed comprehensive evaluation framework to one or more production systems, value chains, or agricultural landscapes in Ontario. In the process of collaborating to create case studies, awareness of and support for the approach will be generated among Ontario's farm and food stakeholders. The completion of one or more successful case studies could be used in future for knowledge transfer activities with an extended group of stakeholders.

Outcomes:

1. Identification of existing approaches used in other jurisdictions for the comprehensive environmental, social, and economic evaluation of agri-food systems.
2. Assessment of existing approaches from other jurisdictions and development of a proposed evaluation framework for application in the context of specific sub-systems/agricultural landscapes within Ontario's agri-food system.
3. Review existing indicators and data sources that currently support assessments of Ontario's agri-food system performance (i.e. Grow Ontario indicators, such as extent of soil tillage practices, agri-food export levels, employment and job vacancy rates, farmland conversion/protection rates) and determine whether and how they might be integrated into a comprehensive evaluation framework.
4. Test application of proposed evaluation framework on one or more sub-systems in Ontario working in collaboration with select external stakeholders to develop case studies, e.g. tender fruit/specialty crop areas, the beef cattle sector, or grain and oilseed sector and their respective value chains in a defined geographic area.
5. Gather lessons learned, define limitations and make modifications to the approach as needed.
6. Conduct knowledge transfer outreach among internal and external ministry stakeholders to broaden understanding and build support for the framework. Learning within the ministry and among stakeholders a critical outcome of this research.
7. Deliver recommendations for the further development and application of the framework, with the ultimate aim of eventually be able to assess the performance of Ontario's entire agri-food system, identifying areas of strong performance balanced across environmental, social, and economic dimensions, as well as areas of underperformance and associated risks.
8. Make recommendations about how the outcomes of the research could feed into provincial policy decision-making on key aspects of agri-food systems, such as farmland protection, business risk management programs, environmental management, and marketing policy.

Gap or Problem Being Addressed

Ontario agriculture is facing challenges from several angles: increased environmental stress related to climate change and shifting weather patterns; a decline in productivity gains; public pressure to demonstrate sustainable and ethical production practices; loss of farmland to development pressures; declining rural

communities and labour shortages; gaps in agri-food system infrastructure; and tough competition in globalized commodity markets. The broader society is also concerned about a range of issues that relate to the agri-food system, such as the issue of food waste, water quality, food-related health issues, and food insecurity in urban, rural and remote communities.

Alternative approaches to understanding and valuing Ontario's agri-food system performance are needed to help generate innovative responses to these challenges. This has already been identified in key ministry and provincial commitments to soil health and agri-food environmental impact. The current focus on productivity metrics for the agri-food system limits ministry and stakeholder ability to perceive hidden costs, such as the degradation of ecosystems and hollowed out rural communities, and the hidden benefits, such as the large number of livelihoods provided by agriculture. A concerted effort to establish a systems-based approach to evaluating the performance of the agri-food system is needed as the basis for identifying the interlocking roots of many of the issues faced by the sector and by society. The proposed research has the potential to generate new systems-based knowledge to help support evidence-based decision-making at multiple levels within Ontario's agri-food system. A key aspect of this work will be developing a common language and understanding of the social, environmental, and economic elements that are key to the success of Ontario's agri-food sector and to articulate the interconnectedness and interdependence of these three pillars.

Intended Use for the Project Outcomes/Output

The main outcome of the project is the identification of a comprehensive environmental, social, and economic evaluation framework that can be applied to various sub-systems within Ontario's agri-food system. Test application of the framework is intended to produce new evidence to support land-use, policy and program decision-making in a way that integrates environmental, social, and economic factors. This research will help support the achievement of research priorities within Ontario's Agricultural Soil Health and Conservation Strategy and the Agri-Environment Plan and support potential future policy development and land-use planning decisions. Case studies will help to illustrate the value of using a holistic, comprehensive evaluation framework that reveals the interdependence of environmental, social, and economic elements in supporting Ontario's agri-food system.

Environmental Scan/Analysis

Currently, there is no agri-food-specific framework that considers the environmental, social, and economic cost and benefits of Ontario's agri-food system. Building a comprehensive evaluation framework that can be applied in a variety of contexts will make it possible to quantify the full range of costs and benefits produced by Ontario's agri-food sector and its various value-chains, landscapes, and specialized production systems.

The academic literature on valuation of ecosystem services has been growing since the 1990's. Because ecosystem services are not typically traded on markets and therefore not priced, their value is excluded from economic impact assessments that are often central to policy decision-making. To solve this problem economists, environmental scientists, and policy-makers have developed several approaches to the valuation of ecosystem goods and services to better account for the costs and benefits of land management decisions. Some approaches also integrate the costs and benefits of land management decisions in terms of food security and

human health outcomes. These approaches have not been systematically reviewed in the context of, nor applied to, Ontario's agri-food system.

The Government of Ontario has some experience with research on the economic valuation of ecosystem services through the Ministry of Natural Resources, which began commissioning studies starting in 2009[2]. To date, the government has not applied this approach to agriculture in Ontario. In 2007, the UN initiated a project called "The Economics of Ecosystems and Biodiversity" (TEEB), which was also applied initially to natural resource management, but has more recently been applied to agriculture and food. In 2016, OMAFRA funded a 4-year research project on the economic and environmental dimensions of sustainability for dairy and cropping systems through the OMAFRA-UofG Agreement[3]. The proposed research would build on all of the above research.

Agriculture both draws upon and provides ecosystem services and impacts human health and food security. This strategic initiative will need to review the following:

- Theory and methodology of current practice in valuation of ecosystem goods and services
- Literature on valuation of ecosystem services in relation to agriculture and food, including human health and food security outcomes
- Review of relevant applications and case studies in comparable jurisdictions
- Review of relevant federal and Ontario provincial government research and experience with the application of valuation methodologies and the integration of the resulting information in policy decision-making processes
- For example, Environment Canada was involved in a study of wetlands valuation in the Prairies[4] and the provincial government has used valuation of ecosystem services in relation to Ontario's Greenbelt and the Credit River[5]. The UNEP website provides access to additional case studies from many other jurisdictions[6].

[2] www.latornell.ca/wp-content/uploads/files/presentations/2014/Latornell_2014_TH1E_Andreas_Link.pdf
[3] UofG2015-2394 – Economic and Environmental Tradeoffs of Ontario's Farming Systems, Alfons Weersink & Claudia Wagner-Riddle.
[4] Badiou, P., C. Edwards, M. Gloutney (2010) TEEB case: Wetland restoration for carbon sequestration in Prairie Canada, available at: TEEBweb.org.

[5] TEEB case by M. Kennedy and J. Wilson (2010) Natural Capital Valuation in the Credit River Watershed, Ontario, available at: TEEBweb.org, and TEEB case by Wilson S. (2010): Economic value of Toronto's Greenbelt, Canada, available at: TEEBweb.org.
[6] http://www.teebweb.org/

SI-2019-13: Investigation of Light Abatement Practices for Year-round Greenhouse Production

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Special Initiative Type: Other

Research Priority: Sustainable Production Systems

Research Focus Area: Nuisance Assessment

Maximum Funding Available: $150,000

Project Duration: 3 Years

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

Various light abatement practices and commercially available products will be tested for their ability to maintain an optimal greenhouse environment and reduce light pollution. As some of the light abatement conditions may have negative effects on plant health, the testing will be done in research greenhouses at a pilot scale and not commercial greenhouses. Research greenhouse space at Harrow Research and Development Centre (HDRC; AAFC) for vegetable crops and Vineland Research and Innovation Centre (VRIC) or Niagara College for cannabis crops are good candidates for this research. The Guelph Campus at the university of Guelph has too much background light pollution. A research license for cannabis must be confirmed by the greenhouse facility at the time of project implementation.

Practices to be tested will include various combinations of multi-leveled curtains, including staggered opening energy curtains and energy plus blackout curtains. As greenhouse vegetables and cannabis require higher light levels, they will be used as model crops for this study. Overhead Light Emitting Diode (LED) and High Pressure Sodium (HPS) lights will be the lighting models as they are most applicable to the chosen crops and responsible for most of the light pollution. The newest technology in greenhouse coverings and energy curtains applicable to commercial greenhouse production will be tested in the research greenhouses, including innovations such as new plastic or glass coverings with the ability to filter light emissions. Temperature, humidity and plant health markers such as yield, and growth patterns will be collected in the greenhouse. The energy consumption of each treatment will also be monitored, along with venting patterns in the greenhouse to regulate climate. Outside light emission levels will be collected and assessed from above and beside the greenhouse at several distances, including 30-50 meters above the roof line and 25, 50 and 100 meters away from side walls.

The aim of this study is to identify a range of light abatement practices that will satisfy the public while not impacting the health or yield of the crop. The results will be used to determine best management practices to reduce light pollution from greenhouses which can be used by all greenhouse producers. These BMPs will include considerations on energy savings and returns on investment for the tested treatments. This research complements an existing SI project on odour abatement that is developing base research on greenhouse cannabis odour production.

Gap or Problem Being Addressed

Greenhouse vegetables have identified year-round production as a market development opportunity, both domestically and internationally. This work is needed to give the greenhouse sector much needed information on light abatement to complement ongoing research around using lighting to improve production in the winter months (October-March).

Light pollution is a top-of-mind issue for the public living near lit greenhouses, especially in Kingsville and Leamington. This work aims to address public concerns and come up with solutions that will benefit both growers using various lighting types (HPS and LED) and strategies, and their neighbours.

Intended Use for the Project Outcomes/Output

The results of this special initiative will be used to determine best management practices to reduce light pollution from greenhouses which can be used by all greenhouse producers. These BMPs will include considerations on energy savings and returns on investment for the tested treatments.

These BMPs will complement ongoing lighting research, which has focused on identifying optimal lighting strategies to produce tomatoes, peppers, cucumbers and strawberries in the winter months. This work has focused on the use of both HPS and LED lighting. HPS lighting is the industry standard, but improvements in fixture quality, price and energy efficiency benefits may make LED technology more attractive to growers in the future. By balancing the needs of the crop with the developed BMPs, growers will be able to produce quality crops year-round and maintain good relationships with their neighbours.

Although the research proposed here will happen at a pilot scale level, the results will be scalable to commercial size greenhouses.

Environmental Scan/Analysis

The Netherlands is the world leader in greenhouse production. Their light abatement guidelines are built into municipal by-laws and strengthened by an agreement between the Dutch greenhouse industry organization and a non-profit environmental group. During night time hours, it is required that 98% of the lit greenhouse be screened. This screening may let out no more than 25% of light output. If 15,000 lux or more is being used, the screens must keep in 98% of the light. Side-wall screening must have at minimum 95% light abatement between 8pm and 12am.

The municipality of Kingsville is reported to have amended bylaws so that all new greenhouses built in or after 2017, are required to have sidewall and roof light abatement curtains. Older greenhouses have not yet been grandfathered in under this bylaw.

The Ontario Greenhouse Vegetable Growers (OGVG) have proposed draft light abatement guidelines which include 100% sidewall abatements from one hour before sunset until one hour after sunrise and significant ceiling light abatement in place between 11pm-6am.

This project needs to identify light abatement levels that are backed by scientific testing to have minimal affects on production and a significant reduction on light emission levels.

SI-2019-14: Examining Barriers to Accessing Food Animal Veterinarians in Underserviced Areas of Ontario

Contact: Desiree Pinkney, Desiree.Pinkney@ontario.ca

Special Initiative Type: Other

Research Priority: Animal Health & Welfare

Research Focus Area: Health, Welfare and Productivity of Young Animals

Maximum Funding Available: $100,000

Project Duration: 1 Year

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

The research study would determine the extent of access to food animal veterinarians in areas that may be underserviced, such as northern and eastern Ontario. The study would assess whether there are sufficient food animal veterinary services in these areas relative to the number of farms and food animals and also determine the range of distances to reach services. It would furthermore elaborate on barriers to food animal services, if any, including social and economic barriers.

Based on findings, the research study would present recommendations for moving forward and specifically provide advice on any potential government interventions or supports that are recommended. Recommendations could be developed in the form of a toolkit that outlines potential next steps for industry, municipalities, the province and academia.

Gap or Problem Being Addressed

The livestock sector is eager for the province to explore options for ensuring veterinary coverage in underserviced areas, such as northern Ontario (e.g., the Beef Farmers of Ontario recently passed a resolution encouraging the government to do so). Anecdotally, OMAFRA has heard that some rural and remote areas of Ontario are underserviced by veterinarians (e.g., farmers are having difficulty accessing veterinary services and veterinary clinics are unable to fill vacancies in some areas).

A preliminary review of existing supports for food animal veterinarians in underserviced areas identified a gap in activities related to attraction and recruitment. Challenges identified in specific geographic areas may be associated with economics and the difficulty sustaining a practice (e.g., not enough clients, long distances between farms and lack of opportunities for family members/spouse). Research is needed in order to validate the issue and provide recommendations.

Intended Use for the Project Outcomes/Output

The output/outcome of the research would be used to inform OMAFRA and other relevant parties' (e.g. municipalities, Ontario Veterinary College, MENDM) decisions around whether support or intervention is needed to increase the supply and access to food animal veterinary services in underserviced regions.

Recommendations could be developed in the form of a toolkit that outlines potential next steps for each industry, municipalities, the province and academia separately.

Environmental Scan/Analysis

In 2013, the Ontario Veterinary Medical Association (OVMA) conducted a census of bovine veterinary practices to determine veterinary coverage of beef and dairy farms. Any region with fewer than 75 total farms was considered to be non-viable to sustain a bovine veterinarian. Based on that number, many of the northern census divisions such as Muskoka, Haliburton, Parry Sound, and Nipissing were predicted to have gaps in service by 2020 due to lack of bovine farms.

Several studies also indicate that there is a general shortage of professionals including veterinarians in specific regions of Ontario such as the north. These same studies point to social factors such as distance to family and friends and perceived difference in quality infrastructure i.e. schools and hospitals as playing a critical factor in decisions to relocate outside of medium to large cities/towns.

Research is required to determine for food animal veterinary services specifically:

- The issues (social, economic) facing underserviced regions and identify gaps in attraction and retention tools/approaches.
- What is needed to better support access to food animal veterinarians in underserviced areas of Ontario (social/economic).
- To develop a report with the findings and a toolkit with recommendations.

There are currently the following related supports:

The Veterinary Assistance Program (VAP), supported by the Ministry of Energy, Northern Development and Mines (ENDM) helps promote the viability of the livestock industry by ensuring access to large animal veterinary services by providing conditional grants to participating veterinarians.

The Federal Immigration Pilot, which has selected eleven northern and rural communities who will be responsible for candidate recruitment and endorsement for permanent residence. Opportunities to leverage the Pilot for increasing veterinary capacity would need to be identified by businesses to their local economic development organization.

NOHFC Northern Ontario Internship Program, which strengthens Northern Ontario's competitive advantage and builds economic development capacity by attracting and retaining college/university graduates in the North.

SI-2019-15: Swine Smallholder Post-mortem Project

Contact: Dr. Tim Pasma, tim.pasma@ontario.ca

Special Initiative Type: Other

Research Priority: Animal Health & Welfare

Research Focus Area: Detection and Surveillance of Pathogens and Pests

Maximum Funding Available: $60,000

Project Duration: 8 Months

DESCRIPTION OF SPECIAL INITITATIVE

Description and Outcomes

The purpose of this project is to conduct a baseline surveillance study of smallholder swine production units and to establish connections with smallholder producers in Ontario.

To do this, the project will include the following activities:

1. **Enrolment** – The project will be broadly advertised by notifying veterinarians and producers through communications to veterinary associations (OASV, OABP, SRVO) and to industry (Ontario Pork, Swine Health Ontario, Ontario Pork Industry Council).
2. **Survey/questionnaire** – The project will develop a submission form to capture basic demographic information and management practices. Participants will be required to obtain a premises identification number (PID) to participate in the project.
3. **Post-mortems** – The project will include post-mortems conducted in the field or at the Animal Health Laboratory (AHL) (preferred). A template to guide sample collection will be developed for use by private veterinarians.
4. **Standardized ancillary testing –** The project will conduct the following testing:
    - All cases: PRRSV, influenza A virus PCRs
    - Individual cases: based on presenting complaint – sudden death, respiratory, gastrointestinal, neurological, other
    - All cases will have a pathology component (gross and / or histopathology) and testing beyond the standardized range of ancillary tests will be done at the discretion of the case pathologist.

For the purposes of this project, a smallholder will be defined as a producer housing less than 100 pigs. Producers must obtain a PID to participate in the project.

Gap or Problem Being Addressed

The Ministry does not currently have baseline surveillance data of smallholder swine production units in Ontario, nor the necessary connections with smallholder producers in Ontario.

The proposed project will:

1. Identify disease problems in Ontario smallholder swine herds that are peripheral to larger commercial operations.
2. Establish communication networks between Ontario swine smallholder producers and veterinarians, and with OAHN.
3. Increase swine smallholder awareness of foreign animal and zoonotic diseases, and associated risks.

Intended Use for the Project Outcomes/Output

The outputs of this project (data and connection with small holder producers in Ontario) will provide the Ministry a better understanding of diseases in small holder pig production. This will improve the Ministry's ability to assess disease risk as part of the health of the provincial swine herd; better evaluate risks of transmission of endemic or foreign animal diseases (e.g. ASF); and inform and increase awareness in a segment of the swine industry that the Ministry currently has limited access to do so.

Environmental Scan/Analysis

Swine production is becoming increasingly dichotomous, with large, highly specialized and vertically integrated intensive farms in contrast with (often subsistent) traditional smallholder production. Half of the world's pig population is raised in a smallholder production setting (Dietze et al, 2011). While smallholder production is typically thought to exist in developing countries, smallholder units are also present in Canada and Ontario. Smallholder swine production has been studied in Kenya (Dewey et al, 2014), Mozambique (Penrith et al, 2008), the Philippines (Parke et al, 2016) and Vietnam (Cuong et al, 2014), but to date there are no known studies of smallholder swine production in Ontario. Currently, Ontario Pork has 1600 registered sites holding less than 50 pigs (Frank Wood, personal communication).