

ONTARIO MINISTRY OF AGRICULTURE, FOOD
AND RURAL AFFAIRS

AND

UNIVERSITY OF GUELPH

AGREEMENT

CONSOLIDATED ANNUAL REPORT
2016 / 2017

APPROVED BY AGREEMENT LEADERSHIP
COMMITTEE
MARCH 19, 2018

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PREFACE

This annual report is being submitted to the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) in accordance with the terms and commitments under the OMAFRA - University of Guelph (U of G) Agreement (also known as the OMAFRA - U of G Partnership, Partnership Agreement, or the Partnership). This is the ninth annual report under the current Agreement between the University of Guelph and OMAFRA that was signed April 1, 2008, for the period April 1, 2008 to March 31, 2018.

The University has complied with all material provisions of the Agreement and is managing the transfer payment funds provided under the Agreement effectively and efficiently and with due regard to obtaining appropriate value for money expended.

The reporting period of this annual report is the U of G's 2016/17 fiscal year (May 1, 2016 to April 30, 2017). The report covers the activities, budgets, expenditures and performance measures for each of the four program areas of the Agreement: Research, Veterinary Clinical Education Program (VCEP), Animal Health Laboratory (AHL) and the Agriculture and Food Laboratory (AFL) programs.

Further details concerning the OMAFRA – University of Guelph Agreement are available at: https://www.uoguelph.ca/omafra_partnership/

Past OMAFRA - U of G Agreement annual reports are posted at The Atrium, U of G's institutional repository at:

<https://atrium.lib.uoguelph.ca/xmlui/handle/10214/12067>

For questions or additional information about this or past OMAFRA - U of G Agreement annual reports, please contact the University of Guelph's Office of Research, Agri-Food Partnership office.

PROGRAM HIGHLIGHTS

Selected highlights from each of the Agreement programs during 2016/17 are reported below. More comprehensive updates, budgets and performance indicators for each of the programs are available in the following sections of this report.

Agriculture and Food Laboratory (AFL) Program, Laboratory Services Division

Entering the final year of the current OMAFRA – U of G Agreement, the AFL is maintaining its strategic focus and continues to gain strength in reputation and position as a fee-for-service laboratory domestically and abroad.

The Agriculture and Food Lab continues to provide novel iterations to methodology for OMAFRA that can be leveraged to all of its clients as well as pursuing targeted marketing activities to build revenue in identified niche areas. As always, the goal is to continue to build external revenues for reinvestment and sustainability (per Schedules “E” and “F” of the Agreement). While much of the AFL revenue is project-based and may not be recurring, expertise and novel services continue to be developed that will serve us well in sustaining a successful not-for-profit business enterprise. The AFL continues to refresh its focus on client service excellence as a means to securing its current market share and reputation. As always, the AFL continues to develop partnerships throughout its regulatory partner organizations to secure its role as a “laboratory partner of choice” across Canada.

In addition to this high level of service to clients in agriculture, food and beverage, corporate and research sectors the AFL has successfully met the annual challenge of maintaining capital intensive technology and infrastructure. LSD continues to reinvest in those capital items, strategically identified by its management team, in keeping with the available revenue. Ongoing support from OMAFRA Capital Expenditure Fund to provide funds annually for equipment purchases by LSD is a critical part of this process given the challenges in securing sufficient external funds for reinvestment.

In 2016/17 the AFL successfully met and in some areas exceeded its budgetary targets.

In 2016/17 the AFL continued the implementation of innovative test approaches and other initiatives that benefit the OMAFRA-University of Guelph Partnership Agreement and the Ministry of the Environment and Climate Change Program:

1. AFL maintains a high profile in the industry in the use of molecular techniques. Implementation of new, cutting-edge methodology and collaborative work with other organizations bring new methodologies online for OMAFRA's ongoing monitoring and research programs. Enhancements include additional targeted *Cryptosporidium* molecular testing for fruit products, improved food safety pathogen identification, bacterial and mycological species identification, and toxin gene detections. (See Program Highlights and Case Studies for more detail). The AFL's contribution to this “leading edge”, advanced-level technological expertise will continue to differentiate the AFL from its competition.
2. In 2016-2017 the AFL Chemistry Research and Development group completed one phase of the initiative to improve on existing methods of drug residue detection. These methods will expand the number of residues that can be simultaneously detected, and add customised lists of compounds that meet OMAFRA's evolving needs, e.g. to be closely aligned with the National Chemical Residue Program. As part of a phased in approach, the lab will implement the testing of additional drug residues in fowl tissue samples in the

coming fiscal year. The list of compounds detected using this method was customised by OMAFRA to address those identified for their risk-based testing program.

Further improvements to methodology for pesticide analysis has resulted in greater batch efficiencies, detection limits and scope of compounds now available and applied for OMAFRA's ongoing monitoring and research projects.

Improvements gleaned from OMAFRA baseline studies will be applied to upcoming chemistry-based projects for the detection of residues in dairy, meat and poultry samples, including expanding the scope with additional compounds of antibiotic residues for meat, milk and poultry samples, e.g. coccidiostat residues in poultry.

3. In the final year of a two year extension to the renewable contract with the Dairy Farmers of Ontario (DFO), and the Ontario Dairy Council (ODC), the Lab continues to test over 800,000 samples annually and works closely with the DFO, the ODC and OMAFRA to support any program issues that may arise periodically in this industry. The AFL collaborates in the research and implementation of new dairy tests as required by this Ontario industry. In 2016-2017 the AFL performed testing for the level of DHA (docosahexaenoic acid) to assist in decision making for the ongoing marketing of DHA milk in Ontario. As fatty acid components continue to challenge the dairy industry across Canada, the AFL is assisting the Ontario dairy industry through its relationships in other international jurisdictions as well as providing reference testing and troubleshooting support on a "fee for service" basis.

The AFL laboratory scientists continue to work closely with OMAFRA Dairy Food Safety Program staff to identify and research ever-emerging new technology that benefits the dairy industry. This year saw the installation of new rapid antibiotic residue test methods for both bovine and goat milk. It is anticipated that this testing will be adopted into the provincial quality testing program for bovine milk in the coming year.

4. AFL Plant Disease Clinic scientists continue to work closely with OMAFRA Agriculture Development specialists to generate rapid detection methods and optimize protocols to detect various plant pests that are detrimental to Ontario Agriculture. See items 5 through 18 listed under AFL Research Projects (Grants) below.

AFL continues to look for niche sector opportunities that are critical to the success of the leveraging strategy needed to secure sufficient revenue to sustain the Laboratory Services Division as a whole. The AFL continues to build important relationships and revenue with the private sector, focusing on unique services that the AFL can provide as well as those services for which we have a solid reputation for excellence. The ability to bundle complementary services for the purpose of food contaminant and/or adulteration investigations is just one factor that allows us to maintain current and attain new clients.

For example, Good Laboratory Practice (GLP) accreditation across both pesticide and soil testing expands the scope of our services to 3rd party clients in the agrochemical market.

Animal Health Laboratory (AHL) Program, Laboratory Services Division

The Animal Health Laboratory (AHL) accessioned 75,687 cases and performed 849,400 procedures in 2016/17 in support of disease surveillance. Compliance with published turnaround times from the AHL Laboratory Information Management Systems (LIMS) was 96%. Standards Council of Canada accreditations were expanded in 2016/17, particularly for honey bee pathogens. Testing equipment in AHL's inventory was replaced in 2016/17 to improve efficiency and surge capacity of the lab. A major information technology initiative was begun in 2016/17 to enhance data quality for OMAFRA and hence disease surveillance in Ontario, including an enhanced client portal for case submissions, optimization of specimen reception accessioning, and improved data mining.

In 2013, OMAFRA contracted with the AHL for the delivery of a Disease Surveillance Plan (DSP) for 2013-2018 that would offer early detection and improved preparedness and response to animal disease in Ontario. As a major component of the DSP, the 10 Ontario Animal Health Network (OAHN) expert networks were all functional in 2016/17. These networks consist of OMAFRA specialists, AHL personnel, Ontario Veterinary College and other U of G researchers, and private veterinarians working with bovine, equine, swine, poultry, aquaculture, small ruminant, companion animal, bee, wildlife, and alternative species. The networks have continued regular scheduled communications and information sharing with the objective of baseline health monitoring and flagging of changes in disease trends, in order to prevent epidemics before they arise.

The AHL also continued work on another component of the Disease Surveillance Plan in 2016/17 - the integration of Ontario animal health surveillance data with national databases, such as the Canadian Animal Health Surveillance System (CAHSS). The AHL is an active participant in CAHSS governance and in various CAHSS committees, including swine, poultry, equine, and bovine species. The AHL continues to collaborate in building a 'network of networks' that will best serve provincial and national interests.

Research Programs

The Agreement's Research Program addresses OMAFRA priorities in seven research theme areas: Agri-Food and Rural Policy, Bioeconomy, Emergency Management, Environmental Sustainability, Food for Health, Products and Value Chains, Production Systems (Plant and Animal). The Agreement's support to research is multi-faceted, including establishment of priorities, development of partnerships, provision of suitable infrastructure, funding of projects, and mobilization of research results.

Research Funding Program

Within each of the seven themes, priorities for funding are established that address the most significant challenges and opportunities for research in Ontario's agriculture, food and rural sectors. Research funding for individual projects is awarded through an annual, competitive program. The rigorous reviews are based on scientific merit, innovation, contributing partners, potential benefits and best fit with established priorities in each theme area.

OMAFRA's investment in the Agreement's Research Program plays an important role in leveraging external third party funding. For 2016/17, OMAFRA's \$7.4 million of research operating funding leveraged \$10.8 million of third party (non-Ontario government funds), a ratio of 1.46:1.

Research Infrastructure

Significant work toward the implementation of Agricultural Research Institute of Ontario's research infrastructure strategy occurred in 2016/17. The strategy, when fully implemented, will see major redevelopment of livestock and crop research infrastructure associated with the ARIO owned Research Stations, supporting and expanding the capacity that is foundational to the Agreement. Highlights for 2016/17 include:

- ARIO purchased 285 hectares in Elora that will support growing crops programs and new livestock developments
- Work began on the development of new turf research plots at the future location of the Guelph Turfgrass Institute (GTI) within the University's Arboretum lands
- Planning began for new beef and swine research facilities
- The renewal and reorganization of crop research capacity in eastern and northern Ontario continued, which Winchester becoming a standalone station
- Planning began for the renewal of crop research capacity at Ridgetown
- Construction of a new swine research demonstration facility began at Ridgetown
- U of G ended all education programming at Alfred and Kemptville
- The minor capital program continued to support critical repair and upgrade priorities at all locations

Communications and Knowledge Translation & Transfer (KTT)

In 2016/17, the KTT Unit of U of G's Office of Research continued to mobilize the knowledge generated from Agreement-funded research in formats tailored to the needs of the knowledge users. Working in collaboration with OMAFRA, KTT staff delivered producer/ industry research days, webinars, Twitter feeds @AgFoodRuralLink, [KTT website](#) updates and the [KTT Research Program](#). The aim of the last program is two-fold: (1) to undertake research that will identify the most effective means of communicating research results to specific user groups, and (2) to fund the actual delivery of research knowledge by researchers to targeted client groups.

There was no Call for Letters of Intent (LOIs) to the KTT Research Program in fall 2016, as most of the program funding had already been allocated in previous years. Seven projects from the fall 2015 call were approved in April 2016 and are therefore being reported here. (Six of these were operationalized during 2016/17 fiscal year, and 1 in 2017/18 fiscal year.)

Examples of KTT research projects on-going in 2016/17 included:

- Establishing an interpretive centre and outreach initiatives to disseminate research on soil health at the Elora Research Station
- A pilot study to develop, implement and evaluate an Ontario swine research KTT network
- Identifying means of accelerating the mobilization of knowledge about genetics to enhance innovation in Canada's beef and sheep industries

A complete list of KTT research projects and knowledge mobilization events of 2016/17 is contained in the Program Updates section of this report and [on-line](#) .

Highly Qualified Personnel (HQP)

The Agreement funds the [Highly Qualified Personnel](#) (HQP) scholarship program for U of G graduate students to equip them with specialized, practical training in agri-food business, research and innovation. Both the students and their future employers benefit from this expertise. In 2016/17, three (3) doctoral students and ten (10) master's students received HQP scholarships. Since 2008/09, approximately 145 students and their employers have participated in the HQP program.

Additionally, five annual Undergraduate Student Experiential Learning awards were made to enable undergraduate students to pursue research and develop their KTT skills, under the joint mentorship of U of G faculty and OMAFRA specialists.

Note: Although the KTT and HQP programs *per se* occurred within the Agreement's Research Program in 2016/17, all of the other Agreement programs (Animal Health Lab, Agriculture and Food Lab and Veterinary Clinical Education programs) also included KTT and HQP components. Growing Forward 2 (GF2) is a federal-provincial-territorial initiative that helped to fund the KTT and HQP programs. In the financial tables of this report, the KTT and HQP programs are shown as 'Growing Forward 2' (GF2), a.k.a. 'Fund 112'.

Commercialization and Intellectual Property

The U of G's Catalyst Centre provides expertise in the management of intellectual property (IP) generated from Agreement-funded research. Total royalties from OMAFRA-supported technologies exceeded \$2.0 million, an increase of 12% over the previous year.

The past year has continued to be a transitional one for Catalyst Centre, which is expected to continue through fiscal 2018. Our new Executive Director, Research Innovation & Knowledge Mobilisation, Sherri Cox, joined the office in August 2016. Due in large part to the dissemination of dedicated funds from Food from Thought, a number of new positions are being posted and will be created, including: Germplasm Technology Transfer Manager (1 FTE, up from .25), Associate Director, New Venture Creations, Knowledge Mobilization Manager, Industry Liaison Officer, and Project Management Assistant.

Veterinary Clinical Education Program

The Ontario Veterinary College (OVC) of U of G was again ranked in the top ten (6th place, up from 8th in 2016) veterinary schools in the world by the prestigious Quacquarelli Symonds (QS) World Rankings for 2016. Based on academic and employer reputation and how often faculty research is cited within academic publications, the OVC ranked the highest of any Canadian university program in any discipline (Quacquarelli Symonds (QS) World Rankings, 2017 (<http://www.topuniversities.com/>)).

In April 2016, the American Veterinary Medical Association (AVMA) granted continued accreditation to OVC for another seven years, the maximum period permitted. The AVMA, in conjunction with the Canadian Veterinary Medical Association, is mandated to develop standards and conduct regular reviews of professional veterinary programs. Accreditation is essential to the operation and reputation of OVC, and dependent on the capacity that the Veterinary Clinical Education Program (VCEP) funds.

In 2014/15 VCEP activities were realigned under three of the OMAFRA research themes: animal production systems, emergency management, and agricultural and rural policy. In 2016/17, VCEP funded 10.9 FTEs (full time equivalents) of faculty research, teaching and clinical services in these priority areas.

The veterinary externship program - one of the cornerstones of VCEP - continued in 2016/17. It provides final (4th) year students hands-on consolidation of clinical skills and knowledge through placement in a veterinary practice.

VCEP funding also helped to support the OVC Health Science Centre's (HSC) faculty and staff. This allowed faculty to focus their time on educating undergraduate and post graduate students, while continuing to provide the highest level of care for OVC HSC clients. The program also supported mobilization of research knowledge to stakeholders, including funding to the Centre for Public Health and Zoonoses (CPHAZ) to share knowledge of the human-animal-environment disease interface with a wide range of stakeholders – from general public to health agencies to other researchers.

VCEP also contributed to the development of Highly Qualified Personnel (HQP) through research funding to 15 Doctor of Veterinary Science (DVSc) /Doctor of Philosophy (PhD) students, and HQP scholarships to five graduate students in large animal specialties.

PROGRAM UPDATES

Laboratory Services Division

Laboratory Services Division (LSD) is comprised of the Animal Health Laboratory (AHL) and the Agriculture and Food Laboratory (AFL). The LSD continues to optimize the leveraging of services offered within the Partnership to other government, commercial and academic clients while maintaining its status as a self-sustaining division of the U of G.

The Animal Health Laboratory (AHL) and the Agriculture and Food Laboratory (AFL) report separately in the annual report under the Agreement.

Agriculture and Food Laboratory Program (AFL)

The AFL is part of the University of Guelph's [Laboratory Services Division](https://www.uoguelph.ca/ahl/). Further information about the division can be found on the University website: <https://www.uoguelph.ca/ahl/>

The AFL continued to make important contributions to education and technology in agriculture and food safety through various publications, presentations and research projects throughout 2016-2017. The AFL's scientific staff made significant advances in analytical testing in 2016-2017.

- Nine (9) peer-reviewed journal articles were published this year by AFL scientific staff (see KTT section below).
- The AFL participated in 18 grant funded research projects.
- Numerous presentations were given to industry, academia and government audiences.

Leveraging of services benefits both the AFL and OMAFRA through means such as introducing efficiencies in economies of scale, e.g. scope expansion of residue detection methods in both veterinary drug and pesticide residues allows OMAFRA to retain its sampling levels while receiving improved and increased data; expanding our current expertise through projects with other clients that is readily applied to OMAFRA programs.

Molecular Biology and Microbiology

The AFL continues to work collaboratively with regulatory, industry and academic partners to expand expertise in molecular subtyping methodologies for food-borne pathogens.

Research continues in developing/validating a comprehensive method for detection, isolation, and confirmation of Shiga toxin-producing *Escherichia coli* (STEC) including the 'Top Seven' O-serogroups in food samples. This project is supported by the OMAFRA-Food Safety Research Program. These organisms continue to pose challenges in the food industry as evidenced by the significant, current CFIA recalls of flour due to an *E. coli* O121 organism.

PCR methodologies for quantitative analysis of animal species (e.g. bovine, pork, chicken and turkey) in food and feed samples were validated and accredited to aid in investigations of food fraud. This lab section moves into another year of collaboration with the Biodiversity Institute of Ontario (BIO) and the CFIA in a pilot baseline study "Examining the Potential for Species Substitution or Adulteration in Sausage Meats".

Other projects in the Molecular and Microbiology laboratory sections include:

- Continued collaboration by Dr. Shu Chen with Dr. Robert Hanner, BIO, U of G for animal species testing and ds DNA virus testing in plants using a next generation sequencing platform.
- “Establishment and validation of an MLVA method for typing a plant pathogen *Phytophthora infestans*” by Drs. Chen, Shan and Li and team.
- Complete genome sequencing of *Listeria monocytogenes* isolates
- Applications of Droplet Digital™ PCR in Food and Feed Testing
- Ongoing development of a molecular subtyping tool for *Salmonella* Enteritidis
- Development of a propagation method for *Listeria* phages, and other bacteriophage projects

Chemistry Testing (Drugs and Pesticides)

The AFL remains cognizant of OMAFRA's desire to remain aligned with Health Canada standards. Following up on work done in 2014-2015, this group developed and implemented a streamlined method capable of testing over 500 pesticides in a single extraction, providing significant savings and efficiencies.

The Chemistry section provided significant support to the agro-chemical industry this year by hosting the Canadian Trace Organic Workshop (CTOW) in Milton, Ontario. This three-day conference draws on experts from across Canada and the US to provide updates on emerging issues and technology in this sector. The AFL contribution included a presentation titled: Analysis of neonicotinoid pesticides in environmental samples using a Quechers-based extraction to evaluate the exposure and impact of seed treatments on honey bee productivity, health and behavior over three seasons.

The chemical residue teams in the AFL Chemistry Section maintain their position of strength in projects requiring the application of the OECD Principles of Good Laboratory Practice (GLP) 1998. Accreditation for testing in this area allows the AFL to work on behalf of the AAFC to verify characteristics of new pesticides coming to market, as well as support the agro-chemical companies in product development. Knowledge gained through these projects continues to be applied to testing when these compounds come to routine use in the agricultural sector. The resources and expertise from this work is readily available to benefit OMAFRA.

Dr. Linda Lissemore, Manager, AFL Chemistry Unit, works collaboratively with University of Guelph researchers from the School of Environmental Sciences on a number of studies. By doing so, expertise is advanced in the area of pesticide residue chemistry allowing expansion of the scope of services provided by the AFL to OMAFRA.

Dairy Testing

Raw Milk Testing Contract

In addition to providing ongoing dairy analysis and services for OMAFRA, the DFO and the ODC, the AFL also plays an important role in troubleshooting industry or program issues that may arise periodically.

In 2016-2017, the AFL continued to provide valuable support to DFO and its members in the development of niche markets such as DHA-enhanced milk, and the emergence of organically-produced products. As a result, new testing was brought online to enhance DFO's advisory capability to its members with respect to herd health and diet balancing.

Analytical testing information and quality testing for regulatory purposes are delivered through the relationship that has been in place for 50 years between the AFL and the DFO, ODC and OMAFRA.

The AFL continues to enhance its dairy analysis services for both regulatory and producer needs. The AFL has implemented and will seek accreditation for drug residue methods that expand the number of compounds to be detected and monitored. The AFL is also implementing testing of additional composition components. This initiative is expected to allow the dairy industry across Canada to expand its scope of composition testing as well. Test results from component composition analysis are a critical factor in the management of herd health and dairy product excellence.

Research and Method Development

Dr. Perry Martos continues to apply significant efforts into upgrading **Multiple Residue Methodologies for the Detection and Quantitative Analysis of Veterinary Drugs** that are developed specifically for OMAFRA's Meat Inspection Program. This work includes all facets of sample extraction and analysis that must meet Standards Council of Canada criteria. The list of target compounds, regulatory and detection limit requirements, and matrices of interest, changes and expands regularly. OMAFRA and the AFL must respond to evolving surveillance and monitoring needs based on the potential use of a wide range of veterinary drugs in various meat and food industries, both domestically and abroad.

New methodologies are also created within the structure of the partnership as OMAFRA's requirements evolve or in anticipation of future need. These methodologies include LC-MS/MS analysis of an ever-expanding list of veterinary drug residues in meat and poultry samples.

Due to the changing nature of industry and regulatory needs in the area of veterinary drugs, it's imperative that the AFL and OMAFRA work closely together on these method development programs. As always, a key consideration is OMAFRA's ongoing need to remain aligned with national and international testing programs.

Plant Diseases

The AFL's Plant Disease Clinic (PDC) scientists continue to work closely with OMAFRA Agriculture Development specialists to develop and optimize protocols.

In 2016-2017 Dr. Shannon Shan and her team published 2 peer reviewed scientific articles and worked on 15 grant funded research projects with support from OMAFRA.

Each of these projects was to establish and validate new methods for the detection of plant related diseases including viral, bacterial, fungal and nematode vectors. These new methodologies, many of which are PCR- based procedures, address OMAFRA's risk-based prioritized testing programs.

Knowledge Translation and Transfer (KTT)

The AFL continues to support the academic enterprise at the University of Guelph directed toward advancing knowledge and technology that can be directly applied to the benefit of regulators and industry.

This is evidenced by the following list of KTT activities for 2016-2017.

Journal Publications

1. Jessica Bannon, Mohammad Melebari, Cleso Jordao Jr, **Carlos G Leon-Velarde**, Keith

- Warriner. Incidence of Top 6 shiga toxigenic *Escherichia coli* within two Ontario beef processing facilities: Challenges in screening and confirmation testing. *AIMS Microbiology*, 2016, 2(3): 278-291.
2. Radford DR, Ahmadi H, **Leon-Velarde CG**, Balamurugan S. Propagation method for persistent high yield of diverse *Listeria* phages on permissive hosts at refrigeration temperatures. *Res Microbiol*. 2016 Oct; 167(8):685-91.
 3. **Leon-Velarde CG**, Happonen L, Pajunen M, Leskinen K, Kropinski AM, Mattinen L, Rajtor M, Zur J, Smith D, **Chen S**, Nawaz A, Johnson RP, Odumeru JA, Griffiths MW, Skurnik M. Yersinia enterocolitica-Specific Infection by Bacteriophages TG1 and ϕ R1-RT Is Dependent on Temperature-Regulated Expression of the Phage Host Receptor OmpF. *Appl Environ Microbiol*. 2016. 82:5340-53.
 4. Natteewan Udomsil, **Shu Chen**, Sureelak Rodtong and Jirawat Yongsawatdigul. Improvement of fish sauce quality by sequential inoculation with *Tetragenococcus halophilus* MS33 and *Virgibacillus* sp. SK37. *Food Control*. 73 (2017) 930-938.
 5. Walid Mottawea, **Shu Chen**, **Saleema Saleh-Lakha**, Sebastien Belanger, Dele Ogunremid. Complete Genome Sequences of 12 Isolates of *Listeria monocytogenes* Belonging to Serotypes 1/2a, 1/2b, and 4b, Obtained from Food Products and Food-Processing Environments in Canada. Genome Announcements. In Press. 2017. Volume 5.
 6. **M Melzer and X Shan**. "Diseases diagnosed on plant samples submitted to the Pest Diagnostic Clinic, University of Guelph in 2015". Canadian Plant Disease Survey, 2016.
 7. **Melzer, M.S.**, Yu, H., Labun, T., Dickson, A. and Boland G.J. 2016. Characterization and pathogenicity of *Rhizoctonia* spp. from field crops in Canada. *Can.J. Plant Pathol*. Vol. 38, No. 3, 367–374
 8. Doreen M. Houston, Heather E. Weese, **Nick P. Vanstone**, **Andrew E. P. Moore**, J. Scott Weese. Analysis of canine urolith submissions to the Canadian Veterinary Urolith Centre, 1998-2014. *Can Vet J* 2017;58:45–50.
 9. S. Balamurugan, Rafath Ahmeda, Andrew Chibeu, **Anli Gao**, Tatiana Koutchma, Phil Strange. 2016. Effect of salt types and concentrations on the high-pressure inactivation of *Listeria monocytogenes* in ground chicken. *International Journal of Food Microbiology* 218:51-56.

Invited presentations

1. **Chen, Shu**. Applications of Droplet Digital™ PCR in Food and Feed Testing: Challenges and Solutions. The 2nd qPCR and Digital PCR Congress. July 11-12, 2016, Philadelphia, USA.
2. **Chen, Shu**. Applications of Droplet Digital™ PCR in Food and Feed Testing. Joint CFIA Ontario Lab Network – LS Genomics Symposium. October 12, 2016. Toronto.
3. **Chen, Shu**. Finding Food Fraud: Salmon, Sausage, or Soy...What Species Are You Eating? The 59th OFPA Spring Technical Meeting. Mississauga, ON. April 6, 2017.
4. Zannat, Thangima, **Carlos G. Leon-Velarde**, **Saleema Saleh-Lakha**, **Jiping Li**, **Honghong Li**, **Anli Gao**, Roger Johnson, **Shu Chen***. Comparison of methods for the Detection and Isolation of Shiga Toxin-Producing *Escherichia coli* (STEC) in Meat Samples. Accepted. IAFP 2017. Tampa, Florida, July 9-12, 2017.
5. **Lissemore, Linda**. "Pesticides in Food". Lecture presented to University of Guelph, Pesticides in the Environment course. April 2017.
6. **Linda Lissemore**, Eric Reiner, **Andrew Harris**, Xavier Ortiz, **Cassandra Patterson**, Judi Brooks and Karen Macpherson organized the Canadian Trace Organic Workshop (CTOW) in Milton, ON, April 24-27, 2017.

7. **Andrew Harris.** Challenges of high volume trace analysis of pesticides in food and environmental matrices, CTOW 2016, Saskatoon, SK, May 16-18, 2016.
8. **David MacKay.** Analysis of neonicotinoid pesticides in environmental samples using a Quechers based extraction to evaluate the exposure and impact of seed treatments on honey bee productivity, health and behavior over three seasons. CTOW 2017, Milton, ON, April 24-27, 2017.

Research Projects (Grants)

1. **Chen, Shu** - PI. Validation of a Comprehensive Method for Detection, Isolation, and Confirmation of Shiga toxin-producing *Escherichia coli* (STEC) including 'Top Seven' O-Serogroups in Food Samples. OMAFRA-FSRP. On-going.
2. **Chen, Shu** - Collaboration with Dr. Robert Hanner, BIO, U of G for animal species testing and ds DNA virus testing in plants using a next generation sequencing platform. On-going.
3. Ogunremi, Dele (PI), CFIA. **Chen, Shu** – Collaborator. Validation of a highly discriminatory molecular subtyping tool for *Salmonella* Enteritidis based on a single nucleotide polymorphism-polymerase chain reaction (SNP-PCR). OMAFRA-FSRP. On-going.
4. **Jiping Li, Shannon Shan, Shu Chen** – Project funded by OMAFRA to establish and validate an MLVA method for typing a plant pathogen *Phytophthora infestans*. Completed.
5. **X Shan (PI)**, J Tudhope, N Tabujara. Project funded by OMAFRA to establish and validate RT-PCR detection method for hop stunt viroid in hop tissues. Completed and applied in 2016 Ontario hop virus survey.
6. **X Shan (PI)**, J Tudhope, N Tabujara. Project funded by OMAFRA to establish and validate RT-PCR detection method for hop mosaic virus in hop tissues. Completed and applied in 2016 Ontario hop virus survey.
7. **X Shan (PI)**, H Cao. Project funded by OMAFRA to establish and validate PCR detection method for systemic hop downy mildew in hop tissues. Completed and applied in 2016 Ontario hop downy mildew survey.
8. **X Shan (PI)**, J Tudhope, N Tabujara. Project funded by OMAFRA to establish and validate RT-PCR detection method for hop latent virus in hop tissues. Completed and applied in 2016 Ontario hop virus survey.
9. **X Shan (PI)**, J Tudhope. Project funded by OMAFRA to establish and verify ELISA protocol for the detection of beet necrotic yellow vein virus (BNYVV) in sugarbeet plant samples. Completed and applied in 2016 Ontario sugarbeet BNYVV survey.
10. **X Shan (PI)**, H Cao. Project funded by OMAFRA to establish and validate PCR method for the detection of *Aphanomyces cochlioides* in sugarbeet seedling and root samples. Completed and applied.
11. **X Shan (PI)**, H Cao. Project funded by OMAFRA to establish and validate a protocol for the identification and detection of sugarbeet cyst nematode (*Heterodera schachtii*) in soil samples. Completed.
12. **X Shan (PI), M Melzer**, H Cao. Project funded by OMAFRA to establish and validate a protocol for the detection of bacterial spot causing xanthomonads (BSX) from swabs of greenhouse and equipment surfaces. Completed and used in survey and other samples.
13. **X Shan (PI)**, H Cao. Project funded by OMAFRA to establish and validate PCR detection method for Rubus Yellow Net Virus (RYNV). Completed and used for Ontario raspberry virus survey 2016.

14. **X Shan (PI)**, N Tabujara. Project funded by OMAFRA to establish and validate RT-PCR detection method for Blackberry chlorotic ringspot virus. Completed and used for Ontario raspberry virus survey 2016.
15. **X Shan (PI)**, N Tabujara. Project funded by OMAFRA to establish and validate RT-PCR detection method for Blackberry yellow vein associated virus. Completed and used for Ontario raspberry virus survey 2016.
16. **X Shan (PI)**, N Tabujara. Project funded by OMAFRA to establish and validate RT-PCR detection method for Black raspberry necrosis virus. Completed and used for Ontario raspberry virus survey 2016.
17. **X Shan (PI)**, N Tabujara. Project funded by OMAFRA to establish and validate RT-PCR detection method for Raspberry leaf mottle virus. Completed and used for Ontario raspberry virus survey 2016.
18. **X Shan, M Melzer (PI)**. Project funded by OMAFRA to establish and validate a protocol for determination of *Phytophthora infestans* mating type and fungicide resistance. In progress.

Highly Qualified Personnel (HQP) Training

1. **Shu Chen** Co-hosted and co-supervised postdoctoral fellows, Dr. Hanan Shehata and Dr. Rafiq Ahad from BIO, University of Guelph for barcoding of animal species and for screening of ds DNA virus in plants using a next generation sequencing platform.
2. **Shu Chen** served on graduate committees for Ph.D. candidates, Carlos Leon-Velarde (Department of Food Science, University of Guelph), Nicola Linton (Department of Environmental Biology, University of Guelph) and Natteewan Udomsil (School of Food Technology, Suranaree University of Technology).

Tours

1. Tour of AFL for Foods of Plant Origin, OMAFRA Summer Students, May 2016.
2. Tour of AFL for Dairy Farmers of Ontario, September 2016.
3. Tour of AFL for Australian vegetable growers, October 2016.
4. Tour of AFL for University of Guelph, Plant Pathology Students, November 2016.

Progress and final reports for the research projects (shown above) have been delivered to the corresponding funding agencies by the Principal Investigators. Additional activities (such as project meetings), as well as publications and presentations for Knowledge Translation and Transfer (KTT) occurred as proposed in the KTT plans for each of the projects.

Leveraging for Reinvestment and Sustainability

The AFL continues in its efforts to leverage its resources and expertise to attain revenue sources sufficient for reinvestment in infrastructure and instrumentation. In so doing it aims to secure the long-term sustainability of the Division. Laboratory Services continues to modify and improve its approach to securing new business opportunities and increasing external revenues for reinvestment (per Schedules “E” and “F” of the Agreement). Each and every year it is necessary for the Division to reinvest up to 10% of its total revenues in order to future-proof its capabilities and capacity.

In 2016-2017, OMAFRA’s capital investment from the Capital Expenditure Fund of \$100,000 included the replacement of instruments integral to support the OMAFRA Meat Inspection and Foods of Plant Origin Programs, and the Environmental Management Branch. The majority of the equipment purchased was to replace aging and outdated pieces.

It is recognized that the Master Agreement with OMAFRA is a critical element in the Division’s ability to maintain the balance between its capability and capacity for the leveraging of services and remaining a self-sustaining entity within the University of Guelph. For twenty years, the AFL has demonstrated its ability to leverage expertise and capacity by generating sufficient revenue from select commercial, government and research projects. Continued success is assured, in part, through ongoing referrals based on the lab’s reputation for quality and expertise. In the coming year, the lab is looking to continue to leverage its opportunities for growth in pesticide GLP testing, agricultural soil and plant testing, and identified niche market opportunities while continuing with applied research projects with industry and government partners.

AFL is committed to providing timely support for urgent/emergency response initiatives as required, as well as ongoing scheduled testing programs for OMAFRA.

Animal Health Laboratory Program (AHL)

The AHL is part of the University of Guelph’s [Laboratory Services Division](#). Further information about the division can be found on the University website: <https://www.uoguelph.ca/ahl/>

Core activities

The AHL receives specimen submissions from private veterinarians, the Ontario Veterinary College Health Sciences Center, the Canadian Wildlife Health Cooperative, and researchers. Direct submissions to the AHL from OMAFRA are primarily meat inspection cases. The AHL’s caseload increased 12% from our annual average of 68,000 cases per year to 75,687 cases in 2016/17, which generated 849,400 procedures and >1,000,000 tests. Tests are conducted on specimens from all of the major and minor animal species in Ontario. The AHL also performs a significant volume of export testing for clients in Ontario and across Canada. Toxicology caseload increased following the closure of the toxicology section at the provincial lab in Abbotsford, BC. The AHL continued to be the only Canadian toxicology lab partner in the Veterinary Laboratory Investigation and Response Network (Vet-LIRN) of the US Food and Drug Administration.

The test spectrum offered by the AHL continues to evolve with newer technologies. For example, fluorescent antibody (FA) testing has largely been replaced by immunohistochemistry (IHC) and molecular techniques. Also, in 2016-17, real-time polymerase chain reaction (PCR) continued to be streamlined in order to offer next business day testing for most tests. Subsequent to identification of pathogens by PCR, gene sequencing is increasingly pursued, especially for influenza A viruses and porcine reproductive and respiratory syndrome (PRRS) virus. Client access for equine

infectious anemia (EIA) testing was improved through the ability to offer accessioning and reporting via GlobalVetLink, for which the AHL served as the beta test site in Canada.

The AHL continues to have close contact with clients through a range of meetings and activities, including the annual Feedback Group meeting, bimonthly Animal Health Laboratory/ Pathobiology/ Health Sciences Center (AHL/PBI/HSC) liaison meetings, and membership in the key veterinary associations in Ontario. Regular communication with clients has occurred since 1997 via the quarterly AHL newsletter, now in its 21st volume. The AHL moved the Newsletter to an electronic format in 2014 as a cost-saving measure, and continues to distribute the newsletter to 1,950 readers via email as well as posting on the AHL website. The AHL website was upgraded in 2016/17 to improve accessibility for clients and to provide them with more background information through links to LabNotes and other information sources.

The AHL has routinely surveyed its clients, by commodity, to determine their satisfaction with key elements of AHL service. In response to feedback from clients, and with agreement from OMAFRA, the client satisfaction survey is now conducted biennially, with the next survey to be conducted in November 2017.

AHL Infrastructure

- The enhanced containment level 2 laboratory (CL2+), room 1822, in the Pathobiology-Animal Health Laboratory building is used for routine TSE testing [transmissible spongiform encephalopathies – bovine spongiform encephalopathy (BSE, mad cow disease); chronic wasting disease in deer and elk (CWD); and scrapie in small ruminants]. This lab was also put to good use in winter 2015 for testing for highly pathogenic avian influenza (HPAI) virus during the outbreak in southern Ontario. The lab is re-certified annually by the Canadian Food Inspection Agency (CFIA).
- The alkaline tissue digester is in bi-weekly use for disposal of animal anatomical waste with the exception of cattle. Final documentation has been submitted to CFIA for approval of bovine SRM (specified risk materials) handling. HEPA filtration is being added to a vent line in the summer of 2017 to allow final approval by CFIA.
- Equipment purchases made to improve efficiency and surge capacity of the lab included replacement of the Thermo Fisher ELISA robot with a Biotek Biospa 8 ELISA automation system. In-house gene sequencing trials have begun with a NanoPore Technologies MinION DNA/RNA sequencer. A minivan was purchased to support lab outreach activities, including the veterinary clinic in-house mastitis quality control project.

Operations

The AHL continued to offer a wide spectrum of tests, with addition/replacement of improved tests over time as enhanced through the DSP. Various tests, including tests for honeybee pathogens, were added to the flexible scope of accreditation by the Standards Council of Canada (SCC).

Following is a list of **new and/or improved tests** offered by the AHL in 2016/17:

- Acute bee paralysis virus (ABPV) in honey bees - qRT-PCR
- Antimicrobial susceptibility, honey bee, *Paenibacillus larvae*
- *Apocephalus borealis* (zombie fly) in honey bees - qPCR detection
- Avian metapneumovirus type C (AMPV type C) – PCR
- Bacterial culture, aerobic and anaerobic, food animal
- Bacterial culture, fecal, *Campylobacter*, add-on test
- Bacterial culture, honey bee
- Bacterial culture, honey bee, American foulbrood (*Paenibacillus larvae*)
- Bacterial culture, honey bee, European foulbrood (*Melissococcus plutonius*)

- Black queen cell virus (BQCV) in honey bees - qRT-PCR
- Chronic bee paralysis virus (CBPV) in honey bees - qRT-PCR
- *Crithidia mellifica* in honey bees - qPCR detection
- Deformed wing virus (DWV) in honey bees - qRT-PCR
- Equine endocrine panel - insulin (RIA), glucose, TT4, cortisol
- Fecal flotation, wildlife
- Fecal oocyst count - modified McMaster
- Generic DNA sequencing
- HSFP, primary and delayed secondary enrichment - *Salmonella* culture
- IBRV/BoHV-1 – Ab ELISA
- Infectious salmon anemia virus – PCR
- Israeli acute paralysis virus (IAPV) in honey bees - qRT-PCR
- Kashmir bee virus (KBV) in honey bees - qRT-PCR
- *Lotmaria passim* in honey bees - qPCR detection
- MIC, NARMS
- *Nosema apis* in honey bees – qPCR
- *Nosema ceranae* in honey bees – qPCR
- Rotavirus, group A, B, C – PCR
- Rotavirus/coronavirus, bovine/equine – PCR - includes coronavirus - PCR, rotavirus group A and B – PCR
- Sacbrood virus (SBV) in honey bees - qRT-PCR
- *Spiroplasma apis* in honey bees - qPCR detection
- *Spiroplasma melliferum* in honey bees - qPCR detection
- Vitellogenin biomarker levels in honey bees - qRT-PCR

In 2016-2017, the AHL made **Continuous Improvements** in the following areas:

- Created improved bee testing spreadsheets to handle large amounts of data, and investigated changes in gBlock to improve stability of reference material.
- Virology is starting a new process of making pools which will start soon. Specimen reception will log in the individual samples and virology will make the pools from the individual samples both within LIMS and on the bench.
- IT continuous improvements included:
 - Cleanup and restructuring of the reporting “Universe”.
 - Improved AHL website hosting and developing.
 - Enhancements to LIMS application – LabVantage.
 - Optimization of LabVantage workflow with particular emphasis on sample/specimen receipt and elimination of custom code.
 - Improved data mining capabilities for OAHN network pathologists and researchers.
 - Upgrade to LabVantage 8.
- New inductively coupled plasma - mass spectrometry (ICP-MS) autosampler significantly reduces testing time.
- Method change improvement to *MOL-257 Chytrid PCR* as a direct result of participating in external proficiency program with Canadian Wildlife Health Cooperative (CWHC) (PEI).
- Extra rinse was added for labware cleaning when using nitric acid in order to prevent contamination (Toxicology).

- Use of new control chart software (North West Analyst) provides new and useful data using filters to monitor trends.
- Creation of a 4-in-1 control for the small flock project so control can be used for 4 tests.
- A cassette labeler was purchased and installed in the PAHL trim room 1802, for use on day-case cassettes to replace the practice of labeling cassettes by hand, increasing the efficiency and reducing the possibility of labelling errors.
- Virology started using LIMSLink to export data from the LC480 PCR machines into LIMS. They recently consolidated 45 LIMSLink worksheets into 2 (based on Ct values under 36 and 37 rather than hazard type).
- *Echinococcus* species PCR – multiple methods are extracted simultaneously and buffer identifications are scanned into worksheets.
- Mycoplasma - sample generated by LIMS with sample information automatically transcribed.
- MYC-100r11 section 14.4.2 includes image of hemolytic zones on a blood agar plate (possible *Mycoplasma*) for quick reference.
- Single telephone number for the entire section (AHL-Kv) is increasing effectiveness over use of multiple extensions.
- *Bac-036* PCR process has been made more efficient by having the Virology lab do the extractions.
- The Clinical Pathology section has recently purchased a HemoCue, an instrument used to analyze avian and reptilian hemoglobin. They are currently learning how to use the instrument and validating the method, which must be modified from its application in human hemoglobin testing.

AHL published 39 scientific articles in the quarterly AHL Newsletters in 2016 (total of 40 pages in 2016). AHL performed >40 lab tours. AHL veterinarians authored or co-authored 49 oral or poster presentations and 13 peer-reviewed publications in the 2016 calendar year. Following is a sampling of AHL outreach activities in 2016:

- Barham M. Ontario Animal Health Network: A collaborative approach to poultry surveillance. Poultry Health Research Network, Seminar Series. PAHL. U of Guelph, Guelph, ON. May 17, 2016.
- Brash ML. Small flock poultry project, sample collection demonstration Small flock poultry workshop for veterinarians. OAHN/OMAFRA/AHL event. PAHL, U of Guelph, Guelph, ON. May 7, 2016.
- Brash ML. Platinum Brooding Ontario Workshops. Cargill Poultry Producers. Kitchener, ON. Feb 9/10, June 8/ 9, 2016.
- Brooks AS, Brash ML, Ouckama R, Varga C, Barham ML. Poultry health and OAHN update. Poultry Industry Council, St. Isidore, ON. Dec 1, 2016.
- Brooks AS. Diseases of sheep. Ontario Sheep Marketing Agency, District 10, Embrun, ON. Mar 2016.
- Fairles J. AHL Update – overview of AHL updates and disease trends (OAHN) for 2016. Ontario Association of Swine Veterinarians, Fall Conference, October 29, 2016.
- Hazlett MJ. Food animal diagnostic pathology – diseases of swine. 4th year OVC DVM students. Dec, 2016.
- Maxie G. AHL laboratory overview. OMAFRA Ministry Emergency Management Planning Committee. Guelph, ON. Jun 20, 2016.
- McEwen B. Animal Health Laboratory - Our role in medicolegal cases. Private Security & Investigative Services Branch Meeting. Ministry of Community Safety & Correctional Services. Toronto ON. Dec 2016.
- Oesterle P, Ojkic D, Buchanan T, Purvis M, Shirose L, Campbell D, Jardine C. Avian influenza in wild birds - 2015 surveillance results from Ontario. Internal Conf Diseases

in Nature Communicable to Man. Guelph, ON, August 7, 2016.

- Ruotsalo K, DeLay JP. 'Opening the Black Box,' maximizing the benefits of diagnostic testing. OAVT Conference. March 2016.
- Ruotsalo K, DeLay JP. Round table discussion Lunch with a pathologist. OVMA Conference. Toronto, ON. Jan 2016.
- Spinato, MT, Maxie, MG. The Animal Health Laboratory's role in emergency response. Farm-to-Fork Emergency Management Exercise for Swine Disease. Guelph, ON. Nov 25, 2016.
- Samman A, Susta L, Guerin M, Brash M, Varga C, Martin E. Detection and surveillance of significant pathogens in Ontario small poultry flocks. PHRN Research Day, U of Guelph, Guelph, ON. Mar 29, 2016.
- Spinato MT. KTT project: Adult small ruminant mortality project launch. Small Ruminant Veterinarians of Ontario. Mar 31, 2016.
- Turner PV, Compo NR, Davidson S, McDowell M, Cai H, Gottstein B, Peregrine AS. Diagnoses of alveolar echinococcosis in lemurs at an exotic animal sanctuary: Implications for public health. DIN Meeting 2016.
- Vaillancourt J-P, Boerlin P, Slavic D, Guerin M. Assessment and mitigation of contamination risks: critical knowledge to reduce diseases and increase biosecurity compliance. OMAFRA Food Safety Research Forum, Guelph, ON, May 2016.

Pathologists in the AHL-Kemptville lab participated in a Peste des petits ruminants postmortem-based laboratory Foreign Animal Disease (**FAD**) **emergency exercise** in November 2016. Pathologists in the AHL-Guelph lab will participate in a postmortem-based laboratory influenza FAD emergency exercise in June 2017 (details will be reported in next year's annual report).

Real-time reporting to OMAFRA of **immediately notifiable hazards** identified in the Regulations of the Ontario Animal Health Act occurs throughout the day via automatic email alerts of positive results in the range of tests available for each hazard. OMAFRA is hence kept well informed of laboratory-based identification of hazards, and can access full information in LabVantage on each case cited by the Web Intelligence (WebI) system that queries the AHL data warehouse. This auto-alert system was fully functional on January 1, 2013. From May 1, 2016 to April 30, 2017, WebI searches were done for OMAFRA, AHL veterinarians, OVC researchers, CFIA, and the OAHN expert networks. These searches form the basis of Ontario's animal health surveillance data, from disease investigations, zoonotic disease reports, research projects, AHL newsletters, and OIE reports.

The AHL performed testing on a total of 96 legal cases (AHL-G, $n = 65$; AHL-Kv, $n = 31$). Mammalian pathologists appeared in court 2 times in 2016-17 to provide an expert opinion on their legal cases.

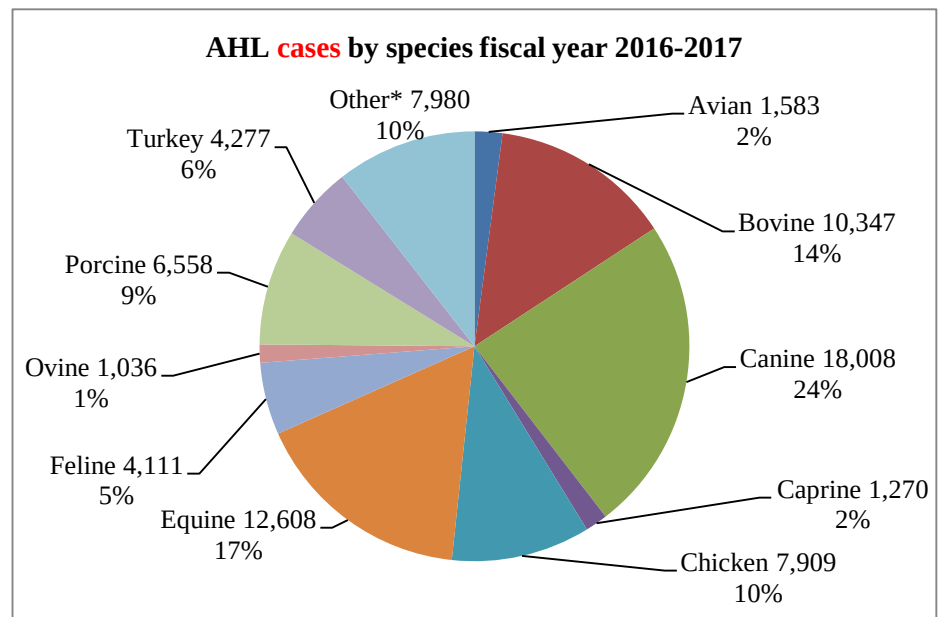
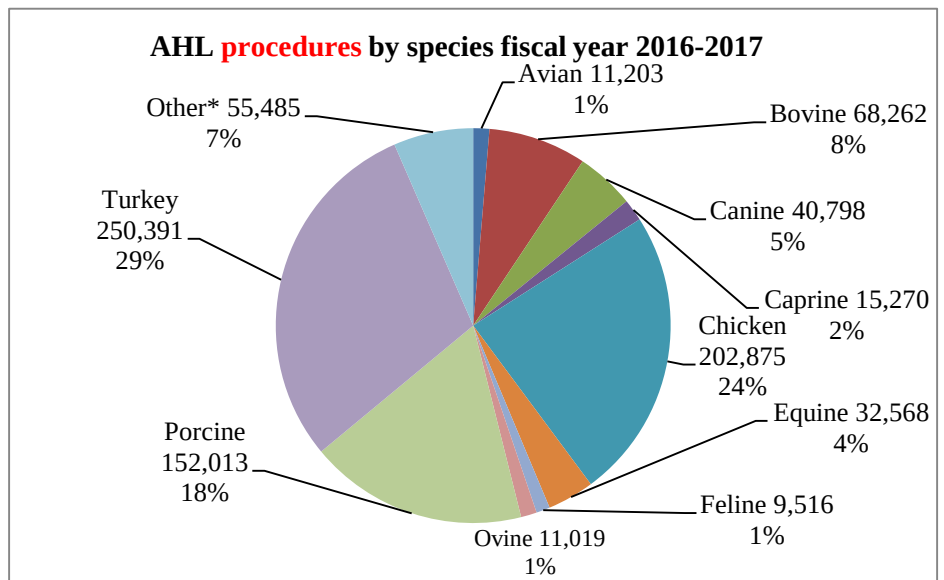
The AHL has inactivated many older or less popular tests, and continues to streamline processes, especially in virology. The AHL accessioned 75,687 cases and performed 849,400 procedures in 2016/17 in support of disease surveillance. Individual procedures are often comprised of multiple tests, e.g., biochemistry profiles of 20 tests each, thus exceeding 1,000,000 tests annually. (See AHL caseload distribution tables and graphs below).

AHL caseload distribution (May 1, 2016 – Apr 30, 2017)

75,687 cases
849,400 procedures
1,000,000 tests

AHL Function	#procedures
Virology	619,116
Bacteriology	85,476
Clinical	58,516
Pathology	31,393
Histotechnology	25,345
External	13,723
Mycoplasmology	6,828
Anatomic	6,051
Pathology	2,952
Parasitology	
Toxicology	
Total	849,400
procedures	

AHL Function	# cases
Clinical	20,433
Pathology	17,630
Virology	15,176
Bacteriology	6,198
Histotechnology	6,073
Toxicology	
Anatomic	
Pathology	2,996
External	2,659
Parasitology	2,583
Mycoplasmology	1,939
Total cases	75,687



Disease Surveillance Program (DSP)

The 2013-2018 Disease Surveillance Plan (DSP) was funded at \$1.3M/year for 5 years, based on the OMAFRA - U of G Agreement and Growing Forward 2 funds, and began May 1, 2013.

The 4 pillars of the DSP are:

1. Environmental scan, consult and engage stakeholders.
2. Enhance Ontario disease surveillance through the development of expert species-based networks.
3. Integrate Ontario animal health surveillance with national surveillance.
4. Develop better tools to manage risk.

Pillar 1 – Developmental activities

- October 5, 2016 – Annual “Staying ahead of the curve (the epidemic curve that is!)” DSP stakeholder meeting.
- March, 2017 – Via competition, hired Michael Deane as OAHN Communications Associate to continue work on our various communications platforms – Facebook, Twitter, Instagram, Pinterest, podcasts, etc.

Pillar 2 – Enhance Ontario disease surveillance

Objectives of the Ontario Animal Health Network (OAHN) Strategic Plan are:

1. Provide a communications hub/platform for topics concerning animal health and welfare issues within Ontario.
2. Identify existing or emerging animal health and welfare issues and trends.
3. Contribute expertise to prevention, detection, and response activities.

Each network consists of at minimum an expert from each of OMAFRA, OVC, the AHL, and 1 to 4 private practitioners in support of disease surveillance in all of the major animal sectors in Ontario. “Clinical impression” surveys of private veterinarians are conducted quarterly, combined with AHL and private laboratory data, plus OMAFRA abattoir condemnation data, and discussed in a quarterly teleconference of the expert network.

During fiscal year 2016-17, all of the expert networks were functional.

- small ruminants
- swine – the OAHN-swine network serves as the Ontario node in the Canadian Swine Health Information Network (CSHIN), which had been operating for 4 years.
- poultry
- equine
- bovine
- fish
- honeybees
- alternative species/fur-bearing animals
- companion animals
- wildlife, in concert with the Canadian Wildlife Health Cooperative (CWHC)

The networks continued regularly scheduled communications and information sharing in 2016/17 with the majority of networks meeting on a quarterly basis.

A quarterly meeting is held with OMAFRA co-leads to share experiences and improve network functionality. Each of the OMAFRA network co-leads provides an annual report to one of the monthly meetings of the DSP Executive Committee (Leslie Woodcock, Paul Innes, Heather Harrison, and Grant Maxie). Melanie Barham also provides a monthly update on key performance indicators (KPIs) of OAHN activities.

As announced in March, 2016, each of the 10 OAHN networks was awarded \$50,000 of DSP funds to conduct a project on a perceived gap in surveillance in their commodity. Quarterly reports have been received on all projects, and final reports on swine, equine, and companion animal projects. The remaining final reports are expected in summer/fall of 2017. Results of some of these projects were presented at the annual meeting of the Canadian Animal Health Laboratorians Network, June 4-7, 2017, in Guelph (e.g. AMR finding from the OAHN Aquatics Network).

The OAHN website is live at oahn.ca, and has both a public side and a password-protected side. Documents on the public side, such as quarterly producer/owner reports, are freely accessible on the Web. Quarterly veterinary reports are posted on the private side of the website for access by veterinarians and RVTs. Page views on oahn.ca totaled 54,104; 397 registered users with 110 new this year, OAHN Newsletter subscribers (Vets) was 667, with 854 total. Social media post impressions (Facebook and Twitter) were 768,108, new podcasts 22, and Podcast listens this year 6,699 with 19,953 all time.

Pillar 3 – Integration with national surveillance

- Continued collaboration with a cross-Canada technical working group planning for the integration of selected provincial laboratory surveillance data into the Canadian Animal Health Surveillance Network (CAHSN) – BC, SK, ON (GF2) – including poultry (ILTV, reovirus, MG), swine (influenza), cattle (BVDV).
- Contributed to the Canadian Animal Health Surveillance System (CAHSS), which is a 'network of networks'
 - o Grant Maxie (AHL) and Tim Pasma (OMAFRA) are members of the Directors Group and the Core Team
 - o Several from the AHL (Maxie, Barham, Fairles) rate PINGs for CEZD (Community for Emerging and Zoonotic Disease), which is now included under the CAHSS umbrella. "PING" is a polling tool available to all members to ask others in the EEZD for feedback on specific issues
 - o Both OMAFRA and the AHL participate in various CAHSS committees – swine, poultry, equine, bovine – that are under development, and are discussing next steps.

Pillar 4 – Better tools for managing risk

- Staffing - two 2-year temporary full time (TFT) technicians were hired to expedite test development; contracts expire in April 2018.
- Equipment purchased and implemented
 - o Virology – Biotek Biospa 8 ELISA automation system
 - o Information technology (IT) projects were started, including an enhanced client portal for case submissions, optimization of specimen reception accessioning, and improved data mining
- New tests – see list above
- Surge capacity
 - o Maintained year-round, and has benefited from the acquisition of high-volume equipment funded by OMAFRA.

Research Programs

The Agreement's [Research Program](#) addresses the innovation continuum comprehensively, from funding market-driven research, to mobilizing research results – into both the public domain and marketplace. Together with research partners along the continuum, the program delivers new knowledge and technologies that support industry competitiveness and public benefits, thereby maximizing the return on public investment.

Research Funding Program

For 2016/17 the Agreement Research Program continued under seven themes: Agricultural and Rural Policy, Bioeconomy – Industrial Uses, Emergency Management, Environmental Sustainability, Food for Health, Product Development & Enhancement through Value Chain Collaboration, and Production Systems – Plants and Animals. The total number of new research projects approved for funding in the 2016/17 was 89.

Examples of proposals funded in each research theme include:

- Developing an approach to measure and monitor local food consumption in Ontario (Agriculture and Rural Policy theme)
- Soil organic carbon and PGPR determination as influenced by biomass crops grown in Ontario and GIS database development (Bioeconomy and Environmental Sustainability research themes)
- Assessment of an air treatment system for enhanced environmental and biosecurity measures on a broiler operation (Emergency Management and Environmental Sustainability research themes)
- Development of evidence-based mental health literacy program and emergency mental health response model for Ontario agriculture (Emergency Management theme)
- Exploration of bean consumption in older adults (Food for Health theme)
- Sweet potato slip production: a new business opportunity for Ontario propagators (Products and Value Chains)
- Improving selection efficiency by combining functional studies and a systems biology approach with the estimation of molecular breeding values in cattle (Production Systems – Animal theme)
- Biology and management of celery leaf curl (Production Systems – Plants theme)
- Barley trait development and germplasm enhancement to meet the needs of Ontario industry (Production Systems – Plants theme)

More examples of research projects underway in each theme can be found in the 2017 Agri-Food Yearbook.

OMAFRA investment in the Agreement's research program continued to leverage external third party funding. For 2016/17, the ratio of leveraged research operating funds to OMAFRA funding was 1.46:1. Specifically, \$10.8 million of third party (non-Ontario government funds) was leveraged by OMAFRA's \$7.4 million of research operating funding. This is one of the Research Program's key performance indicators.

Research Infrastructure

ARIO completed the purchase of approximately 285 hectares of agricultural land adjacent to the Elora Research Station. U of G has initiated a land use planning study to determine how the new land, combined with the existing station will support growing crop research programs, new livestock development (beef, swine, poultry).

Work began in the spring of 2016 on the development of new turf research plots at the future location of the Guelph Turfgrass Institute (GTI) within the University's Arboretum lands. Preliminary design and site investigations were initiated toward securing municipal approvals for the construction of a new GTI headquarters at the same location in anticipation of the eventual sale of the current Guelph Research Station by ARIO.

The redevelopment of livestock research infrastructure at Elora continued with the development of plans for a new Beef Research Centre that will be tendered for construction in the summer of 2017. Preliminary planning for a new Swine Research Centre at the Elora Research Station commenced through an Ontario Pork / OMAFRA/ARIO / University Steering Committee, similar to the Dairy and Beef development processes.

The renewal and reorganization of crop research capacity in eastern and northern Ontario continued with the development of construction plans for new agronomy research service buildings at the Winchester Research Station in the east and New Liskeard Research Station in the north. Winchester will become a standalone station in anticipation of the eventual sale of the former Kemptville Campus property where eastern crop research was formerly based. The new facility at New Liskeard will replace older and less efficient space currently in use. Construction of the new buildings is expected to commence in late fall 2017 for Winchester and in summer of 2018 for New Liskeard. Significant research program equipment was purchased through the minor capital program for the Winchester and New Liskeard stations including precision planting, GPS tracking, and sample analysis equipment.

Planning for the renewal of crop research capacity at Ridgetown campus was initiated through a campus crop research master plan. The major elements under consideration are a new agronomy field service building to replace outdated and disbursed capacity on campus, plus a new laboratory building to provide updated and modern capacity for current and future research needs. With support from Ontario Pork, construction commenced for a new swine demonstration and education facility at Ridgetown. When completed, this 10 sow farrow to finish facility will provide capacity for teaching in agriculture diploma programs, and experiential learning opportunities.

U of G ended all education programming at Alfred and Kemptville by the end of 2016-17. Facilities management continued at the two locations in support of new tenants occupying the locations, and to prepare the sites for disposal under ARIO's direction.

The minor capital program continued to support critical repair and upgrade priorities at all locations including animal care, life cycle repairs for building systems, and the renewal of field equipment for station and core station research capacity.

Communications and Knowledge Translation & Transfer (KTT)

The Agreement's [KTT program](#) is designed to accelerate the transformation of new research knowledge into use. This program includes long-established practices in extension and technology transfer, building and expanding on them. During 2016/17, U of G undertook the following initiatives in collaboration with OMAFRA:

KTT Research Program

Seven projects selected in the fall 2015 Call for Letters of Intent to the KTT Research Program were approved in April 2016 and are being reported here (below) and [on-line](#). This brings the number of KTT funded projects to 70 since 2008/09. There was no Call in fall 2016, as most of the program funding had been allocated in previous years.

KTT Research Projects Approved in 2016/17

U of G Dept.	Project Title
Animal Biosciences	Accelerating the translation and transformation of research knowledge in genetics to enhance innovation in Canada's beef and sheep industries
Plant Agriculture	Inclusive inquiries of production and consumption conundrums for emerging policies to improve food systems in Ontario
Population Medicine	Advancing swine research KTT: A pilot study to develop, implement, and evaluate an Ontario Swine Research KTT Network
Population Medicine	Veterinarians creating change using a Focus Farms approach to the delivery of animal care assessment programs
Environmental Design & Rural Development	Growing resilient agricultural communities through collaborative knowledge transfer and translation
Population Medicine	An evidence based medicine pilot project focusing on the swine veterinary community and Influenza A viruses of swine (IAV-S)
Environmental Sciences	Establishing an interpretive centre and outreach initiatives to disseminate research on soil health and ecosystem services

As part of the administration of the KTT Research Program, the U of G's KTT Unit coordinated the review (with OMAFRA) of the researchers' annual and final project reports, working with the researchers to address budgetary and operational challenges and opportunities.

KTT Knowledge Mobilization and Communications

Tweeting resumed in the summer of 2016 to draw attention to the outcomes of the Partnership programs, in particular the results of research projects of interest to key stakeholder audiences. With a greater focus on social media, no further issues of the Buzz newsletter were produced in 2016/17.

A synthesis of the research conducted since 2008/09 under Environmental Sustainability theme was produced in the summer of 2016, in consultation with the U of G director champion for the theme. The synthesis and its dissemination in various forms will serve as a pilot project for the seven other research themes.

Knowledge exchange events were held for Partnership stakeholders who could benefit from new research results. These included:

1. Soil Health Research KTT Forum
2. Bioeconomy Research and Innovation Forum
3. Dairy Research & Innovation Day
4. Agricultural and Rural Policy Discovery and Dialogue Workshop

5. Food for Health Discovery and Dialogue Workshop and Townhall
6. Gryphon's LAAIR Showcase
7. Research at the Speed of Business: Emerging Technologies and Value Chains
8. Plain language training workshop: graduate student participants, Bioeconomy Research and Innovation Forum
9. Plain language training workshop: Food Safety Forum
10. Knowledge Translation in Australia: A Conversation with Tamika Heiden
11. Affecting Choices: The Power of Nudges
12. Plain Language: KTT for Research Proposals and Reports (Training Session)

In support of OMAFRA staff involved in delivering the OMAFRA-UofG Agreement programs, the U of G offers an 'affiliated researcher program' enabling OMAFRA staff to access online and print publications in the U of G library. Since the program was launched in 2008, 155 OMAFRA applicants have been approved for two-year access to the library's resources. During the 2016/17 fiscal year, there were 21 new and 50 renewed accounts, with a total of 82 active accounts.

Highly Qualified Personnel (HQP) Program

The HQP Program provides scholarships to MSc and PhD students to enhance their skills in and knowledge of the agri-food sector. This has a direct benefit to the students, their future employers and the agri-food sector. During the 2016/17 cycle, we were able to provide opportunities for 10 MSc and 3 PhD students. This brings the total number of program participants to 145 since it began.

These students are located in several Departments and Colleges across campus and conduct research projects that are aligned with OMAFRA priorities. At the KTT/HQP Day held at 1 Stone Road on April 24th 2017 there was an opportunity to showcase several students and their mentors who hosted their work placements. The industry mentors were very enthusiastic about the program and the students they hosted. The mentors were able to highlight the meaningful contributions made by the students and the students discussed the new skill sets they acquired while on the job.

A survey of HQP students (past and present) was undertaken in November 2016 to determine the participants' opinions of the program's impacts. The surveys were emailed to 130 HQP participants. The goal of the survey was a response rate of 50% (i.e. 65 respondents), which was reached by the end of January 2017. Overall, most respondents felt the HQP program is, or was, a positive contribution to their employment success.

The profiles of the experiences of two HQP students are described below:

Jared Stoochnoff is a MSc student in the School of Environmental Science. His research is aimed at improving the efficiency of irrigation systems in plant nurseries, known to require and consume large quantities of water which is often in conflict with local watering guidelines. Jared did his internship with Root Rescue of Waterdown, ON. Jared was involved in many aspects of the business including representing the Company at trade shows where he translated complex technical data into language that could be readily understood by the public.

Nicole Weidner is a PhD candidate in Clinical Studies in the Ontario Veterinary College, who studies animal nutrition of companion animals with cancer. Specifically, Nicole is researching the links between vitamin D and cancer development and progression using canines as a model system. Over the course of her PhD, Nicole has been in contact with many groups and given several presentations to stakeholders. Nicole completed her work term with Alltech Inc. examining and analyzing data from trials on phytase activity in pelleted and mash feeds. She connected with many people in the company including scientists at head office in Kentucky to collect the data and consult on the results of the analysis.

In addition to the formalized HQP program, the Undergraduate Student Experiential Learning (USEL) program annually hires five U of G summer students to address KTT priorities identified collaboratively by OMAFRA Agriculture Development Branch program specialists, and faculty of the U of G's Ontario Agricultural College. Students work under the mentorship of both the specialists and faculty, and present their findings to them at an end of summer event. While achieving knowledge mobilization, they also develop HQP skills. There is interest within OMAFRA to expand the USEL program to other branches. The five USEL projects of 2016/17 are shown below. Since 2010, USEL has sponsored 35 students in research projects.

Undergraduate Student Experiential Learning Projects (2016/17)

Synergies in diversified farm production in livestock/crop farms
Investigation of integrated pest management and production strategies for container crops in the Ontario floriculture industry
Increase interest and understanding of genetic selection for parasites in the Ontario sheep industry
Status of ambrosia beetles in high-density apple production
Developing an integrated pest management (IPM) surveillance network

Note: Although the KTT and HQP programs *per se* occurred within the Agreement's Research Program in 2016/17, all of the other Agreement programs (Animal Health Lab, Agriculture and Food Lab and Veterinary Clinical Education programs) also included KTT and HQP components. In the financial tables of this report, HQP and KTT are shown as 'Growing Forward 2' (GF2), a.k.a. 'Fund 112' as the programs were supported by this federal-provincial-territorial initiative.

Commercialization and Intellectual Property

In 2016/17, the Catalyst Centre (CC) reported 158 disclosures of intellectual property, 17 patents filed, 24 licenses, options, and sub-licenses granted and 10 patents and plant breeders rights certificates issued related to OMAFRA funded technologies. Total license revenue from OMAFRA-supported research exceeded \$2.0 million. Appendix A-2 details these numbers and percentages of OMAFRA-funded technology results.

The Industry Liaison (IL) program as supported by the partnership has flourished under the stewardship of Gregor Lawson. Gregor has done great work helping to shepherd projects through from external partners, and helping them to leverage support from OMAFRA, OCE, OGI, NSERC, MITACS and other funds that can support Ontario agriculture and research. Projects awarded that benefitted from Catalyst Centre's IL Officer support totaled more than \$4.8 million in fiscal 2017. Examples include a canola breeding program funded by Genome Canada and Benson Hill Biosystems (PI Peter Pauls), and the development of a mushroom management system funded by Monaghan Mushrooms and MITACS (PI Rozita Dara).

OMAFRA's [Proof-of-Principle \(POP\) Fund](#) operates outside of the Agreement, however it is directed toward University inventions that support OMAFRA's research objectives, most of which have been developed through Agreement funding. The CC has responsibility to distribute funds to the most promising projects. In 2016/17, two new projects received funding – a project from Adam Dale to develop market opportunities for a mini strawberry (Berrielle™), and a project from Laima Kott to produce mint for a new licensee of her high rosmarinic acid mint variety.

Veterinary Clinical Education Program

The Veterinary Clinical Education Program (VCEP) contributes to the development of Ontario's veterinary capacity, providing students with the knowledge and skills needed to meet the needs of the ministry, the agri-food sector, veterinary public health and rural economic development. Areas to highlight include the funding to the Health Sciences Centre, which provides students with hands-

on, experiential learning in an innovative, clinical environment as well as the funding to support approximately 11 faculty, a subset of the 44 faculty that engage in areas of interest to OMAFRA.

In the 2017 the Quacquarelli Symonds World Rankings of schools of veterinary medicine, the Ontario Veterinary College (OVC) ranked 6th in the world, 3rd in North America and 1st in Canada.

At its March 2017 meeting, the Council on Education (the veterinary accrediting body), reviewed VCEP's 2016 interim report and voted to grant continued full accredited status for the next year. The accreditation status of the OVC is reviewed annually based on its annual report submission.

VCEP activities aligned under OMAFRA research priorities:

a) Production Systems (animal health, animal welfare and impact on environmental ecosystem)

Faculty allocations

4 FTEs total; 2.5 in animal health, 0.5 in animal welfare and 1 related to ecosystem impact - \$697K)

There are currently several faculty engaged in research, teaching and clinical service in these areas; examples of their activities are:

- Investigating the within-herd prevalence and risk factors for ketosis in dairy cattle in Ontario as diagnosed by the test-day concentration of β -hydroxybutyrate in milk.
- The effects of feeding space on the behavioural responses of cattle during rest periods offered as part of long-distance transportation.
- Collaborative epidemiological approach to investigate risk factors for diminished honey bee health in Ontario, Canada.
- Studying the relationship between on-farm environmental conditions and local meteorological station data during the summer.

Highly Qualified Personnel (HQP) Doctoral positions

DVSc or PhD 10 stipends allocated to support research in areas of large animal health, ecosystem impact or animal welfare - \$330K

Example of research include:

- Improvements to disbudding and dehorning practices in Ontario dairy calves by producers and veterinarians.
- Investigating kid mortality in Ontario dairy goat farms.
- Detection and surveillance of significant pathogens in Ontario small poultry flocks.
- Environmental toxicants and stress: failure of innate immunity in development of pneumonia in cetaceans.
- Characterization of the fecal bacterial microbiome of commercial mink
- Use of stem cells to manage Exercise-induced Pulmonary Hemorrhage (EIPH) in horses.
- Equine Herpesvirus -1: prevalence, shedding, and reactivation.
- Epitheliocystis of rainbow and lake trout in Ontario
- Babesiosis in wild and captive cervid
- EEG analyses in poultry undergoing physical euthanasia methods

Post-graduate Clinical training

6 FTEs for Interns and Residents – \$170K

These HQP positions provide support for the advanced clinical training of large animal specialists in areas such as internal medicine, surgery and anesthesia, and pain management. These

graduates will become the next generation of expertise for practicing veterinarians and the animal owning public.

Health Sciences Centre

(HSC) Clinical support 1.2 FTE field service veterinarians and 26 FTE HSC staff - \$2.17M

The OVC Health Sciences Centre is a referral hospital for Ontario's private veterinarians and animal owning public, which provides a comprehensive and innovative clinical environment for experiential learning and discovery through excellent patient care and client experience. Focused on delivering advanced veterinary medical care, the veterinarians (in a wide range of specialties) and support staff operate on a service team concept. Each clinical service team consists of a faculty member, a DVSc student working toward an advanced degree in a clinical specialty, an intern, and during the academic year, a number of final year DVM students completing their clinical rotations.

VCEP funding provides support for the clinical service and teaching responsibilities of the faculty to ensure continuity of veterinary service for OVC clients and allow the faculty to focus their time on educating the students. This is also critical for meeting the client expectations for the level of expertise in veterinary services delivered by the clinicians and staff in the Health Sciences Centre (HSC).

b) Emergency Management (zoonoses / public health, foreign animal disease, food safety)

Faculty Allocations

6.9 FTEs total; 1.4 in public health, 2 in FAD, 3.5 in Food Safety - \$1.2M

Activities of faculty engaged in research, teaching and clinical service include:

- Distribution of Salmonella in humans, production animal operations, and a watershed in a FoodNet Canada Sentinel Site.
- Antimicrobial resistance of *Clostridium perfringens* isolates obtained from commercial broiler chicken flocks in Ontario, Canada.
- Food safety knowledge, attitudes, and self-reported practices in Ontario high school students.
- *Coxiella burnetii* (Q fever) seropositivity and associated risk factors in sheep and goat farm workers in Ontario, Canada.
- Exploring the relationships between small non-community drinking water system characteristics and water system performance in Ontario, Canada.
- Scoping review to identify potential non-antimicrobial interventions to mitigate antimicrobial resistance in commensal enteric bacteria in North American cattle production systems.
- Distribution of ticks and the risk of Lyme disease and other tick-borne pathogens of public health significance in Ontario, Canada.

Centre for Public Health and Zoonoses support (CPHAZ)

1 staff FTE – \$100K

The Centre for Public Health and Zoonoses (<http://ovc.uoguelph.ca/cphaz>) was established in 2006 to coordinate existing public health research and promote new collaborative research activities. Aimed at enhancing capacity to solve problems and implement solutions in public health at the human-animal-environmental interface, CPHAZ works to expand the pool of educated personnel addressing the public health needs of the population. The CPHAZ mobilizes research results and provides a bridge between researchers at the University and the public seeking validated information on areas related to public health and zoonoses. An excellent example of this is the "Worms and Germs" blog (<http://www.wormsandgermsblog.com/>).

HQP Doctoral positions

DVSc or PhD 5 stipends allocated to support research in areas of zoonoses, public health, foreign animal disease and food safety - \$165K

Examples include:

- Dynamics of influenza A virus transmission in a swine herd and analysis of risk factors for recurrent infections.
- Characterization of the fecal microbiota and an evaluation and analysis of antimicrobial resistance in commercial rabbits.
- Longitudinal molecular epidemiology of infectious diarrhea in foals with a focus on *Clostridium difficile*.
- Investigating early host immune response to intestinal *Mycobacterium avium* subspecies paratuberculosis (MAP) infection in young cattle.
- Evaluating the knowledge, attitudes, and behaviours toward radiation safety in the veterinary field and the impact of specific training methods on improving current practices.

c) Rural Policy and Economic Development (*rural business and communities*)

Summer Career Opportunities and Research Experience (CORE)

\$49K

VCEP funds continued to support an MSc student conducting research on “*The rural community veterinary practitioner: using student, veterinary practitioner and faculty focus groups to inform curriculum at the Ontario Veterinary College*”. Over the past year preliminary results of this work have been presented at several conferences.

VCEP funds in this area have also been used to support the stipends of summer students engaged in OMAFRA related research projects with OVC faculty. In last year’s annual report the projects of four summer students were listed, however, given that the projects were undertaken during the summer of 2016, they were actually funded from this past year’s budget. Hence, they will not be reported here. There have been students funded again for this summer (2017) and they will be reported on in next year’s annual report.

Veterinary Externship

0.5 staff FTE- \$80K; plus support for experiential learning of 4th year DVM students - \$200K

The Externship Course started in the mid-1980s to provide practical experience to DVM students entering their final year. Students in the final (4th) year of the veterinary program are placed in a private, multi-species veterinary practice that exposes them to practice in a rural community and allows them to consolidate their knowledge and skills in a hands-on, real-world setting. More than 40 of the practices that host these students have been involved for more than 20 years – their support is critical. Not only do practitioners provide their expertise, they evaluate the students’ clinical, diagnostic and communication skills covering a set list of criteria.

A blog of first-hand student experiences can be found at: <https://externship.ovc.uoguelph.ca>

The blogs provide an opportunity for future students, DVM students, OVC faculty, staff and alumni, government funding agencies and the community to discover what student veterinarians are learning, as well as providing an opportunity for student veterinarians to develop communication and social media skills for use in their future veterinary careers.

FINANCIAL REPORT

The financial reporting included in this Annual Report 2016/17 for the OMAFRA-U of G Agreement consists of two sections, as follows:

1. The “Audited Statement of Revenues and Expenses for the fiscal year May 1, 2016 to April 30, 2017” included here in its entirety in Appendix B.
2. Summary of Revenues and Expenses (Fully Allocated)

This summary shows the actual revenues and expenses (fully allocated) for May 1, 2016 to April 30, 2017 for each of the four programs (Research, VCEP, AFL and AHL) as well as for the Agriculture Research Institute of Ontario (ARIO) Minor Capital Fund (see Note*) funded, as applicable, through:

- The Base Agreement,
- The New Initiatives Fund (the special one-time funding of \$56 million received in March 2008, which the University planned to spend over five years in support of specific new initiatives in the overall partnership. Note: remaining funds shown for 2016/17 are carry forwards),
- The Growing Forward 2 fund, and
- The Total Partnership (Agreement + New Initiatives + Growing Forward 2).

“Fully allocated” refers to the fact that ‘indirect costs’ (such as providing program support services, administrative services such as budget management and human resources functions, and physical plant infrastructure) have been allocated to each individual program using a consistent methodology. This ‘fully allocated’ presentation of costs has been utilized since the 2004/05 Annual Report, at the request of OMAFRA. This format provides a much more informative arrangement of the financial data, and is not subject to the same problems in interpretation of program costs as presented in the years previous to 2004/05. Nevertheless, it is not advisable to use these data for making decisions about incremental allocations/reductions in budget, since such decisions may have variable impact on the direct versus indirect cost bases. For example, reducing ‘Production Systems (PS) Research Theme’ expenditures may have less impact than intended, unless the continuing cost of operating the research stations on which the PS program is built is also part of the decision process.

The second page of this summary shows the revenues and expenses for the Research Program itemized for each of seven themes, as well as for the Research Stations (broken down by “Operations” and “Utilities, Repairs and Maintenance” see note *) and the HQP (Highly Qualified Personnel) and KTT (Knowledge Translation and Transfer) programs. This summary also shows the research stations costs allocated across the seven Research Themes, thus providing fully allocated totals for expenses by theme.

Note*: Financial support for upkeep and maintenance of the ARIO-owned lands and facilities (referred to in the Agreement as ARIO-Locations, and consisting of the Ridgetown regional campus and 14 other research stations, all of which are managed and operated by the University) is provided for the “Utilities, Repairs and Maintenance” program (generally referred to as O&M, funded within the Agreement) and the “ARIO Capital Fund” (funded outside of the Agreement). This O&M and Capital funding is in addition to the normal day-to-day operation of the livestock and crops research stations (station staffing, inputs such as feed, bedding, fertilizer, seed, etc.) at these locations, which is termed Research Station “Operations” (funded within the Agreement, as shown in the broken out costs within the Research Program summary).

The OMAFRA - U of G Partnership Financial Report - Row Definitions

Revenue	
OMAFRA Agreement	That portion of the total Agreement funding recognized for eligible expenses in the reported fiscal year (May 1, 2016 - April 30, 2017).
OMAFRA – Other	These revenues include OMAFRA funding designated for specific activities as well as the “ARIO Minor Capital” funds received.
Sales of Goods and Services	Sales of services or goods from the Agreement operations provided to external organizations and clients. This category records revenue for testing services provided to external clients by the two Lab Services divisions, as well as sales of milk, eggs, crops and other farm products from the research stations.
Other Revenue and Interest	Includes interest earned on the net cash flow in accordance with section 14.6 of the Agreement as well as miscellaneous revenues generated within the Agreement operations. The major component of this category is facility rental income for space managed within the O and M budget. Other Revenue may also include sponsorship revenues, recoveries from the disposal of surplus equipment or other miscellaneous program revenues.
Expenses	
Personnel	All salary and employee benefit costs excluding transfers for Research and VCEP faculty costs. (refer to Faculty Pool Costs definition)
Faculty Pool Costs	Agreement funds transferred to the University in support of the salary and benefits costs of University faculty effort toward Agreement priorities. Two “pools” have been established for the Research and VCEP Programs.
Operating	Expenses for all costs other than salary and benefit costs.
Internal Sales & Recoveries	Sales of goods and services or recovery of costs between units <u>within the University</u> , such as Lab Testing performed by Lab Services or research station recoveries for researchers or departments. In addition, the agreement recovers costs where OMAFRA funded operations provide shared support for other activities such as MTCU-funded Diploma Teaching. The charges for these recoveries are normally approved as ‘invoices’ for services between the specific unit requisitioners and providers within the University. Internal Charges are recorded under “Operating”.
Indirect Costs	Includes costs of program support services, administrative services such as budget management and human resources functions, and physical plant infrastructure, which support the overall Agreement or New Initiatives programs, but cannot be attributed as direct costs to specific programs.

Summary 2016/17 Actuals - Revenue & Expenses of Entire Agreement by Program (in thousands of dollars)

Base Agreement (Fund 110): All Programs	
1	Base Agreement (Fund 110): All Programs

		Research	Vet Clinical Education	Agri-Food Lab	Animal Health Lab	ARIO Minor Capital	Total Agreement
	Object Category						
Revenue	OMAFRA Agreement	(45,048)	(4,797)	(6,492)	(5,760)	-	(62,097)
	OMAFRA Other	-	-	(100)	-	(4,700)	(4,800)
	Sales Goods & Services	(3,590)	-	(7,994)	(6,418)	-	(18,002)
	Other Revenue & Interest	(3,961)	-	(12)	(7)	(101)	(4,081)
	Total Revenue	(52,574)	(4,797)	(14,598)	(12,185)	(4,801)	(88,981)
Expenses	Personnel	19,721	66	10,019	8,986	16	38,808
	Faculty Pool Costs	8,900	1,900	-	-	-	10,800
	Operating	16,405	2,732	4,704	4,766	4,785	33,393
	Internal Sales & Recoveries	(2,257)	(21)	(412)	(1,830)	-	(5,520)
	Indirect Costs	9,830	120	287	263	-	10,500
	Total Expense	52,574	4,797	14,598	12,185	4,801	88,981
	Net Expense (Revenue)	-	-	-	-	-	-

New Initiatives (Fund 111): All Programs

		Total Research		Vet Clinical Education		Agri-Food Lab		Animal Health Lab		ARIO Minor Capital		Total New Initiatives
	Object Category											
Revenue	OMAFRA Agreement	(757)		(6)		-		(19)		-		(783)
	OMAFRA Other	-		-		-		-		-		-
	Sales Goods & Services	-		-		-		-		-		-
	Other Revenue & Interest	-		-		-		-		-		-
	Total Revenue	(757)		(6)		-		(19)		-		(783)
Expenses	Personnel	287		-		-		-		-		287
	Faculty Pool Costs	-		-		-		-		-		-
	Operating	470		6		-		19		-		495
	Internal Sales & Recoveries	-		-		-		-		-		-
	Indirect Costs	-		-		-		-		-		-
	Total Expense	757		6		-		19		-		783
	Net Expense (Revenue)	-		-		-		-		-		-

Growing Forward 2 – Additional Base (Fund 112): All Programs												
		Total Research		Vet Clinical Education		Agri-Food Lab		Animal Health Lab		ARIO Minor Capital		Total New Initiatives
	Object Category											
Revenue	OMAFRA Agreement	(2,196)		(680)		-		(1,331)		-		(4,207)
	OMAFRA Other	-		-		-		-		-		-
	Sales Goods & Services	-		-		-		-		-		-
	Other Revenue & Interest	-		-		-		-		-		-
	Total Revenue	(2,196)		(680)		-		(1,331)		-		(4,207)
Expenses	Personnel	1,045		83		-		566		-		1,694
	Faculty Pool Costs	-		-		-		-		-		-
	Operating	1,147		597		-		764		-		2,508
	Internal Sales & Recoveries	4		-		-		1		-		5
	Indirect Costs	-		-		-		-		-		-
	Total Expense	2,196		680		-		1,331		-		4,207
	Net Expense (Revenue)	-		-		-		-		-		-
Total Partnership (Renewed Agreement, New Initiatives & Growing Forward 2): All Programs												
		Total Research ¹		Vet Clinical Education		Agri-Food Lab		Animal Health Lab		ARIO Minor Capital		Total Partnership
	Object Category											
Revenue	OMAFRA Agreement	(48,001)		(5,483)		(6,492)		(7,110)		-		(67,086)
	OMAFRA Other	-		-		(100)		-		(4,700)		(4,800)
	Sales Goods & Services	(3,590)		-		(7,994)		(6,418)		-		(18,002)
	Other Revenue & Interest	(3,961)		-		(12)		(7)		(101)		(4,081)
	Total Revenue	(55,552)		(5,483)		(14,598)		(13,535)		(4,801)		(93,969)
Expenses	Personnel	21,053		149		10,019		9,552		16		40,789
	Faculty Pool Costs	8,900		1,900		-		-		-		10,800
	Operating	18,022		3,335		4,704		5,549		4,785		36,395
	Internal Sales & Recoveries	(2,253)		(21)		(412)		(1,829)		-		(4,515)
	Indirect Costs	9,830		120		287		263		-		10,500
	Total Expense	55,552		5,483		14,598		13,535		4,801		93,969
	Net Expense (Revenue)	-		-		-		-		-		-

Note 1: See the following pages for the breakout of Research Program finances by theme.

Base Agreement: Research

[illegible]

	Research	ARIO Research	Research	Total
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[illegible]

Continued: Summary 2016/17 Actuals Revenue and Expenses by Research Sub-Program or Theme (in thousands of dollars)

Growing Forward 2: Research

		Research							ARIO Research Stations		Research			Total
	Object Category	Prod Sys	Prod Dev	Food for Health	Env Sust	Bio-economy	Ag Rural Policy	Emg Mgmt	Operations	Utilities / R&M	HQP	KTT	Comm	Research
Revenue	OMAFRA Agreement	-	-	-	-	-	-	-	-	-	(508)	(692)	(996)	(2,196)
	OMAFRA Other	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sales Goods & Services	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other Revenue & Interest	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Revenue	-	-	-	-	-	-	-	-	-	(508)	(692)	(996)	(2,196)
Expense	Personnel	-	-	-	-	-	-	-	-	-	-	437	608	1,045
	Faculty Pool Costs	-	-	-	-	-	-	-	-	-	-	-	-	-
	Operating	-	-	-	-	-	-	-	-	-	508	238	401	1,147
	Internal Sales & Recoveries	-	-	-	-	-	-	-	-	-	-	17	(13)	4
	Indirect Costs	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Expense	-	-	-	-	-	-	-	-	-	508	692	996	2,196
Net Expense (Revenue)		-	-	-	-	-	-	-	-	-		-	-	-

Continued: Summary 2016/17 Actuals Revenue and Expenses by **Research** Sub-Program or Theme *(in thousands of dollars)*

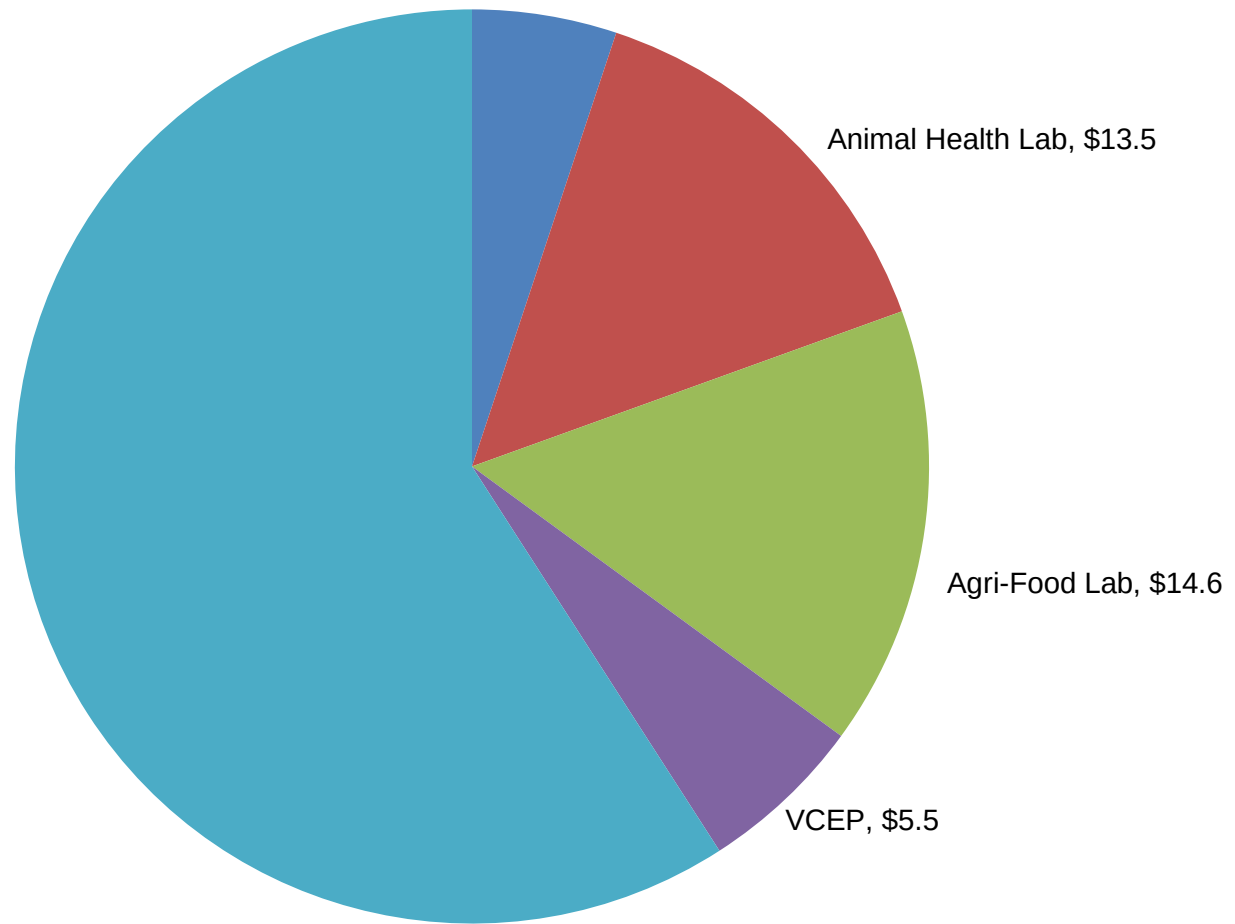
Total Partnership (Base Agreement, New Initiatives & Growing Forward 2): Research

		Research							ARIO Research Stations		Research			Total
	Object Category	Prod Sys	Prod Dev	Food for Health	Env Sust	Bio-economy	Ag Rural Policy	Emg Mgmt	Operations	Utilities / R&M	HQP	KTT	Comm	Research
Revenue	OMAFRA Agreement	(18,777)	(1,630)	(3,368)	(2,605)	(1,929)	(1,655)	(1,403)	(7,617)	(6,744)	(562)	(690)	(1,021)	(48,001)
	OMAFRA Other	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sales Goods & Services	(109)	-	-	(5)	(4)	(2)	-	(3,434)	(36)	-	-	-	(3,590)
	Other Revenue & Interest	(905)	(68)	(119)	(209)	(80)	(61)	(42)	(1,229)	(1,247)	(1)	-	-	(3,961)
Total Revenue		(19,791)	(1,698)	(3,487)	(2,819)	(2,013)	(1,718)	(1,445)	(12,280)	(8,027)	(563)	(690)	(1,021)	(55,552)
Expenses	Personnel	7,918	327	787	833	603	485	280	7,648	1,113	14	437	608	21,053
	Faculty Pool Costs	5,017	386	1,287	580	354	630	647	-	-	-	-	-	8,900
	Operating	2,015	466	492	548	559	183	195	4,887	7,466	549	236	426	18,022
	Internal Sales & Recoveries	(491)	-	(1)	(47)	(24)	(17)	-	(1,014)	(663)	-	17	(13)	(2,253)
	Indirect Costs	5,332	520	922	905	521	437	323	759	111	-	-	-	9,830
	Total Expense	19,791	1,698	3,487	2,819	2,013	1,718	1,445	12,280	8,027	563	690	1,021	55,552
	Net Expense (Revenue)	-	-	-	-	-	-	-	-	-	-	-	-	-

Summary 2016/17 Actuals - Fully Allocated Research Program Expenses by **Research** Sub-Program or Theme *(in thousands of dollars)*

	Research							ARIO Research Stations		Research			Total
	Prod Sys	Prod Dev	Food for Health	Env Sust	Bio-economy	Ag Rural Policy	Emg Mgmt	Operations	Utilities / R&M	HQP	KTT	Comm	Research
Total Theme Expenses as above:	19,791	1,698	3,487	2,819	2,013	1,718	1,445	12,280	8,027	563	690	1,021	55,552
Allocation of ARIO Research Station Costs	13,855	842	1,470	2,067	846	698	529	(12,280)	(8,027)	-	-	-	-
Fully Allocated Theme Expenses	33,646	2,540	4,957	4,886	2,859	2,416	1,974	-	-	563	690	1,021	55,552

Summary 2016/17 Actuals – Revenue and Expenses
of Entire Agreement by Program (\$ millions)



PROGRAM PERFORMANCE REPORTS

Overall Agreement

Data collection for each Performance Indicator (PI) was completed with the assistance of OMAFRA. The table below summarizes the Overall Agreement performance according to six PIs.

Key Outcome	A world class cluster of agriculture, food, bioproduct and rural community resources including academic, government, industry and supplier organizations.	
Performance Indicator OA1	Recognition of the University of Guelph as a world leader in agri-food, veterinary and associated sciences.	
	Metric (a)	Overall University ranking. Same as performance indicator R3 (b).
	Baseline:	Ranking as per 2008 results. U of G ranked 2 nd in the 'comprehensive' universities category.
	Target:	Maintenance or improvement of university standing (2nd) according to the Research Money Inc. ranking of Canadian universities.
	Results (2016/17):	The 2017 Research Infosource Inc. (formerly Research Money) report of Canadian universities' standings ranks U of G as the #2 university in the 'comprehensive' category.
	Metric (b)	Total number of scientific and technical FTEs, and faculty supported or leveraged by the Partnership.
	Baseline:	Scientific and technical FTEs as per 2008/09 results. • Research: 171.9 • VCEP: 45.9 • AFL: 53.0 • AHL: 71.0
	Target:	Maintain total number of scientific and technical FTEs and faculty supported or leveraged by the Agreement at 2008/09 levels. May decline due to inflation.

	Results (2016/17):	Number of faculty, scientific and technical FTEs supported or leveraged by Agreement research projects (same as R2 (b-iii) for Research): • Research: 352.89 • VCEP: 45.9 • AFL: 53.0 • AHL: 71.0
		Corrections: The 2014/15 Annual Report stated correctly that the number of research faculty was 316.9. A note in the 2015/16 consolidated annual report incorrectly indicated that the 2014/15 number for research should have been <u>206</u>. The 2015/16 Annual Report stated that the number of research faculty was <u>171.9</u>; it should have been 290.02.
	Metric (c)	Number of faculty/researchers/staff related to the research theme areas, recognized by their peers, for example through research chairs, awards of recognition, appointment to prestigious positions such as international panels, and leadership of national and international research initiatives etc. Same as performance indicator R3 (a).
	Baseline:	2008/09 results are the baseline. 25 faculty members were Canada Research Chairs, of which 10 had active Agreement research projects.
	Target:	Number of faculty/researchers/staff recognized by their peers, and significance of awards, appointments etc. to be $\geq$ baseline.
	Results (2016/17):	During 2016/17, 29 faculty members were Canada Research Chairs and 12 of these also had active Agreement research projects.

Key Outcome	Broader stakeholder community contributing research funding to building capacity for developing solutions to relevant issues and opportunities	
Performance Indicator OA2	Contribution of the Agreement towards leveraging industry and other government funding and collaboration for building capacity to address sector needs, opportunities and issues.	
	Metric (a)	Total dollars invested/generated from third-party sources, by program
	Baseline:	For 2008/09, total dollars invested from third-party sources were reported as: • Research (operating): \$9.2 million (excluding all provincial government funding). This is funding secured for research projects from third-party sources. • AHL: \$3.6 million • AFL: \$9.8 million • VCEP: no revenue generation
	Target:	Total dollars invested/generated from third-party sources $\geq$ 2008/09 baselines.
	Results (2016/17):	• Research (operating): \$10.8 million • AHL: \$6.42 million • AFL: \$7.11 million • VCEP: no revenue generation
	Metric (b)	Total non-OMAFRA program revenue
	Baseline:	2008/09, total non-OMAFRA program revenue • Research: \$6.4 million • AHL: \$3.7 million • AFL: \$9.5 million, \$0.3 million from OMAFRA, not related to the Agreement • VCEP: no revenue generation
	Target:	Total non-OMAFRA revenue $\geq$ 2008/09 baseline.
	Results (2016/17):	Research: \$7.55 million • AHL: \$6.42 million • AFL: \$7.11 million • VCEP: no revenue generation

		This category records revenues for testing services provided to external clients by the Lab Services division (AFL and AHL), as well as sales of milk, eggs, crops and other farm products from the research stations.
Key Outcome	Partnership seen as integrative and collaborative	
Performance Indicator OA3	OMAFRA and University staff engagement with the Agreement	
	Metric	Level of overall OMAFRA - U of G staff engagement/satisfaction with overall Agreement
	Baseline:	Joint staff engagement survey distributed to all OMAFRA and U of G personnel involved with the Agreement.
	Target:	Maintenance or improvement of 2008/09 survey results.
	Results (2016/17):	This Performance Metric was addressed in a 2012/13 study undertaken as part of the five-year review of the Agreement, (Stoddard, 2012). It indicated positive levels of staff engagement / satisfaction with the overall Agreement. The findings were detailed in OA3 of the <u>2012/13 Annual Report</u>. In 2016/17, OMAFRA and U of G staff continued to work closely and collaboratively as co-chairs for the four program areas of the Agreement, and co-leads for each of the seven research theme areas.
Key Outcome	Leading edge solutions to agriculture, food, bioproduct, animal health and rural community issues and opportunities	
Performance Indicator OA4	Revenue generated from solutions, products and services developed through the Agreement	
	Metric	Outcomes and PIs outlined for OA4, OA5 and OA6 will be assessed as part of the overall five year evaluation of the Agreement, to be conducted by an external third party.
	Baseline:	Performance Indicators OA4, OA5 and OA6 will be achieved through a 2012 midterm study similar to the Deloitte report of 2007 (U of G / OMAFRA Impact Study).
	Target:	Evaluation plan for year five to be undertaken and approved in 2009/10, describing content and format of 2012/13 report. Report was completed in 2012.

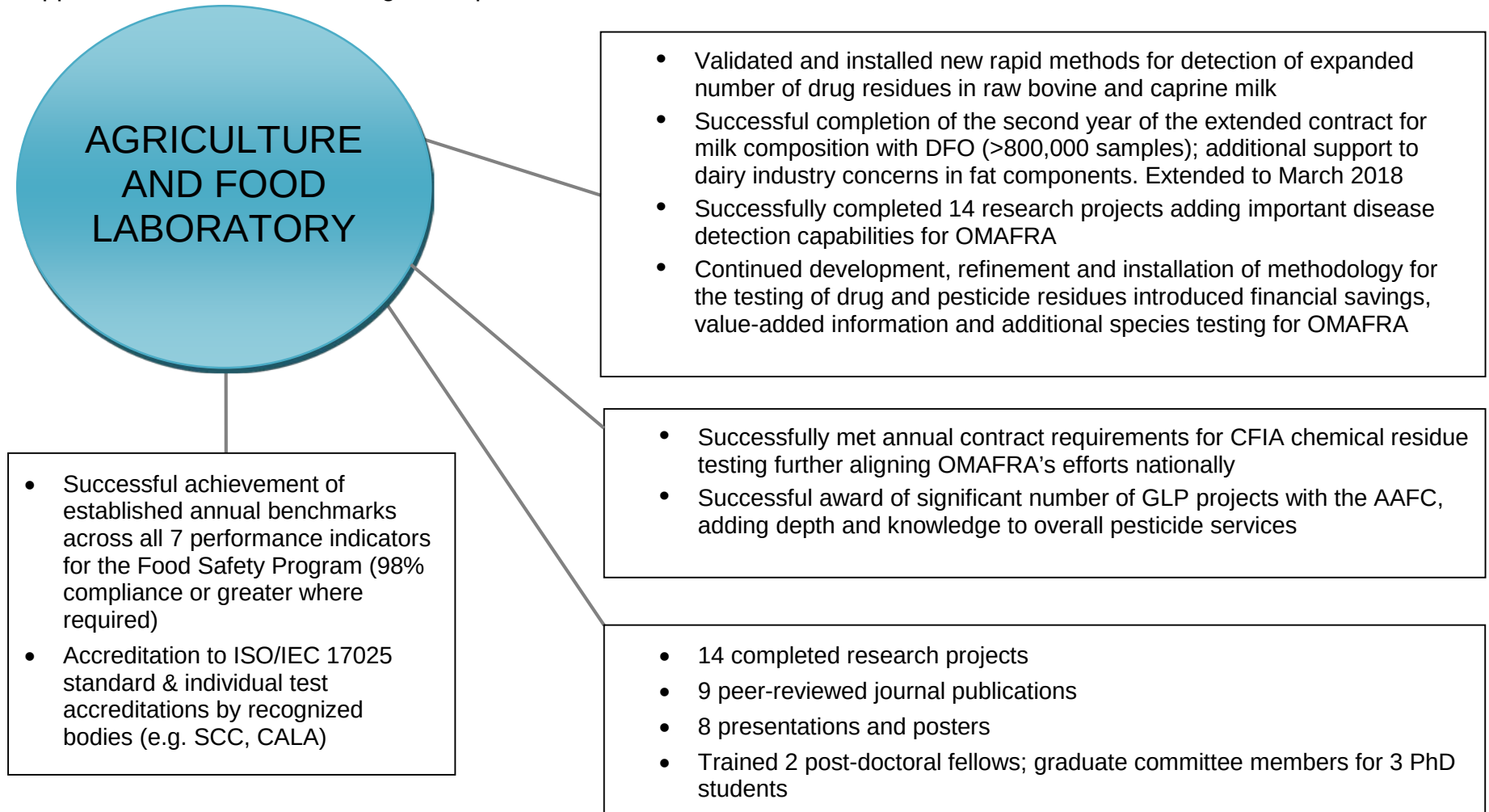
	Results (2016/17):	This Performance Indicator was addressed in a 2012/13 study undertaken as part of the five-year review of the Partnership Agreement (Price Waterhouse Coopers, Dec. 2012). The findings were detailed in OA4 of the 2012/13 Annual Report. Many examples of revenue-generating solutions, products and services developed through the Agreement can be accessed in the 2016 Agri-Food Yearbook posted on the U of G website. Further information concerning revenues is shown in Research performance indicators R1 (b): <i>third party investment in research operating funding</i> and R8 (b) and R8 (c): <i>number of licenses and number of patents applied for</i>.
Key Outcome	Economic and health benefits generated from adoption, utilization and commercialization of knowledge and capacity	
Performance Indicator OA5	Economic and health benefits from solutions, products and services developed through the Agreement	
	Metric	Outcomes and PIs outlined for OA4, OA5 and OA6 will be assessed as part of the overall five year evaluation of the Agreement, to be conducted by an external third party.
	Baseline:	PIs OA4, OA5 and OA6 will be achieved through a 2012 midterm study similar to the Deloitte report of 2007 (U of G / OMAFRA Impact Study).
	Target:	Evaluation plan for year five to be undertaken and approved in 2009/10, describing content and format of 2012/13 report. Report was completed in 2012.
	Results (2016/17):	This PI was addressed in a 2012/13 study undertaken as part of the five-year review of the Agreement (Price Waterhouse Coopers, Dec 2012). The findings were detailed in OA5 of the 2012/13 Annual Report. Current examples of economic and health benefits developed through the Agreement are shown in the 2017 Agri-Food Yearbook.
Key Outcome	Key stakeholders aware of economic and social benefits of solutions led by the Partnership Agreement	
Performance Indicator OA6	External stakeholder satisfaction with benefits and accomplishments of the OMAFRA - U of G Agreement.	
	Metric	Outcomes and PIs outlined for OA4, OA5 and OA6 will be assessed as part of the overall five year evaluation of the Agreement, to be conducted by an external third party.

	Baseline:	PIs OA4, OA5 and OA6 will be achieved through a 2012 midterm study similar to the Deloitte report of 2007 (U of G / OMAFRA Impact Study).
	Target:	Evaluation plan for year five to be undertaken and approved in 2009/10, describing content and format of 2012/13 report. Report was completed in 2012.
	Results (2016/17):	This PI was addressed in a 2012/13 study undertaken as part of the mid-term review of the Agreement (Stoddard, Sept 2012). The study findings were very positive and were detailed in OA6 of the 2012/13 Annual Report. External stakeholder satisfaction continues to drive the research priority setting, funding and mobilization of research results so that maximum benefits accrue to the Ontario public.

Agriculture and Food Laboratory

Selected Performance Indicators and Accomplishments

Program Objective: Scientific, diagnostic and analytical capacity to detect risks and enable effective response to support the health and well-being of the province and its citizens.



Agriculture and Food Laboratory

Data collection for each Performance Indicator (PI) was completed with the assistance of OMAFRA. The table below summarizes AFL's performance according to the seven PIs in the Agreement.

Key Outcome	Highly qualified & skilled lab personnel & equipment supported by required accreditation. Improved lab and food safety technology & practices.	
Performance Indicator AFL1	Maintain required accreditations, proficiency testing and ISO registration to ensure a continuous quality improvement program is applied to laboratory operations.	
	Metric	Summary reports of accreditation and proficiency reports
	Baseline:	Accreditation to the ISO/IEC 17025 standard. Individual test method accreditation by recognized bodies E.g. Standards Council of Canada (SCC), Canadian Association for Laboratory Accreditation (CALA). Maintenance of proficiency for individual test methods per program availability.
	Target:	2016 – 2017: Maintenance of accreditation
	Results (2016/17):	ISO/IEC 17025 Accreditation LSD, including the AFL, is accredited by both of Canada's internationally recognized accrediting bodies, the SCC and the CALA to the ISO/IEC 17025 standard, for specific tests listed on our scopes of accreditation. LSD is accredited by SCC in two program specialty areas: Agriculture Inputs, Food, Animal Health and Plant Protection (AFAP) and Test Method Development and Evaluation and Non-routine Testing (TMD/NRT). As of April 26, 2017, LSD has 99 tests listed on its SCC scope, 85 AFL tests and 14 AHL tests. LSD will be audited by SCC in October 2017 and are planning to submit more methods for accreditation at that time. For a method to be accredited, competence must be demonstrated by submitting the method, forms, training records, validation/verification records, proficiency testing results and internal audit report for the method to SCC for inspection. As of April 18, 2017 LSD is accredited by CALA for twelve (12) environmental tests, nine (9) AFL tests and three (3) AHL (Soil and Nutrient Laboratory) tests. The CALA accredited tests include

three (3) AFL microbiology tests licensed under the Ontario Safe Drinking Water Act (OSDWA).

Schedule F – accreditation

In 2016/2017, under Schedule F, AFL provides testing service for three (3) programs within the Food Inspection Branch. The majority of these tests (67%) are accredited to the ISO/IEC 17025 quality standard. The table below summarizes the accreditation status of tests used for OMAFRA Food Inspection Branch. Note that some methods are used to analyze multiple parameters e.g., CHEM-041 MRD is used to analyze samples for amphenicols, aminoglycosides, beta-lactams, fluoroquinolones, lincomycins, macrolides, NSAIDs, sulfonamides, and tetracyclines.

Branch	No. of tests	SCC accredited	CALA accredited
Meat Inspection Program	22	17	1
Dairy Food Safety Program	51	29	3
Foods of Plant Origin Program	33	20	1
Total – Food safety program	106	66	5

In addition, AFL performs 30 tests for Horticulture and Agriculture Land Use program and Environmental Management program, 11 of the tests are accredited by SCC, CALA or OMAFRA soil fertility program.

Schedule F - proficiency tests

In support of OMAFRA Schedule F testing in 2016/17, the AFL analyzed and reported over 690 PT results.

Key Outcome Scientific & statistical integrity of routine analytical test data to ensure quality, reliable results.

Performance Indicator
AFL2 Proportion of completed tests that meet quality, sample integrity and service level standards.

Metric Percentage / Level of compliance with service level standards, reported by program, related to:

- Turnaround times for screening and confirmation

		• Correct reports • Non-conforming samples
	Baseline:	98% compliance met.
	Target:	2016 – 2017: maintain 98% compliance with service level standard
	Results (2016/17):	The Agriculture and Food Laboratory has met or exceeded the requirement: • Turnaround time for test results was met 99.3% of the time over the full fiscal year 2016/17. • Correct reports – 99.6% of sample results were correct when delivered to OMAFRA • Non-conforming samples – 99.7% of samples received from OMAFRA met the requirements for conforming samples.
Key Outcome	Strong linkages built to ensure effective, timely sharing of information and to communicate violative / actionable test results to stakeholders in a timely manner.	
Performance Indicator AFL3	Track and review incident reports (CAPA) and report all non-conformances, resolution and continuous improvement initiatives.	
	Metric	(a) CAPA reporting of all non-conformances (b) Level of customer satisfaction with services provided by AFL. Given that this survey is aimed at all external AFL clients, and is not relevant information to report to OMAFRA, it was therefore agreed by the AFL PMC that 3b) should be deleted from the AFL performance indicators.
	Baseline:	Service level standard is to continually improve through the process of documenting and reviewing incident reports (CAPA) and associated follow-up and resolution initiatives
	Target:	2016 – 2017: To manage the incidents every year with demonstration of continuous improvements.
	Results (2016/17):	AFL understands that the focus of this performance measure is to demonstrate the AFL's ability to address those results required for OMAFRA actionable response. The significant decrease in medium to high risk incident reports continued through 2016/17. A total of 29 incident reports were identified during the processing /testing /reporting of 66,658 tests reported for OMAFRA Schedule "F" samples, <u>excluding</u> the raw milk testing program. Of the incident reports 27 were identified as low risk situations where there was no impact due to loss of reputation or risk to human health. The majority of incidents were attributed to administrative activities with a decrease observed in the occurrence of technical related issues.

		A total of 66,658 tests (excluding raw milk testing program) were performed for OMAFRA in the Schedule "F" programs. This is an increase from 2015-2016 of 10,139 tests reported for OMAFRA; 99.6% of these tests reported met the performance standards of the agreement. Improvements installed over the past year are aimed at eliminating recurrence of specific non-conformances and preventing future ones. Specifically: • Customization of submission documents in collaboration with OMAFRA Programs continues to improve sample information consistency. • Enhancement of Sample Reception processes with IT and Client Service solutions to improve efficiency and throughput • Continued enhancement of Microbiology and Molecular Biology methods expands the detection of emerging pathogens of food safety concern. • Ongoing testing of IT solutions to identify data formatting issues before information transmitted to OMAFRA.
Key Outcome	Ability and capacity to detect and confirm positive test results to provide effective response to food contamination incidents and other serious plant and environmental hazards with severe human health or economic consequence.	
Performance Indicator AFL4	Level of compliance with communication requirements in the lab testing and sampling protocols.	
	Metric	CAPA reporting of all non-conformances in reporting of adverse results (SOP 95S-028)
	Baseline:	Baseline is service level standard of 98%.
	Target:	2016 – 2017: maintain 98% compliance with service level standard
	Results (2016/17):	100% compliance met: AFL's adherence to 95S-028 continues to be monitored through the IT Adverse Reporting Initiative and Regulatory Partnerships. Overall for the 2016-2017 contract year, the AFL LIMS adverse result alert program generated 307 alert emails reporting 890 adverse or presumptive positive test results to OMAFRA. Approximately

		1.4% of the results reported by AFL to OMAFRA Food Safety Program during the 2016-2017 fiscal year were considered adverse or presumptive positive.
Key Outcome	Capacity and capability to support coordinated and effective emergency management, and the ability and capacity to detect and confirm positive test results to provide effective response to unanticipated / urgent testing requirements and food safety, environmental health and plant health / pest emergencies.	
Performance Indicator AFL5	Effective response to food safety, environmental health and plant health/pest emergencies & unanticipated urgent incidents / requirements in a reasonable timeframe using existing or new methodologies / tests.	
	Metric	Evaluation / case study of AFL's response to and management of significant / unanticipated / urgent situations / events of environmental, health and plant / pest emergencies including any requirement for the development of new AFL tests / methodologies.
	Baseline:	Case study approach.
	Target:	Completion of case study.
	Results (2016/17):	March 28, 2017 AFL contacted OMAFRA regarding potential strike action by Purolator and initiated communications around contingency planning for continued receipt of samples. Teamsters Canada, the union representing Purolator employees issued a 72 hour notice of strike action to begin on Wednesday, March 29, 2017. In preparation for a potential service disruption, Purolator suspended shipment pick-ups effective March 28, 2017. In light of this further development, AFL requested OMAFRA's project prioritization and AFL provided OMAFRA adjusted turnaround times for those priority projects. Purolator reached an agreement with Teamsters Canada and as a result there was no effect on business continuity.

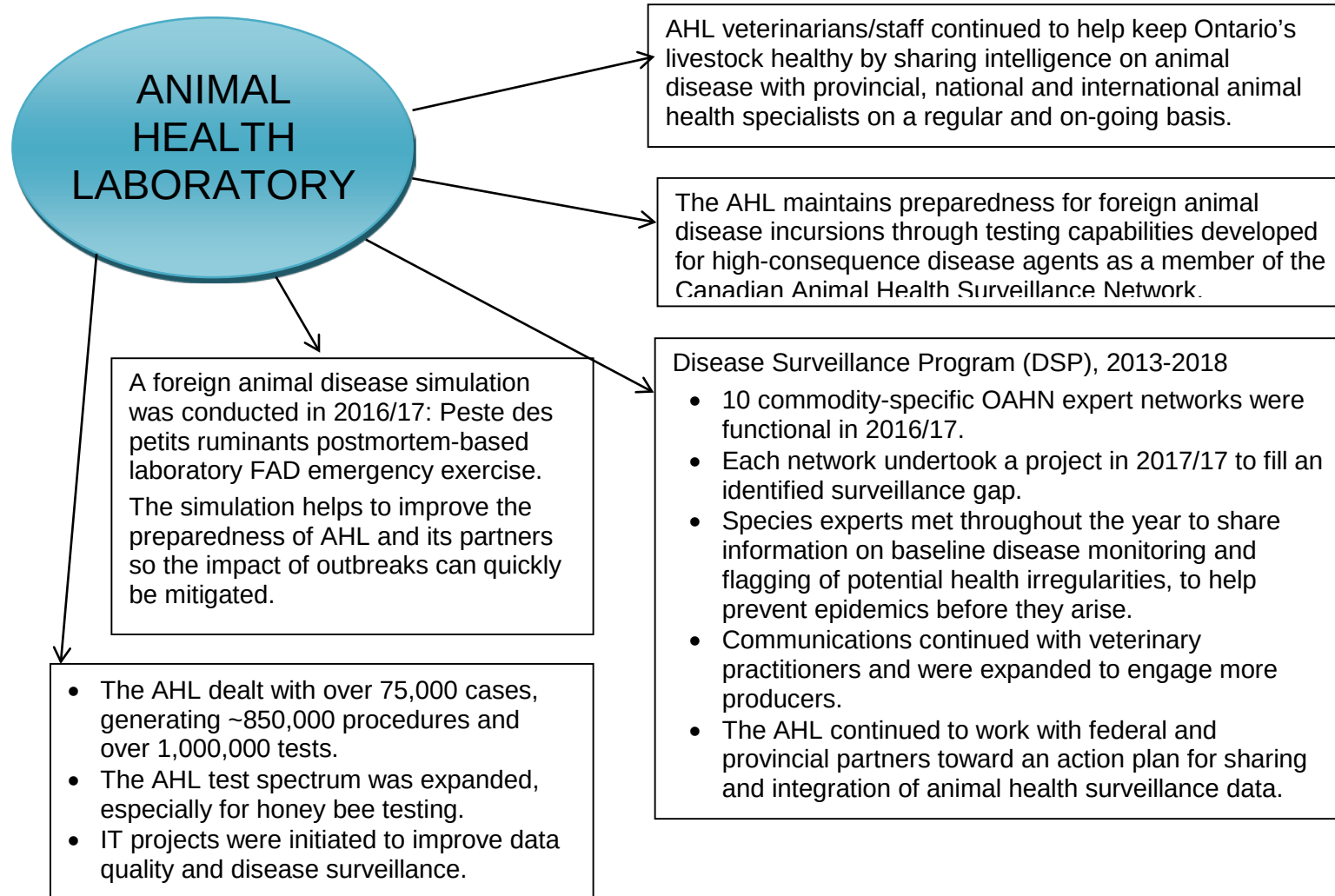
Key Outcome	Ability to detect contamination of the food supply and other testing projects through the implementation of statistically valid sampling plans and ensure the cost effective use of available resources.	
Performance Indicator AFL6	Level of compliance with sampling schedule as described in the annual sampling and testing plan agreements and documented in-year changes.	
	Metric	Percentage compliance with annual Testing and Sampling plans, by program (Schedule F).
	Baseline:	Baseline is service level standard of 98%.
	Target:	2016 – 2017: maintain 98% compliance with service level standard
	Results (2016/17):	The AFL exceeded the required 98% service level standard for the Food Safety Program [99.6% correct reports; 99.3% turnaround time achieved], achieving the testing requirements as specified in the annual testing and sampling plans for the full list of requested parameters across all programs for the Food Safety Program. The AFL exceeded the required 98% service level standard for the Crop Technology Branch & other Programs for correct reports – 99.6% - however, achieved 92.3% with respect to turnaround time. This was due to a force majeure incident involving instrumentation issues and an internal reorganization of personnel. OMAFRA Sampling Plan Request: 17,500 individual test samples (excluding 108,558 raw milk testing program contract samples) AFL Tested: 17,280 individual test samples and produced 66,658 test results (15% increase from 2015/16) The AFL found that 99.7% of the samples submitted by OMAFRA in the Food Safety Programs (Dairy, Foods of Plant Origin and Meat) were suitable for testing; 100% of the samples submitted by OMAFRA in the Crop Technology Branch & other Programs were suitable for testing. OMAFRA strives to reach 100% with its annual sampling and testing plans. Several factors develop throughout the testing year that can affect the ability to meet this compliance goal. They include factors such as: sample collection issues; logistical and resource issues; and various other issues that OMAFRA works diligently to adapt to and overcome. Some factors are however outside the control of OMAFRA such as: weather and seasonal issues; licensing issues; processing facilities going out of business; new facilities coming online; and other factors that can affect OMAFRA's ability to collect the agreed upon number of samples.

Key Outcome	Improved U of G research through laboratory-based expertise.	
Performance Indicator AFL7	Scientific merit and relevance of research conducted by the AFL or University personnel or students to articles, presentations, final project reports, and peer reviewed journals.	
	Metric (a)	Total number of publications in peer reviewed journals and / or final project reports presented, related to OMAFRA strategic research themes.
	Baseline:	There is no existing baseline. Producing more publications year-over-year does not provide an accurate measure of performance. Continuous improvement and measuring beneficial impacts of contributions is more in line with the intent of this measure
	Target:	Demonstration of continued contribution by the AFL; year-to-year fluctuation expected.
	Results (2016/17):	- 9 publications in peer-reviewed journals/book chapters and 5 research grant awards. - 2 post-doctoral fellows from the Biodiversity Institute of Ontario at the U of G were co-hosted/supervised - 3 PhD candidates hosted from the Department of Food Science, University of Guelph
	Metric (b)	Summary of knowledge transfer events re: new practices, including number of attendees.
	Baseline:	There is no existing baseline. Conducting more events year-over-year does not provide an accurate measure of performance. Continuous improvement and measuring beneficial impacts of contributions is more in line with the intent of this measure.
	Target:	Demonstration of continued contribution by the AFL to knowledge transfer.
	Results (2016/17):	Eight (8) knowledge transfer events: - 8 Presentations to government and industry colleagues including scientific posters - 8 oral presentations (1 – 150 attendees) Completed and Ongoing Grant Funded Research Projects - 18 research project contributions; 14 completed; 4 are ongoing into 2017/2018

Animal Health Laboratory

Selected Performance Indicators and Accomplishments

Program Objective: Surveillance, method development and emergency response and surge capacity in place to support Ontario's animal health system and the health and well-being of the province and its citizens.



Animal Health Laboratory

Data collection for each Performance Indicator (PI) was completed with the assistance of OMAFRA. The table below summarizes AHL's Revised PIs (May 2015). To the extent possible, data collection and analysis were used to develop numeric performance metrics. While most of these PIs have supporting documentation, some include narratives, which provide additional information and perspective on the PI results. This supporting documentation is available upon request.

Performance Indicator AHL1	Doing Things Right	
	Key Outcome	• Contributes effectively to developing and implementing an animal health strategy for Ontario/Canada • Acts as a critical resource effectively contributing to animal health policy development and in ongoing program delivery for OMAFRA
	Performance Indicator	• Participation in and contribution of surveillance information to relevant national and provincial bodies or committees that inform Federal/Provincial animal health strategies • Diagnostic services offered by the AHL are appropriate to detect animal hazards present in Ontario
	Results (2016/17):	a) 17 of 20 AHL vets/supervisors participated in 81 meetings of 24 international and 57 national organizations (total 676 hrs.). 20 of 20 AHL vets/supervisors participated in 152 meetings of 27 provincial organizations (total 447 hrs.). All 20 AHL vets/supervisors participated on federal and/or provincial animal health strategy committees and 20 attended meetings or conferences for these committees in 2016/17. b) Average per staff member: 59.1 meeting hours per year spent on relevant committees, equivalent to 3.4% of available working time. *The value presented this year is 3.4% vs. 4.5% in previous years.
		This PI is supported by a table of AHL staff participation in national and provincial committees and scientific meetings. The table also includes information regarding AHL

		staff holding officer roles in these organizations. Two international organizations are included American Association of Veterinary Laboratory Diagnosticians (AAVLD) and the American College of Veterinary Pathologists (ACVP), given that participating in this capacity contributes to international and thus national policy. As requested, this tabulation has otherwise been limited to national and provincial bodies or committees to which AHL veterinary staff members belong. Many AHL staff are also ordinary members of various international organizations and local organizations, which have not been included. Participation in the large number of provincial and national veterinary organizations provides an opportunity to interact with both private practitioner colleagues as well as industry, and brings a laboratory perspective to issues of the day that impact or inform policy development. Participation in the Canadian Animal Health Surveillance Network (CAHSN) has been most useful in helping to train and equip the AHL staff to deal with a foreign animal disease at an enhanced level of preparedness – also a key feature of the OMAFRA / U of G Agreement. The AHL and OMAFRA exchange and integrate information from many sources through vehicles such as OAHN, and hence serve as a cornerstone for the larger Ontario Animal Health System and related public health bodies. Cross-Canada representation is gained through participation in the Canadian Animal Health Laboratorians Network (CAHLN) annual meeting, which includes provincial, university, and federal laboratorians. Other annual meetings held concurrently are the Canadian Association of Veterinary Pathologists (CAVP), the Canadian Animal Health Surveillance Network (CAHSN), and the transmissible spongiform encephalopathy (TSE) Lab Network. These meetings were held at the Atlantic Veterinary College in Charlottetown PEI, June 5-8, 2016, and were hosted by the AHL in Guelph June 4-7, 2017.
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		Notifiable and Alertable Tests May 1, 2016 to April 30, 2017
		Notifiable tests completed
	Workitem	No. of cases
	Anthrax tetracore	3
	CFIA African swine fever	2
	CFIA Avian Influenza	2
	CFIA Classical swine fever	2
	CFIA Newcastle disease	1
	CFIA Pseudorabies	2
	CFIA generic test	1
	<i>Echinococcus</i> - <i>Taenia</i> PCR	3
	Hantavirus(Seoul) PCR	1
	ISAV PCR	1
	Rabies FA	41
	<i>Salmonella</i> serotyping	765
	Small hive beetle PCR	22
	Notifiable Ecode cases	
	TME Code	No. of cases
	<i>Clostridium botulinum</i>	1
	<i>Coxiella burnetii</i>	18
	<i>Listeria monocytogenes</i>	17
	Avian herpesvirus type 1 (AHV-1)/ ILT	8
	Notifiable Alerts	
	Workitem	No. of cases
	<i>C. burnetii</i> ELISA	1
	Culture bacteria	14
	EHV-1 neurotropic PCR	1
	IHC <i>Listeria</i> food animal	2
	ILV rt-RT-PCR	2
	Influenza A matrix PCR	9
	<i>L. monocytogenes</i> isolation	1
	Porcine coronavirus PEDV	5

		Porcine coronavirus PDCoV13 Salmonella pullorum-typhoid tube test3 Salmonella serotyping15 Small hive beetle PCR1 West Nile virus rtRT-PCR1 Reportable Disease Tests <table><thead><tr><th>Disease</th><th>No. of cases</th></tr></thead><tbody><tr><td>Anaplasmosis</td><td>1</td></tr><tr><td>Avian infectious laryngotracheitis</td><td>5</td></tr><tr><td>Fowl cholera</td><td>19</td></tr><tr><td>Rabies</td><td>1</td></tr><tr><td>Small hive beetle (Aethina tumida)</td><td>6</td></tr><tr><td>Turkey viral rhinotracheitis/swollen head disease (chickens)</td><td>2</td></tr><tr><td>West Nile fever</td><td>2</td></tr></tbody></table> A compilation of emerging hazards and first-diagnoses in Ontario is maintained and updated frequently as the “Impact of the AHL diagnostic system on issues of animal health, public health and trade related to Ontario’s livestock and poultry industries”. This document is shared with OMAFRA. Examples of events in 2016-2017 include: • Avian astrovirus in poultry, causing runting/stunting syndrome. • Avian metapneumovirus in turkeys, wild ducks; first identification in Ontario. • Bovine astrovirus – first identification in Ontario, a newly recognized pathogen associated with nonsuppurative encephalitis in cattle. • Brucella ovis in sheep last isolated in Ontario in 1985, an important zoonotic pathogen, and a major cause of infertility and abortion. • Infectious bronchitis virus in chickens. • Streptococcus iniae in cichlids, an important zoonotic pathogen, CFIA annually notifiable pathogen.	Disease	No. of cases	Anaplasmosis	1	Avian infectious laryngotracheitis	5	Fowl cholera	19	Rabies	1	Small hive beetle (Aethina tumida)	6	Turkey viral rhinotracheitis/swollen head disease (chickens)	2	West Nile fever	2
Disease	No. of cases																	
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Rabies	1																	
Small hive beetle (Aethina tumida)	6																	
Turkey viral rhinotracheitis/swollen head disease (chickens)	2																	
West Nile fever	2																	
Performance Indicator AHL2	Doing the Right Things																	
	Key Outcome:	• Test results and diagnoses provided by the AHL meet best practices standards • Capacity and capability in place to provide coordinated and effective surge capacity																

	Performance Indicator	The University maintains an appropriate range of diagnostic specialties, current technology, accreditations, certifications, and service standards at the Animal Health Laboratory.
Performance Indicator AHL3	Being Prepared	
	Key Outcome:	• Early detection and effective response to foreign animal diseases and/or other diseases with human/animal health and economic consequences
	Performance Indicator:	• Effective and timely testing and reporting of laboratory tests to OMAFRA, to support investigation and response to suspected foreign animal and other serious human/animal diseases
	Results (2016/17):	The AHL selected 3 cases from their 2016/17 caseload, with potential significance to animal health and/or public health. The three cases were: Case 1. Outbreak of complex respiratory disease (ILT/IBV/mycoplasmosis and mixed bacterial upper and lower respiratory disease) in a small mixed poultry flock: “This case demonstrates the value of the small flock surveillance project where owners can get subsidized testing for their flocks. Knowing what poultry diseases are circulating in small flocks would help to mitigate infection risks in small flocks and in commercial poultry operations. I commend the staff of the Animal Health Lab (AHL) for their professionalism in diagnosing important poultry diseases (ILT, IBV, Mycoplasma). The follow up with the owner and his veterinarian by OMAFRA and AHL provided opportunities for disease management (i.e. ILT vaccination) and development of a sound biosecurity plan. Moreover, the location of the farm was shared with the Feather Board Command Center that alerted the small flock producers in a 10 km zone around the infected premises. The diagnosis and disease management steps were timely. All lines of communication were followed effectively by notifying the OMAFRA, OCVO, owner, and the submitting veterinarian. The case summary was concise and well written. I have no suggestions or recommendations for improvement.” Dr. Csaba Varga, OMAFRA

		Case 2. Ionophore toxicity in veal calves: “AHL pathologists responded appropriately and dutifully to this weekend emergency case situation. Results were provided in a timely manner. Reasonable differentials were considered and suitable tests provided to assist the practitioners in dealing with the situation. Follow-up dialogue between pathologists and the practitioners hopefully greatly improved everyone’s understanding of the case, the likely diagnosis and assisted in the response. The AHL fee guide precluded multiple calf post mortems from being completed in this case. A total of 3 calves were sent and only one had a post mortem exam completed due to costs. AHL could review the weight cut off of 40 kg per mammal associated with multiple post mortems to ensure that it is reflective of client needs as well as for internal costs”. Dr. Ann Godkin, OMAFRA Case 3. <i>Mycoplasma hyorhinis</i> outbreak in a nursery/weaner operation “This case represents excellent communication between the referring veterinarian and the duty pathologist to ensure that a submission of live pigs was utilized in an optimal manner for diagnostic purposes. History included morbidity, mortality and clinical signs as well as reference to previous submissions from the same herd. Post-mortem examinations of the three pigs were performed immediately with rapid reporting to the herd veterinarian regarding the gross findings. PCR results were reported two days following submission and histologic lesions were reported 3 days following submission along with bacteriology results regarding culture and sensitivity of organisms identified. The case was concluded 8 days following submission, with which I can only assume satisfaction on the part of all involved. In reviewing this case it may have been beneficial to know the age and weights of the pigs submitted. When the presenting complaint is “mainly piglets falling backwards,” the question remains as to whether <i>M. hyorhinis</i> was an opportunist taking advantage of fading pigs or the primary reason for the poor nursery performance.” Dr. Tim Blackwell, OMAFRA
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Performance Indicator AHL4	Knowledge Transfer	
	Key Outcome:	Laboratory expertise and advice on animal health issues available to veterinary and stakeholder organizations
	Performance Indicator:	Effective knowledge transfer and consultation opportunities available to veterinary practitioners and other stakeholders
	Results (2016/17):	By agreement with OMAFRA, the AHL Client Satisfaction Survey will be conducted biennially, rather than annually. The most recent survey was conducted in the fall of 2015 and will be conducted again in 2017. As an alternative documented form of feedback on client service, minutes of the bi-monthly AHL/OVC-HSC/PBI liaison meetings (AHL, OVC Health Sciences Center, and Pathobiology) and the annual AHL Feedback Group meeting (a range of AHL clients attend) were reviewed. Meeting minutes are available upon request. Many clients are aware of and use the AHL Newsletter, LabNotes, and/or the AHL website. Knowledge transfer from the AHL to clients and partners occurs via in-person discussions, newsletters, contributions of scientific articles, and peer-reviewed publications. Additional outlets for knowledge transfer have now been opened with the initiation of the Ontario Animal Health Network and its communication tools of a new website, Facebook, Twitter, podcasts, Infographics, newsletter updates, and veterinary and producer reports. Articles from the AHL and OAHN are often re-broadcast through Ceptor, the Ontario Farmer, Pork News and Views, and other farm outlets. The 20 veterinarians/supervisors in the AHL are typically involved in numerous conversations with private practitioners daily, concerning individual case details, test selection, test interpretation, and technology updates. AHL staff members also attend practitioner meetings on a regular basis. For example, Dr. Jim Fairles, who is AHL's Client Services Veterinarian, provides frequent updates to the Ontario Association of Swine Veterinarians and the Ontario Association of Bovine Practitioners. More broadly, the AHL provides a wealth of information with emphasis on disease trend updates in the quarterly AHL Newsletter, which is distributed widely as well as being posted on the AHL website, and is well regarded.

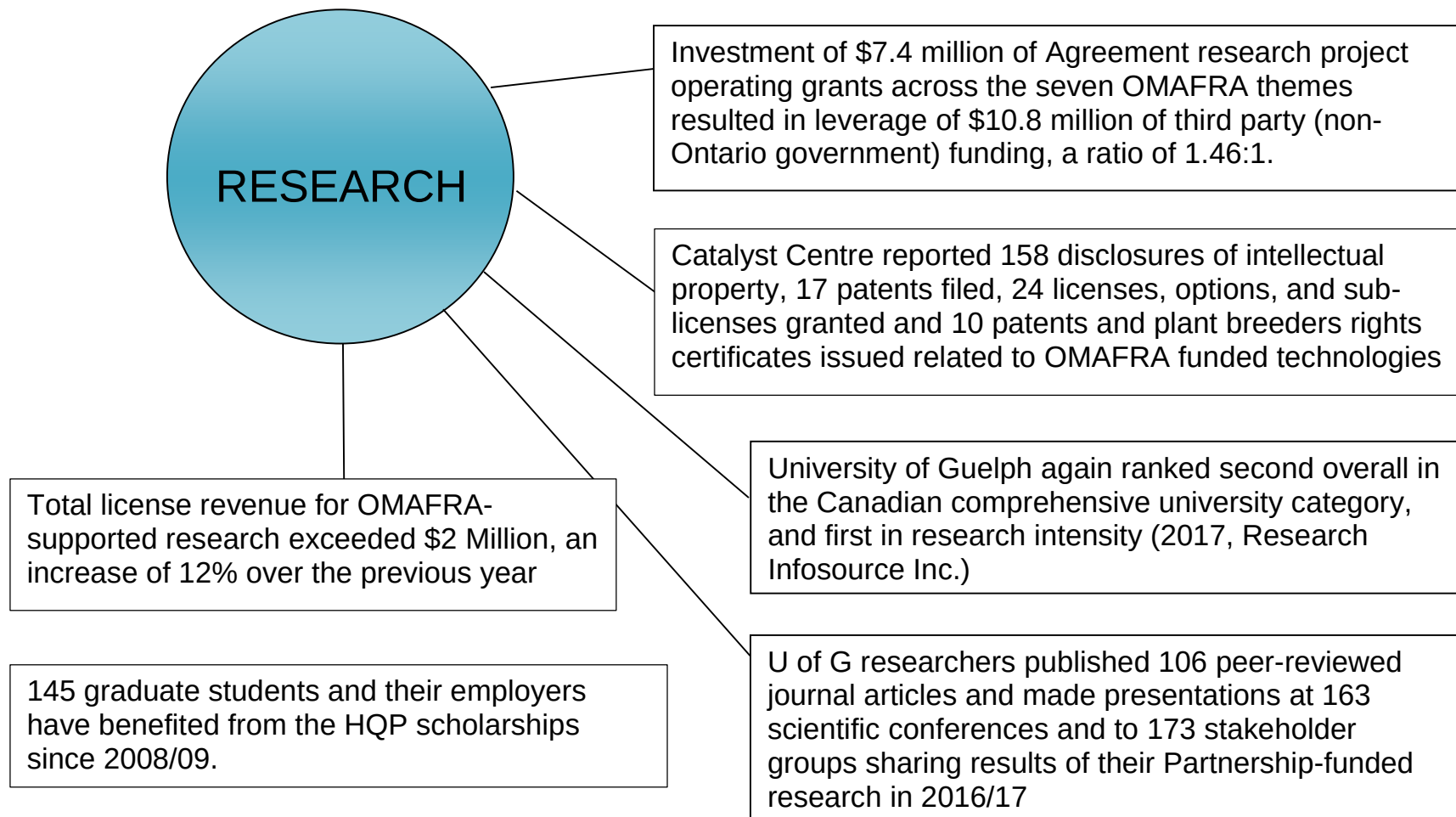
		AHL staff members are regular participants at numerous conferences, e.g., the OVMA and OAVT annual conference, both as exhibitors, and as guest speakers or expert panel members. Dr. Fairles (supported by Ms. Josie Given), actively markets the services of the AHL, and is in regular contact with AHL clients. As a matter of course, the AHL has added many new testing methodologies and tests; such as the expanding list of honeybee PCR tests, which are presented in the AHL Newsletter. The AHL also produces a series of “LabNotes” for more in-depth analysis of current topics, e.g., In-clinic mastitis lab procedures, Seoul virus testing in rats. Finally, AHL staff contribute to a number of peer-reviewed scientific publications every year. From the analysis of survey questions related to knowledge transfer effectiveness, there are some areas for improvement to be considered. While, in general, client responses show a good level of satisfaction in the area of AHL knowledge provision, there remains a gap in accessing and using this information by a proportion of clients. Graphed results provided by the AHL point to the opportunity to improve access to scientific information and knowledge transfer. The OAHN expert networks within the DSP should help to address this opportunity for improvement through regular quarterly reporting. Annual Feedback Group meeting, November 22, 2016. Meeting update from Jim Fairles, Client Services Veterinarian, AHL A meeting of the AHL feedback group was held on Thursday November 22, 2016 - Clients from all facets of AHL business were in attendance. A brief introduction on the happenings around the AHL for 2016 by Jim Fairles included mobile-friendly website, GlobalVetLink, milk bacteriology QA, premises ID, and IT enhancements, plus a review of the 2015 action items. Melanie Barham - provided an OAHN (Ontario Animal Health Network) update. All participants had the opportunity to comment. Overall feedback for the lab is definitely positive but there is always room for improvement. Comments centered around: courier options, increased frequency of testing, possible new testing options and panels, enhanced communications of tests and test
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		requirements, submission forms and electronic form data entry, premises ID, and enhanced delivery of results. Client summary data enhancements were also important, and will be managed through the new client portal.
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Research Programs

Selected Performance Indicators & Accomplishments

Program Objective: High quality, high impact research results that strengthen Ontario's agriculture, food and bio-products sectors, and rural communities



Research Programs

Data collection for each Performance Indicator (PI) was completed with the assistance of OMAFRA. The majority of the data within this table were collected and summarized from annual and final project reports submitted each year by lead researchers of OMAFRA funded research projects. Other information has been provided by OMAFRA, the U of G's Catalyst Centre and Budget Office.

Key Outcome	Research programs reflect OMAFRA strategic needs, coordinate U of G's capacity and mobilize the province's unique competitive strengths.	
Performance Indicator R1	Comparison of actual versus planned OMAFRA - U of G Research Program spending, in total, and in each of the research theme areas.	
	Metric R1 (a-i)	Annual actual dollars in the OMAFRA - U of G Agreement research program spent on research versus planned, in total by research theme.
	Baseline:	Baseline is the allocation of project planned \$ for 2008/09 by theme.
	Target:	Ratio of actual to planned dollars spent of 1:1 .
	Results (2016/17):	The table below shows the total actual dollars committed were \$7.6M. Planned disbursement of funds (committed to approved projects) was \$7.4M. Therefore, the ratio of actual to planned was \$7.6M to \$7.4M, which equals <u>1.03</u> : <u>1.0</u> which is due to carryforward in the theme budgets.

Research Program Project Operating Funds					
Research Themes	Total Committed to Projects April 1, 2008-April 30, 2016	Total Committed to Projects Approved 2016/2017	Budget for 2016/2017	Total Commitments for 9-year Theme Budget	Overall 9-year Theme Budget
Ag Policy & Rural Devel.	\$6,371,126	\$1,214,780	\$1,100,000	\$7,585,906	\$7,926,631
Bioeconomy	\$6,581,120	\$751,954	\$750,000	\$7,333,074	\$7,250,000
Emergency Mgmt.	\$4,013,694	\$555,960	\$500,000	\$4,569,654	\$4,300,000
Environmental Sust.	\$6,416,823	\$746,846	\$900,000	\$7,163,669	\$7,700,000
Food for Health	\$6,959,330	\$672,190	\$1,000,000	\$7,631,520	\$8,700,000
Product Development	\$5,468,381	\$612,718	\$650,000	\$6,081,099	\$6,450,000
Production Systems	\$19,459,653	\$3,054,844	\$2,500,000	\$22,514,497	\$21,636,965
Total	\$55,270,127	\$7,609,292	\$7,400,000	\$62,879,419	\$63,962,596

Corrected 2015/16 Research Program Project Operating Funds					
Research Themes	Total Committed to Projects April 1, 2008-April 30, 2015	Total Committed to Projects Approved 2015/2016	Budget for 2015/2016	Total Commitments for 8-year Theme Budget	Overall 8-year Theme Budget
Ag Policy & Rural Devel.	5,639,716	731,410	1,100,000	6,371,126	6,826,631
Bioeconomy	5,839,600	741,520	750,000	6,581,120	6,500,000
Emergency Mgmt.	3,353,995	659,699	500,000	4,013,694	3,800,000
Environmental Sust.	5,280,048	1,136,775	900,000	6,416,823	6,800,000
Food for Health	6,602,285	357,045	1,000,000	6,959,330	7,700,000
Product Development	4,880,130	588,251	650,000	5,468,381	5,800,000
Production Systems	~~48,433,479~~ \$16,837,705	2,621,948	2,500,000	~~51,055,427~~ \$19,459,653	~~51,663,596~~ \$19,136,965
Total	~~80,029,253~~ \$48,432,497	6,836,648	7,400,000	~~86,865,901~~ \$55,270,127	~~89,090,227~~ \$56,562,596

	Metric R1 (a-ii)	Total number of projects funded in each theme area through peer review and advisory committee, compared to the number of letters of intent and proposals received (i.e., level of demand for funding) in each theme area.
	Baseline:	The number of letters of intent (LOIs) and projects submitted, and projects funded for each of the seven research theme areas in the call of 2008/09.
	Target:	An adequate number of quality research proposals submitted in each research theme area, from which to select projects to be funded in each call for proposals.
	Results (2016/17):	See table below, which indicates the number of research proposals submitted in each research theme area.

2016/17 Results from Call for LOIs for projects beginning May 1, 2017

Theme	Ag Policy Rural Dev	Bio-economy	Emerg Mgmt	Env Sust	Food Health	Prod Devel	PS animal	PS plant	Prod Syst Tier I	Prod Syst Tier II	Total
Number of active projects	22	22	26	27	23	17	61	40	101	67	305
Number of LOIs	16	15	20	21	17	16	32	31	63	n/a	168
Number of Proposals	13	9	12	14	11	9	23	17	40	19	127
Number of proposals funded	6	5	7	9	6	4	14	11	25	19	89
Notes: Some LOIs and proposals were reviewed under more than one theme, and some proposals were funded under more than one theme. Production Systems Tier I is comprised of Production Systems animal and Production Systems Plant research projects. Production Systems Tier II is provided for information purposes and is not included in the totals.											

Total for the period 2008/09 to 2016/17

Theme	Ag Policy & Rural Devel	Bioeconomy	Emerg Mgmt	Env Sust	Food	Prod Dev	Prod Syst Tier I	Prod Syst Tier II	Total
Number of LOIs	64	66	81	124	135	76	296	n/a	842
Number of Proposals	72	47	71	95	83	61	248	176	853
Number of proposals funded	46	33	59	54	55	29	157	176	609

	Metric R1 (b)	Ratio of third-party investment (cash and in-kind) operating funds, leveraged by OMAFRA research program, in total and for each theme area.
	Baseline:	Average for 2008/09 was 2.3:1 third party investment to Partnership Agreement research operating funding.
	Target:	Leveraged dollars to OMAFRA research operating funding (in total, and by theme) to be ≥ 2008/09 baselines (2.3:1) .
	Results (2016/17):	The ratio of third party investment to OMAFRA research operating funds was 1.46:1 Total amount of third party investment was \$10.8 million. Total OMAFRA operating funds of \$7.4 million were committed to projects within fiscal 2016/17.

		Note: There was a change in methodology for calculating the ratios, effective 2013/14 fiscal year, in that “Cash and In-kind Leveraged” through active research projects was divided by “Budget Allocated to Active OMAFRA-U of G Research Projects”, (rather than ‘Budgets committed to projects approved for the year’, as used previously for the calculation).						
Funding \$ leveraged in 2016/17 per research theme	Ag & Rural Policy	Bioeconomy	Emerg Mgmt	Env Sust	Food	Prod Dev	Prod Syst Tier I and II	Total
Cash and in-kind leveraged	\$95,500	\$814,467	\$695,693	\$1,525,890	\$677,739	\$468,064	\$6,539,087	10,816,440
Operating budget allocated to active projects	\$877,915	\$732,007	\$577,005	\$1,053,295	\$874,154	\$629,594	\$2,655,173	\$7,399,109
Ratio of 3 rd party leveraging to allocated operating budgets	0.11:1	1.11:1	1.23:1	1.47:1	0.78:1	0.73:1	2.46:1	1.46:1

	Metric R1(c)	Total external research dollars attracted each year by the University related to the research program areas in total.
	Baseline:	The baseline for 2008/09 of leveraged dollars to OMAFRA funding is \$54.6 million of external research dollars relative to \$51.4 million OMAFRA – U of G Agreement Research expenditures, or a ratio of approx. 1.1:1. This was determined by recalculating the actual leverage of “total external research dollars related to the Agreement research programs” in 2007/08 relative to the new \$7.4 million base of project operating funding.
	Target:	Total external dollars leveraged is to be $\geq$ 2008/09 baseline of \$54.6 million .
	Results (2016/17):	\$48.56M of external funds were leveraged from OMAFRA's \$51.5M investment in the Agreement Research funding program. Explanation of 2016/17 Results: Total funding 'Leveraged from the OMAFRA Partnership' from all sources (including OMAFRA outside the Partnership and other Provincial Ministries, as well as Federal, and Business/Industry/Private/Other sources) increased by ~\$8M in 2016/2017 compared to the previous year. The leveraged funding from OMAFRA (outside the OMAFRA-UofG Agreement) and Other Provincial sources decreased by about \$1M each. Federal funding was up by \$9M and Business/Industry/Private/Other funding was also up by ~1.7M in 2016/17. Leveraged funding from OMAFRA (outside the OMAFRA-UofG Agreement) and from Federal Sources, Other Provincial Sources, and Business/Industry/Private/Other sources substantially exceeds the 5-year average from those sources. Only “other OMAFRA sources” has dipped below the 5 yr average by ~\$0.7M.

Fiscal Year	Total U of G Research Funding (' 000s) (Note 1)	Total OMAFRA Partnership Research Funding ('000s)	Funding Leveraged from OMAFRA Agreement					<i>Ratio</i>
			Total Funding from All Sources (Est. ' 000s)	Breakdown by Source (Note 2)				
				Federal	OMAFRA outside Agreement	Other Provincial	Business / Industry / Private / Other	
2016/2017	146,124	55,552	48,560	23,745	809	6,964	17,042	(48.6:55.6) 0.87:1
2015/2016	134,251	50,969	40,669	14,688	1,871	8,799	15,311	(40.7:51.0) 0.8:1
2014/2015	139,365	52,856	37,605	15,231	775	4,192	17,407	(37.6:52.9) 0.7:1

2013/2014	127,687	52,856	35,149	17,069	2,411	891	14,778	(35.2:52.9) 0.7:1
2012/2013	127,089	57,665	31,847	19,923	1,783	1,754	8,387	(31.9:57.7) 0.6:1
2011/2012	141,748	56,958	37,129	24,740	1,253	418	10,718	(37.1:57.0) 0.7:1
2010/2011	141,494	52,309	49,525	23,206	1,668	7,783	16,868	(49.5:52.3) 0.9:1
2009/2010	158,954	50,604	59,326	27,765	3,354	10,190	18,018	(59.3:50.6) 1.2:1
2008/2009	159,093	51,388	54,651	35,400	3,428	3,007	12,816	(54.6: 51.4) 1.1:1

Note 1: "Funding Leveraged from OMAFRA Contract" (thousands of \$) is the total of all individual research project awards from all sources other than the OMAFRA - U of G Agreement for projects (across all U of G Departments/researchers), which support the objectives of OMAFRA's research priorities. "Total U of G Research Funding" is the total of all research projects (including OMAFRA - U of G Agreement projects), regardless of whether or not they support OMAFRA's priorities.

Note 2: "Breakdown by Source" shows the "Funding Leveraged from the OMAFRA Agreement" by the source of the funding ("Federal" includes NSERC, SSHRC, CIHR, CFI, all federal departments, etc.; "OMAFRA" includes OMAFRA's 'competitive research programs' such as New Directions, Food Safety, etc.; "Other Provincial" includes funding from all other provincial ministries or agencies; and "business/industry/private/other " includes all other sources.

	Metric R1 (d)	Number and list of active research projects funded, by program area.																														
	Baseline:	Number of active research projects established as per performance indicator 1(a-ii), above.																														
	Target:	Targets for number of projects funded in each area to be ≥ 2008/09 levels .																														
	Results (2016/17):	In 2016/17, the total number of active projects funded was approximately three times the number in 2008/09. <table> <tr> <th><u>Number of Active Projects by Theme</u></th><th><u>2016/17*</u></th><th><u>2008/09</u></th></tr> <tr> <td>Agricultural and Rural Policy:</td><td>22</td><td>14</td></tr> <tr> <td>Bioeconomy – Industrial Uses:</td><td>22</td><td>5</td></tr> <tr> <td>Emergency Management:</td><td>26</td><td>2</td></tr> <tr> <td>Environmental Sustainability:</td><td>27</td><td>15</td></tr> <tr> <td>Food for Health:</td><td>23</td><td>9</td></tr> <tr> <td>Product Development:</td><td>17</td><td>5</td></tr> <tr> <td>Production Systems Tier I:</td><td>101</td><td>13</td></tr> <tr> <td>Production Systems Tier II:</td><td><u>67</u></td><td><u>43</u></td></tr> <tr> <td>Total number of Active Projects:</td><td>283</td><td>92</td></tr> </table> * Several projects are funded in more than one theme, hence, the by-theme totals exceed the total number of active research <u>projects</u> in all themes.	<u>Number of Active Projects by Theme</u>	<u>2016/17*</u>	<u>2008/09</u>	Agricultural and Rural Policy:	22	14	Bioeconomy – Industrial Uses:	22	5	Emergency Management:	26	2	Environmental Sustainability:	27	15	Food for Health:	23	9	Product Development:	17	5	Production Systems Tier I:	101	13	Production Systems Tier II:	<u>67</u>	<u>43</u>	Total number of Active Projects:	283	92
<u>Number of Active Projects by Theme</u>	<u>2016/17*</u>	<u>2008/09</u>																														
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Production Systems Tier II:	<u>67</u>	<u>43</u>																														
Total number of Active Projects:	283	92																														
	Metric R1 (e)	Level of utilization of research stations.																														
	Baseline:	Established based on 2008/09 data. Utilization to be reported in three ways: i) number of projects using each station, ii) percentage of utilization and iii) dollar value of research station usage																														
	Target:	Research station utilization to be ≥ 2008/09 levels .																														
	Results	See table below.																														

(2016/17):							
Animal Research Stations		Number of OMAFRA - U of G Projects		Percentage of Utilization- (Note #1)		Value of Research Station Utilization (Note #2)	
	Units	2016/17	Average of 5 years (2011/12 - 2016/17)	2016/17	Average of 5 years (2011/12 - 2016/17)	2016/17	Average of 5 years (2011/12 - 2016/17)
Alma Aquaculture (Note #3)	Tanks	6	7	16%	27%	\$635,300	\$540,300
Arkell Poultry	Animals	27	13.6	93%	76%	\$832,300	\$716,156
Arkell Swine	Animals	6	8.8	42%	38%	\$1,351,800	\$1,225,081
Arkell Equine	Animals	4	5.6	69%	92%	\$548,800	\$469,586
Elora / Ponsonby Dairy (Note #4)	Animals	8	6.6	113%	59%	\$1,803,600	\$1,357,835
Elora Beef	Animals	6	3.6	82%	81%	\$1,231,200	\$1,050,838
Ponsonby Sheep	Animals	2	1.4	113%	89%	\$375,400	\$321,433
Ponsonby General Animal Facility (Note #5)	Animals	4	5.6	43%	90%	\$374,200	\$316,033
Alfred Dairy (Note #6)	Animals	Closed	n/a	Closed	n/a	Closed	n/a
Kemptville Dairy (Note #7)	Animals	Closed	n/a	Closed	n/a	Closed	n/a
New Liskeard Beef (Note #7)	Animals	2	2.6	30%	29%	\$836,300	\$556,716
Ridgetown Swine	Animals	Ridgetown swine facility was closed in January 2013					

Crop Research Stations	Units	Number of OMAFRA - U of G Projects		Percentage of Utilization (Note #1)		Value of Research Station Utilization (Note #2)	
		2016/17	Average of 5 years (2011/12 - 2016/17)	2016/17	Average of 5 years (2011/12 - 2016/17)	2016/17	Average of 5 years (2011/12 - 2016/17)
Bradford (Muck Crops)	Acres	2	3.4	43%	355%	\$293,300	\$271,100
Elora (Field Crops)	Acres	43	34	35%	36%	\$492,700	\$443,800
Guelph (turf, agroforestry)	Acres	13	17.6	69%	80%	\$254,600	\$238,781
Simcoe (horticultural crops)	Acres	15	15	22%	35%	\$722,800	\$639,925
Vineland (horticultural crops)	Acres	not reported (managed by VRIC)		not reported (managed by VRIC)		\$1,039,200	\$1,000,350
Woodstock (field Crops)	Acres	8	8	33%	28%	\$85,500	\$109,900
Kemptville/Winchester (field crops) (Note #7)	Acres	24	27.4	22%	48%	\$210,600	\$234,050
New Liskeard (field crops)	Acres	33	29.4	11%	49%	\$568,200	\$543,363
Emo (field crops)	Acres	23	21.8	9%	38%	\$89,400	\$107,683
Ridgetown (Note #9)	Acres	62	59	90%	87%	\$1,763,600	\$2,829,689
Huron	Acres	104	44.5	44%	71%	Included with Ridgetown	
Cedar Springs	Acres	11	9	99%	92%	Included with Ridgetown	

Note #1: "Percentage of Research Station Utilization":

Livestock Research Stations (Poultry, Swine, Equine, Beef, Sheep, Dairy),

Starting with the 2013/2014 Annual Report, the methodology for calculating Research Station Utilization statistics was modified for most of the livestock stations (Poultry, Swine, Equine, Beef, Sheep, Dairy), in order to produce data that presents a much more realistic snapshot of station utilization than was given by the methodology used in previous years (2008 - 2013). Most of these stations have 'breeding' herds/flocks, where herd/flock replacement animals are generated within the herd/flock and grown to maturity. Also, many researchers tend to focus their research efforts on particular demographic segments of the overall herd/flock (i.e., calves; transition and lactating cows; mature laying hens; weaner or grower pigs, etc.), and consequently, there are often large segments of the overall breeding herd/flock demographics that may see little or no use (but nevertheless these animals must be maintained, in order to generate the required replacement stock for the herd/flock).

The previously used calculation methodology expressed the '% station utilization' as the "total no. of research animal-days utilized in the year" divided by the "overall total number of animal-days available" in the year. In that scenario, use of, say, 90 animals on a research trial for a period of 50 days out of the year would be utilization of 4500 (=90x50) research animal days, out of an overall total days available of 32,850 (=90x365), or a 13.7% utilization rate (assuming none of the animals were utilized for another period within the same year). As noted above, since researchers tend to heavily utilize certain demographic segments of a herd/flock, but other segments are often utilized relatively little, this previous methodology generally grossly underestimated the true utilization of the herds/flocks (i.e., utilized research demographics were greatly diluted by animals needed to be maintained for herd/flock replacement purposes).

In the modified method adopted for 2013/14 and used in subsequent years, the utilization rate (for Arkell Poultry, Arkell Swine, Arkell Equine, Elora Beef, Ponsonby Sheep, and the Elora/Ponsonby, Alfred and Kemptville dairy herds) is now presented as "Average % of Animals in Use for Research" and is calculated as the "total no. of animals utilized for research at any point in time within the year" as a percentage of the "average number of animals in the herd/flock for that year". This methodology provides a much better recognition of the fact that certain demographic segments of the herd/flocks are very heavily (perhaps 100%) utilized for varying (short or longer) portions of the year, but avoids the often very substantial 'diluting' effect of the often large portion of a year (i.e., large number of days) some of these animals may not be 'on-trial' and also from other demographic segments having no utilization for research during the year (i.e., necessary to be kept as herd/flock replacement animals).

Given the diversity of the livestock herd/flocks at the research stations, no single 'utilization rate' calculation can give a perfect picture of the true utilization of herd/flock animals for research. The modified methodology for calculating "% Research Station Utilization" was, as noted above, applied to Arkell Poultry, Arkell Swine, Arkell Equine, Elora Beef, Ponsonby Sheep, and the Elora/Ponsonby, Alfred and Kemptville dairy herds. This modified methodology was not utilized for calculating the "% Station Utilization" for the Alma Aquaculture or the Ponsonby General Facility as detailed in the respective notes below.

Crops Research Stations (Bradford; Elora; Guelph; Simcoe; Vineland; Woodstock; Kemptville/Winchester; New Liskeard; Emo; Ridgetown),

For the crops research stations (Bradford; Elora; Guelph; Simcoe; Vineland; Woodstock; Kemptville/Winchester; New Liskeard; Emo; Ridgetown), the methodology used to calculate "% Research Station utilization" remains unchanged from previous years, calculated as "total acreage in research studies as a percentage of the total station acreage available for research studies in the year". Given that crops research typically requires a 3-year rotation cycle (one year in research trials followed by two years out of trials, to allow assessment of residual effects

and preparing for optimized uniformity of land going into new trials) this would generally suggest utilization rates of ~33% if research land is 'fully utilized'. This can be affected, however, by rotations which can be as short as 2 years or may need to be extended to 4 years depending on the nature of the research), and there are situations, such as the long-term cropping systems research plots at Elora and Ridgetown, where these are in-use as research trials every year (thus raising the average effective utilization rate for the station).

Note #2: "\$ Value of Research Station Utilization": The methodology for reporting these values was altered for the 2013/2014 Annual Report. The values are now the actual net total operating costs of the specified station. (In previous years, comparable values would have been prorated by the "% research station utilization" values, which resulted in artificially low values for station utilization costs.) As a result of implementing the new methodology for the 2013/2014 reporting year, the multi-year average is currently for a total of 4 years (except where otherwise noted).

Note #3: Alma Aquaculture: There was no change made in how utilization rate was calculated for the Alma Aquaculture Research Station, as the previously used method (based on the number of tanks utilized for research relative to the total number of tanks available, rather than on the numbers of fish utilized and for how long) actually closely approximates the new methodology adopted for most of the other livestock stations.

Note #4: Elora & Ponsonby Dairy: All research projects being conducted in the old dairy research facilities at Elora and Ponsonby were brought to completion on or before September/October 2014, in preparation for commissioning and moving animals into the new Elora dairy research facility. Research in the new Elora Dairy facility only started to commence in late fall 2015 and slowly ramped up over the following 4 to 6 months (i.e., not really full steam until ~ May 2016). Consequently, the 5 year averages for "numbers of projects", and "% utilization" will be artificially reduced reflecting this drop in research activity relative to a 'normal' year.

Note #5: Ponsonby General Animal Facility (PGAF): There is no resident herd or flock in the Ponsonby General Animal facility. Rather, groups of animals are moved into the facility for a period of time, either for conducting specific research trials, or to hold animals in preparation for research trials. Animals are generally moved out of the General Facility soon after the research trials are completed. Consequently, the "% Station utilization" rate for this facility was retained as "total no. of research animal-days utilized in the year" divided by the "overall total number of animal-days available", since neither of the two 'dilution effects' noted above (portions of demographics not utilized for research; year-round resident research animals only used for a portion of the year) are applicable to animals housed at PGAF.

Note #6: Alfred and Kemptville Dairy Herds: Due to the closure of the Alfred and Kemptville Campuses by UofG, research projects in both of these herds were wound down in early 2015/2016, and the herds were dispersed as of August & Sept 2015, respectively. Consequently no data are reported for 2015/16 or subsequent years.

Note #7: Ridgetown, Huron and Cedar Springs Crops Research Stations: The data for the three stations of Ridgetown, Huron and Cedar Springs were separated for each station beginning in 2013/2014. (In prior years the data were reported as combined values for all 3 locations together.) Consequently, the multi-year averages reported here are 4-year averages for 2013/2014 through 2016/2017.

Key Outcome	A critical mass of world class faculty, technical staff and graduate students addressing OMAFRA critical challenges and opportunities.		
Performance Indicator R2	Total faculty and research personnel employed by the University related to OMAFRA research themes, and the proportion funded through the OMAFRA - U of G Research Program.		
	Metric R2(a)	Total number of faculty full time equivalents (FTEs) and list of faculty and UGFA Unit 2 faculty (formerly CARG researchers) showing area of expertise, employed at the university related to theme areas.	
	Baseline:	Established at 128 Faculty Research FTEs	
	Target:	Number of FTEs to be ≥ 2008/09 baseline of 128 Faculty Research FTEs	
	Results (2016/17):	98 Faculty Research FTEs	
<u>Research / Researcher Awards Supportive of OMAFRA Priorities</u>			
	No. of Researchers engaged in research supportive of OMAFRA priorities	"Faculty Research FTEs" focused on OMAFRA-related priorities (Note 1)	No. of OMAFRA-Supportive Research Awards (outside the OMAFRA - U of G Partnership)
2016/17	215	98	534
2015/16	200	89	496
2014/15	206	92	484
2013/14	222	98	514
2012/13	218	100	505
2011/12	236	105	593
2010/11	224	102	654
2009/10	265	115	737
2008/09	280	128	852

"Research FTE" (Research Full Time Equivalent) should not be confused with faculty FTE. Each faculty member has a defined "Distribution of Effort (DOE)" apportioning their full FTE among 'research', 'teaching' and 'service', which is for most faculty, 40:40:20, respectively. Some faculty, for example those with research chairs might have a DOE for research that is more than 40%.

Note 1: *'Portion of "Research FTE" focused on OMAFRA-related priorities'* is estimated for each researcher based on the value of their OMAFRA-supportive research awards received as a portion of their total research awards received within the specified fiscal year. These individual research FTE portions were averaged across those faculty who had some portion of their research time engaged on OMAFRA Supportive Research project(s).

Explanation of Results: (for Research Performance Indicator R2 (a) Total number of U of G Faculty FTEs and list of faculty and UGFA Unit 2 faculty (formerly CARG researchers) showing area of expertise related to Theme areas).

For 2016/17 the "Total number of Faculty FTEs showing expertise related to Theme areas" (i.e., engaged in research supportive of OMAFRA priorities) is estimated at approximately 195.5 'Research FTEs' (compared to ~183 in 2014/2015 and ~177 in 2015/2016), interrupting a downward trend that has been evident over the term of the current ten-year OMAFRA-UofG Agreement. These 195.5 'Research FTEs' would equate to approximately 97.75 full person FTEs of time devoted to research, if one were to assume, reasonably, that on average (across all UofG faculty) a 'research FTE' represents 0.5 of each faculty member's full FTE (see note above explaining 'Research FTE' and diversity across Colleges).

A listing of faculty engaged in research supportive of OMAFRA priorities in 2016/17 is available from the Office of Research, U of G.

As in previous years, there was a broad diversity among academic units, with OAC showing the highest values for: the number of researchers, and the proportion of total researchers in the College, engaged in research supportive of OMAFRA priorities. By comparison, these values are substantially lower in OVC, CBS CPES and CBE, with the lowest values for the CoA and CBE in 2016/17, essentially due to the dilution effect of a greater portion of researchers in these other colleges whose programs, in general are not as OMAFRA-centric. Nevertheless, regardless of college, for those researchers that are involved in research supportive of OMAFRA priorities, they dedicate the bulk of their effort to this, as demonstrated by the consistently high values for "Proportion of Research FTE focused on OMAFRA supportive research".

	Metric R2 (b-i)	Number of faculty FTEs funded by OMAFRA - U of G Agreement
	Baseline:	65 faculty FTEs as of 2008/09, compared to ~52 faculty FTEs as of 2007/08

	Target:	Retain the number of faculty FTEs to the 2008/09 level (65) , but may erode due to inflation & other financial pressures.																																																																																																																							
	Results (2016/17):	Number of faculty FTEs specifically allocated to Agreement research projects: Total: 78.65																																																																																																																							
		<table><tr><th>Research Theme</th><th>2016/17</th><th>2015/16</th><th>2014/15</th><th>2013/14</th><th>2012/13</th><th>2011/12</th><th>2010/11</th><th>2009/10</th><th>2008/09</th></tr><tr><td>Ag & Rural Policy</td><td>6.01</td><td>4.92</td><td>5.69</td><td>5.00</td><td>6.69</td><td>5.98</td><td>4.31</td><td>3.31</td><td>2.10</td></tr><tr><td>Bioeconomy</td><td>6.01</td><td>2.77</td><td>5.84</td><td>3.19</td><td>4.79</td><td>3.31</td><td>2.86</td><td>1.79</td><td>1.20</td></tr><tr><td>Emerg Manag</td><td>6.30</td><td>5.08</td><td>4.96</td><td>6.18</td><td>4.85</td><td>3.74</td><td>3.22</td><td>2.32</td><td>0.80</td></tr><tr><td>Env Sustain</td><td>8.41</td><td>4.53</td><td>4.27</td><td>5.76</td><td>8.82</td><td>9.57</td><td>9.37</td><td>5.20</td><td>5.10</td></tr><tr><td>Food for Health</td><td>9.55</td><td>10.05</td><td>7.67</td><td>8.96</td><td>10.10</td><td>8.63</td><td>6.60</td><td>3.69</td><td>2.20</td></tr><tr><td>Prod Dev</td><td>3.79</td><td>3.01</td><td>3.11</td><td>3.28</td><td>4.31</td><td>2.76</td><td>2.94</td><td>3.37</td><td>2.50</td></tr><tr><td>Prod Syst Tier I</td><td>30.38</td><td>27.31</td><td>23.00</td><td>21.12</td><td>19.98</td><td>19.09</td><td>17.87</td><td>22.81</td><td>25.20</td></tr><tr><td>Prod Syst Tier II</td><td>8.2</td><td>11.98</td><td>17.08</td><td>11.65</td><td>13.17</td><td>15.71</td><td>15.82</td><td>12.38</td><td>13.00</td></tr><tr><td>Prod Syst Tier III, IV</td><td>NA</td><td>NA</td><td>0.6</td><td>0.90</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td></tr><tr><td>Totals</td><td>78.65</td><td>69.83</td><td>72.22</td><td>66.04</td><td>72.71</td><td>68.79</td><td>62.99</td><td>54.87</td><td>52.10</td></tr></table>	Research Theme	2016/17	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09	Ag & Rural Policy	6.01	4.92	5.69	5.00	6.69	5.98	4.31	3.31	2.10	Bioeconomy	6.01	2.77	5.84	3.19	4.79	3.31	2.86	1.79	1.20	Emerg Manag	6.30	5.08	4.96	6.18	4.85	3.74	3.22	2.32	0.80	Env Sustain	8.41	4.53	4.27	5.76	8.82	9.57	9.37	5.20	5.10	Food for Health	9.55	10.05	7.67	8.96	10.10	8.63	6.60	3.69	2.20	Prod Dev	3.79	3.01	3.11	3.28	4.31	2.76	2.94	3.37	2.50	Prod Syst Tier I	30.38	27.31	23.00	21.12	19.98	19.09	17.87	22.81	25.20	Prod Syst Tier II	8.2	11.98	17.08	11.65	13.17	15.71	15.82	12.38	13.00	Prod Syst Tier III, IV	NA	NA	0.6	0.90	NA	NA	NA	NA	NA	Totals	78.65	69.83	72.22	66.04	72.71	68.79	62.99	54.87	52.10									
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	Metric R2 (b-ii)	Total number of research personnel FTEs (i.e. post-doctoral students, graduate students, research associates), that are <u>funded</u> through the OMAFRA – U of G Agreement, in total and by research theme area.																																																																																																																							
	Baseline:	2008/09:113 research personnel (post-doctoral students, graduate students, research associates) funded through Agreement approved projects.																																																																																																																							
	Target:	Retain the number of research personnel FTEs to the 2008/09 level (113) , but may erode due to inflation & other financial pressures.																																																																																																																							
	Results (2016/17):	Total number of research personnel FTEs: 274 Note: A 2013/14 change in the reporting template provided a more thorough reporting of research personnel FTEs, thus providing a more accurate account of the FTEs																																																																																																																							

		Research Theme	2016/17	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09
		Ag & Rural Policy	25.95	20.44	17.00	23.20	19.45	16.50	14.20	14.13	4.00
		Bioeconomy	32.02	15.06	10.15	11.20	15.35	14.25	15.46	5.00	0.09
		Emerg Management	17.41	15.99	11.05	18.79	27.17	23.75	23.06	7.50	1.90
		Environ Sustainability	23.63	24.47	17.40	23.95	17.37	15.10	12.85	10.01	11.80
		Food for Health	38.97	42.62	22.15	45.52	40.61	34.80	23.46	15.85	5.14
		Products & Value Chains	17.11	9.13	10.75	13.77	23.32	20.21	13.21	7.38	0.29
		Prod Systems Tier I	118.85	99.17	72.4	96.32	65.81	56.28	40.87	18.18	57.18
		Prod Systems Tier II	Not Appl.	Not Appl.	22.18	20.38	34.83	34.91	30.77	42.70	32.44
		Totals	273.95	226.88	182.83	253.13	243.91	215.80	173.88	120.75	112.84
		Note: Research personnel (post-doctoral students, graduate students, research associates) are not <u>funded</u> by the OMAFRA – U of G Agreement Research Program in the Production Systems II theme.									
	Metric R2 (b-iii)	Number of faculty, UGFA Unit 2 faculty (formerly CARG researchers) and research personnel FTEs that are funded through the OMAFRA - U of G Agreement in total and by research theme area.									
	Baseline:	2008/09: Established at 172 faculty and UGFA Unit 2 faculty (formerly CARG researchers) funded through the partnership in total.									
	Target:	To retain the number of FTEs as close to the 2008/09 level (172) , but may erode due to inflation & other financial pressures.									
	Results (2016/17):	Total number of faculty, UGFA Unit 2 faculty (formerly CARG researchers) & research personnel FTEs: 353									

		Total FTEs by Theme	2016/17	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09
		Ag & Rural Policy	31.96	24.95	22.69	28.20	22.80	20.78	18.86	20.89	6.24
		Bioeconomy	38.13	17.91	15.99	14.94	20.14	18.93	19.04	7.69	2.10
		Emerg Management	23.70	20.91	38.68	23.88	32.12	25.58	26.61	9.82	2.65
		Environ Sustainability	32.24	29.91	22.47	34.65	25.34	25.42	24.61	19.59	19.59
		Food for Health	48.52	50.05	29.87	54.13	50.76	43.82	30.41	7.34	7.34
		Product Development	20.90	11.29	52.34	16.78	27.63	22.91	16.15	2.79	2.79
		Prod Systems Tier I	149.24	122.92	95.60	118.98	87.27	77.15	60.87	84.74	84.74
		Prod Systems Tier II	8.20	11.98	39.26	50.69	49.10	52.32	48.19	46.52	46.52
		Total All Themes:	352.89	290.02	316.90	342.25	315.16	286.91	244.74	181.98	171.97
		Note: The reported number of faculty, UGFA Unit 2 faculty (formerly CARG researchers) and research personnel FTEs who are funded through the OMAFRA - U of G Agreement in the Production Systems II theme excludes research personnel (post-doctoral students, graduate students, research associates) and UGFA Unit 2 faculty (formerly CARG researchers) who are not funded by the OMAFRA – U of G Agreement Research Program in the Production Systems II theme.									

Key Outcome	A critical mass of world class faculty, technical staff and graduate students addressing OMAFRA critical challenges and opportunities	
Performance Indicator R3	Level of recognition of faculty and students by their peers.	
	Metric R3 (a)	Number of faculty/researchers/staff related to the research theme areas, recognized by their peers through research chairs, awards of recognition, appointment to prestigious positions (international panels) and leadership of national and international research initiatives
	Baseline:	In 2008/09, 25 U of G faculty members were Canada Research Chair holders, of which 10 had active OMAFRA research projects. Same as performance indicator OA 1(c).
	Target:	Recognition as indicated by awards, appointments etc. to be $\geq$ 2008/09 of 25 faculty members.
	Results (2016/17):	During 2016/17, 12 faculty having Canada Research Chairs also had active Agreement research projects. This is up from 10 in 2014/15 and 2015/16.
	Metric R3 (b)	U of G's position compared to other Canadian universities, and their ranking in the previous year in the comprehensive category as published annually by Research Money Inc.
	Baseline:	Research Money Inc.'s 2009 rankings put U of G in second place among Canadian 'comprehensive' universities. Same as metric OA1 (a).
	Target:	U of G's ranking to be second or better among comprehensive universities in Canada.
	Results (2016/17):	The 2017 Research Infosource Inc. (formerly Research Money) report of Canadian universities' standings ranks U of G as the #2 university in the 'comprehensive' category.
	Metric R3 (c)	Number of faculty who publish in high impact journals.
	Baseline:	91 faculty published in high impact journals in 2008/09. 'High impact' journals were identified by the OMAFRA - U of G Research Program Directors.
	Target:	Number of faculty publishing in high impact journals to be $\geq$ 2008/09 baseline of 91 . Due to the highly subjective method for assessing the impact factor of journal publications, effective 2016/17, this performance metric reports the # of peer-reviewed publications, but does not assess the impact of those journals.

	Results: (2016/17):	Total number of faculty published in (high impact) peer-reviewed journals: 106									
		No. of Faculty by Theme	2016/17	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09
		Ag Policy & Rural Policy	4	1	4	5	8	8	3	2	3
		Bioeconomy	23	11	2	1	6	2	1	3	3
		Emergency Management	13	8	5	1	5	0	0	2	0
		Environmental Sustainability	7	4	2	2	4	12	8	5	5
		Food for Health	15	7	9	4	11	13	2	1	7
		Product Development	13	10	4	0	4	6	4	0	6
		Production Systems I & II	40	36	30	18	42	44	44	75	67
		Totals	106	77	56	33	80	85	62	88	91
Note: The by-theme totals include multi-theme project publications and add up to more than the total # of publications.											
Key Outcome	High quality research focused on OMAFRA priorities										
Performance Indicator R4	Scientific merit and relevance of research projects in each research theme area supported through the Agreement.										
	Metric R4 (a)	Report how composition of advisory committee is representative of stakeholders in each theme									
	Baseline:	2008/09 baseline for stakeholder representation is described in ‘Theme Research Proposal Review’.									
	Target:	Adequate representation of stakeholders on advisory committees, as achieved in 2008/09									
	Results (2016/17):	See table below that indicates representation of stakeholders in 2016/17, with representation from research/scientific, OMAFRA/other government, and user community/industry/non-government.									

Research Theme	Ag Policy & Rural Devel		Bioeconomy		Emerg Mgmt		Env Sust		Food		Prod Dev		Prod Syst – Animal		Prod Syst - Plant	
	LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP
Research /Scientific	7	7	4	3	5	5	4	3	4	4	3	2	4	2	2	2
OMAFRA / Gov't	8	8	1	2	4	4	2	3	4	4	3	3	3	4	3	4
User Community / Industry / Non-Gov't	3	3	4	4	0	1	3	3	1	1	2	2	2	3	2	4
Total	18	18	9	9	9	10	9	9	9	9	8	7	9	9	7	10
LOI denotes Letters of Intent FP denotes Full Proposals																

	Metric R4 (b)	Total number of publications in peer reviewed journals and % of those appearing in high impact journals (as identified by U of G Research Program Directors).				
	Baseline:	2008/09 baseline of 265 publications, 57% of which were in 'high impact' journals.				
	Target:	Number of publications and % in high impact journals to be $\geq$ 2008/09 baseline of 265 and 57% respectively.				
	Results (2016/17):	Total number published in peer reviewed journals: 106 ; total percentage in high impact journals: not reported Due to the highly subjective method for assessing the impact factor of journal publications, effective 2016/17 this performance metric reports the # of peer-reviewed publications, but does not assess the impact of those journals. <u># of publications in peer reviewed journals (by theme), & ratio in high impact journals (historic reporting)</u>				
		Research Theme	2016/17	2015/16	2014/15	2013/14
		Ag Policy & Rural Devel	4	1 – 100%	6 – 67%	5 – 100%
		Bioeconomy – Industrial Uses	23	13 – 85%	12 – 17%	7 – 14%
		Emergency Management	13	8 – 100%	9 – 56%	8 – 13%
		Environmental Sustainability	7	10 – 40%	5 – 40%	4 – 50%
		Food for Health	15	8 – 88%	13 – 70%	17 – 24%
		Product Development	13	12 – 83%	9 – 40%	2 – 0%
		Production Systems I & II	40	47 – 81%	43 – 70%	69 – 26%
		Totals	106	85 – 70%	97 – 58%	112 – 30%

		Note: The by-theme totals include multi-theme project publications and add up to more than the total # of publications.																																																															
	Metric R4 (c)	Number of collaborations and/or partnerships with external institutions.																																																															
	Baseline:	Number of collaborators in 2008/09 (265) will be the baseline.																																																															
	Target:	Number and significance of collaborations and/or partnerships targeted to be ≥ 2008/09 baseline of 265 .																																																															
	Results (2016/17):	i) Total number of collaborators for continuing projects in 2016/17: 218 ii) Total number of collaborators for new projects approved for 2016/17: 148																																																															
		<table><tr><th rowspan="2">Research Theme</th><th colspan="2"># of Collaborators for Continuing Projects</th><th colspan="2"># of Collaborators for New Projects</th></tr><tr><th>Non-OMAFRA</th><th>OMAFRA</th><th>Non-OMAFRA</th><th>OMAFRA</th></tr><tr><td>Agriculture and Rural Policy</td><td>18</td><td>8</td><td>4</td><td>11</td></tr><tr><td>Bioeconomy</td><td>13</td><td>2</td><td>8</td><td>2</td></tr><tr><td>Emergency Management</td><td>16</td><td>17</td><td>9</td><td>7</td></tr><tr><td>Environmental Sustainability</td><td>17</td><td>10</td><td>18</td><td>15</td></tr><tr><td>Food for Health</td><td>24</td><td>2</td><td>14</td><td>4</td></tr><tr><td>Products & Value Chains</td><td>31</td><td>2</td><td>14</td><td>4</td></tr><tr><td>Production Systems I</td><td>56</td><td>34</td><td>39</td><td>24</td></tr><tr><td>Production Systems II</td><td>3</td><td>5</td><td>7</td><td>2</td></tr><tr><td>Total Collaborations (includes multi-theme collaborators)</td><td>169</td><td>104</td><td>99</td><td>65</td></tr><tr><td>Total # <u>distinct</u> Collaborators</td><td>155</td><td>63</td><td>96</td><td>52</td></tr></table>	Research Theme	# of Collaborators for Continuing Projects		# of Collaborators for New Projects		Non-OMAFRA	OMAFRA	Non-OMAFRA	OMAFRA	Agriculture and Rural Policy	18	8	4	11	Bioeconomy	13	2	8	2	Emergency Management	16	17	9	7	Environmental Sustainability	17	10	18	15	Food for Health	24	2	14	4	Products & Value Chains	31	2	14	4	Production Systems I	56	34	39	24	Production Systems II	3	5	7	2	Total Collaborations (includes multi-theme collaborators)	169	104	99	65	Total # <u>distinct</u> Collaborators	155	63	96	52				
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	Bioeconomy	13	2	8	2																																																												
	Emergency Management	16	17	9	7																																																												
	Environmental Sustainability	17	10	18	15																																																												
	Food for Health	24	2	14	4																																																												
	Products & Value Chains	31	2	14	4																																																												
	Production Systems I	56	34	39	24																																																												
	Production Systems II	3	5	7	2																																																												
	Total Collaborations (includes multi-theme collaborators)	169	104	99	65																																																												
Total # <u>distinct</u> Collaborators	155	63	96	52																																																													

Results (2015/16)	i) Total number of collaborators for continuing projects in 2015/16: 154 ii) Total number of collaborators for new projects approved for 2015/16: 118
Results (2014/15)	i) Total number of collaborators for continuing projects in 2014/15: 244 ii) Total number of collaborators for new projects approved for 2014/15: 138
Results (2013/14)	i) Total number of collaborators for continuing projects in 2013/14: 476 ii) Total number of collaborators for new projects approved for 2013/14: 53
Results (2012/13)	i) Total number of collaborators for continuing projects in 2012/13: 326 ii) Total number of collaborators for new projects approved for 2012/13: 146
Results (2011/12)	i) Total number of collaborators for continuing projects in 2011/12: 345 ii) Total number of collaborators for new projects approved for 2011/12: 124
Results (2010/11)	i) Total number of collaborators for continuing projects in 2010/11: 168 ii) Total number of collaborators for new projects approved for 2010/11: 269
Results (2009/10)	i) Total number of collaborators for continuing projects in 2009/10: 203 ii) Total number of collaborators for new projects approved for 2009/10: 167
Results (2008/09)	i) Total number of collaborators for continuing projects in 2008/09: 230 ii) Total number of collaborators for new projects approved for 2008/09: 47

Key Outcome	High quality research focused on OMAFRA priorities										
Performance Indicator R5	Benefits to the economy, the environment and the health and well-being of the province, generated from the Research Program.										
	Metric	One case study completed annually of initiatives undertaken related to each research theme that impacted Ontario. This outcome would also be assessed by the expert review of each research theme area scheduled at the end of five years.									
	Results (2016/17):	The benefits to the economy, environment and health and well-being of Ontarians, generated from the Research Program are described in case studies presented in the <u>2017 Agri-Food Yearbook</u> .									
Key Outcome	Highly skilled U of G graduates meet changing workforce demands										
Performance Indicator R6	Level of engagement of University graduate students in OMAFRA - U of G research projects.										
	Metric R6 (a)	Total number of graduate students working on research projects related to each Agreement theme areas									
	Baseline:	140 grad students in 2008/09.									
	Target:	Number of grad students to be maintained at 2008/09 level (140) , but may decline due to inflation.									
	Results (2016/17):	Number of graduate students working on research projects related to each Agreement theme areas: 235									
		Graduate Students by Theme	2016/17	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09
		Ag & Rural Policy	23	22	14.75	19.05	19.10	15.00	12.60	21.00	4.00
		Bioeconomy	20	9	5.60	9.30	12.90	7.50	8.45	0.50	5.00
	Emerg Management	14	19	8.82	15.68	12.41	15.80	9.00	5.00	3.00	

		Env. Sustainability	16	19	12.50	21.24	17.27	19.55	11.05	4.50	8.00
		Food for Health	35	42	18.40	35.80	29.96	22.85	15.87	8.00	4.00
		Products & Value Chains	15	13	10.10	13.00	20.95	14.25	9.50	5.00	4.00
		Production Systems Tier I	76	82	60.21	94.49	80.38	65.40	51.20	57.00	112.00
		Production Systems Tier II	36								
		Total All Themes:	235	180	130.38	208.56	192.97	160.35	117.67	101.00	140.00
	Metric R6 (b)	Total number of graduate students enrolled in the Highly Qualified Personnel (HQP) program funded under the Partnership.									
	Baseline:	HQP program scheduled to be implemented in summer 2009.									
	Target:	Target to be based on 2009/10 student enrolment, which was 32.									
	Results (2016/17):	35 graduate students were enrolled in the HQP program during 2015/16. 13 were new awards in 2016/17, 22 continuing.									
	Metric R6 (c)	Percentage of HQP graduates that are employed in sectors or fields related to the theme areas.									
	Baseline	Results for this PI will not be available until after first HQP program students graduate (likely 2012 for MSc HQP graduate students)									
	Target	In 2012/13 (the baseline year), 31 HQP students graduated, of which 95% were estimated to be employed in sectors or fields related to their research areas of study.									
	Results (2016/17):	The estimate of the percentage of HQP graduates working in their field has not changed. Examples of HQP graduates now working in their areas of study are shown in the 2017 Agri-Food Yearbook.									

Key Outcome	Industry and other stakeholders adopt state of the art practices and systems	
Performance Indicator R7	Transfer of new knowledge and utilization by industry and other stakeholders, related to OMAFRA research theme areas.	
	Metric R7 (a)	Total number of knowledge transfer (KTT) events related to new practices and technologies in each theme area.
	Baseline:	See table below for 2008/09 baseline of knowledge transfer events. Note: 2008/09 results were incorporated into average for past five years.
	Target:	Number of knowledge transfer events $\geq$ 2008/09 baseline. Note: 2008/09 results were incorporated into average for past five years.
	Results 2016/17	The table below shows knowledge transfer events for 2016/17 in each research theme area, compared to average of past five years.

Knowledge Transfer (KTT) Events by Research Theme

	Ag & Rural Policy		Bioeconomy		Emerg Mgmt		Env Sust		Food for Health		Prod Dev		Prod Systems		Total	
	2016 /17	5 yr avg (yr 4)	2016/ 17	5 yr avg (yr 4)	2016/ 17	5 yr avg (yr 4)	2016/ 17	5 yr avg (yr 4)	2016 /17	5 yr avg (yr 4)	2016 /17	5 yr avg (yr 4)	2016/ 17	5 yr avg (yr 4)	2016/ 17	5 yr avg (yr 4)
Peer-reviewed publications	4	5.4	23	18.2	13	10.2	7	8	15	14.1	13	11.4	40	53.6	106	115.4
Presentations at scientific conferences	8	9.9	23	18.1	29	25.6	12	14.4	27	22.4	6	9.1	78	88	163	175.3
Media citations	6	9	5	6.6	48	30.7	18	13	11	8.8	8	6.8	36	55.8	128	127.6
Presentations posted on the internet	7	6.7	3	3.2	9	5.7	4	4.9	3	3	7	5.3	12	13.1	41	39.7
Presentations to stakeholder or industry	18	21	10	13.8	27	24.1	16	20.8	9	14.6	14	14.4	95	113.7	173	212.9

	Metric R7 (b)	Examples of utilization of new knowledge by stakeholders
	Baseline:	Anecdotal reports of utilization of new knowledge by stakeholders
	Target:	Annual reports of utilization of new knowledge by stakeholders
	Results (2016/17):	Examples of utilization of new knowledge by stakeholders in 2016/17 included: Healthier cheese and meat products Food Science Dept. Prof. Alexandro Marangoni's research team has taken a major step forward in their research to replace highly saturated fat in products such as cheese and processed meat with oil high in unsaturated fatty acids, while at the same time not compromising the eating quality. Food products with the healthier replacement fats are now being tested by a major multinational food company. New, industrial soybean variety A new soybean variety with a 33 per cent higher linoleic acid level than commodity soybean oil is being tested by companies interested in a wide range of industrial applications. This high linoleic oil, bred by Plant Agriculture Dept.'s Prof. Istvan Rajcan, is more reactive and easier to use in products like coatings, paints and plastics using biobased ingredients. If the oil performs well, U of G may partner with a seed company to move the variety into commercial production. Read more examples of stakeholder utilization of new knowledge in the <u>2017 Agri-Food Yearbook</u>.
	Metric R7 (c)	Total number of licences and patents, and those applied for. Same performance indicator as R8 (b) and (c).
	Baseline:	9 patents filed in 2008/09 17 licenses granted in 2008/09
	Target:	No. of patent applications $\geq$ 2008/09, which was 9 No. of licenses granted $\geq$ 2008/09, which was 17
	Results (2016/17)	Total number of OMAFRA related patents filed: 17

		<u>Patents filed by research theme:</u>	<u>2016/17</u>	<u>15/16</u>	<u>14/15</u>	<u>13/14</u>	<u>12/13</u>	<u>11/12</u>	<u>'10/11</u>	<u>'09/10</u>
		Ag Policy & Rural Development:	0	0	0	0	0	0	0	0
		Bioeconomy – Industrial Uses:	8	6	6	3	3	3	4	5
		Emergency Management:	0	0	0	0	0	0	0	0
		Environmental Sustainability:	1	0	0	0	0	0	0	0
		Food for Health:	0	0	1	0	0	1	2	1
		Product Development:	0	19	10	11	7	3	1	0
		Production Systems (Animals):	3	0	0	1	0	1	4	3
		Production Systems (Crops):	5	10	0	1	3	0	4	1
		Total:	17	35	17	16	13	8	15	10
		Note: The increase in applications in the Production Systems (Crops) category stems from increased requests for Plant Breeders Rights applications from our commercial partners. We expect to continue to pursue more Plant Breeders Rights applications than we have done in the past.								
		Total number of OMAFRA related licenses granted: 24								
		<u>License & amending agreements</u>								
		<u>by research theme:</u>	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	<u>2011/12</u>	<u>2010/11</u>	<u>'09/'10</u>
		Ag Policy & Rural Development:	0	1	0	0	0	0	0	0
		Bioeconomy – Industrial Uses:	1	2	0	3	2	3	0	1
		Emergency Management:	0	0	0	0	0	0	0	0
		Environmental Sustainability:	0	0	0	0	0	0	0	0
		Food for Health:	1	0	0	0	0	1	0	0
		Product Development:	1	7	3	1	4	0	1	1
		Production Systems (Animals):	0	0	1	0	2	2	1	1
		Production Systems (Crops):	21	13	11	45	6	27	13	18
		Total:	24	23	15	49	14	32	15	20
		Note: Analysis of germplasm-related deals led to a more precise decision of which agreements to include as licenses. As a result, the 2013/14 year had an abnormally high result.								

	Metric R7 (d)	Ratio of third-party investment leveraged by Agreement research funding, in each theme area. Same metric as R1 (b), but this PI identifies the leveraging by research theme.							
	Baseline:	Third-party investment in 2008/09, the baseline year by each theme area (shown below):							
		2008/09 Theme	Ag Policy & Rural Devel	Bio-economy	Emergency Mgmt	Environ. Sustain.	Food	Prod Dev	Prod Syst Tiers I and II
		Cash and in-kind leveraged (\$000s)	283,900	323,626	500	1,037,475	782,324	734,324	5,990,994
		Ratio of 3 rd party leveraging to allocated operating budgets	1:1	0.7:1	0.1:1	1.8:1	2.2:1	1.1:1	4.1:1
	Target:	Ratio of third-party investment leveraged by Agreement research funding, by each theme area, ≥ 2008/09 which was 2.3:1 Total amount of third party investment - \$9,153,412.							
	Results (2016/17):	The 2016/17 ratio of third party investment to Agreement funding was 1.46:1. Total amount of third party investment – \$10.8 million. Ratio is based on total OMAFRA operating funds of \$7.4 million committed to research projects within fiscal 2016/17.							
		This performance indicator reports the same results as R1 (b).							

Key Outcome	Research results commercialized	
Performance Indicator R8	Patents, products (technologies, software, germplasm, registered trademarks, copyright), licenses granted to existing or start-up companies, existing businesses spun out and community-based service businesses created, and the economic impact. R8 is also a performance indicator for the Joint Intellectual Property Committee of the Partnership.	
	Metric R8 (a)	Number of disclosures and technology assessments, by research theme
	Baseline:	364 total disclosures and technology assessments in 2008/09
	Target:	Number of disclosures and technology assessments ≥ 2008/09 baseline of 364 .

	Results (2016/17):	Total number of OMAFRA related disclosures: 158					
		<u>Disclosures by theme:</u>	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>
		Ag Policy & Rural Devel:	0	0	0	0	0
		Bioeconomy – Industrial Uses	4	0	6	3	2
		Emergency Management	0	0	1	0	0
		Environmental Sustainability:	1	0	0	0	0
		Food for Health:	3	0	0	0	0
		Product Development:	0	6	3	6	6
		Production Systems (Animals):	2	0	1	3	1
		Production Systems (Crops):	148	4	71	155	258
		Totals:	158	10	82	167	267
		Note: Fluctuation in disclosure numbers is due primarily to fluctuation in the number of seed varieties that have been disclosed in a particular year. For example, in the 2008/09 fiscal year, there was an inordinately large disclosure of 176 tomato varieties. A similar event also occurred in 2012/13, with the disclosure of 100 grape varieties. In 2016/17, the number of total varieties disclosed (143) was higher than normal because the timing of reporting pushed varieties that would have been disclosed in 2015/16 into 2016/17.					
	Metric R8 (b)	Number of patent applications filed, by research theme					
	Baseline:	9 patents filed in 2008/09					
	Target:	Number of patent applications to be $\geq$ 2008/09 baseline of 9 .					

	Results (2016/17):	Total number of OMAFRA related patents filed: 17 <table><tr><td><u>Patents filed by research theme:</u></td><td><u>2016/17</u></td><td><u>2015/16</u></td><td><u>2014/15</u></td><td><u>2013/14</u></td><td><u>2012/13</u></td></tr><tr><td>Ag Policy & Rural Development:</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Bioeconomy – Industrial Uses:</td><td>8</td><td>6</td><td>6</td><td>3</td><td>3</td></tr><tr><td>Emergency Management:</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Environmental Sustainability:</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Food for Health:</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>Product Development:</td><td>0</td><td>19</td><td>10</td><td>11</td><td>7</td></tr><tr><td>Production Systems (Animals):</td><td>3</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>Production Systems (Crops):</td><td>5</td><td>10</td><td>0</td><td>1</td><td>3</td></tr><tr><td>Totals:</td><td>17</td><td>35</td><td>17</td><td>16</td><td>13</td></tr></table> Note: The increase in applications in the Production Systems (Crops) category over the past two years stems from increased requests for Plant Breeders Rights applications from our commercial partners. We expect to continue to pursue more Plant Breeders Rights applications than we have done in the past.	<u>Patents filed by research theme:</u>	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	Ag Policy & Rural Development:	0	0	0	0	0	Bioeconomy – Industrial Uses:	8	6	6	3	3	Emergency Management:	0	0	0	0	0	Environmental Sustainability:	1	0	0	0	0	Food for Health:	0	0	1	0	0	Product Development:	0	19	10	11	7	Production Systems (Animals):	3	0	0	1	0	Production Systems (Crops):	5	10	0	1	3	Totals:	17	35	17	16	13
<u>Patents filed by research theme:</u>	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>																																																									
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Totals:	17	35	17	16	13																																																									
	Metric R8 (c)	Number of licenses (plus options and sublicenses) granted by theme																																																												
	Baseline:	17 licenses granted in 2008/09																																																												
	Target:	Number of licenses granted to be ≥ 2008/09 baseline of 17 .																																																												
	Results (2016/17):	Total number of OMAFRA related licenses granted: 24 <table><tr><td><u>License & amending agreements by research theme:</u></td><td><u>2016/17</u></td><td><u>2015/16</u></td><td><u>2014/15</u></td><td><u>2013/14</u></td><td><u>2012/13</u></td></tr><tr><td>Ag Policy & Rural Development:</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Bioeconomy – Industrial Uses:</td><td>1</td><td>2</td><td>0</td><td>3</td><td>2</td></tr><tr><td>Emergency Management:</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Environmental Sustainability:</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Food for Health:</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Product Development:</td><td>1</td><td>7</td><td>3</td><td>1</td><td>4</td></tr></table>	<u>License & amending agreements by research theme:</u>	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	Ag Policy & Rural Development:	0	1	0	0	0	Bioeconomy – Industrial Uses:	1	2	0	3	2	Emergency Management:	0	0	0	0	0	Environmental Sustainability:	0	0	0	0	0	Food for Health:	1	0	0	0	0	Product Development:	1	7	3	1	4																		
<u>License & amending agreements by research theme:</u>	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>																																																									
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		Production Systems (Animals): 0 0 1 0 2 Production Systems (Crops): 21 13 11 45 6 Totals: 24 23 15 49 14 Note: Analysis of germplasm-related deals led to a more precise decision of which agreements to include as licenses. As a result, the 2013/14 year has an abnormally high result.
	Metric R8 (d)	Number of patents issued
	Baseline:	Five patents issued, as per 2008/09
	Target:	Number of patents issued to be $\geq$ 2008/09 baseline of 5.
	Results (2016/17):	Total number of OMAFRA related patents issued: 10 <u>Patents issued by research theme:</u> <u>2016/17</u> <u>2015/16</u> <u>2014/15</u> <u>2013/14</u> <u>2012/13</u> Ag Policy & Rural Development: 0 0 0 0 0 Bioeconomy – Industrial Uses: 1 1 0 0 0 Emergency Management: 0 0 0 0 0 Environmental Sustainability: 1 0 0 0 0 Food for Health: 0 0 0 2 0 Product Development: 0 3 3 1 0 Production Systems (Animals): 6 0 0 0 0 Production Systems (Crops): 2 2 3 0 1 Totals: 10 6 6 3 1 Note 1: Of the 10 issued patents in 2016/17, 1 was the Trade Mark for “Asparabest”. Note 2: Patents are evaluated and issued by the Patent Office. The U of G’s Catalyst Centre does not have control over the schedule of evaluations/issuances by CIPO or USPTO, or other patent offices around the world.

	Metric R8 (e)	Total dollar value of revenue generated from licenses associated with OMAFRA-supported research																												
	Baseline:	\$1.3 million revenue generated as per 2008/09.																												
	Target:	Total dollar value to be ≥ 2008/09 baseline of \$1.3 million .																												
	Results (2016/17):	Total dollar value of revenue generated from licenses associated with OMAFRA-supported research: \$2.05 million Revenue from OMAFRA-supported non-seed research from fiscal year end April 30, 2017: Revenue from OMAFRA-supported seed research fiscal year-end March 31, 2017: <table><tr><td>License revenue generated</td><td><u>2016/17</u></td><td><u>2015/16</u></td><td><u>2014/15</u></td><td><u>2013/14</u></td><td><u>2012/13</u></td></tr><tr><td>Non-seed research</td><td>\$835,407</td><td>\$662,910</td><td>\$528,429</td><td>\$417,038</td><td>\$494,156</td></tr><tr><td>Seed research</td><td>\$1,213,753</td><td>\$1,164,305</td><td>\$1,116,483</td><td>\$922,625</td><td>\$884,120</td></tr><tr><td>TOTAL:</td><td>\$2,049,160</td><td>\$1,827,215</td><td>\$1,644,912</td><td>\$1,339,664</td><td>\$1,378,276</td></tr></table> Note: While the revenue for 2017 has been strong, we expect it to decline in 2018 due to the end of revenue for DHA milk this year.					License revenue generated	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	Non-seed research	\$835,407	\$662,910	\$528,429	\$417,038	\$494,156	Seed research	\$1,213,753	\$1,164,305	\$1,116,483	\$922,625	\$884,120	TOTAL:	\$2,049,160	\$1,827,215	\$1,644,912	\$1,339,664	\$1,378,276
License revenue generated	<u>2016/17</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>																									
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TOTAL:	\$2,049,160	\$1,827,215	\$1,644,912	\$1,339,664	\$1,378,276																									
	Metric R8 (f)	Three brief case studies of individual files from different themes and initiatives taken to advance commercialization																												
	Baseline	Three case studies as per 2008/09																												
	Target	Three case studies presented annually.																												
	Results (2016/17):	Examples of research projects advancing commercialization in 2016/17 include: • This spring, Ontario Genomics announced three projects to the University of Guelph, one of which was to develop improved canola genetics, including creating a new start-up company with Benson Hill Biosystems. Part of the funding from the project is going toward developing canola plants based on the technology in a patent application from Ian Tetlow and Mike Emes, who showed that they could treble the productivity of a model plant. If successful, the technology could lead to great outcomes for the canola industry. • The 'Innovation of the Year' award this year featured two projects that have received support from OMAFRA in the past. Start-up company Mirexus recently announced that they raised over \$12 million and will build a manufacturing facility in Guelph. Their 'Phytospherix' product was launched onto the market in																												

		2016. Bonnie Mallard also won as a result of her 'High Immune Response' test, capable of distinguishing cattle between those with strong and weak immune systems. The license holder, Semex, has made millions in sales since the product was released in 2013. • Start-up company MicroSintesis announced the launch of two products developed in the lab of Mansel Griffiths. YGIA for dogs, and NUVIO for swine. These products, called 'proteobiotics', are effective at reducing the virulence of pathogenic bacteria in the gut by interrupting cell-to-cell communication – known as 'quorum sensing'. The original license to MicroSintesis occurred in 2011, and the company has supported significant research in the lab of Dr. Griffiths since that time. MicroSintesis's website is www.microsintesis.com.
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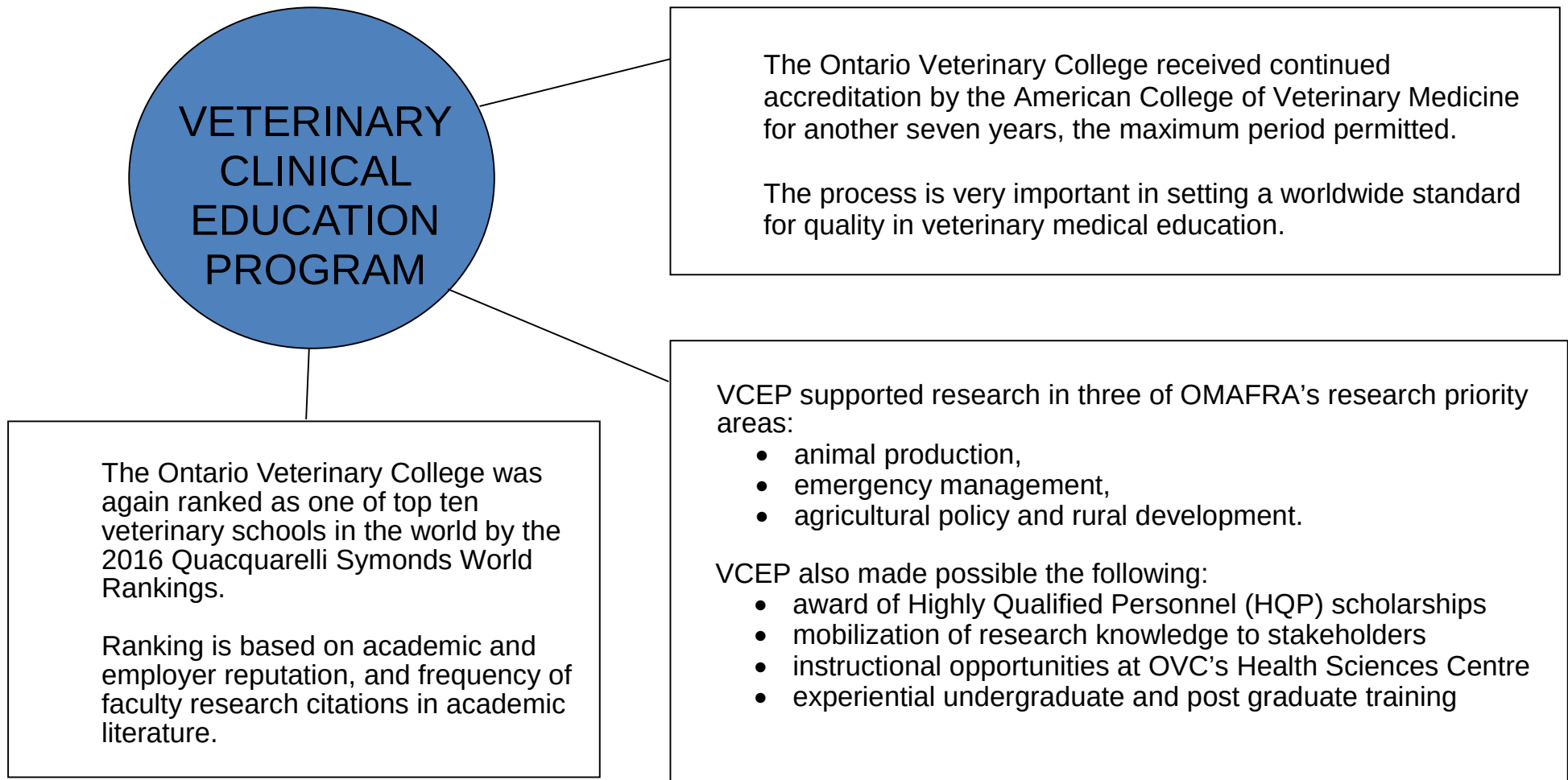
Key Outcome	Awareness of research outcomes and impacts among decision makers, staff and stakeholders	
Performance Indicator R9	Stakeholder assessment of Agreement research outcomes on industry, the economy and the health and well-being of Ontario citizens. Similar to performance indicator OA6.	
	Metric	This outcome would also be assessed by the Expert Review of each theme area schedule at the end of five years.
	Baseline:	This performance indicator will be addressed through an assessment similar to the 'U of G / OMAFRA Impact Study' (Deloitte, 2007), to be conducted in 2012/13. An assessment was completed in 2012.
	Target:	A 2012/13 expert review of awareness of research outcomes and impacts among decision makers.
	Results (2016/17)	This PI was addressed in a 2012/13 study undertaken as part of the year five review of the Agreement (Stoddard, Sept 2012). The study findings were very positive and were detailed in OA6 of the 2012/13 Annual Report. In 2016/17, stakeholder awareness of research outcomes continued to be a priority. The Agreement's many 'knowledge translation and transfer' activities mobilize research knowledge directly to stakeholders, tailored to their sector's needs. For a listing, see the Program Updates: Research - KTT section of this report.
Key Outcome	Awareness of research outcomes and impacts among decision makers, staff and stakeholders	
Performance Indicator R10	Media citations related to research in Agreement research theme areas.	
	Metric	Total number of media citations
	Baseline:	A total of 190 media citations were identified by researchers in their 2009 U of G annual and final reports. Additionally, 135 media articles were picked up by clipping services. This 2008/09 baseline is likely a significant underestimate of media pick-up but it is the best available measure.
	Target:	Number of media citations to be $\geq$ 2008/09 baseline of 190 .

	Results (2016/17)	From researchers' 2016/17 annual and final research reports, number of media citations:	
		Ag Policy & Rural Policy:	7
		Bioeconomy:	5
		Emergency Management:	8
		Environmental Sustainability:	18
		Food for Health:	11
		Product Development:	8
		Production Systems I & II:	36
		Total	128
These media citations were identified by researchers in their 2016/17 U of G annual and final reports. This count is again, likely a significant underestimate of media pick-up.			

VETERINARY CLINICAL EDUCATION PROGRAM

Selected Performance Indicators and Accomplishments

Program Objective: Support the Ontario economy by training professionals skilled in maintaining the health and welfare of animals and their interrelationships with people and the environment



Veterinary Clinical Education Program

Data collection and establishment of baselines for each Performance Indicator (PI) was completed with the assistance of OMAFRA. The following table summarizes the VCEP Program's performance according to the five VCEP PIs of the Agreement.

Key Outcome: Maintain American Veterinary Medical Association / Canadian Veterinary Medical Association accreditation.
Performance Indicator VCEP 1: Level of accreditation achieved - Maintain AVMA/CVMA accreditation
Metric: Review of accreditation reports in order to assess performance and maintenance of accreditation.
Baseline: AVMA/CVMA Full Accreditation
Target: Maintain AVMA/CVMA Accreditation
Results (2016/17): Veterinary colleges in Canada, the United States, and top colleges throughout the rest of the world, are accredited by the Council on Education (COE) of the American and Canadian Veterinary Medical Associations (AVMA; CVMA). As an accredited veterinary school, graduates from OVC's Doctor of Veterinary Medicine (DVM) program can be licensed and employed worldwide as veterinarians without additional training or expense upon completion of the program. Continued accreditation is key to maintaining OVC's global reputation and ability to attract exceptional applicants, train highly qualified personnel, and retain world-renowned researchers, faculty and staff. It also supports Ontario's reputation for food safety and access to markets both domestically and internationally. In March 2017, the College received a letter from the COE stating that based on their review of our annual interim report, the OVC was granted continued full accreditation status for another year. Further, the COE stated that they accepted our plans to address the minor curriculum deficiencies that were identified during their site visit in October 2015. The annual interim report provided to the COE by OVC provides updates on any changes that have taken place at the College over the last year with respect to meeting the requirements of the 11 Accreditation Standards (https://www.avma.org/ProfessionalDevelopment/Education/Accreditation/Colleges/Pages/coe-pp-requirements-of-accredited-college.aspx).

Key Outcome: Attracts and retains highly qualified clinical faculty from around the world as a source of new knowledge
Performance Indicator VCEP 2: An appropriate number of high quality faculty
Metric: Number of faculty provided by U of G-OMAFRA funding
Baseline: Established as the number of faculty positions supported through the Agreement in 2009/10, at 12.4 faculty FTEs
Target: Maintain 2008 level (baseline likely to decline due to flat-lined budget) of 12.4 FTEs
Results (2016/17): VCEP directly supports the following faculty: a) 4 FTEs in production systems: (2.5 in animal health, 0.5 in animal welfare and 1 related to ecosystem impact) b) 6.9 FTEs in emergency management: (1.4 in public health, 2 in foreign animal disease and 3.5 in food safety) c) 0.5 FTEs to develop and lead rural community veterinary stream for 4th year students VCEP funding helps ensure that the OVC faculty complement meets the standards addressed by the accreditation process. OVC is required to document an adequate number, breadth of discipline and post-graduate training of our faculty to be able to deliver the DVM program, conduct research and provide clinical service. Currently, there are about 44 faculty that teach and conduct research in areas of interest to OMAFRA. Specialties include: Food Animal Health Management, Food Animal Welfare, Large Animal Medicine and Surgery, Epidemiology, Public Health, Anatomic Pathology, Bacteriology, Pharmacology/Toxicology, Reproductive Biology, Theriogenology, Immunology, Virology, Parasitology, Laboratory Animal Medicine and Population Disease Modelling.

Key Outcome: Provide a comprehensive training program for undergraduate veterinary students.

Performance Indicator VCEP3: Readiness of graduates for employment
(Provide a comprehensive training program for undergraduate veterinary students)

Metric: Percentage level of students' and employers' satisfaction regarding readiness for employment.

Baseline: Baseline for Agreement will be the results for the 2007/08 graduating class (2008/09 data were not used due to technical collection errors.)

Target: Maintain percentages from 2007/08 annual student and employer surveys

2007/08 Results: Of graduates who responded, **97%** were satisfied; Of the employers who responded **95%** were satisfied

Results (2016/17):

Of those graduates (2014 Cohort) who responded in their first year following graduation, **100%** (n = 46) were satisfied (i.e. rated their performance as Superior, Very Good, or Good) with their overall performance/competence to do the job for which they were hired.

Of the employers who responded, **95%** (n = 18) were satisfied (i.e. rated the new graduate as Superior, Very Good, or Good) with their employee's overall performance/competence to do the job for which they were hired.

	2016 Cohort	2015 Cohort	2014 Cohort	2013 Cohort	2012 Cohort	2011 Cohort	2010 Cohort	2009 Cohort
Per cent satisfaction of grads who responded	100	93	94	99	98	100	100	98
Per cent satisfaction of employers who responded	95	100	100	100	100	96	95	92

Results of a five-year post-graduation survey (2012 cohort) indicated that 87% of respondents (n=20) felt that their DVM training prepared them (very well, more than adequately, or adequately) for their first position of employment and for the different/changing role(s) they have held since graduation.

Key Outcome: Provide a comprehensive training program for undergraduate veterinary students.

Performance Indicator VCEP4: Graduating students' performance in the North American Veterinary Licensing Exam (NAVLE).

Metric: Percentage of VCEP students who pass the North American Veterinary Licensing Exam (NAVLE), compared to the percentage average of other North American institutions.

Baseline: Baseline is the 2008/09 pass rate for NAVLE students.

Target: That OVC students continue to meet or exceed the mean pass rate for all students writing the NAVLE exam, which was **97%** in the baseline year.

Results (2016/17):

The North American Veterinary Licensing Exam (NAVLE) is the standardized licensing test that graduates of accredited schools are allowed to take in the final year of their program. Success allows OVC graduates to essentially obtain licensure to practice anywhere in the world. As noted in the table below, OVC graduates continue to demonstrate a high success rate on the NAVLE, both in the passing rate and in the overall score obtained, which is consistently higher than the average of all other candidates. The comparison group is all other candidates who took the examination at all other veterinary schools.

Graduation Year	OVC Students taking exam(s)	Students passing exams	OVC % Passing
2017	119	117	98
2016	112	112	100
2015	118	118	100
2014	122	118	97
2013	105	104	99
2012	109	107	98
2011	108	108	100

Key Outcome: Graduate individuals highly qualified in relevant post-graduate specialties.
Performance Indicator VCEP5: Number of students starting and completing post-graduate studies each year by area related to OMAFRA priorities.
Metric: Number of VCEP funded students working on projects related to OMAFRA priorities. The metric would include both students beginning and completing post-graduate studies.
Baseline: Baseline is 15.1 DVSc students.
Target: Maintain funding for 15.1 DVSc or PhD students working in areas of priority to OMAFRA.
Results (2016/17): a) Production Systems DVSc or PhD: 10 stipends allocated to support research in areas of large animal health, ecosystem impact or animal welfare. Example areas of research include: • Improvements to disbudding and dehorning practices in Ontario dairy calves by producers and veterinarians. • Investigating kid mortality in Ontario dairy goat farms. • Detection and surveillance of significant pathogens in Ontario small poultry flocks. • Environmental toxicants and stress: Failure of innate immunity in development of pneumonia in cetaceans. • Characterization of the fecal bacterial microbiome of commercial mink • Use of stem cells to manage Exercise-induced Pulmonary Hemorrhage (EIPH) in horses. • Equine Herpesvirus -1: Prevalence, Shedding, and Reactivation. • The Role of Nitric Oxide in Equine Endometritis. • Characterization of the equine airway microbiome using high throughput sequencing • EEG analyses in poultry undergoing physical euthanasia methods Internship & Residents: 6 FTEs These HQP positions provide support for the advanced clinical training of large animal specialists in areas such as internal medicine, surgery and anesthesia and pain management. These graduates will become the next generation of expertise for practicing veterinarians and the animal owning public.

b) Emergency Management

DVSc or PhD: 5 stipends allocated to support research in areas of zoonoses, public health, foreign animal disease and food safety

Example areas of research include:

- Dynamics of influenza A virus transmission in a swine herd and analysis of risk factors for recurrent infections.
- Characterization of the fecal microbiota and an evaluation and analysis of antimicrobial resistance in commercial rabbits.
- Longitudinal molecular epidemiology of infectious diarrhea in foals with a focus on *Clostridium difficile*.
- Investigating early host immune response to intestinal *Mycobacterium avium* subspecies paratuberculosis (MAP) infection in young cattle.
- Evaluating the knowledge, attitudes, and behaviours toward radiation safety in the veterinary field and the impact of specific training methods on improving current practices.

c) Rural Policy & Economic Development

Summer Career Opportunities & Research Experience (CORE) Program

VCEP funds continued to support an MSc student conducting research on “*The rural community veterinary practitioner: using student, veterinary practitioner and faculty focus groups to inform curriculum at the Ontario Veterinary College*”. Over the past year preliminary results of this work have been presented at several conferences.

VCEP funds in this area have also been used to support the stipends of summer students engaged in OMAFRA related research projects with OVC faculty. In last year’s annual report the projects of four summer students were listed, however, given the projects were undertaken during the summer of 2016, they were actually funded from this past year’s budget. Hence, they will not be repeated in this report. There have been students funded again for this summer (2017) and they will be reported on in next year’s annual report.

SCHEDULE G: BUSINESS CONTINUITY, EMERGENCY RESPONSE AND SURGE CAPACITY PLANNING

After Year 5 of the Partnership Agreement (2012/13), the Schedule G milestones are determined by the AFL and AHL Program Management Committees (PMCs) annually (*Article 5.3, OMAFRA-U of G Partnership Agreement*).

Agriculture and Food Laboratory

During the 2016/17 fiscal year, the AFL maintained the Emergency Surge Capacity process.

- The AFL Strategic Partnership staff completed OMAFRA's EMS training
- Annual updates of existing documentation are in progress.

The Business Continuity communication plans were employed on one occasion in 2016/17.

- One event occurred in this quarter that presented potential to cause business interruption. The primary courier used for delivery of OMAFRA samples found itself in a strike position with its workforce under an agreement with Teamsters Canada. This would have resulted in delayed testing and reporting of OMAFRA's time sensitive and critical surveillance and/or emergency response samples. Over the course of just a few days, negotiations with the courier resulted in a workable contingency plan for both OMAFRA and the LSD.

OMAFRA was notified of this potential event and the potential to impact receipt of OMAFRA samples or delivery of results to OMAFRA within established project requirements.

The AFL will continue to work in partnership with OMAFRA to test and to implement continuous improvements to the Business Continuity, Emergency Response and Surge Capacity Planning documents and processes. Schedule "G" activities consolidate our organizations' efforts to address incidents and events of critical concern. The outcomes of these incidents and recovery activities influence our abilities to fulfill our collective mandate to protect the public health of Ontarians through food safety.

Animal Health Laboratory

For 2016/17, the AHL FAD simulation is noted above - see performance indicator AHL2 for details. Business Continuity and Emergency Response plans for AHL remain in place.

Schedule G related activities in fiscal 2016/17 included:

- The list of "**essential staff**" for LSD is updated every fall in order to define staff expected to report to work in the case of a weather event, e.g., snow day, labor disruptions.
- **Surge capacity** is maintained year-round, and has benefited from the acquisition of high-volume equipment funded by OMAFRA. The AHL averages ~500,000 ELISAs per year and ~100,000 PCR reactions per year, and given our level of automation, can relatively easily accommodate more testing on an emergency basis. The larger challenge usually exists in collection and transfer of large volumes of well-documented samples by CFIA to the AHL.

- Through the CAHSN Executive Board, Dr. Maxie participates in review of various CFIA table-top exercises, such as foot-and-mouth disease, with a view to improving our emergency response plans.
- As part of routine AHL surveillance and vigilance, samples were submitted to CFIA in 2016/17 for confirmatory negative testing for various federally reportable diseases for various agents as above, including classical swine fever virus, pseudorabies virus, and infectious salmon anemia virus.

SCHEDULE N: JOINT INTELLECTUAL PROPERTY

The Joint Intellectual Property Management Committee is a sub-group of the Research Committee. It is co-chaired by the OMAFRA Director of Research & Innovation Branch, and the U of G Director of the Catalyst Centre.

The Joint IP Committee uses Research Performance Indicator R8 as its metric:

Patents, products, licenses granted to existing or start-up companies, existing businesses spun out and community-based service businesses created and the economic impact.

For a description of 2016/17 highlights and updates of joint intellectual property activity in the Agreement, please see Research Program sections (under 'Commercialization and Intellectual Property') of this report.

Appendices A-1 and A-2 also provide further information regarding joint intellectual property of the Agreement.

Greg Meredith
Deputy Minister
OMAFRA
2nd Floor, 1 Stone Rd. W.
Guelph ON
N1G 4Y2

Dr. Franco Vaccarino
President
University of Guelph
Level 4, University Centre
Guelph, ON
N1G 2W1

Letter of Mutual Approval
Subject: OMAFRA – University of Guelph Agreement
2016/17 Annual Report

We are pleased to provide you with the 2016/17 Annual Report of the OMAFRA – University of Guelph Agreement.

The delivery of OMAFRA priorities continues to be effectively accomplished through the Agreement programs of research, laboratory services and veterinary clinical training.

The activities funded leverage additional external investments each year, making the Agreement a significant driver in the Ministry's research and innovation efforts. It is also a key vehicle in OMAFRA's agri-food growth plan and the Ontario government's agenda for jobs and economy.

This annual report provides information on the performance indicators jointly established by the ministry and U of G, to reflect the Agreement's joint oversight and reporting requirements.

As co-chairs of the Agreement Executive Committee, we have approved the 2016/17 annual report. It is being forwarded for your approval as co-chairs of the Agreement Leadership Committee, per article 6.4. of the Master Agreement.

By signing below, you are indicating that you have received and approved this report. If you have any questions, please do not hesitate to contact us.

Approved:


Christine Primeau
ADM, RCSD
OMAFRA

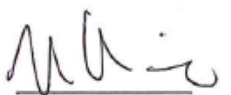
Feb. 22/18
Date


Dr. Malcolm Campbell
Vice President (Research)
University of Guelph

22-02-18
Date


Greg Meredith
Deputy Minister
OMAFRA

Mar 19/18
Date


Dr. Franco Vaccarino
President
University of Guelph

19-03-18
Date

APPENDIX A-1: LICENSE AGREEMENTS (2016/17)

Agreement ID	Type	Description	Company
Hall 20161128	Amendment - New Deal - Ex	Amendment #1 to 2013 License Agreement	PlantForm Corporation Ltd.
Kott 20160502	License - Exclusive	Spearmint variety 700B and variety CI, expressing elevated levels of rosmarinic acid	Mazza Innovation Ltd
Mohanty 20161221	License - Exclusive	License for Methods for creation of sub-micron biocarbon materials	Competitive Green Technologies, Inc.
ZZ Cherry 20161128	Germplasm License - Exclusive	Sweet Cherry Varieties (V68061, V69062, V69068, V690630 and V690628)	Calissi Farms Inc.
ZZ Fruit 20160815	Germplasm Amendment - New Deal - EX	Amendment #4 - addition and removal of varieties	Vineland Research and Innovation Centre
ZZ Hemp 20160615	Germplasm License - Exclusive	Hemp varieties Jutta and Yvonne	CBD Baker Inc.
ZZ Soybean 20160216	Germplasm License - Non- Exclusive	mfa soybean	Cerom, Centre de Recherche sur les Grains Inc.
ZZ Soybean 20160324a	Germplasm License - Exclusive	OAC Prosper / SC 7512N	SeCan Association
ZZ Soybean 20160324b	Germplasm License - Exclusive	OAC Adare / SeCan 12-82C	SeCan Association
ZZ Soybean 20160324c	Germplasm License - Exclusive	SC 7912N	SeCan Association
ZZ Soybean 20160324d	Germplasm License - Exclusive	SeCan 12-87C	SeCan Association
ZZ Soybean 20160324e	Germplasm License - Exclusive	SC 8412N	SeCan Association
ZZ Soybean 20160410	Germplasm Amendment - New Deal - EX	Amendment 2 to schedule	Saatzucht Donau GesmbH & CoKG
ZZ Soybean 20160510	Germplasm Amendment - New Deal - EX	Amend #9 - New lines added	Bonis and Company

ZZ Soybean 20160510b	Germplasm Amendment - New Deal - EX	Amendment 2 to license	Takano Foods Co Ltd
ZZ Soybean 20160517	Germplasm License - Exclusive	OAC 13-50-ZL	Huron Commodities Inc.
ZZ Soybean 20160518	Germplasm License - Exclusive	14S61C-05 (OAC 16-16C- Nat) and 14S61C-07 (OAC 16-18C-Nat)	Huron Commodities Inc.
ZZ Soybean 20160916	Germplasm License - Non- Exclusive	MFA Soybean Agreement	Schillinger Genetics, Inc.
ZZ Soybean 20170118a	Germplasm License - Exclusive	SVX 16T0G4	Sevita International Corporation (Formerly Hendrick Seeds and PRO Seeds)
ZZ Tomato 20170222	Germplasm Amendment - New Deal - NON- EX	Amendment Schedule 1	BHN Seed
ZZ Tomato 20170222-2	Germplasm Amendment - New Deal - NON- EX	2017 - Schedule 1 amendment (20 lines)	H.J Heinz Company L.L.P
ZZ Seed 20160412	Seed - New deal - Option	Amendment #5 to option agreement	SeCan Association
Raizada 20170310	Option	Grant with IP Term Sheet for GAAP proposal	Hybrid Turkeys
Tetlow 20170101	Option	Grant with IP Term Sheet for GAAP proposal	Parmalat Canada
ZZ Apple 20170101	Sublicense	Sublicense Agreement between Bonnyville Forest Nursery Inc. (UG licensee) and Upper Canada Growers	<Multi-Party>

APPENDIX A-2: PROOF OF PRINCIPLE FUNDED RESEARCH PROJECTS **(2016/17)**

Project Title	Primary Investigator	Status	Value	Result
Vegetated roofing system refinement and manufacturing	Youbin Zheng	Complete	\$49,410	Provisional patent application filed. 2017: Technology was licensed to start-up company 'Smart Green Technologies'
Development of a vaccine for necrotizing enteritis of foals	John Prescott	Complete	\$35,000	Patents filed using research results generated from POP grant. License agreement secured with Idexx (diagnostic test) and License agreement secured with Lake Immunogenics (development of hyperimmune plasma – treatment of disease in horses).
Optimization of a Serological Test for Johne's Disease	Lucy Mutharia	Complete	\$50,000	Patents filed – An Ontario company (Prolab) is proceeding with a NSERC CRD application in collaboration with Lucy
High rosmarinic acid mint to treat inflammation in horses	Laima Kott	Complete	\$18,500	Success – License issued 2017: License to Ceapro has terminated. Now licensed to Mazza
Boar taint solution	Jim Squires	Complete	\$24,000	Success – POP research lead to industry sponsored research project. 2017: The research continues with significant funding, but there are no more patents. The approach (patenting SNPs) is no longer viable.
Tomatoes with early red colouring	Steve Loewen	Complete	\$12,225	Research ongoing 2017: the research still continues. Work progresses on obtaining genetic details of the trait so that a utility patent application can be filed.
Phosphopeptide-based interventions	Yoshi Mine	Complete	\$25,000	Marketing of technology to industry ongoing

				2017: we have an issued patent, but no current partners
Soy cheese (blend of soy & milk protein soft cheese)	Milena Corredig	Complete	\$5,500	Scientific success – marketing of technology to industry ongoing 2017: the project was abandoned due to lack of market interest
1,3-Diacylglycerols for hard fat applications	Rob Lencki	Complete	\$45,000	Scientific success – Current production methods are extremely expensive and unviable for industry application. 2017: the technology is abandoned. It was too early stage for market success (production method not commercially viable), and the PI was not interested in continuing the project.
Modification of starch metabolism in transgenic <i>Arabidopsis thaliana</i> increases plant biomass and doubles oil seed production	Ian Tetlow	Complete	\$25,000	2017: A company (Benson Hill) has signed an option for the technology and has entered a GAPP project to help develop it that is worth \$3.6 million over 3 years
High Linoleic soybean oil	Istvan Rajcan	Complete	\$25,000	2017: The project generated samples of high-lin soybean oil. In cooperation with Soy 20/20, the oil has been provided to industry users, generating some interest. Further market studies are being conducted by Soy 20/20
Production of mint plugs for commercial use	Laima Kott	NEW/Complete	\$10,000	The project generated mint plugs for use by a new licensee, Mazza Innovation
Development of 'Berielles' strawberries	Adam Dale	NEW	\$25,000	The project will enable commercial trials of Berielles berries to determine market acceptability

Appendix B: OMAFRA - U of G Audited Statement of Revenues and Expenses

Financial information

University of Guelph

OMAFRA Agreement

Year ended April 30, 2017

Independent auditors' report

To the Ontario Ministry of Agriculture, Food and Rural Affairs

We have audited the accompanying statement of revenue and expenses for the year ended April 30, 2017 [the "Statement"] of the University of Guelph [the "University"] with respect to the OMAFRA program carried out in accordance with the agreement between the University and the Ontario Ministry of Agriculture, Food and Rural Affairs dated April 1, 2008 [the "Agreement"]. The Statement has been prepared by management using the basis of accounting described in note 2.

Management's responsibility for the Statement

Management is responsible for the preparation of the Statement in accordance with the basis of accounting described in note 2, and for such internal control as management determines is necessary to enable the preparation of a Statement that is free from material misstatement, whether due to fraud or error.

Auditors' responsibility

Our responsibility is to express an opinion on the Statement based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the Statement is free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the Statement. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the Statement, whether due to fraud or error. In making those risk assessments, the auditors consider internal control relevant to the entity's preparation of the Statement in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the Statement.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our qualified audit opinion.

Basis for qualified opinion

Our verification of the total expenses is limited to the amounts recorded in the records of the University, the completeness of which is not susceptible to satisfactory audit verification. We are, therefore, not able to determine whether any adjustments might be necessary to total expenses for the year ended April 30, 2017.

Qualified opinion

In our opinion, except for the possible effects of the matter described in the basis for qualified opinion paragraph, the Statement is prepared, in all material respects, in accordance with the basis of accounting described in note 2.



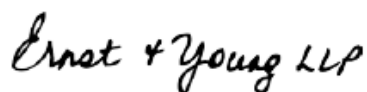
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- 2 -

Basis of accounting and restriction on use

Without modifying our opinion, we draw attention to note 2 to the Statement, which describes the basis of accounting. The Statement is prepared to assist the University to comply with the financial reporting requirements of the Agreement. As a result, the Statement may not be suitable for another purpose. Our report is intended solely for the University and the Ontario Ministry of Agriculture, Food and Rural Affairs and should not be distributed to or used by parties other than the University or the Ontario Ministry of Agriculture, Food and Rural Affairs.

Kitchener, Canada
September 7, 2017

The signature of Ernst & Young LLP is written in a cursive, handwritten style.

Chartered Professional Accountants
Licensed Public Accountants



A member firm of Ernst & Young Global Limited

University of Guelph

Ontario Ministry of Agriculture, Food and Rural Affairs Agreement

Statement of revenue and expenses

(in thousands of dollars)

For the year ended April 30, 2017

	OMAFRA Programs					Total OMAFRA 2017	Total OMAFRA 2016
	Research	Vet Clinical Education	Agri-food Laboratory	Animal Health Laboratory	Minor Capital Repairs		
	\$	\$	\$	\$	\$	\$	\$
Revenue							
Provincial	47,244	5,478	6,591	7,090	4,701	71,104	70,295
Sales of goods and services	3,590	-	7,994	6,418	-	18,002	18,020
Investment income	221	-	-	-	-	221	180
Other	3,738	-	12	9	101	3,860	1,591
Total revenue	54,793	5,478	14,597	13,517	4,802	93,187	90,086
Expenses							
Personnel Costs	20,766	149	10,019	9,552	16	40,502	41,182
Support for faculty costs	8,900	1,900	-	-	-	10,800	10,800
Operating	17,549	3,330	4,703	5,532	4,786	35,900	32,702
Internal recoveries	(2,252)	(21)	(412)	(1,830)	-	(4,515)	(5,098)
Service costs	9,830	120	287	263	-	10,500	10,500
Total contract expenses	54,793	5,478	14,597	13,517	4,802	93,187	90,086
Net income (expense)	-	-	-	-	-	-	-

See accompanying notes

University of Guelph

Ontario Ministry of Agriculture, Food and Rural Affairs Agreement

Notes to the statements

[in thousands of dollars]

For the year ended April 30, 2017

1. Authority and purpose

The University of Guelph operates as a not-for-profit entity under the authority of the *University of Guelph Act (1964)*. The University is a comprehensive, research-intensive university offering a range of undergraduate and graduate programs. With the exception of academic governance, which is vested in the University's Senate, the University is governed by the Board of Governors. The University is a registered charity [#10816 1829 RR0001] and is therefore exempt from income taxes under section 149 of the *Income Tax Act*.

In April 2008, a ten-year agreement [the "Agreement"] was signed between the University and OMAFRA [Ontario Ministry of Agriculture, Food and Rural Affairs]. This financial statement has been prepared under the terms of the Agreement, which requires an audited financial statement of revenues and expenditures summarized by program.

2. Summary of significant accounting policies and reporting practices

[a] Fund accounting

The accounts of the University are maintained in accordance with the principles of fund accounting in order to observe the limitations and restrictions placed on the use of available resources. Under fund accounting, resources for various purposes are classified for accounting and reporting purposes into separate funds in accordance with specified activities or objectives.

[b] Recognition of revenue

The University accounts for revenue in accordance with the deferral method whereby externally restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unspent revenue is deferred until the goods or services are provided.

Unrestricted revenue is recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

3. Unspent revenue

The Agreement provides revenue restricted for use in approved research and service programs. Funds that were received but unspent during the year will be recognized as revenue in future years as eligible expenses are incurred.

	2017	2016
Opening Balance	32,917	26,376
Funds Received	66,800	71,300
Expenditure	(66,303)	(64,759)
Ending Balance	33,414	32,917

University of Guelph

Ontario Ministry of Agriculture, Food and Rural Affairs Agreement

Notes to the statements

[in thousands of dollars]

For the year ended April 30, 2017

4. Minor capital repairs

The University operates facilities designated under the Agreement located across Ontario. These facilities are either owned by the Province or Agricultural Research Institute of Ontario ["ARIO"].

For ARIO owned properties, the cost of minor capital projects for facilities are funded through separate funds held by ARIO.

5. New initiative funds

While not formally included as part of the Agreement a major one-time allocation of \$56 million was received in April 2008. The New Initiative funds are not included in the attached statement of revenue and expenses.

The \$56 million was expected to be utilized during the five-year period starting May 2008 and ending April 2013. As at April 30, 2017 all funding has been spent.

The expenditures were spent in the following OMAFRA programs:

	2017	2016
Research	757	1,333
Veterinary Clinical Education Program	6	(9)
Animal Health Laboratory	19	-
	<u>782</u>	<u>1,324</u>

