

ONTARIO MINISTRY OF AGRICULTURE, FOOD
AND RURAL AFFAIRS

AND

UNIVERSITY OF GUELPH

AGREEMENT

CONSOLIDATED ANNUAL REPORT
2015 / 2016

APPROVED BY AGREEMENT LEADERSHIP COMMITTEE
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UNIVERSITY
of GUELPH



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EXECUTIVE SUMMARY

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, or Partnership Agreement). This is the eighth 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 2015/16 fiscal year (May 1, 2015 to April 30, 2016). 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: www.uoguelph.ca/omafra_partnership/en/omafrauofgpartnership.asp

The OMAFRA - U of G Agreement annual reports are posted at:
www.uoguelph.ca/omafra_partnership/research/en/researchresult/ReportsAndPublications.asp

PROGRAM HIGHLIGHTS (2015/16)

Selected highlights from each of the Agreement programs during 2015/16 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

As the final year (2017/18) of the current Agreement approaches, 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 AFL continues to provide novel methodological approaches for OMAFRA which can be leveraged to support all of the lab's clients. New revenue streams are being built in niche areas by pursuing targeted marketing activities. As always, the goal is to continue to build revenue that can be reinvested to sustain the laboratory (per Schedules "E" and "F" of the Agreement).

While some of the AFL's revenue is project-based and not ongoing, the lab continues to expand its expertise and develop unique services that help secure its future as a successful not-for-profit business enterprise. The AFL continues to develop partnerships with its regulatory partner organizations to secure its role as a "laboratory partner of choice" across Canada.

In 2015/16, the AFL continued to implement innovative test approaches and other initiatives that benefit the OMAFRA - University of Guelph Agreement and the Ministry of the Environment and Climate Change program, such as:

- Further improvements to methods for detecting pesticide residues have resulted in greater batch efficiencies, detection limits and scope of compounds that are now applied and available for OMAFRA's ongoing monitoring and research projects. One such method for detecting pesticides has now expanded to approximately 500 compounds in agriculture and food samples.
- The AFL continues to test over 800,000 samples annually for the Dairy Farmers of Ontario and the Ontario Dairy Council.¹ It also works with these organizations and OMAFRA to address any program issues that may arise throughout the year. The AFL collaborates in the research and implementation of new dairy tests as required by this thriving Ontario industry.
- AFL scientists continue to work closely with OMAFRA Dairy Food Safety Program staff to identify and research evolving new technology that benefits the dairy industry. The recent merger of bovine and goat processors will improve the goat industry's access to the level of testing used by their bovine counterparts.

¹ This work was completed in the first year of a two-year extension to the renewable contract with the Dairy Farmers of Ontario and the Ontario Dairy Council.

- The Molecular Biology lab helps drive continuous improvement of OMAFRA's ongoing monitoring and research programs. Recent advancements include use of bacterial subtyping, and toxin gene detection as well as improved identification of food borne pathogens and mycological species.
- AFL Pest Diagnostics scientists work closely with OMAFRA Agriculture Development Branch specialists to generate rapid detection methods and optimize protocols for the detection of various plant pests that are detrimental to Ontario agriculture.
- The AFL continues to improve and expand its multi-residue screening methods to include regulatory testing of drug and pesticide residues in the wide variety of samples received from OMAFRA. Samples include animal tissues and milk from several species, as well as fruits and vegetables, grains/feeds and honey.

In 2015/16, the AFL Chemistry Method Development Section continued working toward improved methods of drug residue detection, which will expand the number of drug residues that can be simultaneously detected. These methods also target customized lists of compounds that help OMAFRA to be closely aligned with the National Chemical Residue Program. This is especially important when OMAFRA needs to take regulatory action. Expanding the AFL's scope of testing in honey and related samples is an important development in this area of concern.

The AFL continues to pursue testing opportunities to attract other government, commercial and academic clients, in order to maintain its status as a self-sustaining division of the U of G. Leveraging these services benefits both the AFL and OMAFRA. For example, expanding the scope of residue detection methods in both veterinary drugs and pesticides allows OMAFRA to maintain its sampling levels while receiving improved and increased data.

In addition, the expanded scope of services gained through projects with other clients can be applied to OMAFRA programs. Examples include:

- collaborating with the Public Health Agency of Canada to implement improved Top 7 Shigatoxigenic *E. coli* identification services.
- collaborating with the Biodiversity Institute of Ontario and the Canadian Food Inspection Agency in a pilot baseline study "Examining the Potential for Species Substitution or Adulteration in Sausage Meats".
- expanding testing for the honey industry to benefit Ontario's hive health and honey market.

Animal Health Laboratory (AHL) Program, Laboratory Services Division

The Agreement's [AHL](#) program provides a full-service, fully accredited veterinary diagnostic laboratory that supports provincial diagnostic animal disease surveillance and emergency response. Within the Agreement, AHL scientists, U of G faculty and OMAFRA's Animal Health & Welfare Branch, and Chief Veterinarian work together to provide a coordinated and informed

approach to the management of livestock health in Ontario. AHL leverages the provincial investment by offering laboratory services to other government, commercial and academic clients.

Among the AHL's 2015/16 highlights were:

- The addition of significant new testing equipment to the AHL's inventory in order to accommodate fish and bees testing, and to improve the efficiency and surge capacity of the lab.
- Renovation of the building's Specimen Reception lab in winter 2015 to improve the flow of incoming samples and their biocontainment.
- AHL's emergency response to the April 2015 outbreak of highly pathogenic avian influenza (H5N2) in Ontario.

Preventing animal disease is a major goal for the AHL. In 2013, the AHL contracted with OMAFRA to deliver a disease surveillance plan ([DSP](#)) from 2013 to 2018 that would offer early detection, better preparedness and quicker responses to animal disease in Ontario.

By 2015/16, the building of the Ontario Animal Health Network (OAHN) was completed as the core of the DSP, and species' networks were operational. Following stakeholder consultations in 2013/14, the AHL had assembled networks of species experts in 2014/15 and 2015/16 consisting of OMAFRA specialists, Ontario Veterinary College and other U of G researchers, AHL personnel and veterinarians working in bovine, equine, swine, poultry, aquaculture, small ruminants, companion animals, bees, wildlife, and alternative species. The networks began regularly scheduled communications and information sharing to monitor baseline health and flag potential irregularities in 2015/16.

The AHL also continued work on another component of the DSP in 2015/16: integrating Ontario animal health surveillance data with national databases. The lab and its federal and provincial partners worked towards an action plan for this complex undertaking and 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: agricultural 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.

Project Funding

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 2015/16, OMAFRA's \$6.0 million of research operating funding leveraged \$10.7 million of third party (non-Ontario government funds), a ratio of 1.8:1.

Infrastructure

The U of G led several large infrastructure construction projects for properties owned by the Agricultural Research Institute of Ontario (ARIO) in 2015/16. These were in support of ARIO's research infrastructure strategy to provide modern, efficient facilities so that research priorities can be addressed:

- The new, state-of-the-art Livestock Research and Innovation Centre — Elora Dairy Facility was completed and commissioned in fall 2015.
- Work continued on relocating the Guelph Turfgrass Institute, developing a comprehensive site plan for new beef, swine and poultry research facilities at Elora, and planning new crops capacity at the New Liskeard, Winchester and Huron research stations.
- Significant minor capital projects included building an irrigation system at the Muck Research Station, refurbishing the Ridgetown Vet Tech Building, and major equipment purchases to enhance the crops research capability at the Winchester station.
- As part of the ARIO Infrastructure Strategy, significant changes occurred in the operations of Alfred and Kemptville campuses. See 'Program Updates' for details.

Communications and Knowledge Translation & Transfer (KTT)

In 2015/16, 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, 'The BUZZ' e-newsletters, 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.

The annual Call for Letters of Intent (LOIs) to the KTT Research Program was held in fall 2015. As the projects were not selected until May 2016, they will be reported in the Agreement's 2016/17 annual report. There were 16 active KTT Research Program projects in 2015/16: 10 were approved in spring 2015 and six had been approved in previous years.

As part of the administration of the program, the KTT Unit coordinated the collaborative review (with OMAFRA) of the researchers' annual and final project reports, and worked with the researchers to address budgetary and operational challenges and opportunities.

Examples of KTT research projects on-going in 2015/16 included:

- Determining the most effective means of communicating with dairy veterinarians to deliver provincial dairy programs.

- Workshops for dairy and beef producers to help them adopt the latest knowledge in wastewater management.
- Understanding opinion leaders in online media to encourage more evidence-based communications on agricultural biotechnology.

A complete list of KTT research projects and knowledge mobilization events of 2015/16 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 2015/16, three doctoral students and four master's students received HQP scholarships. Since 2008/09, approximately 130 students and their employers have participated in the HQP program.

The [Undergraduate Student Experiential Program](#) was again delivered collaboratively by OMAFRA (Agriculture Development Branch specialists) and U of G (Ontario Agricultural College facility). It supported five U of G summer students to mobilize research results on a topic of priority to both parties. Students presented their findings to OMAFRA and U of G faculty in Sept. 2016. While achieving knowledge mobilization, they also develop HQP skills. There is interest from OMAFRA in expanding the program to other branches.

Note: Although the KTT and HQP programs *per se* occurred within the Agreement's Research Program in 2015/16, 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](#) (CC) provides expertise in the management of intellectual property (IP) generated from Agreement-funded research. Total royalties from Agreement-supported technologies exceeded \$1.8 million in 2015/16, an increase of 11 per cent over the previous year.

Examples of research commercialization being advanced by the CC in 2015/16 included:

- A 100 per cent compostable resin developed for the production of coffee pods by Coffee Roaster Club Coffee. They are in use by Loblaw in its President's Choice line, as well as by U.S. companies such as Hills Bros.
- A technology to extend the shelf life of fruits and vegetables through the use of a naturally occurring plant chemical, hexanal. This has resulted in the formation of the start-up company 'Harvest One Agritech' in British Columbia.
- The start-up company 'Smart Green Technologies' achieved its first commercial sales in 2015/16. The company arose from Dr. Youbin Zheng's research into producing green roof technologies for the Ontario and other markets.

Read about many more examples of research commercialization in the [2016 Agri-Food Yearbook](#).

In 2015/16, the Gryphon's LAAIR (Leading to Accelerated Adoption of Innovative Research) program funded three major (commercialization) projects and nine minor (exploration) projects for a total of \$600,000. Funded projects included a range of projects from a cow-side detection device for metabolic diseases to commercialization strategies for Ontario quinoa. More details are available on the Gryphon's LAAIR [2015/16 projects page](#) and in the Program Updates section of this report.

Veterinary Clinical Education Program (VCEP)

The Ontario Veterinary College (OVC) of U of G was again ranked in the top ten (8th place) 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, 2016 (<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 had been realigned under three of the OMAFRA research themes: animal production systems, emergency management, and agricultural and rural policy. In 2015/16, 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 2015/16. 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 (2015/16)

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

The Agreement's [AFL](#) program provides OMAFRA with quality, special purpose laboratory services in support of Ontario's agri-food sectors and rural communities. These include meeting OMAFRA's regulatory and program needs, emergency response, scientific method development, research, technology transfer and education.

Within the Agreement, AFL scientists, U of G faculty and OMAFRA's Food Inspection Branch work together to develop laboratory testing sampling plans for each program and new testing methodology, as needed. AFL leverages the provincial investment by offering laboratory services to other government, commercial and academic clients, benefitting both OMAFRA and the U of G.

Molecular Biology and Microbiology

In 2015/16 the AFL continued to work collaboratively with regulatory, industry and academic partners to expand expertise in molecular subtyping methodologies for food-borne pathogens, such as a single nucleotide polymorphism-polymerase chain reaction (SNP-PCR) method for highly discriminatory subtyping of *Salmonella* Enteritidis, in collaboration with the Canadian Food Inspection Agency (CFIA).

AFL scientists, in collaboration with regulatory and industry partners, have been developing and validating a "Comprehensive Method for Detection, Isolation, and Confirmation of Shiga toxin-producing *Escherichia coli* (STEC) including 'Top Seven' O-Serogroups in Food Samples". The method represents a rapid, comprehensive and flexible alternative to existing methods and allows for selective testing for the 'Top Seven' STEC or all STEC. Providing more accurate and sensitive testing results will help to reduce the risks of releasing contaminated food products or unnecessary product downgrades due to limitations of the current methods for testing STEC.

Polymerase chain reaction (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. Using these methods, the AFL collaborated 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".

New PCR methods for confirming *Enterococcus*, biotyping (speciation) *Campylobacter* and profiling *Bacillus cereus* for a toxin gene are advances that have also been realized by AFL and are available for use for OMAFRA projects. Of particular interest, AFL and AHL scientists routinely work together to sequence whole genomes of the Influenza A virus in animal specimens using protocols developed on the Ion Torrent Personal Genome Machine (PGM) platform.

The AFL's contribution to this leading-edge, advanced level technological expertise will continue to set the AFL apart from its peers, and further OMAFRA's food safety excellence from farm to fork.

Chemistry Testing (Drugs and Pesticides)

To support OMAFRA's intent to remain aligned with national testing programs and to follow up on work done in 2014/15, this group developed and implemented a streamlined method capable of testing over 500 pesticides in a single extraction, providing significant savings and efficiencies. A modification of this method provides low level detection of neonicotinoid residues in water samples, to parts per trillion level. The scope of the method has been extended to include the analysis of pollen, bees, honey and plant material.

The AFL has expanded the list of beta-agonist compounds it detects for OMAFRA's annual residue monitoring and surveillance program. This further aligns OMAFRA's testing program with that of CFIA, which is particularly important for the province when regulatory action is required.

The chemical residue teams in the AFL Chemistry Section maintain their position of strength in projects requiring the application of the Organization for Economic Co-operation and Development (OECD) Principles of Good Laboratory Practice (GLP) 1998. Their accreditation in this area allows the AFL to work on behalf of Agriculture & Agri-Food Canada to verify characteristics of new pesticides coming to market, as well as to support 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.

The AFL Chemistry Unit worked collaboratively with University of Guelph researchers from Environmental Biology within the School of Environmental Sciences on several research 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-related analysis and services for OMAFRA, Dairy Farmers of Ontario (DFO) and Ontario Dairy Council (ODC), the AFL also plays an important role in troubleshooting any industry or program issues that may arise periodically.

The Laboratory provided valuable support during 2015/16 to DFO and its members during an adverse inhibitor situation. As a result, new testing was brought online to enhance DFO's advisory capability to its members with respect to herd health and balancing diets.

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

The AFL has verified and applied for accreditation for a method to determine the presence of docosahexaenoic acid (DHA fatty acids) in bovine milk to confirm evidence of this health claim in eligible products. The AFL has also verified the Charm® MRL Trio Test for beta-lactams, sulfa drugs, and tetracyclines in raw commingled cow milk and has applied for accreditation of this method.

Other Species' Milk

As demand for goat milk in Ontario has been steadily increasing, so too has the requirement for OMAFRA's regulatory testing. In support of OMAFRA's efforts specific to inhibitor testing, the AFL verified and applied for accreditation both the CHARM® Sulfa test for raw commingled goat milk at MRL (SULF-MRL) and the CHARM® MRL Beta-lactam and tetracycline test for raw commingled goat milk (MRLBLTET2).

Method Development

Dr. Perry Martos continues to apply significant effort to upgrading multiple residue methodologies for the detection and quantitative analysis of veterinary drugs. The methodologies 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 change and expand 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 internationally.

New methodologies are also created within the structure of the Agreement as OMAFRA's requirements evolve or in anticipation of future need. These methodologies include LC-MS analysis of parasiticides in milk and developing a larger multi-residue analysis of antibiotics in honey.

Due to the changing nature of industry and regulatory needs in the area of veterinary drugs, it is 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 Pest Diagnostics

AFL Pest Diagnostics scientists continue to work closely with OMAFRA Agriculture Development Branch specialists to develop and optimize protocols to:

- Detect tomato bacterial spot causing agent *Xanthomonas spp.* on greenhouse hard surfaces.
- Detect *Aphanomyces cochlidioides* in sugar beets.
- Detect Downy Mildew systemic infection in hop, hop latent virus, hop stunt viroid, and hop mosaic virus.
- Identify sugar beet cyst nematode to species using PCR methodology

As well, new methodologies have been introduced to further OMAFRA's interests in Ontario crop protection. These methods include three new PCR (polymerase chain reaction)- based

procedures: one that can detect multiple mealy bug species that infest grapes, another detecting the carlavirus group in hops, and RT-PCR to detect Potexvirus group, a plant virus genus that has a wild host range. Of note, the AFL designed specific primers to sequence the PCR products of the carlavirus assay in order to further identify the virus to the species level.

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 for the benefit of regulators and industry. This is evidenced by the following list of KTT activities for 2015/16

Journal Publications

1. Cloke, Jonathan, Katharine Evans, David Crabtree, Annette Hughes, Helen Simpson, **Carlos Leon-Velarde**, **Nathan Larson**, **Keron Dave**, Jani Holopainen, Nina Wickstrand, and Mikko Kauppinen. "Method Modification of the Thermo Scientific SureTect Listeria Monocytogenes Assay for Raw Meat, Dairy, Produce, and Seafood." *Journal of AOAC International* J AOAC Int 98.5 (2015): 1315-324.
2. Cloke, Jonathan, Katharine Evans, David Crabtree, Annette Hughes, Helen Simpson, Jani Holopainen, Nina Wickstrand, Mikko Kauppinen, **Carlos Leon-Velarde**, **Nathan Larson**, **Keron Dave**, Yi Chen, Elliot Ryser, and Mark Carter. "Method Modification Study for the Thermo Scientific SureTect™ Listeria Species Assay–Matrix Extension." *Journal of AOAC International* J Aoac Int 99.2 (2016): 417-27.
3. Jugulam, M., Asma Ziauddin, Kenny K. Y. So, **Shu Chen**, and J. Christopher Hall. "Transfer of Dicamba Tolerance from Sinapis Arvensis to Brassica Napus via Embryo Rescue and Recurrent Backcross Breeding." *PLOS ONE* PLoS ONE 10.11 (2015): DOI: 10.1371/journal.pone.0141418.
4. **Udomsil**, **Natteewan**, **Shu Chen**, Sureelak Rodtong, and Jirawat Yongsawatdigul. "Quantification of Viable Bacterial Starter Cultures of *Virgibacillus* Sp. and *Tetragenococcus Halophilus* in Fish Sauce Fermentation by Real-time Quantitative PCR." *Food Microbiology* 57 (2016): 54-62.
5. Jose Luis Rodriguez-Gil, **Linda Lissemore**, Keith Solomon and Mark Hanson. "Dissipation of a commercial mixture of polyoxyethylene amine surfactants in aquatic outdoor microcosms: Effect of water depth and sediment organic carbon." *Science of The Total Environment* 550 (March 2016):449-458.
6. 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 (February 2016):51-56.
7. Houston, D.M., Vanstone, N.P, Moore, A.E., **Weese, J.S.** "Evaluation of 21,426 feline bladder urolith submissions to the Canadian Veterinary Urolith Centre (1998-2014)" *Can Vet J.* 57 (February 2016): 196-201.

8. **Melzer M, Shan X.** "Diseases diagnosed on plant samples submitted to the Pest Diagnostic Clinic, University of Guelph in 2014". Canadian Plant Disease Survey, 2015.
9. Balamurugan, S., R. Ahmed, **A. Gao.** 2015. Survival of Shiga toxin-producing *Escherichia coli* in broth as influenced by pH, water activity and temperature. Letters in Applied Microbiology 60:341-346.

Invited presentations

1. **Chen, Shu.** Molecular Diagnostic Methods in Food Safety and Quality. Invited Seminar. June 19, 2015. Suranaree University of Technology. Thailand.
2. M. Skurnik, **C.G. Leon-Velarde**, L.J. Happonen, M. Pajunen, A. Nawaz, L. Mattinen, A.M. Kropinski, **S. Chen**, R.P. Johnson, M.W. Griffiths, Joseph A. Odumeru. Characterization of vB_YenM_TG1 and vB_YenM_phiR1-RT, two highly related broad host range bacteriophages infecting *Yersinia enterocolitica*. Presentation at Bacteriophages 2016 meeting, London U.K, January 19-22, 2016.
3. **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.
4. **MacKay, David.** "Effects of neonic pesticides used in field applications of corn on honeybees".
 - a) Eastern Apiculture Society Conference. August 12, 2015. Guelph, ON.
 - b) OMAFRA Meeting. August 20, 2015.
 - c) Ontario Beekeepers Association Annual General Meeting. November 20, 2015. Peterborough ON.
5. **Lissemore, Linda.** "Pesticides in Food". Lecture presented to University of Guelph, Pesticides in the Environment course. April 5, 2016.
6. **Martos, Perry.** "Newest Methods in Veterinary Drug Analysis (implications for high sample throughput and data analysis". AOAC, September 2015. Los Angeles, CA.

Poster presentations

1. Balamurugan, S., **Leon-Velarde, C.** and **Saleh-Lakha, S.** Fate of *Salmonella* spp., *E. coli* O157:H7 and *Listeria monocytogenes* during the manufacture of dry cured Westphalian style ham. International Association for Food Protection Annual Meeting, Portland, Oregon, July 25-28, 2015.
2. Blythe, CA, **Leon-Velarde, C.** and **Saleh-Lakha, S.** Performance of the 3M Molecular Detection Assay *Listeria monocytogenes* as compared to the Canadian Reference Method MFHPB-30. International Association for Food Protection Annual Meeting, Portland, Oregon, July 25-28, 2015.
3. Cloke, J., **Leon-Velarde, C., Larson, N., Dave, K.,** Simpson H, Hopper C, Evans K, Crabtree D, Hughes A, Oleksiuk M, Withey S. Validation of the Thermo Scientific SureTect Real-Time PCR Method for Detection of *Listeria monocytogenes* in Food and Environmental Samples. International Association for Food Protection Annual Meeting, Portland, Oregon, July 25-28, 2015.

4. Cloke, J., Clark D, Radcliff R, **Leon-Velarde C, Larson N, Dave K.** Validation of the Thermo Scientific SureTect Real-Time PCR Method for Detection of Salmonella in Food and Environmental Samples. International Association for Food Protection Annual Meeting, Portland, Oregon, July 25-28, 2015.
5. **Gao, Anli, Jennifer Fischer-Jenssen, Colin Cooper, Susan Lee, Carlos Leon-Velarde, Honghong Li, Jiping Li, Shu Chen and Perry Martos.** 2015. Development of a method for detection of Shiga toxin-producing *Escherichia coli* (STEC) in fruits, vegetables and ready-to-eat meats using real-time multiplex PCR. AOAC 2015. Los Angeles, CA. September 27-30, 2015.
6. **Gao, Anli, Jennifer Fischer-Jenssen, Perry Martos, Susan Lee, Jiping Li, Carlos Leon-Velarde and Shu Chen.** Identification of Foodborne Organisms Using Automated Matrix Assisted Laser Desorption Ionization Time of Flight Mass Spectrometry (MALDI TOF MS) and 16S rRNA Gene Sequence-based Method. OMAFRA 13th Annual Food Safety Research Forum, Guelph. May 8, 2015.
7. **Leon-Velarde C, Chen S,** Griffiths MW, Johnson RP, Odumeru JA. Application of Bacteriophage Receptor Binding Proteins for the Selective Separation of *Yersinia enterocolitica* in Foods. OMAFRA 13th Annual Food Safety Research Forum, Guelph. May 8, 2015.
8. Pajunen, M., **CG. Leon-Velarde,** L.J. Happonen, A. Nawaz, L. Mattinen, A.M. Kropinski, **S. Chen,** R. P. Johnson, M. W. Griffiths, J. A. Odumeru, D. Smith, and M. Skurnik. Identification of phage receptors of two broad host range bacteriophages, vB_YenM_TG1 and vB_YenM_phiR1-RT, *Yersinia enterocolitica*. Presentation at Bacteriophages 2016 Meeting, London U.K, January 19-22, 2016.
9. **Logie, C., CG. Leon-Velarde, S. Lee, S Saleh-Lakha, A. Gao,** J. Chambers, K. Warriner, J.A. Odumeru. Evaluation of Rapid Screening Methods for the Detection of *Salmonella* Enteritidis in Poultry Environmental Samples. Presentation at OFPA Fall Annual Meeting 2015, Mississauga ON, November 20, 2015. (Award Won)
10. **Gao, Anli, Jennifer Fischer-Jenssen, Colin Cooper, Susan Lee, Carlos Leon-Velarde, Honghong Li, Jiping Li, Shu Chen, Perry Martos.** Detection of Shiga Toxin-producing *Escherichia coli* (STEC) in Fruits, Vegetables and Ready-to-eat Meats Using Real-time Multiplex PCR. AOAC International 129th Annual Meeting. September 27-30, 2015. Los Angeles, CA.
11. Balamurugan, S., Rafath Ahmed, **Anli Gao,** Philip Strange. 2015. Survival of non-O157 STEC and *Escherichia coli* O157:H7 during the manufacture of dry fermented sausages. International Association for Food Protection, July 25-28, 2015. Portland, Oregon.
12. **Shan, X., Cao, H., Tudhope, J., Melzer, M.** Application of rapid detection methods in routine plant pathogen screening and disease diagnosis. Botany 2015, Edmonton, Canada.

Tours of AFL

1. For Paul Kozak (OMAFRA), Franco Mutinelli (Italy), Tom Cowan (Ministry of the Environment). Friday August 7 2015.
2. For P5 Raw Milk Quality TC, March 18, 2016
3. For Reed M. Johnson (Ohio State University). April 11, 2016.
4. For Provincial Apiarists from ON, QE, PEI, NB. April 27, 2016.

5. For University of Guelph, Plant Pathology Students, November 2015.

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** - host and co-supervisor of Natteewan Udomsil's PhD thesis research work conducted at AFL, and funded by Thailand Government (as Natteewan's scholarship), in collaboration with Dr. Jirawat Yongsawatdigul (Natteewan's supervisor at Suranaree University of Technology, Thailand). The research is for the development of qPCR methods for quantification of *Virgibacillus* sp. and *Tetragenococcus halophilus* in fish sauce fermentation and analysis of overall microbial population in fish sauce using a next generation sequencing platform, PhD thesis defended, June, 2015.
3. Ogunremi, Dele – PI; **Shu Chen** – Corroborator. 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.

Highly Qualified Personnel (HQP) Training

1. Shu Chen hosted and trained a PhD student (Natteewan Udomsil) for the development of qPCR methods for monitoring fermentation process.
2. Shu Chen hosted and trained a MSc student (Jessica Bannon) for her laboratory work on "Detection and Prevalence of Top 6 non-O157 Shiga Toxin-Producing *Escherichia coli* in Beef", in collaboration with Dr. Keith Warriner, Department of Food Science, University of Guelph.
3. Shu Chen served on graduate committees for PhD 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).
4. Shu Chen hosted and trained an FSQA student (Cynthia Logie) for "Evaluation of rapid screening methods for the detection of Salmonella Enteritidis in Poultry Environmental Samples". Advisor: Dr. Joseph Odumeru, Department of Food Science, University of Guelph.
5. Shu Chen trained a 4th year course project student from the University of Guelph for the development of ddPCR methods for GMO testing.

6. Shu Chen hosted and trained an FSQA student (Helen Redda) and a visiting scholar from the Department of Food Science, University of Guelph for the development of ddPCR methods, in collaboration with Dr. Keith Warriner, Department of Food Science, University of Guelph.

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) in addition to publications and presentations for Knowledge Translation and Transfer (KTT) took place, as proposed in the KTT plans for each of the projects.

Leveraging for Reinvestment and Sustainability

The AFL continues its efforts to leverage its resources and expertise to attain revenue sources sufficient for reinvestment in infrastructure and instrumentation. In so doing, AFL 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 year, it is necessary for the Division to reinvest up to 10 per cent of its total revenues in order to future-proof its capabilities and capacity.

In 2015/16, capital investment included the replacement of several instruments used to support the OMAFRA 'Meat Inspection' and 'Foods of Plant Origin' programs, and the Environmental Management Branch. New equipment was added to enhance pesticide testing as well as increase AFL storage capacity of samples.

It is recognized that the Master Agreement with OMAFRA is a critical element in the Division's ability to maintain the balance between its capacity for leveraging services and remaining a self-sustaining entity within the University of Guelph. For 18 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, and identified niche market opportunities while continuing with applied research 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 (AHL) Program, Laboratory Services Division

The Agreement's [AHL](#) program provides a full-service, fully accredited veterinary diagnostic laboratory that supports provincial diagnostic animal disease surveillance and emergency response.

Within the Agreement, AHL scientists, U of G faculty and OMAFRA's Animal Health & Welfare Branch, and Chief Veterinarian work together to provide a coordinated and informed approach to the management of livestock health in Ontario. AHL leverages the provincial investment by offering laboratory services to other government, commercial and academic clients.

Core Activities

AHL receives specimen submissions from private veterinarians, the Ontario Veterinary College Health Sciences Centre, the Canadian Wildlife Health Cooperative, and researchers. Direct submissions to the AHL from OMAFRA are primarily meat inspection cases. AHL's caseload has exceeded 69,000 cases per year (2008-2015) which generates approximately 800,000 procedures and more than 1,000,000 tests annually. Tests are conducted on specimens of all major and minor animal species in Ontario. AHL also performs a significant volume of export testing for clients in Ontario and across Canada.

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 2015/16, 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.

The AHL continues to have close contact with clients through a range of meetings and activities, including the annual Feedback Group meeting, bimonthly AHL/Pathobiology/Health Sciences Centre 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 20th volume. The AHL moved the newsletter to an electronic format in 2014 as a cost-saving measure, and continues to distribute it to 1,400 readers via email and posting on the AHL website.

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 survey is now conducted biennially, with the latest survey conducted in November 2015. Results of the latest survey are shown in AHL performance indicator #2 of this report.

In addition to the core AHL program encompassed in Schedule E of the Agreement, OMAFRA contracted with the AHL to develop collaboratively a "Disease Surveillance Plan" (DSP) for Ontario. Progress in 2015/16 is described later in this section under 'AHL Operations'.

AHL Infrastructure

The higher containment laboratory (CL2+), room 1822, in the Pathobiology-Animal Health Laboratory is used for routine TSE testing [Transmissible Spongiform Encephalopathies, including

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 of samples for highly pathogenic avian influenza (HPAI) virus during the outbreak in southern Ontario.

The alkaline tissue digester is in bi-weekly use to dispose 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. Significant new testing equipment was added to the inventory of the AHL through Agreement funding.

AHL Operations

The AHL continued to offer a wide spectrum of tests, with addition/replacement of improved tests over time as enhanced through the Partnership's Animal Health Strategic Investment (2008-13) and DSP (2013-18). The following is a list of new and/or improved tests offered by the AHL in 2015/16:

- o *Escherichia coli*, APEC (avian pathogenic *E. coli*) – genotyping
- o Tumor necrosis factor alpha – ELISA
- o Interleukin 6 - ELISA
- o Leptin – ELISA
- o Lymphocyte clonality histology sample prep
- o IHC, lymphocyte clonality – PCR
- o COI mtDNA – gene sequencing and analysis for species identification
- o *Echinococcus multilocularis*, *E. granulosa*, and *Taenia* spp. – triplex PCR
- o *Mycoplasma meleagridis* – real-time PCR
- o *Mycoplasma* species – PCR
- o *Ophidiomyces ophiodiicola* – PCR
- o Small hive beetle (*Aethina tumida*) – PCR
- o *Canid herpesvirus 1* (CaHV-1)-PCR; *Canine adenovirus 2* (CAdV-2)-PCR; *Canine parainfluenza virus* (CPIV)-PCR
- o *Bovine coronavirus* (BCoV) - PCR; Rotavirus ruminant Group A and B – duplex PCR
- o *Seneca Valley virus* – PCR
- o Bovine neonatal enteric panel (includes *Bovine coronavirus* (BCoV) - PCR, Rotavirus ruminant Group A and B - PCR (pcropc), Sucrose wet mount (sucwt), Bacterial culture, food/fiber producing animals (other than swine) (cultf, bsetup).

AHL has deactivated many older or less popular tests, and continues to streamline processes, especially in virology. The AHL accessioned 71,717 cases and performed 795,457 procedures in 2015/16 in support of disease surveillance. Individual procedures are often comprised of multiple tests, e.g., biochemistry profiles of 20 tests each. (See AHL caseload distribution tables and graphs below).

The AHL published 31 scientific articles in the quarterly AHL Newsletters in 2015 (total of 44 pages in 2015). As well, AHL veterinarians authored or co-authored 41 oral or poster presentations and 15 peer-reviewed publications in calendar 2015. The AHL performed testing for a total of 77 legal cases (AHL Guelph, $n=67$; AHL Kemptville, $n=10$). Mammalian pathologists appeared in court a total of five times in 2015/16.

The American Association of Veterinary Laboratory Diagnosticians (AAVLD) accreditation site visit conducted on June 16-19, 2014 resulted in the Animal Health Laboratory, Laboratory Services

Division, University of Guelph maintaining full accreditation for all species. The AHL has full accreditation by the AAVLD for 5 years through December 31, 2019.

Pathologists in the AHL Kemptville lab participated in a Classical swine fever disease postmortem-based laboratory Foreign Animal Disease (FAD) emergency exercise in November 2015. Pathologists in the AHL Guelph lab participated in a “Lips and toes disease” postmortem-based laboratory FAD emergency exercise in March 2016.

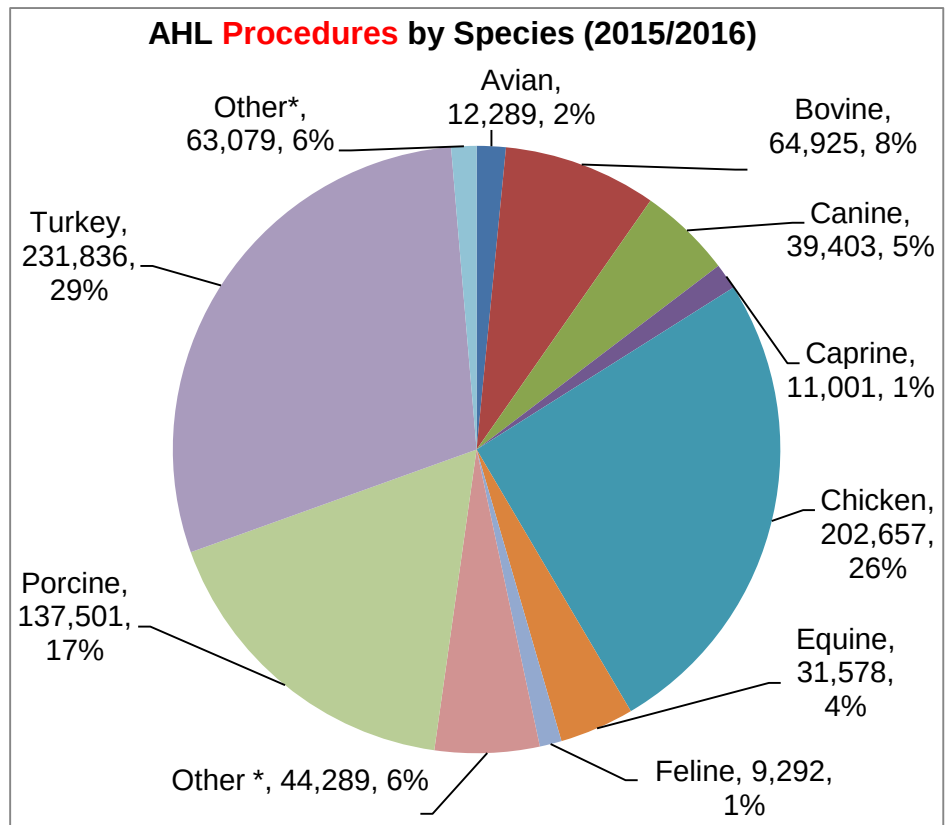
Real time reporting to OMAFRA of immediately notifiable hazards identified in the OCVO (Office of the Chief Veterinarian of Ontario) Animal Health Act Regulations occurs throughout the day via automatic email alerts of positive results in the range of tests available for each hazard. OMAFRA is kept well informed of laboratory-based identification of hazards, and can access full information on each case cited by the Web Intelligence (WebI) system that queries the AHL data warehouse. This auto-alert system became fully functional on January 1, 2013.

From May 1, 2015 to April 30, 2016, WebI searches were done for OMAFRA, AHL veterinarians, OVC researchers, CFIA, and the OAHN (Ontario Animal Health Network) 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

AHL Caseload Distribution (May 1, 2015 – Apr 30, 2016)

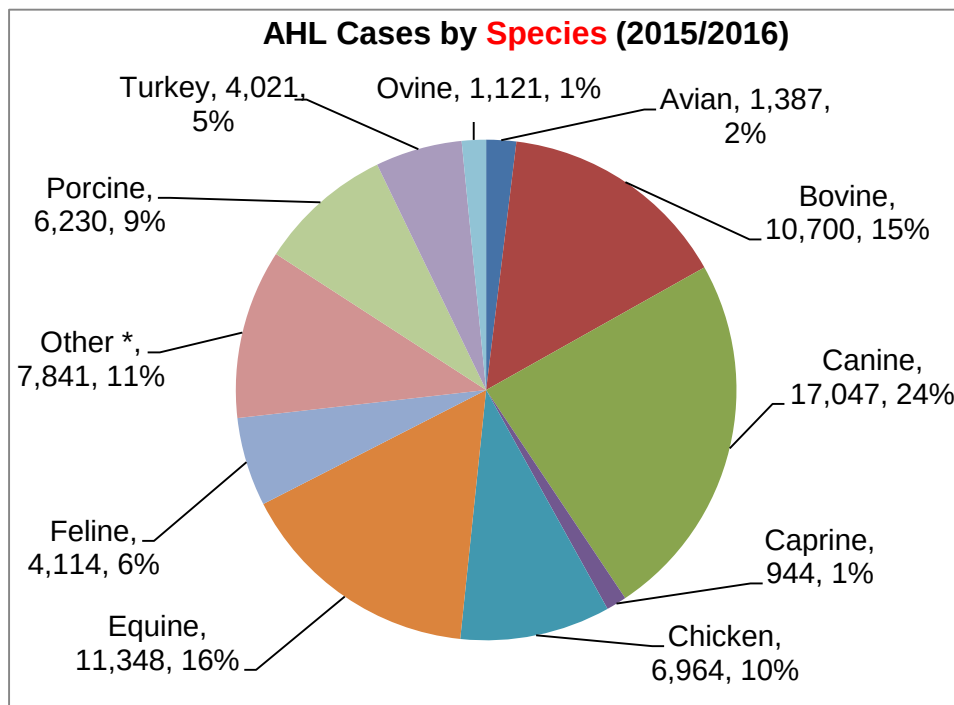
• 71,717 cases • 795,457 procedures • 1,000,000 tests

AHL Function	# tests
Virology	582,767
Bacteriology	78,778
Clinical Pathology	51,543
Histotechnology	28,648
External	26,440
Mycoplasma	11,211
Anatomic Pathology	6,137
Parasitology	5,511
Toxicology	4,315
Total Tests	795,457



*Other = bees, fish, other animals and non-animal

AHL Function	# cases
Clinical Pathology	18,789
Virology	16,150
Bacteriology	15,034
Toxicology	6,079
Histotechnology	6,014
Anatomic Pathology	2,755
Parasitology	2,501
External	2,483
Mycoplasmaology	11,912
Total Cases	71,717



*Other = bees, fish, other animals and non-animal

Disease Surveillance Program (DSP) 2015/16

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

Annual face-to-face meetings ("Staying ahead of the curve") have been held with stakeholders in the fall of 2013, 2014, and 2015. Agendas and proceedings are posted on the Partnership website: http://www.uoguelph.ca/omafra_partnership/en/partnershipprograms/DiseaseSurveillancePlanDSP.asp

In 2015/16, the building of the Ontario Animal Health Network (OAHN) was completed as the core of the DSP. The expert species networks include membership from OMAFRA, OVC, the AHL, and private practice in support of disease surveillance in all of the major and minor animal sectors in Ontario. The networks contribute to:

- Early detection to prevent epidemics.
- Monitoring animal health to maintain baseline data.
- Proving freedom from disease in support of productivity and trade.

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. Quarterly veterinary reports are posted on the private side of the website.

DSP Pillar 1 – Developmental activities

Activities included:

- April 2016 – Via competition, hired Dr. Melanie Barham as Ontario Animal Health Network Coordinator to continue with her work on the expert networks in Ontario serving various sectors – swine, poultry, bovine, small ruminants, equine, fish, bees, companion animals, wildlife, and alternative species.
- October 1, 2015 – Annual "Staying ahead of the curve" (the epidemic curve that is!) DSP stakeholder meeting. Agenda, attendees, presentations posted on Partnership website.
- Fall 2015, winter 2016 – conducted various stakeholder consultations, focus groups, presentations to Ontario Association of Poultry Veterinarians, Small Ruminant Veterinarians of Ontario, Ontario Association of Equine Practitioners, Ontario Association of Bovine Practitioners, and Ontario Association of Swine Veterinarians. Participated in the formation of Swine Health Ontario – a partnership of Ontario Pork, Ontario Pork Industry Council, and OMAFRA.

DSP Pillar 2 – Enhance Ontario disease surveillance

Objectives of the OAHN Strategic Plan are to:

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

Each network consists of (at minimum) an expert from each of OMAFRA, OVC, the AHL, and one to four 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. These are discussed in a quarterly teleconference of the expert network.

During fiscal year 2015/16, all of the expert networks were functional: small ruminants, poultry, equine, bovine, fish, honeybees, alternative species/fur-bearing animals and companion animals. The wildlife network is run in concert with the Canadian Wildlife Health Cooperative (CWHC), and in swine, the OAHN-swine network serves as the Ontario node in the Canadian Swine Health Information Network, (CSHIN) which had been operating for four years.

DSP Pillar 3 – Integrate with national surveillance

Among the accomplishments under this pillar are:

- Continued collaboration with a cross-Canada technical working group planning for integration of selected provincial laboratory surveillance data into the Canadian Animal Health Surveillance Network (CAHSN) – British Columbia, Saskatchewan, Ontario (Growing Forward 2)
- Developed a framework for the ‘network of networks’, which has become the Canadian Animal Health Surveillance System (CAHSS):
 - o September 2014 – CAHSN Governance meeting Ottawa, facilitated by Dr. McNab
 - o October 2014 – CEZD-IIR (Center of Emerging and Zoonotic disease – Integrated Intelligence and Response)
 - o November 2014 – National Farmed Animal Health and Welfare Council, Ottawa. Support was formally received for the ‘network of networks’ concept. Appointed Cheryl James, CAHSN coordinator, & Francois Bedard, AAFC secretariat.
 - o December 2014; Jan, 2015 – CAHSS Champions group met – Vision, Mission developed
 - o March, May 2015 – Directors’ group teleconferences – Purpose, Principles generated
 - o June 23/24, 2015 – Directors meet in Ottawa – action plan developed
 - o Feb 2016 – poultry and swine sector meetings in Ottawa, CAHSS website under development

DSP Pillar 4 – Better tools for managing risk

Under this pillar, the following were accomplished:

- Staffing: six technicians hired, two-year temporary full time to expedite test development. Contracts expired in April 2016.
- Equipment purchased and implemented: Molecular – Lightcycler 480, Lightcycler 96, Microscopes (Guelph-Kemptville link), Advia 2120 hematology analyzer, -80 degree C freezers, microplate dispensers, decapper, pass-through fridges
- Renovated Specimen Reception – streamlined flow, improved biocontainment
- New tests (note SCC flexible scope additions):
 - o Bees – validated tests for mites, PCR for 7 viruses, *Nosema* fungus, vitellogenin biomarker, 26K bee PCRs in winter 2015
 - o Fish – gross and histopathology, VHSV, bacteria (MALDI-TOF) - Dr. Nikki LePage (contract fish pathologist)
 - o Swine – porcine coronavirus triplex PCR (PEDV, PDCoV, TGEV), orf virus/papular stomatitis virus PCR, virus sequencing
- CDV, CPV-2/FPLV PCR, feline calicivirus / herpesvirus PCR, amphibian chytrid fungus PCR.
- Surge capacity maintained year-round, and has benefited from the acquisition of high-volume equipment funded by OMAFRA.

Research Program

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.

Project Funding

For 2015/16, 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 2015/16 was 61.

Examples of proposals funded in each research theme included:

- Development of Russian Dandelion as a rubber crop for Ontario (Bioeconomy research theme)
- Putting more nutrition on the plate at a reduced cost (Food for Health research theme)
- An evidence-based mental health literacy program and emergency mental health response model for Ontario agriculture (Emergency Management research theme)
- Cultural, biological and chemical management of downy mildew of hops (Production Systems – Plants research theme)
- Promoting a smooth transition to lactation by changing the particle size of diets of early lactation cows (Production Systems – Animal research theme)
- Robotics in greenhouses: precision scouting for disease detection and yield prediction. (Products and Value Chains research theme)
- Developing an approach to measure and monitor local food consumption in Ontario (Agricultural and Rural Policy research theme)
- Diverse cropping systems as a best management practice: Insight from lysimeters on soil health, air and water quality (Environmental Sustainability research theme)

More examples of research projects underway in each theme can be found in the [2016 Agri-Food Yearbook](#), published and posted on the U of G website.

OMAFRA investment in the Agreement's research program continued to leverage external third party funding. For 2015/16, the ratio of leveraged research operating funds to OMAFRA funding was 1.8:1. Specifically, \$10.7 million of third party (non-Ontario government funds) was leveraged by OMAFRA's \$6.0 million of research operating funding. This is one of the Research Program's key performance indicators.

Infrastructure

The [Agricultural Research Institute of Ontario's](#) (ARIO) ten-year research infrastructure strategy continued to be implemented by the U of G through 2015/16. The strategy is foundational to the Agreement Research Program and its ability to address OMAFRA research priorities.

The new [Livestock Research and Innovation Centre - dairy research facility](#) at Elora was completed and commissioned in fall 2015. Work continued on the relocation of the Guelph

Turfgrass Institute, development of a comprehensive site plan for new beef, swine and poultry research facilities at Elora, and planning new crops capacity at the New Liskeard, Winchester and Huron research stations. Significant minor capital projects included construction of an irrigation system at the Muck research station, refurbishment of the Ridgetown Vet Tech Building, and major equipment purchases to enhance the crops research capability at the Winchester station.

Also as part of the ARIO Infrastructure Strategy, significant changes occurred at the Kemptville and Alfred campuses:

- All Kemptville and Campus d'Alfred research programs and project operations were discontinued or phased down at these locations by July 30, 2015 or earlier, with few exceptions. (In a couple of cases, access to field plots was granted to researchers to the end of the field 2015 season.)
- Where Kemptville or Alfred researchers relocated to either Guelph or Ridgetown, these researchers retained responsibility for continuance of any on-going projects from their new location. Any un-completed projects led by other researchers who departed from the U of G, were reassigned to other U of G researchers for completion.
- Eastern Ontario field crops research projects and operations (including support staff) were refocused in summer 2015 to be conducted predominantly using the Winchester Research Station, although a few longer-term trials based on the Kemptville Campus remained in continued use, under the endorsement of OMAFRA/ARIO.
- All other research support operations (i.e., staffing, dairy facility operations, etc.) were also phased down and terminated through the spring and summer of 2015 (i.e. Alfred dairy operations were transferred to a new operator effective Sept 1, 2015 and at Kemptville, dairy operations ceased as of Sept 30).
- The U of G remains responsible, under contract to OMAFRA through the OMAFRA - U of G Agreement, for management oversight of the facilities (building operations, maintenance, utilities, etc.) at both Kemptville, and Campus d'Alfred, largely to ensure that the needs of existing and new tenants of the ARIO properties are adequately serviced. This responsibility remains in place until March 2018, subject to any sale or transfer of property ownership or oversight to another party in the interim.

[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 2015/16, U of G undertook the following initiatives in collaboration with OMAFRA:

KTT Research Program

The annual Call for Letters of Intent (LOIs) to the [KTT Research Program](#) was held in fall 2015, but projects were not selected until May 2016, so they will be reported in the Agreement's 2016/17 annual report. A listing of these projects and summaries is available [on-line](#).

As of the end of 2015/16, there were 16 active KTT Research Program projects (10 approved in spring 2015 and six approved earlier). They are listed in the table below and on the KTT website.

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 Research Program Projects (Active in 2015/16)

Project Title	U of G Dept.
The hard-to-reach veterinarian: understanding KTT preferences of dairy veterinarians to effectively communicate and deliver provincial programs*	Population Medicine
Understanding opinion leaders in online media to balance the agricultural biotechnology conversation*	Food Science
Guelph Family Health Study: improving family health by increasing knowledge translation between Ontario agriculture, policy makers, researchers, health professionals, and parents*	Family Relations & Applied Nutrition
Mapping food waste challenges and opportunities across the value chain*	Geography
Performance benchmarking for Ontario dairy farms: shaping the future through understanding the present*	Food, Agricultural & Resource Economics
Building healthy rural communities through knowledge translation, transfer and dissemination*	School of Environmental Design & Rural Development
Developing a web GIS based modelling tool for examining the cost effectiveness of best management practices in a representative agricultural watershed*	Geography
Apps to foster precision feeding on Ontario dairy farms*	Animal Biosciences
Growing the biomass marketplace: agronomy, and livestock bedding - knowledge and application*	Plant Agriculture
Development and delivery of workshops and guidebook on wastewater management for dairy and beef operations*	Ridgetown Campus

* Projects approved spring 2015

Development of smartphone apps for implementation of dairy health management research by producers and advisors (i-Ketone)**	Population Medicine
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Taking the pain out of disbudding in dairy calves for dairy producers**	Population Medicine
Bridging the gaps in Ontario agriculture, food, nutrition and health to create healthy aging strategies**	Human Health and Nutritional Sciences
Creating, translating, and transferring knowledge for rural innovation: assessing the potential for a rural knowledge network for Ontario**	School of Environmental Design & Rural Development
Distance support for on-farm investigation of adult small ruminant mortalities**	Animal Health Lab
Enhanced variety selection and crop management through information technology**	Computer Science

** Projects approved spring 2014

KTT Knowledge Mobilization and Communications

The Agri-Food and Rural Link name and logo continued to be used as the KTT program branding. A Twitter feed was active until Nov 2015, when KTT Unit staff vacancies forced a tweeting hiatus. At the time, the Twitter followers numbered over 2,680. (Tweeting resumed in summer 2016.) U of G KTT staff also continued to manage the U of G web pages of the Agreement Research, HQP and KTT programs.

The Agreement's [2016 Agri-Food Yearbook was published](#), distributed to all 3000+ readers of 'Ontario Farmer', and posted on the Agreement website. Three editions of the "Buzz" e-newsletter were sent to more than 2800 contacts in the 2015/16 year. The newsletter showcases partnership research and events to internal and external stakeholders.

The OMAFRA and U of G KTT staff continued to deliver research and knowledge exchange events for stakeholders such as industry, government, and other researchers, across several research themes, as listed below:

- Food for Health research day*
 - Value Chain/Product Development research day*
 - Emergency Management research day*
 - Guelph Family Health study presentation
 - Food Waste presentation to OMAFRA employees
 - Small regulatory RNAs in embryos
 - Dairy Cow behaviour and feed management
 - Best Practices for aquatic ecosystem health
 - Mobile food processing facilities
 - Climate change research update by F.A.R.E.
 - Climate change findings by Dr. Alan Kerr
 - Climate change findings by Dr. Wagner-Riddle
 - KTT Community of Practice Guelph
- *webinar also offered

In support of the development of HQP beyond the scholarship program, the U of G offers an 'affiliated researcher program' to OMAFRA staff so they may have access to online and print publications in the U of G library. Since the program was launched in 2008, 163 OMAFRA applicants have been approved for two-year access to the library's resources. In 2015/16, there were 16 new and 40 renewed accounts.

Highly Qualified Personnel (HQP) Scholarship Program

The [HQP program](#) is intended to enhance the agri-food business skills of graduate students for the benefit of the students, their future employers, and Ontario's agri-food industry. As of the beginning of 2015/16, there were 11 masters and nine doctoral students in the HQP program. The 2015/16 HQP awards added a further four masters students and three doctoral students. Since 2008/09, approximately 130 students and their employers have benefitted from this program. A profile of the experiences of two HQP students are described below:

Nael Thaher is a PhD candidate in the School of Environmental Design and Rural Development. His research is in the area of intellectual property (IP) and technology transfer. Specifically, he has been reviewing legislation, policies and strategies for management of IT related to OMAFRA. Over the course of his PhD, he has had contact with grower and government organizations and made several presentations at KTT related events. Nael's work term was spent at the U of G's Catalyst Centre. He attended IP courses at the World Intellectual Property Organization in Geneva, Switzerland and an international conference in Rio de Janeiro, Brazil. A case study he developed on Round-up Ready™ soybeans, which included data from Brazil, received international recognition. Nael expects to complete his PhD in early 2017.

Sarah Hirschfeld is a MSc student in the Department of Plant Agriculture. Her research is the first to systematically catalog plant communities for Canadian permaculture farms. This study will analyze biodiversity and landscape heterogeneity in order to evaluate the potential of permaculture farms in contributing to food security and ecological conservation. Sarah completed her internship during the summer of 2016 in Salmo, British Columbia where she learned sustainable practices by working with the head grower on an organic farm. Sarah was involved in all aspects of the farm which uses intercropping and companion planting practices. The organic produce was marketed locally and was a major supplier to a large music festival.

In addition to the formalized HQP program, the '[Student Undergraduate 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.

Note: Although the KTT and HQP programs *per se* occurred within the Agreement's Research Program in 2015/16, 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

The past year was one of transition for Catalyst Centre (CC), which will continue into fiscal 2017 as the University evaluates how to best support the Centre's services. The year has also seen a focus on increasing the visibility of the Catalyst Centre, resulting in a newsletter, new posters that successes of commercialization activities achieved through the OMAFRA – U of G Agreement, and the development of an annual report document (not yet published).

In 2015/16, the CC reported 10 disclosures of intellectual property, 35 patents filed, 23 licenses and options granted, and six patents and plant breeders rights certificates issued – all related to OMAFRA funded technologies. Total license revenue for OMAFRA-supported research exceeded \$1.8 million, an increase of 11 per cent over the previous year.

Appendix A-2 details these numbers and percentages of OMAFRA-funded technology results.

In addition to the management of the intellectual property listed above, the CC further advanced the commercialization of Agreement-supported research including:

- A compostable resin developed for production of compostable coffee pods by Coffee Roaster Club Coffee. They are in use by Loblaw in their President's Choice line, and by US companies such as Hills Bros.
- A technology to improve the shelf life of fruits and vegetables through use of a naturally occurring plant chemical, hexanal. It has resulted in the formation of the start-up company 'Harvest One Agritech', of B.C.
- Ontario start-up company 'Smart Green Technologies' achieved its first commercial sales in fiscal 2016. The company arose from the research program of Dr. Youbin Zheng to produce green roof technologies for the Ontario and other markets.

Read about these case studies and many more in the 2016 Agri-Food Yearbook.

The Agreement's 'Industry Liaison' program at the CC continued to help industry leverage support from OMAFRA, Ontario Centres of Excellence, Ontario Centres for Innovation, Natural Sciences and Engineering Research Council, MITACS and others. Examples of research-industry collaborations that have arisen from this program include:

- Commercial production of apple rootstocks in collaboration with an Ontario nursery.
- Evaluation of systems to remove airborne pathogens from poultry barns.

The Catalyst Centre again delivered the Gryphon's LAAIR (Leading to Accelerated Adoption of Innovative Research) research commercialization program in 2015/16, which has seen a wide variety of projects successfully enter or scope out the marketplace. Ten more projects were funded in 2015/16, and are listed below:

Gryphon's LAAIR: Projects Funded in 2015/16

A. <u>Gryphon's LAAIR Commercialization Stream - Maximum \$125,000 award</u>	
Technology	Researcher
Airlift pump technology for sustainable aquaculture production	Wael Ahmed
Advanced nutraceuticals from Ontario sweet corn	John Dutcher

On-farm field trial to validate a point-of-care device for detection of metabolic diseases in dairy cattle	Suresh Neethirajan
B. <u>Gryphon's LAAIR Exploration Stream – Maximum \$25,000 award</u>	
Technology	Researcher
Evaluation of advanced wine grape selections for cool/cold climate wine growing regions	Helen Fisher
Evaluation of avian flu multiplex biosensor platform to the point of care setting	Suresh Neethirajan
Automated plot extraction and image analysis software-as-a-service for agricultural fields	Graham Taylor
Unlocking new value for an old crop: Measuring and identifying channel specific strategies to commercialize a differentiated Ontario quinoa based food product.	John Cranfield
Developing a reagent to detect fecal antibodies against <i>Mycobacterium avium</i> subsp. Paratuberculosis	Lucy Mutharia
Market assessment of a chromosome screening and diagnostic service for the swine industry	Wm. Allan King
Integrated plant production system for Hop (<i>Humulus lupulus</i> L.)	Praveen Saxena
A new biopesticide for greenhouse crops: mode of action, regulatory requirements and patent protection	Brandon Gilroyed
Testing of novel micro-algal strains for the reduction of carbon dioxide, nitrates, and phosphates in recirculating shrimp aquaculture systems	Andreas Hyland

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 a responsibility to distribute funds to the most promising projects in terms of commercial potential. In 2015/16, one new project received funding – a project from U of G researcher Istvan Rajcan to develop a modified soybean oil useful for industrial applications.

Veterinary Clinical Education Program (VCEP)

VCEP supports faculty and programs critical to the clinical training of undergraduate and graduate students at the Ontario Veterinary College (OVC), U of G. Within the Agreement, VCEP ensures OVC remains an internationally renowned leader in the training of veterinarians with competencies to meet the needs of Ontario's human and animal populations. In doing so, it provides highly respected post-graduate training and research programs to raise the standard of veterinary and public health in Ontario.

In 2015/16, OVC was again ranked in the top ten (8th place) veterinary schools in the world by the prestigious Quacquarelli Symonds (QS) World Rankings for 2016. In April 2016, OVC received

notice from the American Veterinary Medical Association (AVMA) that it was granted continued accreditation for another seven years, the maximum period permitted. Accreditation is essential to the operation and reputation of OVC, and dependent upon the capacity that 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 2015/16, VCEP continued to fund research and mobilization of knowledge in priority areas of these themes, as well as development of Highly Qualified Personnel (HQP) through graduate and undergraduate programs, support for the OVC Health Sciences Centre. These activities are reported by research theme, below.

a) OMAFRA Research Theme: Production Systems (animal health, animal welfare and impact on environmental ecosystem)

OVC Faculty allocations (four 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 include;

- Farm-level prevalence and risk factors for the detection of hepatitis E virus, porcine enteric calicivirus, and rotavirus in Canadian finisher pigs.
- Development of a network based model to simulate the between-farm transmission of the porcine reproductive and respiratory syndrome virus.
- An on-farm comparison of keel fracture prevalence and other welfare indicators in conventional cage and floor-housed laying hens in Ontario.
- Investigations into the association of rumination time with subclinical ketosis in transition dairy cows.

Highly Qualified Personal (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 areas of research include;

- Improvements to disbudding and dehorning practices in Ontario dairy calves by producers and veterinarians.
- Management through the peripartum period for improvement of metabolic and reproductive health in dairy cows.
- Investigation of the immune response of sheep to gastrointestinal nematode infection under Ontario grazing conditions for the purposes of identifying genetically resistant animals.
- Environmental toxicants and stress: Failure of innate immunity in development of pneumonia in cetaceans.
- Characterization of the fecal bacterial microbiome of commercial mink
- Stimulation of the innate immune system as a means to reduce the impact of bovine respiratory disease.
- Equine Herpesvirus -1: prevalence, shedding and reactivation
- Understanding the diagnosis and risk factors for respiratory disease in dairy calves
- Characterization of the equine airway microbiome using high throughput sequencing
- EEG analyses in poultry undergoing physical euthanasia methods

OVC Post-graduate clinical training (six 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.

OVC 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. It 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 in 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 final year DVM students completing their clinical rotations.

VCEP funding provides support for the clinical service and teaching responsibilities of the faculty to ensure the continuity of veterinary service for OVC clients, and to allow the faculty to focus their time on educating the students. This is critical to 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) OMAFRA Research Theme: Emergency Management (zoonoses / public health, foreign animal disease, food safety)

OVC 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:

- A study of the spatial-temporal epidemiology of human *Salmonella enteritidis* infections with major phage types in Ontario.
- Study of antimicrobial dispensing practices by Ontario dairy veterinarians.
- Investigations of the biosecurity risks associated with the feed delivery.
- A study of climate-sensitive health priorities in Nunatsiavut, Canada.
- Descriptive analysis and spatial epidemiology of porcine reproductive and respiratory syndrome (PRRS) for swine sites participating in area regional control and elimination programs from three regions of Ontario.
- Seasonal prevalence and determinants of food insecurity in Iqaluit, Nunavut.
- Extended spectrum cephalosporin resistance genes in *Escherichia coli* from beef cattle.

Centre for Public Health and Zoonoses support (CPHAZ) – (one staff FTE – \$100K). CPHAZ (<http://ovc.uoguelph.ca/cphaz>) was established in 2006 to coordinate existing public health research related to zoonoses, and promote new collaborative research activities. Aimed at enhancing the capacity to solve problems and implement public health solutions 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 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. (five 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 in swine herds.

- 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) OMAFRA Research Theme: Agricultural and Rural Policy (rural business and communities)

Summer Career Opportunities and Research Experience (CORE) (\$49K)

Each year, approximately 50 students from both DVM and BSc degree programs participate in a summer research experience in which they participate in the research project of their faculty mentor. In addition to their individual research projects, the students attend a series of seminars where they are exposed to a variety of career opportunities. At the end of the summer, the students prepare and present a poster on their summer research. The four student projects funded by VCEP this year are:

- Evaluation of a camera for body condition scoring of dairy cattle
- Investigation of immune response of sheep to gastrointestinal nematode infection under Ontario grazing conditions for purposes of identifying genetically resistant animals
- Estimating incidence of infection with Influenza A virus in replacement breeding stock in pig herds
- Phase II in the development of a vaccine to protect against *Toxoplasma gondii* infection in sheep

In January 2016, a research project was initiated entitled: *The rural community veterinary practitioner: using student, veterinary practitioner and faculty focus groups to inform curriculum at the Ontario Veterinary College*. An MSc (Epidemiology) graduate student is working on this project and VCEP funds are providing operating support for the research.

Veterinary Externship (0.5 staff FTE- \$80K; plus experiential learning for 4th year DVM students - \$200K)

As part of the final (4th) year of the veterinary program, all final year students are placed in a private, multi-species veterinary practice. This exposes them to practice in a rural community and consolidates their knowledge and skills in a hands-on, real-world setting. The externship course began in the mid-1980s to provide practical experience to DVM students entering their final year. More than 40 of the practices that host these students have been involved for more than 20 years, and 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 externship 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 2015/16 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, 2015 to April 30, 2016” 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, 2015 to April 30, 2016 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 2014/15 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 beginning in 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, 2015 - April 30, 2016).
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 2015/16 Actuals - Revenue & Expenses of <u>Entire Agreement</u> by Program (in thousands of dollars)								
Base Agreement (Fund 110): All Programs								
	Object Category	Research	Vet Clinical Education	Agri-Food Lab	Animal Health Lab	ARIO Minor Capital	Total Agreement	
Revenue	OMAFRA Agreement	(44,660)	(4,773)	(6,310)	(5,975)	-	(61,718)	
	OMAFRA Other	-	-	(500)	-	(5,037)	(5,537)	
	Sales Goods & Services	(4,609)	-	(7,373)	(5,862)	-	(17,844)	
	Other Revenue & Interest	(1,723)	(2)	(7)	(2)	-	(1,734)	
	Total Revenue	(50,967)	(4,775)	(14,190)	(11,839)	(5,037)	(86,834)	
Expenses	Personnel	21,324	65	9,916	8,516	6	39,827	
	Faculty Pool Costs	8,900	1,900	-	-	-	10,800	
	Operating	13,993	2,725	4,422	4,624	5,031	30,796	
	Internal Sales & Recoveries	(3,055)	(35)	(435)	(1,564)	-	(5,089)	
	Indirect Costs	9,830	120	287	263	-	10,500	
	Total Expense	50,967	4,775	14,190	11,839	5,037	86,834	
	Net Expense (Revenue)	-	-	-	-	-	-	
New Initiatives (Fund 111): All Programs								
	Object Category	Total Research	Vet Clinical Education	Agri-Food Lab	Animal Health Lab	ARIO Minor Capital	Total New Initiatives	
Revenue	OMAFRA Agreement	(1,332)	9	-	-	-	(1,324)	
	OMAFRA Other	-	-	-	-	-	-	
	Sales Goods & Services	-	-	-	-	-	-	
	Other Revenue & Interest	(1)	-	-	-	-	(1)	
	Total Revenue	(1,333)	9	-	-	-	(1,325)	
Expenses	Personnel	785	-	-	-	-	785	
	Faculty Pool Costs	-	-	-	-	-	-	
	Operating	557	(9)	-	-	-	548	
	Internal Sales & Recoveries	(9)	-	-	-	-	(9)	
	Indirect Costs	-	-	-	-	-	-	
	Total Expense	1,333	(9)	-	-	-	1,325	
	Net Expense (Revenue)	-	-	-	-	-	-	

Growing Forward 2 – Additional Base (Fund 112): All Programs								
	Object Category	Total Research	Vet Clinical Education	Agri-Food Lab	Animal Health Lab	ARIO Minor Capital	Total New Initiatives	
Revenue	OMAFRA Agreement	(1,508)	(521)	-	(1,012)	-	(3,041)	
	OMAFRA Other	-	-	-	-	-	-	
	Sales Goods & Services	(6)	-	-	(170)	-	(176)	
	Other Revenue & Interest	(36)	-	-	-	-	(36)	
	Total Revenue	(1,550)	(521)	-	(1,182)	-	(3,253)	
Expenses	Personnel	688	87	-	580	-	1,355	
	Faculty Pool Costs	-	-	-	-	-	-	
	Operating	868	437	-	602	-	1,907	
	Internal Sales & Recoveries	(6)	(3)	-	-	-	(9)	
	Indirect Costs	-	-	-	-	-	-	
	Total Expense	1,550	521	-	1,182	-	3,253	
	Net Expense (Revenue)	-	-	-	-	-	-	
Total Partnership (Renewed Agreement, New Initiatives & Growing Forward 2): All Programs								
	Object Category	Total Research ¹	Vet Clinical Education	Agri-Food Lab	Animal Health Lab	ARIO Minor Capital	Total Partnership	
Revenue	OMAFRA Agreement	(47,500)	(5,285)	(6,310)	(6,987)	-	(66,082)	
	OMAFRA Other	-	-	(500)	-	(5,037)	(5,537)	
	Sales Goods & Services	(4,615)	-	(7,373)	(6,032)	-	(18,020)	
	Other Revenue & Interest	(1,760)	(2)	(7)	(2)	-	(1,771)	
	Total Revenue	(53,875)	(5,287)	(14,190)	(13,021)	(5,037)	(91,410)	
Expenses	Personnel	22,797	152	9,916	9,096	6	41,967	
	Faculty Pool Costs	8,900	1,900	-	-	-	10,800	
	Operating	15,418	3,153	4,422	5,226	5,031	33,249	
	Internal Sales & Recoveries	(3,070)	(38)	(435)	(1,564)	-	(5,106)	
	Indirect Costs	9,830	120	287	263	-	10,500	
	Total Expense	53,875	5,287	14,190	13,021	5,037	91,410	
	Net Expense (Revenue)	-	-	-	-	-	-	

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

Summary 2015/16 Actuals – Revenue and Expenses by Research Sub- Program or Theme (in thousands of dollars)

Base Agreement: 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	(17,457)	(952)	(3,188)	(2,271)	(1,986)	(1,781)	(1,253)	(8,560)	(7,175)	(12)	-	(25)	(44,660)
	OMAFRA Other	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sales Goods & Services	(215)	-	-	(4)	-	-	-	(4,346)	(44)	-	-	-	(4,609)
	Other Revenue & Interest	(307)	(6)	(25)	(19)	(69)	(11)	(8)	(405)	(873)	-	-	-	(1,723)
Total Revenue		(17,979)	(958)	(3,213)	(2,294)	(2,055)	(1,792)	(1,261)	(13,311)	(8,092)	(12)	-	(25)	(50,967)
Expense	Personnel	7,878	116	829	506	376	406	317	8,281	2,604	11	-	-	21,324
	Faculty Pool Costs	4,349	393	950	1,171	850	778	409	-	-	-	-	-	8,900
	Operating	1,382	170	375	165	243	103	127	5,361	6,041	1	-	25	13,993
	Internal Sales & Recoveries	(928)	-	(71)	(46)	(5)	-	(8)	(1,215)	(782)	-	-	-	(3,055)
	Indirect Costs	5,298	279	1,130	498	591	505	416	884	229	-	-	-	9,830
	Total Expense	17,979	958	3,213	2,294	2,055	1,792	1,261	13,311	8,092	12	-	25	50,967
Net Expense (Revenue)		-	-	-	-	-	-	-	-	-	-	-	-	-

New Initiatives: 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	(266)	(223)	(204)	(82)	(235)	(133)	(110)	-	-	(52)	(27)	-	(1,332)
	OMAFRA Other	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sales Goods & Services	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other Revenue & Interest	-	-	-	-	(1)	-	-	-	-	-	-	-	(1)
Total Revenue		(266)	(223)	(204)	(82)	(236)	(133)	(110)	-	-	(52)	(27)	-	(1,333)
Expense	Personnel	134	168	124	63	126	76	67	-	-	-	27	-	785
	Faculty Pool Costs	-	-	-	-	-	-	-	-	-	-	-	-	-
	Operating	133	62	80	20	110	57	43	-	-	52	-	-	557
	Internal Sales & Recoveries	(1)	(7)	-	(1)	-	-	-	-	-	-	-	-	(9)
	Indirect Costs	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Expense	266	223	204	82	236	133	110	-	-	52	27	-	1,333
Net Expense (Revenue)		-	-	-	-	-	-	-	-	-	-	-	-	-

Continued: Summary 2015/16 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	-	-	-	-	-	-	-	-	-	(358)	(411)	(739)	(1,508)
	OMAFRA Other	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sales Goods & Services	-	-	-	-	-	-	-	-	-	(6)	-	-	(6)
	Other Revenue & Interest	-	-	-	-	-	-	-	-	-	-	(36)	-	(36)
	Total Revenue	-	-	-	-	-	-	-	-	-	(364)	(447)	(739)	(1,550)
Expense	Personnel	-	-	-	-	-	-	-	-	-	4	221	463	688
	Faculty Pool Costs	-	-	-	-	-	-	-	-	-	-	-	-	-
	Operating	-	-	-	-	-	-	-	-	-	360	226	282	868
	Internal Sales & Recoveries	-	-	-	-	-	-	-	-	-	-	-	(6)	(6)
	Indirect Costs	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Expense	-	-	-	-	-	-	-	-	-	364	447	739	1,550
	Net Expense (Revenue)	-	-	-	-	-	-	-	-	-	-	-	-	-

Continued: Summary 2015/16 Actuals Revenue and Expenses by **Research** Sub-Program or Theme *(in thousands of dollars)*

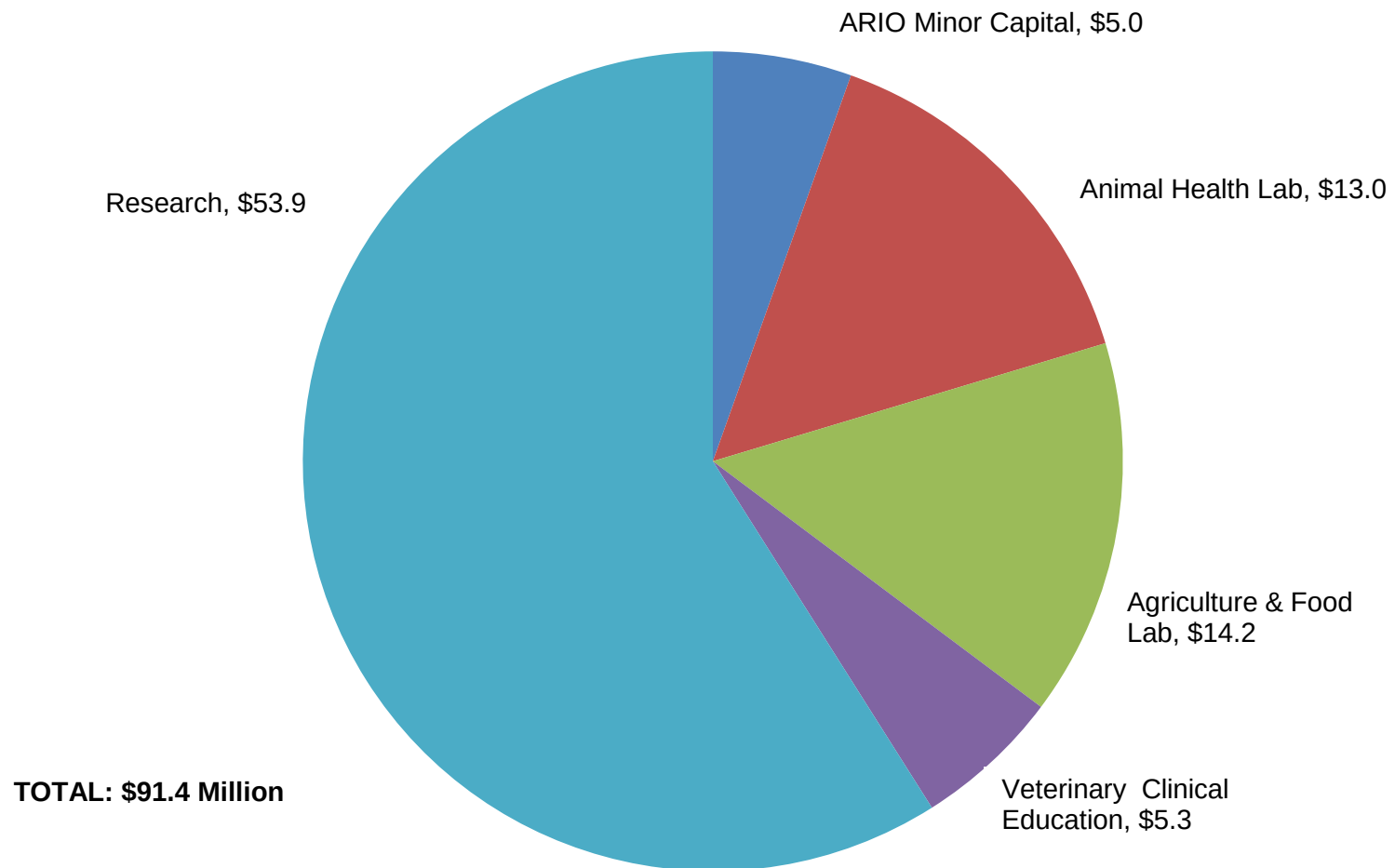
Total Partnership (Base Agreement, New Initiatives & Growing Forward 2): Research

		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	(17,723)	(1,175)	(3,392)	(2,353)	(2,221)	(1,914)	(1,363)	(8,560)	(7,175)	(422)	(438)	(764)	(47,500)
	OMAFRA Other	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sales Goods & Services	(215)	-	-	(4)	-	-	-	(4,346)	(44)	(6)	-	-	(4,615)
	Other Revenue & Interest	(307)	(6)	(25)	(19)	(70)	(11)	(8)	(405)	(873)	-	(36)	-	(1,760)
Total Revenue		(18,245)	(1,181)	(3,417)	(2,376)	(2,291)	(1,925)	(1,371)	(13,311)	(8,092)	(428)	(474)	(764)	(53,875)
Expenses	Personnel	8,012	284	953	569	502	482	384	8,281	2,604	15	248	463	22,797
	Faculty Pool Costs	4,349	393	950	1,171	850	778	409	-	-	-	-	-	8,900
	Operating	1,515	232	455	185	353	160	170	5,361	6,041	413	226	307	15,418
	Internal Sales & Recoveries	(929)	(7)	(71)	(47)	(5)	-	(8)	(1,215)	(782)	-	-	(6)	(3,070)
	Indirect Costs	5,298	279	1,130	498	591	505	416	884	229	-	-	-	9,830
	Total Expense	18,245	1,181	3,417	2,376	2,291	1,925	1,371	13,311	8,092	428	474	764	53,875
Net Expense (Revenue)		-	-	-	-	-	-	-	-	-	-	-	-	-

Summary 2015/16 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:		18,245	1,181	3,417	2,376	2,291	1,925	1,371	13,311	8,092	428	474	764	53,875
Allocation of ARIO Research Station Costs		14,503	456	1,813	2,174	965	813	679	(13,311)	(8,092)	-	-	-	-
Fully Allocated Theme Expenses		32,748	1,637	5,230	4,550	3,256	2,738	2,050	-	-	428	474	764	53,875

Summary 2015/16 Actuals – Revenue and Expenses
of Entire Agreement by Program (\$ millions)



PROGRAM PERFORMANCE REPORTS

Overall Agreement

Performance Indicators

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 (2015/16):	The most current (2015) 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 (2015/16):	Number of faculty, scientific and technical FTEs supported or leveraged by Agreement research projects: • Research: 177.0 • VCEP: 45.9 • AFL: 53.0 • AHL: 71.0
		Corrections: The number of FTEs in VCEP, AFL and AHL were determined when the 2008-2018 Agreement was negotiated, and have not been updated since. The 2013/14 Annual Report was in error when it reported changes to these. Furthermore, the 2014/15 Annual Report stated the number of research faculty was 316.9. It should have been 206.
	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 (2015/16):	During 2015/16, 30 faculty members were Canada Research Chairs, of which 10 had active Agreement research projects. This is unchanged from 2014/15.

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 (2015/16):	• Research (operating): \$10.7 million • AHL: \$6.03 million • AFL: \$7.38 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 (2015/16):	• Research: \$6.37 million • AHL: \$6.03 million • AFL: \$7.38 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 (2015/16):	This PI 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 2015/16, 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, 5 and 6 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, 5 and 6 will be achieved through a 2012 midterm study similar to the Deloitte report of 2007 (U of G / OMAFRA Impact Study).

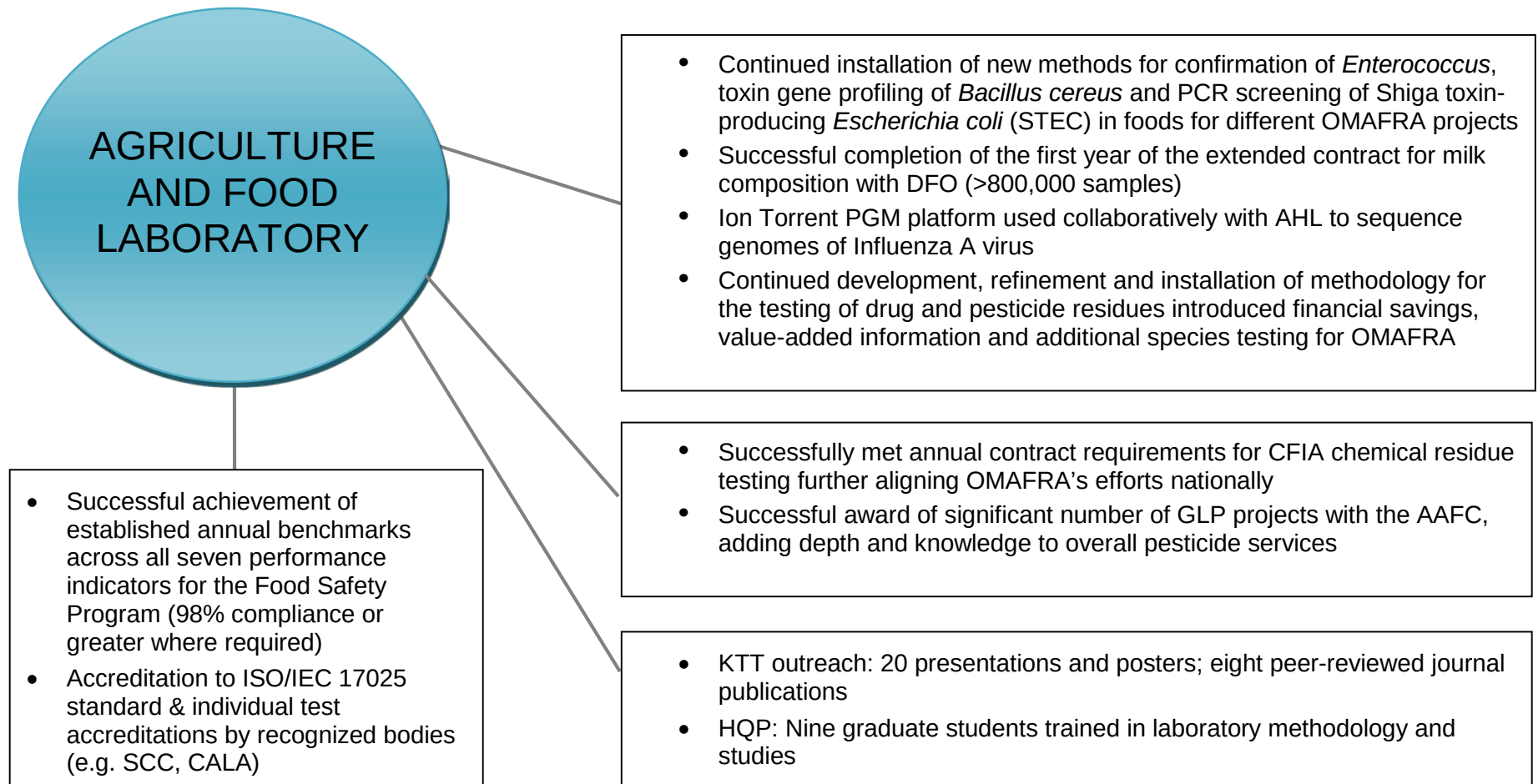
	Target:	Evaluation plan for year five to be undertaken and approved in 2009/10, describing content and format of 2012/13 report. Report was completed in 2012.
	Results (2015/16):	This PI was addressed in a 2012/13 study undertaken as part of the five-year review of the Partnership Agreement (Price Waterhouse 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, 5 and 6, will be assessed as part of the overall 5-year evaluation of the Agreement, to be conducted by an external third party.
	Baseline:	PIs OA4, 5 and 6 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 (2015/16):	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 2016 Agri-Food Yearbook posted on the U of G website.

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, 5 and 6 will be assessed as part of the overall 5-year evaluation of the Agreement, to be conducted by an external third party.
	Baseline:	PIs OA4, 5 and 6 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 (2015/16):	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.



Laboratory Services Division

Agriculture and Food Laboratory

Performance Indicators

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:	Maintenance of accreditation
	Results (2015/16):	ISO/IEC 17025 Accreditation The AFL at Laboratory Services Division (LSD), is accredited by both of Canada's internationally recognized accrediting bodies, the Standard Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (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 (TMDENRT). As of Aug. 25, 2015, LSD has 105 tests listed on their SCC scope, 92 AFL

	tests and 13 AHL tests. Once SCC updates our scope based on our Fall 2015 audit we will add the following 9 new AFL tests and remove accreditation for 4 AFL tests also shown below. 1. CHEM-119 Charm® MRL Trio Test for Beta-lactams, Sulfa Drugs, and Tetracyclines in Raw Commingled Cow Milk 2. CHEM-308 CHARM Sulfa Test for Raw Commingled Cow, Goat, and Sheep Milk at MRL 3. CHEM-309 CHARM MRL Beta-lactam and Tetracycline Test for Raw Commingled Cow, Goat, and Sheep Milk 4. CHEM-306 Enzyme immunoassay for the identification of Staphylococcus enterotoxin A, B, C, D and E in food and bacterial cultures 5. CHEM-159 Milk fat from enriched dairy products- Determination of omega-3 and omega-6 fatty acid content by gas-liquid chromatography 6. MFHPB-03 Determination of the pH of foods including foods in hermetically sealed containers (MID-233) 7. MFLP-66 Determination of water activity using the Decagon Aqualab (MID-055) 8. MOL-020 Microbial species ID determination based on 16S/18S rRNA gene sequencing 9. MOL-250 Quantification of residual bovine DNA in feed samples Since June 2015 AFL has streamlined its scope by withdrawing the accreditation of 4 SCC-accredited tests on Aug 25, 2015 as listed below: 1. <i>TOPS-118 Organochlorine pesticides, synthetic pyrethroids and N-methyl carbamates in animal fat tissue (modified CFIA PYR-SP01 & COL-SP02)</i> 2. <i>TOPS-125 Formetanate in fruits and vegetables.</i> 3. <i>TOPS-126 Pesticides in Honey, Fruit Juices and Wine (with solid phase extraction clean-up and GC/MSD and HPLC fluorescence detection) (Modified CFIA PMR-002-V1.1).</i> 4. <i>TOPS-127 Pesticides in Fruits and Vegetables (with Solid Phase Extraction Clean-up and GC/MSD and HPLC Fluorescence Detection) (Modified CFIA PMR-005-V1.7)</i> As of March 2, 2016 LSD is accredited by CALA for 13 environmental tests; 10 AFL tests and 3 AHL (soil and nutrient lab) tests. The CALA accredited tests include 3 AFL microbiology tests licensed under the Ontario Safe Drinking Water Act (OSDWA). The AFL CALA scope of testing has been revised since May 1, 2015 as follows:
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	1. Addition: <i>TOPS-142 Multi-residue pesticide determination by liquid chromatography/electrospray ionization-tandem mass spectrometry (LC/ESI-MS/MS) and gas chromatography-tandem mass spectrometry (GCMS/ MS)</i> a. Added January 22, 2016 for GC compounds. b. Added March 2, 2016 for LC compounds 2. July 24, 2015 deletions: a. <i>TOPS-105 Multi-residue pesticide screening in water</i> b. <i>TOPS-115 Herbicides: Triazines and chloroacetamides.</i> Schedule F – accreditation In 2015/16, under Schedule F, AFL provides testing service for 3 programs within the Food Inspection Branch. The majority of these tests (60%) 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. TOPS-142 a multiple residue detection method is used to analyze samples for up to 500 different pesticide compounds. <table><tr><td>Branch</td><td>No. of tests</td><td>SCC accredited</td><td>CALA accredited</td></tr><tr><td>Meat Inspection Program</td><td>18</td><td>11</td><td>0</td></tr><tr><td>Dairy Food Safety Program</td><td>39</td><td>21</td><td>3</td></tr><tr><td>Foods of Plant Origin Program</td><td>39</td><td>20</td><td>1</td></tr><tr><td>Total – Food safety program</td><td>96</td><td>52</td><td>4</td></tr></table> In addition, AFL performs 39 tests for Horticulture and Agriculture Land Use program and Environmental Management program, 7 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 2015/16, the AFL analyzed and reported over 470 PT results.	Branch	No. of tests	SCC accredited	CALA accredited	Meat Inspection Program	18	11	0	Dairy Food Safety Program	39	21	3	Foods of Plant Origin Program	39	20	1	Total – Food safety program	96	52	4
Branch	No. of tests	SCC accredited	CALA accredited																		
Meat Inspection Program	18	11	0																		
Dairy Food Safety Program	39	21	3																		
Foods of Plant Origin Program	39	20	1																		
Total – Food safety program	96	52	4																		
Key Outcome	Scientific & statistical integrity of routine analytical test data to ensure quality, reliable results.																				
Performance Indicator	Proportion of completed tests that meet quality, sample integrity and service level standards.																				

AFL2	
	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: Maintain 98% compliance with service level standard
	Results (2015/16): The Agriculture and Food Laboratory has met or exceeded the requirement: • Turnaround time for test results was met 99.5% of the time over the full fiscal year 2015/16. • Correct reports – 99.5% of sample results were correct when delivered to OMAFRA • Non-conforming samples – 99.6% of samples received 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 AFL 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: To manage the incidents every year with demonstration of continuous improvements.
	Results (2015/16): AFL understands that the focus of this performance measure is to demonstrate the AFL's ability to address those results <i>required for OMAFRA actionable response</i> .

		The significant decrease in medium to high risk incident reports continued through 2015/16. A total of 35 incident reports were identified during the processing /testing /reporting of 56,238 tests reported for OMAFRA Schedule “F” samples, excluding the raw milk testing program. Of the incident reports 31 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 56,238 tests (excluding raw milk testing program) were performed for OMAFRA in the Schedule “F” programs. This is an increase from 2014/15 of 2,006 tests reported for OMAFRA. 99.5% 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. • Continued enhancement of Microbiology lab processes including replacing manual with automated steps and use of rapid methods. • Implementation of additional Program Specific quarterly meetings to allow open exchange of information and ideas to shape future program services. • Ongoing testing of IT solutions to identify data formatting issues before information transmitted to OMAFRA. • Identification of industry changes to routine honey matrix; resulted in modification of testing methodology.
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:	2015 – 2016: maintain 98% compliance with service level standard
	Results (2015/16):	100% compliance met: AFL's adherence to 95S-028 continues to be monitored through the IT Adverse Reporting Initiative and Regulatory Partnerships. There were <u>no</u> incidents related to reporting of adverse results in Schedule F programs during 2015/16. The AFL LIMS adverse result alert program reported 1,003 adverse or presumptive positive test results during this fiscal year. Adverse test results represent approximately 2% of all test results reported to OMAFRA. These test results were reported to OMAFRA per 95S-028.
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 (2015/16):	No urgent requests or emergency response events occurred in 2015/16.
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.	

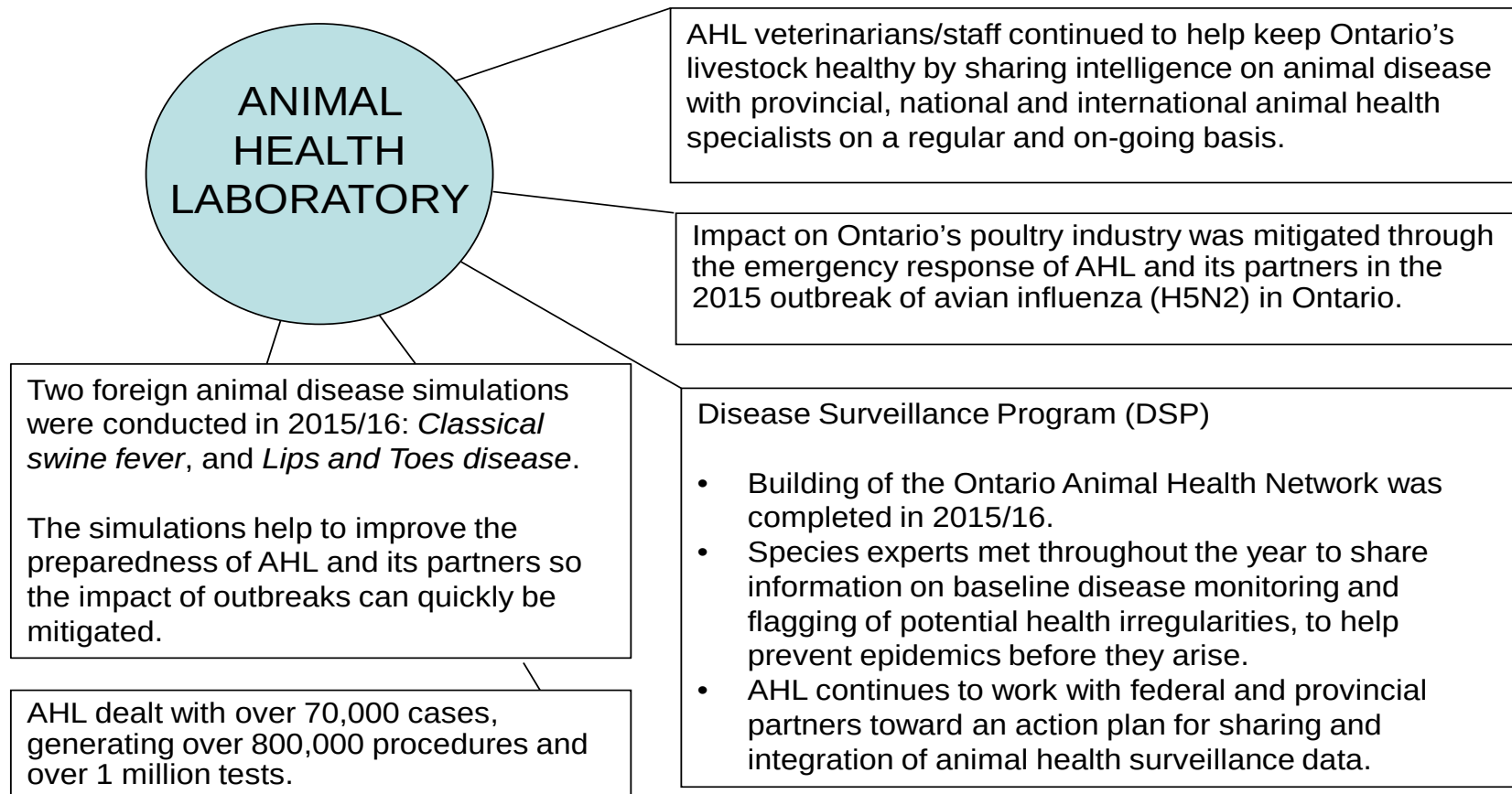
Performance Indicator AFL6	Level of compliance with sampling schedule as described in the annual sampling and testing plan agreements and documented in-year changes.	
	Metric	Percentage compliance with annual testing and sampling plans, by program (Schedule F).
	Baseline:	Baseline is service level standard of 98%.
	Target:	Maintain 98% compliance with service level standard
	Results (2015/16):	The AFL met and exceeded the required 98% service level standard for the Food Safety Program [99.5% correct reports; 99.2% 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 met and 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: 25,259 individual test samples (excluding 108,558 raw milk testing program contract samples) AFL Tested: Approximately 24,000 individual test samples (this document published before OMAFRA's final Sample Reconciliation Report) The AFL found that 99.6% 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 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	Contribution of AFL / U of G students to articles, posters and final project reports presented/published.	
	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 (2015/16):	• eight publications in peer-reviewed journals/book chapters and five research grant awards
	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 (2015/16):	Twenty (20) knowledge transfer events: 20 Presentations to government and industry colleagues including scientific posters • two oral presentations (1 – 50 attendees) • six oral presentations (50 – 150 attendees) • twelve poster presentations at scientific conferences (20 -100+ attendees)

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

Performance Indicators

Data collection for each Performance Indicator (PI) was completed with the assistance of OMAFRA. The table below summarizes AHL's performance indicators for 2015/16, which were revised and approved 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.

AHL1: Doing Things Right
Key Outcomes: • 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 Indicators • 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 (2015/16): a) <u>Total AHL participation/contribution:</u> 13 of 20 AHL vets/supervisors participated in 99 meetings of 32 international and 67 national organizations (total 715 hrs). 15 of 20 AHL vets/supervisors participated in 196 meetings of 27 provincial organizations (total 786 hrs) All 20 AHL vets/supervisors participated on federal and/or provincial animal health strategy committees and 12 attended meetings or conferences for these committees in 2015/16.

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Approved by Agreement Leadership Committee March 15, 2017

b) Average per staff member:

79 meeting hours per year spent on relevant committees, equivalent to 4.5% of available working time

*The value presented this year is 4.5% vs. 4.7% in previous years. This is a result of revising the total possible working hours to include 50 weeks/year vs. 52 weeks/year, to account for at least 2-week vacation.

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 (AAVLD and ACVP), as 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 on 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. As core members of the Ontario Animal Health Surveillance Network (OAHSN), the AHL and OMAFRA exchange and integrate information from many sources such that OAHSN serves as a cornerstone of the larger Ontario Animal Health System and related public health bodies.

Cross-Canada representation is gained through attendance at 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 TSE Lab Network.

Notifiable and Alertable Tests 2015

Notifiable Tests Completed

Workitem

No. of Cases

Notifiable Tests Completed cont'd

Workitem

No. of Cases

CFIA African swine fever	2	CFIA Pseudorabies	2
CFIA BSE	4	CFIA Scrapie ELISA	1
CFIA Bluetongue	3	CFIA Vesicular stomatitis	2
CFIA Bovine tuberculosis	1	Rabies FA	30
CFIA Classical swine fever	4	Salmonella Serotyping	673
CFIA Foot-and-mouth disease	2		
Notifiable Ecode Cases		Notifiable Ecode Cases cont'd	
TME Code	No. of Cases	TME Code	No. of Cases
Clostridium botulinum	1	Eastern equine encephalitis (EEE)	1
Coxiella burnetii	15	Listeria monocytogenes	13
Eastern equine encephalitis (EEE)	1	Avian herpesvirus type 1 (AHV-1)/ ILT	5
Notifiable Alerts		Notifiable Alerts cont'd	
Workitem	No. of Cases	Workitem	No. of Cases
AEV rt-RT-PCR	1	ILTV rt-RT-PCR	5
APMV-1m rt-RT-PCR	2	Influenza A vir MultiS-sc	10
Botulism MIT (Serum)	3	Influenza A matrixPCR	103
Botulism MIT Tissue/Feed	1	Listeria monocytogenes Isolation	1
C burnetii PCR	35	Porcine coronavirus PEDV	695
C. burnetii ELISA	5	S. pullorum-typhoid tube	9
Culture Bacterial	34	Salmonella Serotyping	128
EEEV IgM ELISA	4	Small Hive Beetle PCR	12
EEEV rRt-PCR	2	VTEC PCR Geno	8
EHV-1 Neuropathogenic	5	WNV IGM ELISA-IOWA	1
HSFP Environmental Culture	8	WNV rRT-PCR	18
IHC Influenza A Virus	9		

A compilation of emerging hazards and first-diagnoses in Ontario is maintained and updated frequently by Dr. Beverly McEwen 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 12-page document is shared with OMAFRA. Examples of events in 2015/16 include: Cache Valley virus in sheep (Toronto Star article on CVV compared it to the emerging Zika virus that causes microencephaly in people), *Pneumocystis carinii* in horses (associated with immunosuppression in animals and people and is an important zoonotic pathogen), *Trueperella abortus* in swine (described as an emerging pathogen in Germany and Japan), and blackleg in cattle as an outbreak in a dairy herd that killed over five animals in less than 12 hours.

AHL2: Doing Things Right

Key Outcomes:

- 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.

Results (2015/16)

Client satisfaction: By agreement with OMAFRA, the AHL Client Satisfaction Survey is conducted biennially, rather than annually. This survey was again conducted in fall 2015. As an additional documented form of feedback on client service, minutes of the bi-monthly liaison meetings between 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. Satisfaction is high with the timeliness of communications, however there is not a numerical satisfaction rating.

AHL Client Survey update:

J. Fairles (AHL Client Services Veterinarian) presented an update at the Feedback Group meeting on the 2015 client survey sent to 700 clients with 100 responses. 2015 saw an increase in overall level of satisfaction with AHL service.

Items suggested for improvement were in the areas of:

- Electronic submission forms • Improved courier services • Integrating results with practice management • Submission supplies
- Field validation of tests • Streamline reports • QA services for clinics • Communication

J. Fairles noted that a new fee schedule due to be posted May 1 will be converted to accessible HTML format – allowing for better mobile access. Submission forms are all available in PDF fillable format. E-form submissions are also custom made for clients.

Accreditations: The University maintains appropriate accreditations at the Animal Health Laboratory (AHL), including ISO/IEC 17025, American Association of Veterinary Laboratory Diagnosticians (AAVLD) and Canadian Food Inspection Agency (CFIA).

AHL is audited every 5 years to maintain full AAVLD accreditation, all species. The next AAVLD audit will be spring-summer 2019. The current AAVLD accreditation certificate expires Dec. 2019.

ISO/IEC 17025 accreditation

Laboratory Services Division (LSD), including AHL, is accredited by both of Canada's internationally recognized accrediting bodies: the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) to the ISO/IEC 17025 standard, for specific tests listed on our scopes of accreditation. SCC and CALA jointly audited LSD from Sept 29-Oct 2, 2015 as part of the regular biennial audit. LSD will be audited next in 2017.

LSD/AHL is accredited by SCC in the program specialty areas (PSAs): Agriculture Inputs, Food, Animal Health and Plant Protection (AFAP) and Test Method Development and Evaluation and Non-routing Testing (TMNENRT). As of Aug. 25, 2015, LSD has 105 tests listed on their SCC scope, 92 AFL tests and 13 AHL tests, including 1 Soil and Nutrient lab test. Once SCC updates LSD's scope based on the fall 2015 audit, AFL will add 9 new tests and remove accreditation for 2 AFL tests.

In addition, (AHL) is accredited for 5 laboratory techniques listed under the Medical – Veterinary flexible scope.

Since the implementation of the flexible scope AHL has focused on adding tests to the flexible scope rather than the SCC fixed scope. AHL is in the process of adding 8 new methods to the flexible scope – 1 ELISA test and 7 PCR tests.

MEDICAL – Veterinary (flexible scope)

Description of Activities:

The Animal Health Laboratory identifies unknown hazards in a range of matrices, for example, animal samples, feed, soil and plants. Hazards include infectious agents (bacteria, mycoplasmas, yeast, molds, viruses, and parasites), organic and inorganic elements and compounds. Infectious agents are detected directly or indirectly through various technologies, (for example, culture, ELISA and PCR techniques) for which the laboratory is accredited, listed below:

1. Culture detection of microorganisms

Method code	Method name	Agent
MYC-100	Mycoplasma and Ureaplasma isolation	<i>Mycoplasma, Ureaplasma, Acholeplasma</i>

2. Inorganic analysis by Inductively Coupled Plasma spectroscopy (ICP)

Method code	Method name	Elements
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CHEM-162	ICP-MS analysis of trace metals in serum, plasma and blood	Manganese, iron, cobalt, copper, zinc, selenium, molybdenum, lead
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3. Enzyme Linked Immunosorbent Assay (ELISA)

Method code	Method name	Agent
V-002	ELISA	Anaplasma Bovine viral diarrhea virus Equine infectious anemia virus Porcine reproductive & respiratory syndrome virus Transmissible gastroenteritis virus

4. Agglutination

Method code	Method name	Agent
V-008 (was IAV-CIS-180)	Leptospira Microscopic Agglutination Test (MAT)	<i>Leptospira</i> spp.

5. Polymerase chain reaction

Method code	Name	Agent
MOL-197	<i>Mycoplasma iowae</i> real-time PCR	<i>Mycoplasma iowae</i>
MOL-249	PCR detection of fish viruses	Viral hemorrhagic septicemia virus (VHSV)
V-005	Polymerase chain reaction (PCR)	Avian paramyxovirus-1/Newcastle disease virus Classical swine fever virus Foot-and-mouth disease virus Infectious laryngotracheitis virus Influenza A virus Porcine coronavirus (porcine epidemic diarrhea virus, transmissible gastroenteritis virus, porcine deltacoronavirus) Porcine reproductive and respiratory syndrome virus Porcine respiratory coronavirus (PRCV)

As of March 2, 2016, LSD was accredited by CALA for 13 environmental tests: 10 in AFL and 3 in the Soil and Nutrient lab (AHL).

Canadian Food Inspection Agency (CFIA) accreditation

AHL is accredited by the CFIA – Retrovirology Centre for Expertise (RCE) for Equine Infectious Anemia (EIA). AHL was audited by CFIA on Feb 3-4, 2016 and maintained accreditation for EIA.

The actual adherence to published turnaround times from the AHL Laboratory Information Management Systems (LIMS) was **95.5%**.

Turnaround time (TAT) is one of the most critical measures of a laboratory's effectiveness and efficiency. Customer loyalty is often based on this one aspect of service. Given that there are a large number of tests and services provided, it is often a challenge to maintain TAT and manage clients' expectations. The AHL has done this by proactively measuring and analyzing their TAT performance to identify areas needing continuous improvement. A component of the AHL's AAVLD accreditation is an analysis of the adherence to quoted TAT expectations as published in the AHL User's Guide and Fee Schedule. A detailed explanation of the 2015/16 TAT statistics report is available upon request.

Summary Report: AHL Guelph Postmortem Laboratory

Foreign Animal Disease Exercise – “Lips and Toes Disease” (March 16, 2016)

Report prepared by: Dr. Maria Spinato, Postmortem Supervisor, Animal Health Laboratory -Guelph

Background: On March 16, 2016 the annual foreign animal disease (FAD) simulation was held at the AHL Guelph (AHL-G) Postmortem laboratory section. The simulated disease was Lips and Toes Disease.

Objectives:

- 1) to test and validate the standard operating procedure and work instructions related to emergency management of a carcass in the PM lab that is infected with a suspected immediately notifiable/FAD; and
- 2) to evaluate joint co-ordination and communication networks among the AHL, OVC, University of Guelph, OMAFRA and the Canadian Food Inspection Agency.

The exercise involved postmortem of a feeder pig exhibiting crusted, bleeding scabs and vesicles on the snout and interdigital skin. This scenario is of particular relevance given the emergence of Seneca Valley virus infection in pigs, a disease that closely mimics the lesions of Foot and Mouth Disease. The exercise involved closure of the contaminated sections of the PM suite, parking lot and Specimen Receiving entry, collection of appropriate tissue samples, and communication with CFIA staff involved in picking-up samples for confirmatory diagnosis. Protocols for the disposal of the infected carcass, disinfection of contaminated facilities, and decontamination of AHL staff were also tested during the exercise.

AHL Guelph participants:

Pathologists: Dr. Maria Spinato, Beverly McEwen

PM Technicians: Megan MacAlpine, Harry Maimaiti, Bruce Cornfield

Specimen Receiving Staff: Dr. Jim Fairles, Kris Lesniewski

Laboratory Director: Dr. Grant Maxie

External evaluator: Dr. Cathy Furness, OMAFRA Lead Veterinarian, Planning and Preparedness, accepted the role of formal evaluator.

Overall assessment: The exercise was well designed to adequately test the implementation of the AHL SOP. Pertinent instructions and anticipated timeframes were provided to the participants. The exercise materials were clear and concise. All of the exercise participants fulfilled their respective roles and responsibilities and worked as a cohesive team. The participants remained calm throughout the exercise and handled challenges as they arose. All of the exercise objectives were fulfilled (as defined in the exercise evaluator guide). There were very few weaknesses identified during the exercise.

Report: AHL Kemptville Foreign Animal Disease Exercise (Nov. 6, 2015)

Prepared by: Andrew Brooks, Pathologist, Laboratory Head, AHL Kemptville

Background: On Nov. 6 2015 the 5th annual foreign animal disease (FAD) simulation was held at AHL-Kemptville (AHL-Kv). The simulated disease was Classical swine fever.

AHL Kemptville participants:

Andrew Brooks (Pathologist/Lab head)

Jan Shapiro (Pathologist)

Tom McLean (Client Service Representative (CSR)/PM Technician)

Debbie Scissons (Client Service Representative/PM Technician, observer – in training).

External evaluators:

Dr. Erin Wilson (Veterinarian), CFIA, Ottawa District Office

Dr. Ines Walther (Veterinarian-TSE diagnosis and Research), CFIA Ottawa Laboratory – Fallowfield

Objective: To evaluate the ability of AHL Kemptville personnel to conduct the appropriate sampling, decontamination and reporting following SOP *AHL-K-016- Post mortem room and general laboratory procedures for handling a foreign animal disease (FAD) suspect*, and to identify areas for improvement of the protocol.

The session began at 9:00 AM with a pre-exercise meeting and ended at approximately 12:00 PM. Evaluators were distributed between the office, reception and postmortem areas to observe the various activities over the course of the exercise. Debriefing occurred at lunch following conclusion of the exercise.

Overall assessment: The exercise was successful and objectives were completed. The exercise was a valuable training experience for AHL Kemptville staff and several action items were generated to improve the protocol. The evaluators provided detailed and useful feedback.

With the conduct of the notifiable exercise and the participation in a full disease outbreak simulation, the milestones as defined in Schedule G of the Agreement were achieved.

AHL participated in 45 proficiency test (PT) programs in 2015/ 2016 in two main categories:

1. Biological programs: panels of samples are tested, or identification agrees with consensus ID. Results are usually pass / fail.
2. Chemical programs which produce numerical results and the results are usually categorized as satisfactory, questionable, or unsatisfactory.

When a PT result is identified as questionable or unsatisfactory, the problem is investigated. For unsatisfactory results corrective action is applied and documented.

Chemical PT programs

In 2015/2016 the chemical sections of AHL, Clinical Pathology and Toxicology/ Soil & Nutrient, participated in 28 different PT programs. Note that multiple sets of samples were tested within each PT program. In 2015/2016, AHL reported over 1700 chemical PT results. The OMAFRA soil PT program results are not included in these totals since the OMAFRA soil PT program is based on NAPT proficiency samples results and including both programs double counts results. A summary of chemical PT results is available for onsite review.

Overall the chemistry results are as follows:

1. satisfactory 98.8% (Satisfactory = 98.0% acceptable and 0.8% questionable)
2. unsatisfactory 1.0%

Biological PT programs

In 2015/2016 AHL reported 79 biological results or panels in 17 programs. The programs are listed in Table 1 (next page). The number of proficiency samples was down from previous years due to issues with importing.

Overall the biology results are as follows:

1. pass: 96.2%
2. fail: 3.8%

Table 1. 2015/16 AHL Biological Proficiency Results

Lab Section	Proficiency program	Parameter	Scoring criteria	Results reported	Pass
VIROLOGY	CFIA- BSE	BSE panel	Panel passes	1	1
VIROLOGY	CFIA- BSE Rapid Test	BSE Elisa panel	Analyst passes panel	5	5
VIROLOGY	CFIA-CWD and scrapie	CWD panel - certified analysts	Analyst passes panel	5	5
VIROLOGY	CFIA EIA	EIA panel - certified analysts	Analyst passes panel	3	3
VIROLOGY	CFIA AIV rRT-PCR	Polymerase chain reaction	Analyst passes panel	8	8
VIROLOGY	CFIA AIV ELISA	ELISA	Analyst passes panel	6	6
VIROLOGY	CFIA AIV RT PCR	AIV/APMV PCR panel	Analyst passes panel	8	8
Bacti	NVSL – Johne's Direct PCR and Liquid Media (Bacti=Bacteriology)	Johne's disease fecal proficiency panel (<i>Liquid media results pending</i>)	Panel passes if 3 non-critical samples or less were missed	2	2
Bacti	VLA QAP Bacteriology	Disease diagnosis and susceptibility	Agrees with benchmark result	2	2
Bacti	VLA VETQAS	Salmonella in poultry	Agrees with benchmark result	10	10
Bacti	VET-LIRN	Salmonella in dog feces	Laboratory scores above the 75% threshold	12	10
Parasit	VLA-QAP parasitology	Parasite identification	Agrees with consensus ID	1	1
Pathology	VLA-QAP Histopathology	Disease diagnosis	Agrees with consensus ID	3	3
Mol Bio	CFIA Scrapie panel exchange	Scrapie genotype: 10 CFIA samples tested by 3 AHL analysts. 10 AHL samples/ results confirmed by CFIA	Agree with reference lab (CFIA)	5	5
Mol Bio	VHSV PCR testing -interlab comparison	VHSV in fish	Agree with reference lab (CFIA)	1	1
VIROLOGY	CFIA-FMD ABC ELISA	FMD 3 antibody ELISA	Certified analysts pass panel	4	3

VIROLOGY	CFIA-FMDV RRT-PCR	FMD RRT-PCR	Certified analysts pass panel	3	3
AHL 3: 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 (2015/16): The AHL selected three cases from their 2015/16 caseload, with potential significance to animal health and/or public health. The three cases were: Case #1 Infectious laryngotracheitis- G16-009000 Study Comments <i>"The AHL is receiving increased numbers of laboratory submissions due to the current small flock surveillance project, which helps to evaluate the current health status of small flocks, and also supports extension activities.</i> <i>This case came through the small flock surveillance project. The AHL followed all the required diagnostic and reporting steps in a timely manner. The primary diagnosis of ILT was completed and reported rapidly that helped OMAFRA to do the risk assessment effectively. Based on the diagnosis of ILT, an ILT Advisory was sent out by the Feather Board Command Center to advise commercial poultry farmers in the proximity of this case to enhance their biosecurity protocols".</i> Dr. Csaba Varga Case #2 Cache Valley virus- G15-097961 Study Comments <i>"Dr. Spinato logically followed the required diagnostic steps and described the events during and following the initial diagnosis of Cache Valley virus in a sheep flock accurately.</i>					

OMAFRA was notified of this case and an additional two other potential cases in a very timely manner. A disease write-up (including photos) by Dr. Spinato was received by OMAFRA and emailed out to small ruminant veterinarians. The disease notification provided by Dr. Spinato was of great assistance to veterinary practitioners and again very timely. Confirmation of Cache Valley virus was performed at the Texas A&M Veterinary Medical Diagnostic Laboratory. Additional extension materials (co-authored by Dr. Spinato) were provided to veterinarians and the small ruminant industries to provide more details on additional cases, the disease itself, zoonotic potential and preventive measures. This case is a good example of teamwork among AHL pathologists, OVC and the OMAFRA species specialist, that shared and provided timely information to veterinary practitioners, producers, industry and other government agencies”.

Dr. Jocelyn Jansen

Case #3 *Salmonella enterica* serotype Dublin- K15-078273 Study Comments

“This case highlights the isolation of Salmonella Dublin from a dead calf submitted from an Ontario dairy herd to the Animal Health Laboratory in Kemptville. To date this is an unusual pathogen. As of May 2016 only two dairy herds and 10 veal operations have had a diagnosis of S. Dublin. This and previous cases with S. Dublin highlight the need to have suitable submissions to make diagnoses with important consequences for animal and human health. So far, all herd S. Dublin situations, except one, have been identified via isolations from tissue, either submitted tissues from on-farm postmortem examinations or from whole calf carcass submissions to AHL. Bovine carcass and tissue submissions to the AHL underrepresent the calf mortality experienced across the bovine sectors. On-going extension to veterinarians and producers, highlighting the need for these kinds of submissions and participation in the OAHN bovine network project, may increase the diagnostic rate and give a better estimate of the prevalence of S. Dublin infected operations. Due to the low submission rate to date, it is likely that S. Dublin has been underdiagnosed as it is an unanticipated finding with a variety of presentations.

This case was well handled by AHL (kudos to Dr. Slavic, AHL Veterinary Microbiologist, for initiating early utilization of enhanced isolation techniques as early as 2012, for any lung submissions received to identify S. Dublin). Recording the calf CCIA identification number was appreciated, as it is useful in tracing activities. Unfortunately, no Premises Identification (PID) number was included by the veterinarian on the submission. This has been an ongoing challenge with bovine submissions, making monitoring of the pattern of S. Dublin isolations, and other diseases, difficult.

The take-home message provided by this case is that OMAFRA and the AHL need to continue to work together, and with veterinarians and their clients, to improve logistics that will enhance the rate of appropriate submissions”.

Dr. Ann Godkin

AHL's comment:

“AHL and OMAFRA recognize the importance of PIDs. In response, a working group has been created to communicate the perceived value of PIDs to both veterinarians and producers. OAHN projects will be used as a platform requiring that PIDs be included on all laboratory submissions for each livestock species network. Both the AHL and OMAFRA hope that by demonstrating value, veterinary practitioners will voluntarily submit PIDs on laboratory submissions going forward.”

AFL 4: 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 (2015/16)

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. 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 -Veterinary Teaching Hospital 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 19 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. As well, AHL staff occasionally submits contributions to OMAFRA's newsletter, "Ceptor".

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 PEDV-TGEV-PDCoV triplex PCR test, 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., concerns surrounding chicken jerky products for dogs, testing of undifferentiated diarrhea in pigs.

Finally, AHL staff contributes 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 potential improvement which should be considered. While, in general, client responses show a good level of satisfaction in the area of AHL knowledge provision, there remains a significant gap in accessing and using this information by a proportion of clients. Graphed results provided by the AHL point to the significant opportunity to improve access to scientific information and knowledge transfer. The planned expert networks within the DSP should help to address this opportunity for improvement.

Annual Feedback Group meeting, November 12, 2015.

Meeting update from Jim Fairles, Client Services Veterinarian, AHL

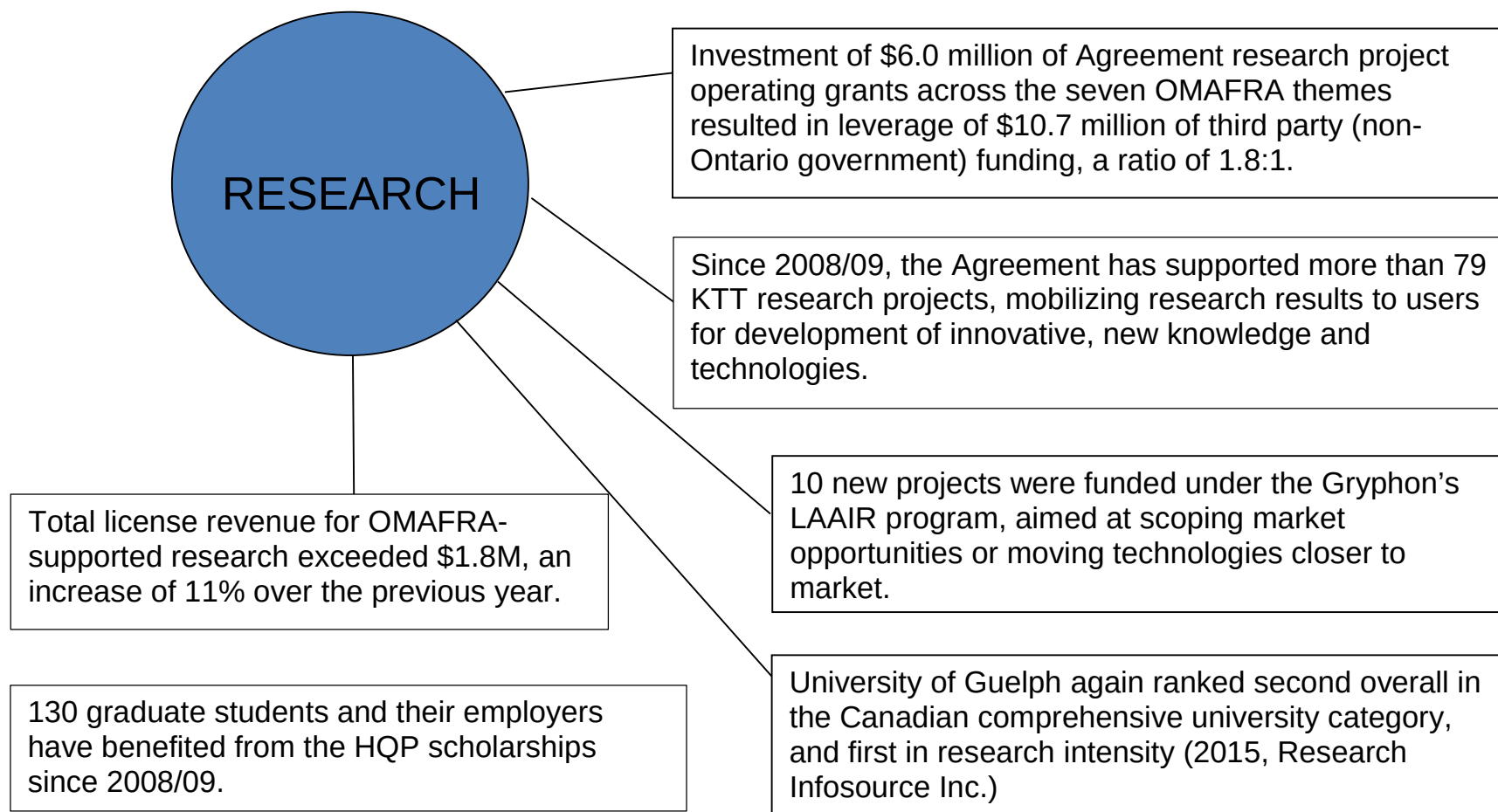
"A meeting of the AHL feedback group was held on Thursday November 12th 2015 - Clients from all facets of AHL business were in attendance. After a brief introduction on the happening around AHL for 2015 by Jim Fairles - all participants had the opportunity to comment. Overall feedback for the lab is definitely positive but there is always room for improvement. Comments centered around, increased frequency of testing, possible new testing options and panels, enhanced communications of tests and test requirements, submission forms and eform data entry, Premises ID, and results. Client summary data enhancements were also important.

Melanie Barham - provided an OAHN (Ontario Animal Health Network) update to conclude the meeting."

RESEARCH PROGRAM

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



OMAFRA - U of G Consolidated Annual Report 2015/16

Approved by Agreement Leadership Committee March 15, 2017

Research Programs

Performance Indicators

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 (2015/16):	The table below shows the total actual dollars spent were \$7.4M. Planned disbursement of funds (committed to approved projects) was \$6.8M. Therefore, the ratio of actual to planned was \$7.4M to \$6.8M, which equals 1.1 : 1.0

Research Program Project Operating Funds					
Research Themes	Total Committed to Projects April 1, 2008-April 30, 2015	Total Committed to Projects Approved for 2015/2016	Budget for 2015/2016	Total Commitments for 7-year Theme Budget	Overall 7-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	2,621,948	2,500,000	51,055,427	51,663,596
Total	80,029,253	6,836,648	7,400,000	86,865,901	89,090,227

	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 (2015/16):	See table below, which indicates the number of research proposals submitted in each research theme area.										
2015/16 (Results from Call for LOIs for projects to begin May 1, 2016)												
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	21	15	29	23	21	16	51	39	90	55	270	

Number of LOIs	15	12	16	24	4	10*	37	33	70	n/a	151
Number of Proposals	8	9	12	16	5*	7	26	17	43	15	115
Number of proposals funded	6	7	9	9	5	4	16	13	29	15	84
Notes: * 1 LOI submitted in the Product Development & Value Chain Enhancement theme was invited to submit full proposal in Food for Health theme. Production Systems Tier 1 is comprised of Production Systems animal + Production Systems plant research projects. Production Systems Tier II is provided for information purposes and is not included in the totals.											
Corrected 2014/15 (Results from Call for LOIs for projects to begin May 1, 2015)											
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	14	8	14	13	16	8	66	33	99	53	225
Number of LOIs	16	15	20	22	17	14	33	29	62	n/a	166
Number of proposals	13	9	12	14	11	9	21	16	37	23	128
Number of proposals funded	6	5	8	9	8	6	14	11	25	23	90
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 1 is comprised of Production Systems animal + Production Systems plant research projects. Production Systems Tier II is provided for information purposes and is not included in the totals.											

Corrected Total for the period 2008/09 to 2014/15									
Theme	Ag Policy & Rural Devel	Bioeconomy	Emerg Mgmt	Env Sust	Food	Prod Dev	Prod Syst Tier I	Prod Syst Tier II	Total
Number of active projects	49	30	42	47	37	31	141	76	453
Number of LOIs	49	54	65	100	131	66	226	n/a	691
Number of Proposals ¹⁴⁵⁰	64	38	59	79	79	54	225	161	759
Number of proposals funded	40	26	50	45	50	25	128	161	525
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 1 is comprised of Production Systems animal + 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 2015/6									
Theme	Ag Policy & Rural Devel	Bioeconomy	Emerg Mgmt	Env Sust	Food	Prod Dev	Prod Syst Tier I	Prod Syst Tier II	Total
Number of active projects	55	37	51	56	58	35	170	91	553
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
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 1 is comprised of Production Systems animal + Production Systems plant research projects. Production Systems Tier II is provided for information purposes and is not included in the totals.									

	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 (2015/16):	The ratio of third party investment to OMAFRA research operating funds was 1.8:1 Total amount of third party investment was \$10.7 million. Total OMAFRA operating funds of \$6.04 million were committed to projects within fiscal 2015/16. 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 2015/16 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	1,083,200	639,517	713,298	957,065	960,644	376,514	5,948,827	10,722,565
Operating budget allocated to active projects	759,900	634,170	424,155	597,743	810,285	365,625	2,395,511	6,037,514
Ratio of 3 rd party leveraging to allocated operating budgets	1.43:1	1.01:1	1.68:1	1.60:1	1.19:1	1.03:1	2.48:1	1.78:1

	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 \$7.6 million base of project operating funding.
	Target:	Total external dollars leveraged is to be $\geq$ 2008/09 baseline of \$54.6 million .
	Results (2015/16):	\$40.7 million of external funds were leveraged from OMAFRA's \$51M investment in the Agreement. <u>Explanation of 2015/16 Results:</u> Total funding 'Leveraged from the OMAFRA Agreement' from all sources (including OMAFRA outside the Partnership Agreement and other provincial ministries, as well as federal, and business/industry/private/other sources) increased to \$40,669,000 in 2015/16, compared to \$37,605,000 in 2014/15 and \$35,149,000 in 2013/14. See notes 1 and 2 following the tables for further explanations.

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	
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

OMAFRA - U of G Consolidated Annual Report 2015/16

Approved by Agreement Leadership Committee March 15, 2017

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 (2015/16):	In 2015/16, the total number of projects funded was approximately double the number funded in 2008/09. <table> <tr> <th><u>Number of Active Projects by Theme</u></th><th><u>2015/16*</u></th><th><u>2008/2009*</u></th></tr> <tr> <td>Agricultural and Rural Policy:</td><td>17</td><td>14</td></tr> <tr> <td>Bioeconomy – Industrial Uses:</td><td>13</td><td>5</td></tr> <tr> <td>Emergency Management:</td><td>26</td><td>2</td></tr> <tr> <td>Environmental Sustainability:</td><td>18</td><td>15</td></tr> <tr> <td>Food for Health:</td><td>24</td><td>9</td></tr> <tr> <td>Product Development:</td><td>12</td><td>5</td></tr> <tr> <td>Production Systems Tier I:</td><td>85</td><td>13</td></tr> <tr> <td>Production Systems Tier II:</td><td><u>N/A</u></td><td><u>43</u></td></tr> <tr> <td>Total number of Active Projects:</td><td>195</td><td>92</td></tr> </table> * several projects are funded in more than one theme	<u>Number of Active Projects by Theme</u>	<u>2015/16*</u>	<u>2008/2009*</u>	Agricultural and Rural Policy:	17	14	Bioeconomy – Industrial Uses:	13	5	Emergency Management:	26	2	Environmental Sustainability:	18	15	Food for Health:	24	9	Product Development:	12	5	Production Systems Tier I:	85	13	Production Systems Tier II:	<u>N/A</u>	<u>43</u>	Total number of Active Projects:	195
<u>Number of Active Projects by Theme</u>	<u>2015/16*</u>	<u>2008/2009*</u>																													
Agricultural and Rural Policy:	17	14																													
Bioeconomy – Industrial Uses:	13	5																													
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Environmental Sustainability:	18	15																													
Food for Health:	24	9																													
Product Development:	12	5																													
Production Systems Tier I:	85	13																													
Production Systems Tier II:	<u>N/A</u>	<u>43</u>																													
Total number of Active Projects:	195	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 (2015/16):	See table below.																													

Animal Research Stations		Number of OMAFRA - U of G Projects		Percentage of Utilization- (Note #1)		Value of Research Station Utilization (Note #2)	
	Units	2015/16	Average of 5 years (2011/12 - 2015/16)	2015/16	Average of 5 years (2011/12 - 2015/16)	2015/16	Average of 5 years (2011/12 - 2015/16)
Alma Aquaculture (see Note #3)	Tanks	5	6.8	25%	28%	\$472,000	n/a
Arkell Poultry	Animals	16	14.0	93%	80%	\$689,100	n/a
Arkell Swine	Animals	13	11.2	53%	55%	\$1,321,150	n/a
Arkell Equine	Animals	5	6.4	71%	86%	\$454,100	n/a
Elora / Ponsonby Dairy (see Note #4)	Animals	6	8.6	34%	29%	\$1,264,800	n/a
Elora Beef	Animals	5	4.8	69%	72%	\$1,287,450	n/a
Ponsonby Sheep	Animals	1	1.6	102%	65%	\$364,300	n/a
Ponsonby General Animal Facility (see Note #5)	Animals	7	7.0	105%	100%	\$316,050	n/a
Alfred Dairy (Note #6)	Animals	Closed	1.8	Closed	26%	Closed	n/a
Kemptville Dairy (Note #7)	Animals	Closed	3.3	Closed	39%	Closed	n/a
New Liskeard Beef (Note #7)	Animals	2	2.8	29%	125%	\$577,000	n/a
Ridgetown Swine	Animals	Ridgetown swine facility was closed for use 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)	

		2015/16	Average of 5 years (2011/12 - 2015/16)	2015/16	Average of 5 years (2011/12 - 2015/16)	2015/16	Average of 5 years (2011/12 - 2015/16)
Bradford (Muck Crops)	Acres	2	7.8	35%	66%	\$276,000	n/a
Elora (Field Crops)	Acres	45	30.2	30%	43%	\$416,050	n/a
Guelph (turf, agroforestry)	Acres	16	17.6	76%	82%	\$243,000	n/a
Simcoe (horticultural crops)	Acres	13	14.4	24%	10%	\$631,000	n/a
Vineland (horticultural crops)	Acres	7	4.6	43%	40%	\$950,000	n/a
Woodstock (field Crops)	Acres	8	8.2	29%	25%	\$98,000	n/a
Kemptville/Winchester (field crops)	Acres	25	23.0	36%	35%	\$257,500	n/a
New Liskeard (field crops)	Acres	51	23.6	6%	61%	\$518,525	n/a
Emo (field crops)	Acres	18	13.4	30%	56%	\$143,475	n/a
Ridgetown (see note #9)	Acres	58	39.6	90%	74%	\$3,895,778	n/a
Huron	Acres	25	22.5	45%	71%	Included with Ridgetown	
Cedar Springs	Acres	12	9.5	90%	93%	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 now shown are the actual values for full operation of the specified station. (In previous years, comparable values would have been pro-rated by the "% research station utilization" values, which resulted in artificially low values for station utilization costs.) As a result of the new methodology, the 5-year average station costs have been omitted. (However, a fair assumption is that station operation costs in previous years closely approximated the values shown for the current reporting year.)

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 Sept./Oct. 2014, in preparation for commissioning and moving animals into the new Elora dairy research facility. Consequently, the utilization numbers for dairy are reduced due to reduced research activity for several months leading up to September 2014, and essentially no research activity after Oct., 2014 to April 30, 2015 (end of fiscal 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 “percent station utilization rate” for this facility was retained as “total number 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 U of G, research projects in both of these herds were wound down in early 2015/16, and the herds were dispersed as of Aug. and Sept. 2015 respectively. Consequently, no data are reported in the 2015/16 annual report.

Note #7: Ridgetown, Huron and Cedar Springs Crops Research Stations: The data for these three stations were segregated out for each station beginning in 2013/2014. (In prior years the data were reported as combined values for all 3 stations together.) Consequently, the multi-year averages reported here are 3-year averages for 2013/14, 2014/15 and 2015/16.

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 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 (2015/16):	89 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)
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 to 'research', 'teaching' and 'service'. In some departments (i.e., CA, CSAHS) the majority of faculty may have a relatively low 'Research DOE' (therefore low Research FTE, say 0.25), whereas in some other Colleges/Departments (i.e., OAC, OVC) a greater number of faculty may have a much higher 'Research DOE' (therefore a higher Research FTE, perhaps 0.5 or 0.6).

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 with some portion of their research time engaged on OMAFRA Supportive Research project(s).

Note 2: *'Portion of "Departmental Research FTE" supportive of OMAFRA-related priorities'* is estimated by averaging the individual researcher FTE portions focused on OMAFRA-related priorities (see Note 1) across all researchers in the department (receiving any awards in the specified fiscal year).

Note 3: The 5 'OMAFRA-Supportive Research Awards' recorded in the "Other Academic Units" refers to a share of the overhead payments associated with Tri-council (NSERC; SSHRC; CIHR) grants received by the U of G.

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

For 2015/16 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 177 'Research FTEs' (compared to ~183 in 2014/15 and 195 in 2013/2014), thus continuing the downward trend that is evident over the term of the current ten-year OMAFRA-U of G Agreement. This reduction was most prevalent within OAC, perhaps related to the significant number of retirements that have occurred in that College over the past few years. These 177 'Research FTEs' would equate to approximately 88.5 full person FTEs of time devoted to research, if one were to assume, reasonably, that on average (across all U of G 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 2015/16 is available from the Office of Research, U of G.

As in previous years, there was a broad diversity between departments, 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 'social science' heavy colleges of CSAHS and CoA, 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 (2015/16):	Number of faculty FTEs specifically allocated to Agreement research projects: Total: 69.83 plus an HQP Director at 0.10 (this is not included below), or 47.85, not including HQP Director or Tier II, III or IV.																																																																																																		
		<table><tr><th>Research Theme</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>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>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>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>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>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>3.01</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>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>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>0.6</td><td>0.90</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td></tr></table>	Research Theme	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09	Ag & Rural Policy:	4.92	5.69	5.00	6.69	5.98	4.31	3.31	2.10	Bioeconomy:	2.77	5.84	3.19	4.79	3.31	2.86	1.79	1.20	Emerg Manag:	5.08	4.96	6.18	4.85	3.74	3.22	2.32	0.80	Env Sustain:	4.53	4.27	5.76	8.82	9.57	9.37	5.20	5.10	Food for Health:	10.05	7.67	8.96	10.10	8.63	6.60	3.69	2.20	Prod Dev:	3.01	3.11	3.28	4.31	2.76	2.94	3.37	2.50	Prod Syst Tier I:	27.31	23.00	21.12	19.98	19.09	17.87	22.81	25.20	Prod Syst Tier II:	11.98	17.08	11.65	13.17	15.71	15.82	12.38	13.00	Prod Syst Tier III & IV	NA	0.6	0.90	NA	NA	NA	NA	NA								
	Research Theme	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09																																																																																											
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		Totals	69.83	72.22	66.04	72.71	68.79	62.99	54.87	52.10	
		Note: R2 (b-i) reports only faculty funded through U of G Faculty Pool and does not include some regional faculty that are funded through the OMAFRA - U of G Agreement.									
	Metric R2 (b-ii)	Total number of research personnel FTEs (i.e. post-doctoral students, graduate students, research associates), that are funded 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 (2015/16):	Total number of research personnel FTEs: 226.88 Note: A 2013/14 change in the reporting template provided a more thorough reporting of research personnel FTE's, thus providing a more accurate account of the FTE's									
		Research Theme	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09	
		Ag & Rural Policy:	20.44	17.00	23.20	19.45	16.50	14.20	14.13	4.00	
		Bioeconomy:	15.06	10.15	11.20	15.35	14.25	15.46	5.00	0.09	
		Emerg Management:	15.99	11.05	18.79	27.17	23.75	23.06	7.50	1.90	
		Environ Sustainability	24.47	17.40	23.95	17.37	15.10	12.85	10.01	11.80	
		Food for Health:	42.62	22.15	45.52	40.61	34.80	23.46	15.85	5.14	
		Product Development	9.13	10.75	13.77	23.32	20.21	13.21	7.38	0.29	
		Prod'n Systems Tier I	99.17	72.4	96.32	65.81	56.28	40.87	18.18	57.18	
		Prod'n Systems Tier II:	Not Appl.	22.18	20.38	34.83	34.91	30.77	42.70	32.44	
		Totals	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 funded by the OMAFRA – U of G Agreement Research Program in the Production Systems II theme.																																																																																										
	Metric R2 (b-iii)	Number of faculty, 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 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 (2015/16):	Total number of faculty, CARG & research personnel FTEs: 290.02 <table><tr><th>Total FTEs by Theme</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>24.95</td><td>22.69</td><td>28.20</td><td>22.80</td><td>20.78</td><td>18.86</td><td>20.89</td><td>6.24</td></tr><tr><td>Bioeconomy</td><td>17.91</td><td>15.99</td><td>14.94</td><td>20.14</td><td>18.93</td><td>19.04</td><td>7.69</td><td>2.10</td></tr><tr><td>Emerg Management</td><td>20.91</td><td>38.68</td><td>23.88</td><td>32.12</td><td>25.58</td><td>26.61</td><td>9.82</td><td>2.65</td></tr><tr><td>Environ Sustainability</td><td>29.91</td><td>22.47</td><td>34.65</td><td>25.34</td><td>25.42</td><td>24.61</td><td>19.59</td><td>19.59</td></tr><tr><td>Food for Health</td><td>50.05</td><td>29.87</td><td>54.13</td><td>50.76</td><td>43.82</td><td>30.41</td><td>7.34</td><td>7.34</td></tr><tr><td>Product Development</td><td>11.29</td><td>52.34</td><td>16.78</td><td>27.63</td><td>22.91</td><td>16.15</td><td>2.79</td><td>2.79</td></tr><tr><td>Prod'n Systems Tier I</td><td>122.92</td><td>95.60</td><td>118.98</td><td>87.27</td><td>77.15</td><td>60.87</td><td>84.74</td><td>84.74</td></tr><tr><td>Prod'n Systems Tier II</td><td>11.98</td><td>39.26</td><td>50.69</td><td>49.10</td><td>52.32</td><td>48.19</td><td>46.52</td><td>46.52</td></tr><tr><td>Total All Themes:</td><td>290.02</td><td>316.90</td><td>342.25</td><td>315.16</td><td>286.91</td><td>244.74</td><td>181.98</td><td>171.97</td></tr></table>	Total FTEs by Theme	2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09	Ag & Rural Policy	24.95	22.69	28.20	22.80	20.78	18.86	20.89	6.24	Bioeconomy	17.91	15.99	14.94	20.14	18.93	19.04	7.69	2.10	Emerg Management	20.91	38.68	23.88	32.12	25.58	26.61	9.82	2.65	Environ Sustainability	29.91	22.47	34.65	25.34	25.42	24.61	19.59	19.59	Food for Health	50.05	29.87	54.13	50.76	43.82	30.41	7.34	7.34	Product Development	11.29	52.34	16.78	27.63	22.91	16.15	2.79	2.79	Prod'n Systems Tier I	122.92	95.60	118.98	87.27	77.15	60.87	84.74	84.74	Prod'n Systems Tier II	11.98	39.26	50.69	49.10	52.32	48.19	46.52	46.52	Total All Themes:	290.02	316.90	342.25	315.16	286.91	244.74	181.98	171.97
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		Note: The reported number of faculty, 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 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 (2015/16):	During 2015/16, 10 faculty having Canada Research Chairs also had active Agreement research projects. This is unchanged from 2014/15.
	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 (2015/16):	In the most current (2015) Research Infosource Inc. (formerly Research Money) report of Canadian universities' standings rank U of G as second in the comprehensive category, and first in research intensity.
	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 .
	Results:	Total number of faculty published in high impact journals: 77

	(2015/16):																
		No. of Faculty by Theme		2015/16	2014/15	2013/14	2012/13	2011/12	2010/11	2009/10	2008/09						
		Ag Policy & Rural Policy:		1	4	5	8	8	3	2	3						
		Bioeconomy – Industrial Uses:		11	2	1	6	2	1	3	3						
		Emergency Management:		8	5	1	5	0	0	2	0						
		Environmental Sustainability:		4	2	2	4	12	8	5	5						
		Food for Health:		7	9	4	11	13	2	1	7						
		Product Development:		10	4	0	4	6	4	0	6						
		Production Systems I & II:		36	30	18	42	44	44	75	67						
		Totals		77	56	33	80	85	62	88	91						
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 (2015/16):	See table below that indicates representation of stakeholders in 2015/16, 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 – Livestock		Prod Syst - Plants	
		LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP	LOI	FP
Research /Scientific		6	4	4	4	5	5	3	3	4	4	3	2	5	4	5	5
OMAFRA / Gov’t		5	5	3	3	4	4	4	4	4	4	3	3	3	3	4	4

User Community / Industry / Non-Gov't	5	4	4	4	2	1	2	2	2	2	4	4	3	3	3	3
Total	16	13	11	11	11	10	9	9	10	10	10	9	11	10	12	12
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 ≥ 2008/09 baseline of 265 and 57% respectively.			
	Results (2015/16):	Total number published in peer reviewed journals: 85 ; total percentage in high impact journals: 70% No explanation is available concerning these results in comparison to the target.			
		<u>Total number of publications in peer reviewed journals (by theme), & ratio in high impact journals</u>			
		Research Theme	2015/16	2014/15	2013/14
		Ag Policy & Rural Devel:	1 – 100%	6 – 67%	5 – 100%
		Bioeconomy – Industrial Uses:	13 – 85%	12 – 17%	7 – 14%
		Emergency Management:	8 – 100%	9 – 56%	8 – 13%
		Environmental Sustainability:	10 – 40%	5 – 40%	4 – 50%
		Food for Health:	8 – 88%	13 – 70%	17 – 24%
		Product Development:	12 – 83%	9 – 40%	2 – 0%
		Production Systems I & II:	47 – 81%	43 – 70%	69 – 26%
		Totals	85 – 70%	97 – 58%	112 – 30%
	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 $\geq$ 2008/09 baseline of 265 .	
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	
	<u>Research Theme</u> <u>Continuing Projects in 2015/16</u>	<u>(i) # of Collaborators by Theme</u> <u>New Projects for 2015/16</u> Ag & Rural Policy: 9 (includes 3 OMAFRA staff) Bioeconomy – Industrial Uses: 4 (includes 2 OMAFRA staff) Emergency Management: 23 (includes 15 OMAFRA staff) Environmental Sustainability: 15 (includes 6 OMAFRA staff) Food for Health: 26 (includes 2 OMAFRA staff) Product Development: 13 (includes 0 OMAFRA staff) Production Systems I & II: 95 (includes 40 OMAFRA staff) Total All Themes: 154 (includes 49 OMAFRA staff)
		<u>(ii) # of Collaborators by Theme</u> 27 (includes 6 OMAFRA staff) 7 (includes 2 OMAFRA staff) 23 (includes 12 OMAFRA staff) 19 (includes 6 OMAFRA staff) 9 (includes 1 OMAFRA staff) 16 (includes 4 OMAFRA staff) 35 (includes 18 OMAFRA staff) 118 (includes 37 OMAFRA staff)
Results (2014/15)	i) Total number of collaborators for continuing projects in 2013/14: 244 ii) Total number of collaborators for new projects approved for 2013/14: 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 (2015/16):	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>2016 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 (2015/16):	<table><tr><th>Graduate Students by Research Theme</th><th>2015/16</th><th>2014/15</th><th>'13/'14</th><th>'12/'13</th><th>'11/'12</th><th>'10/'11</th><th>'09/'10</th><th>2008/09</th></tr><tr><td>Ag & Rural Policy</td><td>22</td><td>14.75</td><td>19.05</td><td>19.10</td><td>15.00</td><td>12.60</td><td>21.00</td><td>4.00</td></tr><tr><td>Bioeconomy</td><td>9</td><td>5.60</td><td>9.30</td><td>12.90</td><td>7.50</td><td>8.45</td><td>0.50</td><td>5.00</td></tr><tr><td>Emerg Management</td><td>19</td><td>8.82</td><td>15.68</td><td>12.41</td><td>15.80</td><td>9.00</td><td>5.00</td><td>3.00</td></tr><tr><td>Env. Sustainability</td><td>19</td><td>12.50</td><td>21.24</td><td>17.27</td><td>19.55</td><td>11.05</td><td>4.50</td><td>8.00</td></tr></table>									Graduate Students by Research Theme	2015/16	2014/15	'13/'14	'12/'13	'11/'12	'10/'11	'09/'10	2008/09	Ag & Rural Policy	22	14.75	19.05	19.10	15.00	12.60	21.00	4.00	Bioeconomy	9	5.60	9.30	12.90	7.50	8.45	0.50	5.00	Emerg Management	19	8.82	15.68	12.41	15.80	9.00	5.00	3.00	Env. Sustainability	19	12.50	21.24	17.27	19.55	11.05	4.50	8.00
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		Food for Health: 42 18.40 35.80 29.96 22.85 15.87 8.00 4.00 Prod Development 13 10.10 13.00 20.95 14.25 9.50 5.00 4.00 Prod Systems Tier I & II: 82 60.21 94.49 80.38 65.40 51.20 57.00 112.00 Total All Themes: 180 (9 work across multiple themes) 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 (2015/16):	27 graduate students were enrolled in the HQP program during 2015/16. Seven were new awards in 2015/16.	
	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 (2015/16):	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 <u>2016 Agri-Food Yearbook</u> .	

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 2015/16	The table below shows knowledge transfer events for 2015/16 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 Syst Tiers I & II		Total	Total
	2015 /16	Avg of past 5 years	2015/ 16	Avg of past 5 years	2015/ 16	Avg of past 5 years	2015/ 16	Avg of past 5 years	2015 /16	Avg of past 5 years	2015/ 16	Avg of past 5 years	2015/ 16	Avg of past 5 years	2015/ 16	Avg of past 5 years
Peer-reviewed publications	1	6.8	13	13.4	8	7.4	10	9	8	13.2	12	9.8	47	67.2	85	124.8
Presentations at scientific conferences	2	11.8	6	13.2	28	22.2	11	16.8	10	17.8	7	12.2	61	98	103	187.6
Media citations	4	12	0	8.2	23	13.4	5	8	1	6.6	2	5.6	39	75.6	63	127.2
Presentations posted on the internet	5	6.4	3	3.4	7	2.4	2	5.8	1	3	4	3.6	10	14.2	30	38.4
Presentations to stakeholder or industry	13	24	6	17.6	22	21.2	3	25.6	6	20.2	10	14.8	82	132.4	127	252.8

	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 (2015/16):	Examples of utilization of new knowledge by stakeholders in 2015/16 included: Robots developed for greenhouse harvest Prof. Medhat Moussa has been working with greenhouse operators in Leamington Ontario (which has one of the largest concentrations of greenhouses in North America) to develop a robotic harvester. The robot can identify tomatoes that are ripe for picking, and pluck them carefully without squeezing them. Greenhouse labour can amount to 30 percent of total expenses; the robots are expected to achieve cost recovery within six years, but research advances could make them more affordable, sooner. http://news.uoguelph.ca/2016/03/19374/ Genetic approaches to livestock health The High Immune Response Technology (HIR™) developed by Prof. Bonnie Mallard and colleagues has been implemented globally in the dairy industry by Canada's largest dairy genetics company, the Semex alliance Inc. under the tradename, <i>Immunity+</i>™. The unique features of the HIR technology allow for identification of animals with more robust and balance immune responses. Prof. Mallard is also investigating the application of genetic tools to the health improvement of other livestock species, including swine. Read more examples of stakeholder utilization of new knowledge in the 2016 Agri-Food Yearbook.
	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 ≥ 2008/09, which was 9 No. of licenses granted ≥ 2008/09, which was 17

	Results (2015/16)	Total number of OMAFRA related patents filed: 35							
		<u>Patents filed by research theme:</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>2009/10</u>
		Ag Policy & Rural Development:	0	0	0	0	0	0	0
		Bioeconomy – Industrial Uses:	6	6	3	3	3	4	5
		Emergency Management:	0	0	0	0	0	0	0
		Environmental Sustainability:	0	0	0	0	0	0	0
		Food for Health:	0	1	0	0	1	2	1
		Product Development:	19	10	11	7	3	1	0
		Production Systems (Animals):	0	0	1	0	1	4	3
		Production Systems (Crops):	10	0	1	3	0	4	1
	Totals:	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: 23							
		<u>License & amending agreements by research theme:</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>2009/10</u>
		Ag Policy & Rural Development:	1	0	0	0	0	0	0
		Bioeconomy – Industrial Uses:	2	0	3	2	3	0	1
		Emergency Management:	0	0	0	0	0	0	0
		Environmental Sustainability:	0	0	0	0	0	0	0
		Food for Health:	0	0	0	0	1	0	0
		Product Development:	7	3	1	4	0	1	1
		Production Systems (Animals):	0	1	0	2	2	1	1
		Production Systems (Crops):	13	11	45	6	27	13	18
	Totals:	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 Syst Tiers I and II
		Cash and in-kind leveraged (\$000s)	283,900	323,626	500	1,037,475	782,324	734,324
		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
	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 (2015/16):	The 2015/16 ratio of third party investment to Agreement funding was 1.8:1. Total amount of third party investment – \$10.7 million. Ratio is based on total OMAFRA operating funds of \$6.04 million committed to research projects within fiscal 2015/16. 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 $\geq$ 2008/09 baseline of 364 .																																																																																																
	Results (2015/16):	Total number of Agreement related disclosures: 10 See explanatory note below. <table> <tr> <th><u>Disclosures by research theme:</u></th><th><u>2015/16</u></th><th><u>2014/15</u></th><th><u>2013/14</u></th><th><u>2012/13</u></th><th><u>2011/12</u></th><th><u>2010/11</u></th><th><u>2009/10</u></th><th><u>2008/09</u></th></tr> <tr> <td>Ag Policy & Rural Devel:</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>-</td></tr> <tr> <td>Bioeconomy – Industrial Uses</td><td>0</td><td>6</td><td>3</td><td>2</td><td>3</td><td>3</td><td>1</td><td>0</td></tr> <tr> <td>Emergency Management</td><td>0</td><td>1</td><td>0</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><td>0</td><td>1</td><td>0</td></tr> <tr> <td>Food for Health:</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>2</td><td>0</td></tr> <tr> <td>Product Development:</td><td>6</td><td>3</td><td>6</td><td>6</td><td>5</td><td>2</td><td>1</td><td>2</td></tr> <tr> <td>Production Systems (Animals):</td><td>0</td><td>1</td><td>3</td><td>1</td><td>1</td><td>4</td><td>16</td><td>3</td></tr> <tr> <td>Production Systems (Crops):</td><td>4</td><td>71</td><td>155</td><td>258</td><td>68</td><td>151</td><td>100</td><td>359</td></tr> <tr> <td>Totals:</td><td>10</td><td>82</td><td>167</td><td>267</td><td>78</td><td>160</td><td>121</td><td>364</td></tr> </table> 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, however the total disclosures fall short of the 2008/09 numbers. In 2015/16, no new seed varieties were disclosed, because the annual disclosures were delayed beyond the end of the fiscal year. It is expected that a relatively large number will be reported in fiscal 2016/17 due to the carry-over from 2015/16, plus new varieties that may be reported before the end of fiscal 2017.							<u>Disclosures by research theme:</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>2009/10</u>	<u>2008/09</u>	Ag Policy & Rural Devel:	0	0	0	0	0	0	0	-	Bioeconomy – Industrial Uses	0	6	3	2	3	3	1	0	Emergency Management	0	1	0	0	0	0	0	0	Environmental Sustainability:	0	0	0	0	0	0	1	0	Food for Health:	0	0	0	0	1	0	2	0	Product Development:	6	3	6	6	5	2	1	2	Production Systems (Animals):	0	1	3	1	1	4	16	3	Production Systems (Crops):	4	71	155	258	68	151	100	359	Totals:	10	82	167	267	78	160	121	364
<u>Disclosures by research theme:</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>2009/10</u>	<u>2008/09</u>																																																																																										
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Emergency Management	0	1	0	0	0	0	0	0																																																																																										
Environmental Sustainability:	0	0	0	0	0	0	1	0																																																																																										
Food for Health:	0	0	0	0	1	0	2	0																																																																																										
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Totals:	10	82	167	267	78	160	121	364																																																																																										

	Metric R8 (b)	Number of patent applications filed, by research theme					
	Baseline:	9 patents filed in 2008/09					
	Target:	2010-13: Number of patent applications to be ≥ 2008/09 baseline of 9 .					
	Results (2015/16):	Total number of Agreement related patents filed: 35					
		<u>Patents filed by research theme:</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	<u>2011/12</u>
		Ag Policy & Rural Development:	0	0	0	0	0
		Bioeconomy – Industrial Uses:	6	6	3	3	3
		Emergency Management:	0	0	0	0	0
		Environmental Sustainability:	0	0	0	0	0
		Food for Health:	0	1	0	0	1
		Product Development:	19	10	11	7	3
	Production Systems (Animals):	0	0	1	0	1	
	Production Systems (Crops):	10	0	1	3	0	
	Totals:	35	17	16	13	8	
		Note: The increase in applications in the Production Systems (Crops) category stems from increased requests for Plant Breeders Rights applications from commercial partners. We expect to continue to pursue more Plant Breeders Rights applications than has been done in the past.					
	Metric R8 (c)	Number of licenses granted by theme					
	Baseline:	17 licenses granted in 2008/09					
	Target:	Number of licenses granted to be ≥ 2008/09 baseline of 17 .					

	Results (2015/16):	Total number of OMAFRA related licenses granted: 23					
		<u>License & amending agreements by research theme:</u>					
		<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	<u>2011/12</u>	
		1	0	0	0	0	
		2	0	3	2	3	
		0	0	0	0	0	
		0	0	0	0	0	
		0	0	0	0	1	
		7	3	1	4	0	
		0	1	0	2	2	
		13	11	45	6	27	
		Totals:	23	15	49	14	32
		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 R8 (d)	Number of patents issued					
	Baseline:	Five patents issued, as per 2008/09					
	Target:	Number of patents issued to be ≥ 2008/09 baseline of 5					
	Results (2015/16):	Total number of OMAFRA related patents issued: 6					
		<u>Patents issued by research theme:</u>	<u>2015/16</u>	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	<u>2011/12</u>
		Ag Policy & Rural Development:	0	0	0	0	0
		Bioeconomy – Industrial Uses:	1	0	0	0	0
		Emergency Management:	0	0	0	0	0
		Environmental Sustainability:	0	0	0	0	0
		Food for Health:	0	0	2	0	0
		Product Development:	3	3	1	0	0

		Production Systems (Animals):00000 Production Systems (Crops):23010 Totals:66310																								
		Note 1: Of the 6 issued patents in 2015/16, 2 were plant breeders' rights. 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 Agreement-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 (2015/16):	Total dollar value of revenue generated from licenses associated with Agreement-supported research: \$1.8 million. Note: Revenue from Agreement-supported non-seed research is reported to fiscal year end April 30, 2016. Revenue from Agreement-supported seed research is reported to fiscal year-end March 31, 2016. <table><tr><td>License revenue generated</td><td>2015/16</td><td><u>2014/15</u></td><td><u>2013/14</u></td><td><u>2012/13</u></td><td><u>2011/12</u></td></tr><tr><td>Non-seed research</td><td>\$662,910</td><td>\$528,429</td><td>\$417,038</td><td>\$494,156</td><td>\$666,490</td></tr><tr><td>Seed research</td><td>\$1,164,305</td><td>\$1,116,483</td><td>\$922,625</td><td>\$884,120</td><td>\$789,445</td></tr><tr><td>TOTAL:</td><td>\$1,827,215</td><td>\$1,644,912</td><td>\$1,339,664</td><td>\$1,378,276</td><td>\$1,455,935</td></tr></table>	License revenue generated	2015/16	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	<u>2011/12</u>	Non-seed research	\$662,910	\$528,429	\$417,038	\$494,156	\$666,490	Seed research	\$1,164,305	\$1,116,483	\$922,625	\$884,120	\$789,445	TOTAL:	\$1,827,215	\$1,644,912	\$1,339,664	\$1,378,276	\$1,455,935
License revenue generated	2015/16	<u>2014/15</u>	<u>2013/14</u>	<u>2012/13</u>	<u>2011/12</u>																					
Non-seed research	\$662,910	\$528,429	\$417,038	\$494,156	\$666,490																					
Seed research	\$1,164,305	\$1,116,483	\$922,625	\$884,120	\$789,445																					
TOTAL:	\$1,827,215	\$1,644,912	\$1,339,664	\$1,378,276	\$1,455,935																					

	Metric R8 (f)	Three brief case studies of individual files from different (research) themes and initiatives taken to advance commercialization
	Baseline	Three case studies as per 2008/09
	Target	Three case studies presented annually.
	Results (2015/16):	Examples of research projects advancing commercialization in 2015/16 include: • The Bioproducts Discovery and Development Centre developed a compostable resin for use in the production of 100% compostable coffee pods. The pods, known as the PurPod100, are in use by Loblaw in their President's Choice line, as well as by US companies such as Hills Bros. For more information, visit http://purpod100.com • A project led by Dr. Paliyath and Dr. Subramanian, to improve the shelf life of fruits and vegetables, has resulted in the formation of the start-up company Harvest One Agritech. The start-up is based in British Columbia and is helping the project team to make strong connections in both North America and in India to improve the chances of commercial applications of the technology. Harvest One's website is http://harvestoneagritech.com • Start-up company Smart Green Technologies achieved their first commercial sales in fiscal 2016. Company arose from the research program of Dr. Youbin Zheng to produce green roof technologies for the Ontario and broader markets. The founder of the company, Greg Yuristy, was a graduate student in Dr. Zheng's lab and also participated in OMAFRA's booth at 2016's Discovery conference. For more details on the company, visit http://smartgreentechnologies.com Read about these case studies and many more in the 2016 Agri-Food Yearbook.

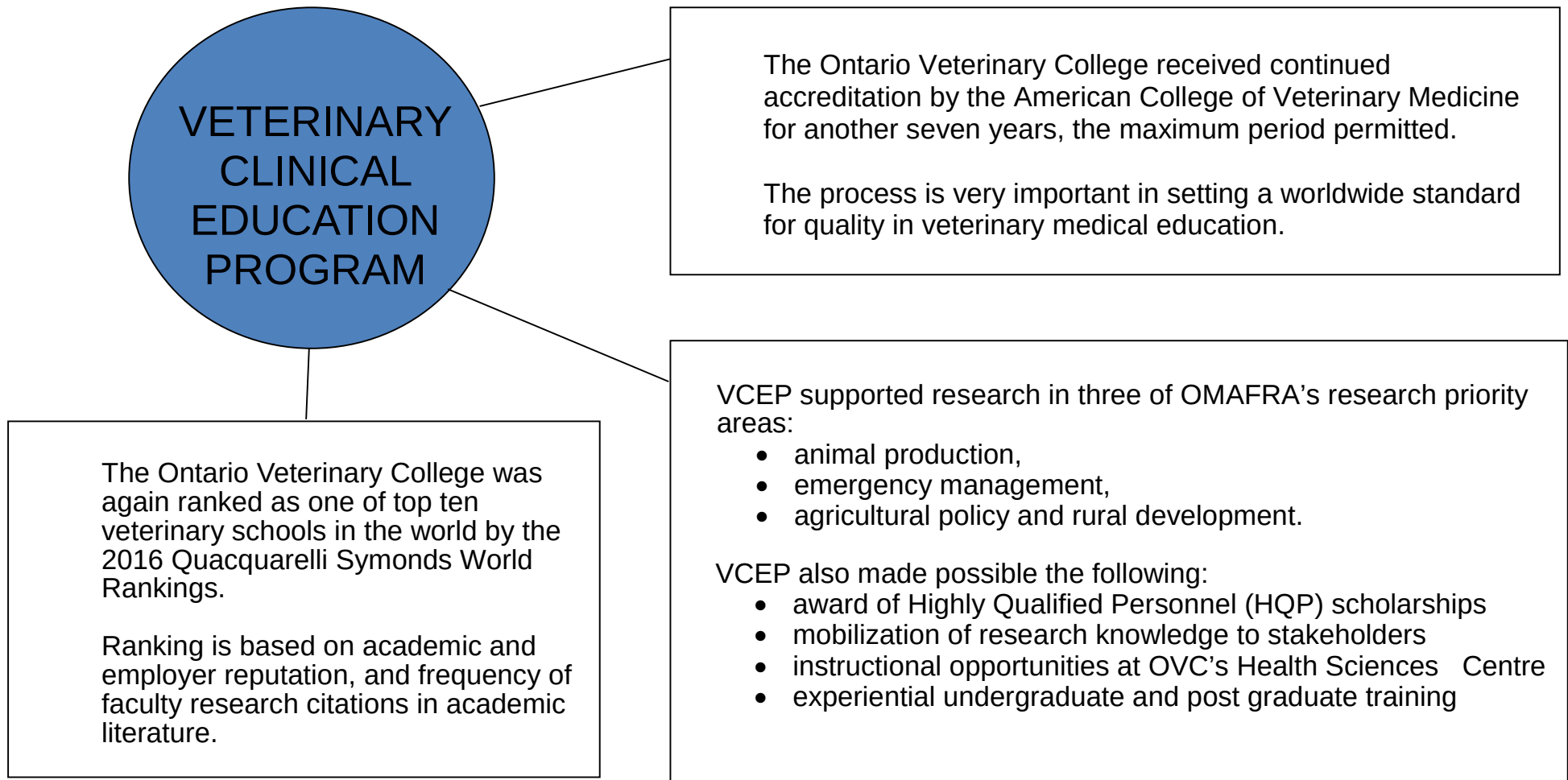
Key Outcome	Awareness of research outcomes and impacts among decision makers, staff and stakeholders	
Performance Indicator R9	Stakeholder assessment of Agreement research outcomes on industry, the economy and the health and well-being of Ontario citizens. Similar to performance indicator OA6.	
	Metric	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 (2015/16)	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 2015/16, 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 (a)	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 represents the best available measure.
	Target:	Number of media citations to be $\geq$ 2008/09 baseline of 190 .

	Results (2015/16)	From researchers' 2015/16 annual and final research reports, number of media citations: <table><tr><td>Ag Policy & Rural Policy:</td><td>2</td></tr><tr><td>Bioeconomy:</td><td>0</td></tr><tr><td>Emergency Management:</td><td>15</td></tr><tr><td>Environmental Sustainability:</td><td>0</td></tr><tr><td>Food for Health:</td><td>0</td></tr><tr><td>Product Development:</td><td>2</td></tr><tr><td>Production Systems I & II:</td><td>31</td></tr><tr><td>Total</td><td>50</td></tr></table> These media citations were identified by researchers in their 2015/16 U of G annual and final reports. This count is again, likely a significant underestimate of media pick-up.	Ag Policy & Rural Policy:	2	Bioeconomy:	0	Emergency Management:	15	Environmental Sustainability:	0	Food for Health:	0	Product Development:	2	Production Systems I & II:	31	Total	50
Ag Policy & Rural Policy:	2																	
Bioeconomy:	0																	
Emergency Management:	15																	
Environmental Sustainability:	0																	
Food for Health:	0																	
Product Development:	2																	
Production Systems I & II:	31																	
Total	50																	

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

Performance Indicators

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 (2015/16): OVC again obtained full accreditation from the AVMA and CVMA (The American and Canadian Veterinary Medical Associations). The Associations' Council on Education annually reviews the updates provided by OVC and conducted a full review and site visit in October 2015. Specifically, OVC received an accredited status with a minor deficiency in the Standard 9 Curriculum for a period of seven years. With respect to this minor deficiency the Council directed the OVC to: 1. Review the role of the summer externship as a core course or increase the academic oversight of this course to ensure attainment of required educational goals 2. Provide hands-on experiences in isolation procedures. Veterinary colleges in Canada, the United States, and top colleges throughout the rest of the world are accredited by the Council on Education of the American and Canadian Veterinary Medical Associations. (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.

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 (2015/16):

VCEP directly funded the following faculty engaged in research that supported the OMAFRA priorities:

- a) **4.0** 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 helped 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 who 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 (2015/16):

Of those graduates (2014 Cohort) who responded in their first year following graduation, **93%** (n = 43) 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, **100%** (n = 22) 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.

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

Results of a five-year post-graduation survey (2011 cohort) indicated that 96% of respondents (n=24) 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 (2015/16):

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
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 (2015/16):

a) OMAFRA Research Theme: Production Systems

DVSc or PhD students: **10** HQP 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.
- Management through the peripartum period for improvement of metabolic and reproductive health in dairy cows.
- Investigation of immune response of sheep to gastrointestinal nematode infection under Ontario grazing conditions for purposes of identifying genetically resistant animals.
- Environmental toxicants and stress: Failure of innate immunity in development of pneumonia in cetaceans.
- Characterization of the fecal bacterial microbiome of commercial mink
- Stimulation of the innate immune system as a means to reduce the impact of bovine respiratory disease.
- *In vivo* measurement of pulmonary artery pulse wave velocity in horses
- EEG analyses in poultry undergoing physical euthanasia methods.
- Equine Herpesvirus -1: prevalence, shedding, and reactivation.
- Longitudinal molecular epidemiology of infectious diarrhea in foals with a focus on *Clostridium difficile*.

Post graduate Interns & Residents: 6 HQP stipends 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) OMAFRA Research Theme: Emergency Management

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

Examples of research include:

- Dynamics of Influenza A virus in swine herds.
- Characterization of the fecal microbiota and an evaluation and analysis of antimicrobial resistance in commercial rabbits.
- Characterization of epitheliocystis in fish.
- 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) OMAFRA Research Theme: Agricultural and Rural Policy

Summer career opportunities & research experience (CORE) program:

Each year approximately 50 students from both DVM and BSc degree programs participate in summer research in a project of their faculty mentor. Through seminars they are exposed to a variety of career opportunities. Listed below are four student projects funded this year:

- Evaluation of a camera for body condition scoring of dairy cattle
- Investigation of immune response of sheep to gastrointestinal nematode infection under Ontario grazing conditions for purposes of identifying genetically resistant animals
- Estimating incidence of infection with Influenza A virus in replacement breeding stock in pig herds
- Development of a vaccine to protect against *Toxoplasma gondii* infection in sheep

In January 2016, a research project was initiated entitle 'The rural community veterinary practitioner: using student, veterinary practitioner and faculty focus groups to inform curriculum at the Ontario Veterinary College. An MSc (epidemiology) graduate student is working on the project and VCEP funds are providing operating support for the research.

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

“After the Year 5 review, the Parties shall develop further milestones for the balance of the term of the Agreement.” (*Article 5.3, OMAFRA-U of G Partnership Agreement*)

Agriculture and Food Laboratory:

During the 2015/16 fiscal year, the AFL maintained contingency planning in case of disruption to laboratory operations. This includes updating of staff contact information so they can be quickly reached. Additional yearly milestones were not defined.

OMAFRA is always notified of any potential events, if they can be foreseen (such as labour or weather interruptions), and the potential to impact receipt of OMAFRA samples or delivery of results to OMAFRA with 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

After Year 5 of the Partnership Agreement (2012/13), the Schedule G milestones are determined by the AHL Program Management Committee annually. For 2015/16, the AHL Guelph lab (AHL-G) participated in an emergency Foreign Animal Disease simulation, as did the AHL Kemptville lab (AHL-Kv).

See performance indicator AHL2 and below for details. ‘Business Continuity and Emergency Response’ plans for AHL remain in place.

Schedule G related activities in fiscal 2015/16 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.
- **Surge capacity** is maintained year-round, and has benefited from the acquisition of high-volume equipment funded by OMAFRA. The major high-volume emergency testing event that started in January 2014 as the result of the incursion of porcine epidemic diarrhea (PED) continued at a diminished level through 2015/16. Over 120,000 PCR reactions were performed over the course of the PED outbreak. Low level monitoring continues.
- On November 6, 2015, the AHL-Kv lab conducted a **foreign animal disease (FAD) simulation** on Classical swine fever. The objectives were: to evaluate the ability of AHL-Kv personnel to conduct the appropriate sampling, decontamination and reporting following

SOP AHL-K-016 – Post mortem room and general laboratory procedures for handling a foreign animal disease (FAD) suspect, and to identify areas for improvement of the protocol. The exercise was observed by two evaluators from CFIA (CFIA Ottawa District Office and the CFIA Ottawa Laboratory – Fallowfield). The exercise was successful and objectives were completed. The exercise was a valuable training experience for AHL-Kv staff and several action items were generated to improve the protocol. The evaluators provided detailed and useful feedback.

- On March 16, 2016 the annual **foreign animal disease (FAD) simulation** was held at the AHL Guelph (AHL-G) Postmortem laboratory section. The simulated disease was Lips and Toes Disease. The objectives were: 1) to test and validate the standard operating procedure and work instructions related to emergency management of a carcass in the PM lab that is infected with a suspected immediately notifiable/FAD; and 2) to evaluate joint co-ordination and communication networks among the AHL, OVC, University of Guelph, OMAFRA and the Canadian Food Inspection Agency.

The exercise was observed by Dr. Cathy Furness, OMAFRA Lead Veterinarian, Planning and Preparedness who accepted the role of formal evaluator. The exercise was well designed to adequately test the implementation of the AHL SOP. Pertinent instructions and anticipated timeframes were provided to the participants. The exercise materials were clear and concise. All of the exercise participants fulfilled their respective roles and responsibilities and worked as a cohesive team. The participants remained calm throughout the exercise and handled challenges as they arose. All of the exercise objectives were fulfilled (as defined in the exercise evaluator guide). There were very few weaknesses identified during the exercise.

- As part of routine AHL surveillance and vigilance, samples were submitted to CFIA in 2015/16 for **confirmatory negative testing** for various federally reportable diseases, including African swine fever, BSE, bluetongue, bovine tuberculosis, classical swine fever, foot-and-mouth disease, pseudorabies, scrapie, vesicular stomatitis, *Salmonella* serotyping, and rabies.

SCHEDULE N: JOINT INTELLECTUAL PROPERTY (OMAFRA AND U OF G)

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 2015/16 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 below also provide further information regarding joint intellectual property of the Agreement.

APPENDIX A–1: LICENSE AGREEMENTS (2015/16)

Agreement ID	Type	Description
Hambly 20160422	License - Non-Exclusive	R2B2 project (rural broadband)
Zheng 20150515	License - Exclusive	HydroMat Green roof production system; prefabricated green roof module; growing substrates
Paliyath 20160112	License - Exclusive	Inhibition of phospholipase D activity by CG aldehydes and alcohols
Paliyath 20151028	Option	Inhibition of phospholipase D activity by C6 aldehydes and alcohols
Nagy 20151201	License - Exclusive	FadV9-MV
Prescott 20160101	License - Non-Exclusive	To sell diagnostic tests or assays to identify animals infected with Type A <i>Clostridium perfringens</i>
Mohanty 20150601	License - Exclusive	Biodegradable bioplastics based on binary, ternary or quaternary polymer blends
Raizada 20151215	License - Exclusive	Endophytes
Mohanty 20151028	Option	bioABS
Raizada 20150731	Option	Bacterial strains that show efficacy in controlling plant fungal pathogens
Seeds:		
ZZ Wheat 20151208	Germplasm License - Exclusive	Wheat varieties
ZZ Wheat 20150721	Germplasm License - Exclusive	UGRCC2-78 (UGRC Ring)
ZZ Oat 20160217	Germplasm License - Exclusive	OAC Markdale
ZZ Aspar 20151103	Germplasm License - Exclusive	G24 x G305, G178 x G305, UG001, UG005, UG009, UG010, UG020
ZZ Soybean 20150326	Germplasm License - Exclusive	SeCan 12-205 RR2Y

ZZ Soybean 20151014	Germplasm License - Non-Exclusive	Soybean Lines
ZZ Tomato 20150813	Germplasm License - Non-Exclusive	Tomato Inbred Agreement
ZZ Seed 20150511	Amending Agreement	Amendment #4
ZZ Tomato 20160127	Amending Agreement	Amended Schedule 1
ZZ Soybean 20160106	Amending Agreement	Amendment #2
ZZ Soybean 20151130	Amending Agreement	Amendment #8
ZZ Tomato 20160127b	Amending Agreement	Amendment Schedule 1
ZZ Tomato 20150810	Amending Agreement	Amend #1 - new varieties & payment - 2015 Schedule 1

APPENDIX A-2: PROOF OF PRINCIPAL (POP) **FUNDED RESEARCH PROJECTS (2015/16)**

Project Title	Primary Investigator	Value	Result
High linoleic soybean oil	Istvan Rajcan	\$25,000	Success - Used to generate samples for companies – waiting on response from companies
Modification of starch metabolism in transgenic <i>Arabidopsis thaliana</i> increases plant biomass and doubles oil seed production	Ian Tetlow	\$25,000	Research is ongoing
Vegetated roofing system refinement and manufacturing	Youbin Zheng	\$49,410	Success – start-up company Smart Green Technologies formed
Development of a vaccine for necrotizing enteritis of foals	John Prescott	\$35,000	Patents filed using research results generated & Option agreement secured
Optimization of a Serological Test for Johne's Disease	Lucy Mutharia	\$50,000	Patents filed – Collaboration formed. Seeking licensees

High rosmarinic acid mint to treat inflammation in horses	Laima Kott	\$18,500	Success – License issued
Boar taint solution	Jim Squires	\$24,000	Success – POP research lead to industry sponsored research project
Tomatoes with early red colouring	Steve Loewen	\$12,225	Research ongoing
Phosphopeptide-based interventions	Yoshi Mine	\$25,000	Marketing of technology to industry ongoing
Soy cheese (blend of soy & milk protein soft cheese)	Milena Corredig	\$5,500	Scientific success, but commercialization was unsuccessful
1,3-Diacylglycerols for hard fat applications	Rob Lencki	\$45,000	Scientific success, but commercialization was unsuccessful

APPENDIX B: OMAFRA - U OF G AUDITED STATEMENT OF REVENUES AND EXPENSES

Financial information

University of Guelph
OMAFRA Agreement

Year ended April 30, 2016



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, 2016 [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, 2016.

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.

- 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 27, 2016

The logo for Ernst & Young LLP is written in a black, cursive script font.

Chartered Professional Accountants
Licensed Public Accountants

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, 2016

	OMAFRA Programs					Total OMAFRA 2016	Total OMAFRA 2015
	Research	Vet Clinical Education	Agri-food Laboratory	Animal Health Laboratory	Minor Capital Repairs		
	\$	\$	\$	\$	\$	\$	\$
Revenue							
Provincial	46,167	5,294	6,810	6,987	5,037	70,295	69,601
Sales of goods and services	4,615	—	7,373	6,032	—	18,020	18,366
Investment income	180	—	—	—	—	180	303
Other	1,580	2	7	2	—	1,591	1,447
Total revenue	52,542	5,296	14,190	13,021	5,037	90,086	89,717
Expenses							
Personnel costs	22,012	152	9,916	9,096	6	41,182	40,259
Support for faculty costs	8,900	1,900	—	—	—	10,800	10,800
Operating	14,861	3,162	4,422	5,226	5,031	32,702	33,575
Internal recoveries	(3,061)	(38)	(435)	(1,564)	—	(5,098)	(5,417)
Service costs	9,830	120	287	263	—	10,500	10,500
Total contract expenses	52,542	5,296	14,190	13,021	5,037	90,086	89,717
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, 2016

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 RR001] 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.

	<u>2016</u>	<u>2015</u>
Opening Balance	26,376	29,864
Funds Received	71,300	61,300
Expenditures	<u>(64,759)</u>	<u>(64,788)</u>
Ending Balance	<u>32,917</u>	<u>26,376</u>

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, 2016

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, 2016, \$55,218 has been spent leaving a balance of \$782. It is now expected that the remaining \$0.8 million will be spent within the next year.

The expenditures were spent in the following OMAFRA programs:

	<u>2016</u>	<u>2015</u>
Research	1,333	2,396
Veterinary Clinical Education Program	(9)	26
Animal Health Laboratory	-	56
	<u>1,324</u>	<u>2,478</u>

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
2015/16 Annual Report

We are pleased to provide you with the 2015/16 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 information regarding the Agreement is increasingly available on line, this annual report has focused on updates and highlights of 2015/16 exclusively. Links are available in the report to direct the reader to sources of further information.

As co-chairs of the Agreement Executive Committee, we have approved the 2015/16 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.

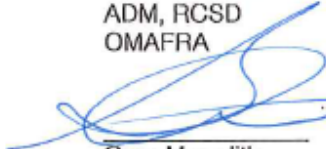
Approved:


Christine Primeau
ADM, RCSD
OMAFRA

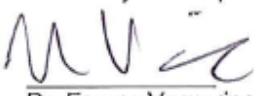
Mar. 11/17
Date


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

13-02-17
Date


Greg Meredith
Deputy Minister
OMAFRA

March 15/17
Date


Dr. Franco Vaccarino
President
University of Guelph

March 15/17
Date