ONTARIO MINISTRY OF AGRICULTURE, FOOD AND RURAL AFFAIRS (OMAFRA) / UNIVERSITY OF GUELPH (UOFG) AGREEMENT

CONSOLIDATED ANNUAL REPORT
YEAR 1
2018/19

Version 4

SEPTEMBER 20, 2019

Table of Contents

1 Introduction

This annual report is 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 (UofG) Agreement. This is the first annual report under the Agreement that operates for the period of April 1, 2018 to March 31, 2023.

The University of Guelph has complied with all material provisions of the Agreement and managed 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 UofG's 2018/19 fiscal year (May 1, 2018 to April 30, 2019). The report covers the activities, budgets, expenditures and performance measures for each of the five program areas of the Agreement: Research Program, Veterinary Capacity Program (VCP), Animal Health Laboratory (AHL), the Agriculture and Food Laboratory (AFL) and the Property Management Program.

After approval, this report will be posted at The Atrium, UofG's digital repository (https://atrium.lib.uoguelph.ca/).

1.1 An Updated Report Structure

The structure of this first consolidated annual report has been modified from the annual reports submitted under the prior Agreement. It leads with the *Growing Ontario Solutions*, followed by seven sections.

Growing Ontario Solutions provides a visual summary of how the programs are integrated and their outputs amplified to meet the Agreement's strategic objectives. The vision of this document is to reaffirm UofG's commitment to demonstrating how the Agreement delivers value for Ontario and how the UofG leverages the Province's investment to make Ontario a global leader in agri-food innovation.

Section 1 is this Introduction. Section 2 is a Financial Summary. Sections 3 through 7 are reports from the Program Management Committees of each of the Agreement's Programs. These sections include highlights, updates and performance information.

1.2 About Us

The UofG and OMAFRA strive to be a world-renowned model of government-university collaboration. By working together, the UofG and OMAFRA enable the research, innovation, laboratory science, training and infrastructure necessary to keep Ontario's agri-food sectors and rural communities vital, competitive and sustainable. Agri-food is one of Ontario's largest industries; worth $37 billion to the province's economy and directly employing more than 800,000 people. The agri-food sector is evolving and tasked with providing solutions to a growing number of challenges, from producing more food while protecting the environment to making greater contributions to human health.

The University of Guelph is a natural leader in addressing these challenges. The long-standing partnership with OMAFRA, known as the Ontario Agri-Food Innovation Alliance, is fueled by a shared commitment to support the growth and prosperity of Ontario's agri-food sectors and the vitality of rural communities. By working together, the Alliance has become more than an example of government-university collaboration; it is also producing Ontario Solutions with Global Impact.

1.3 Strategic Focus

The University of Guelph works with OMAFRA and partners to support the success of Ontario's agriculture, food and bioproduct sectors. The University also focuses on supporting the vibrancy of rural communities, and the health and well-being of the Province, its environment and its citizens. The University's work includes:

- Advancing a world-class research and innovation system;
- Training the next generation of agri-food innovators;
- Creating a platform for collaboration and innovation;
- Enhancing transparency and confidence in the agri-food sector;
- Protecting Ontario's agri-food sector; and
- Improving data access and storage.

1.4 Approach

The OMAFRA/UofG Agreement invests in the people, places and programs that support the Agreement's strategic focus to strengthen Ontario's agriculture, food, bioproduct and rural sectors for the benefit of Ontario and Ontarians. The University of Guelph administers and leverages this investment to make Ontario a global leader in agri-food innovation. It is making a difference across Ontario by achieving assurance in food safety, supporting a competitive and sustainable agri-food sector, and building healthier communities and a healthier environment.

2 Financial Summary and Analysis

2.1 Definitions

Tables 2.1, 2.2 and 2.3 provide the definitions for the terms used in the financial tables in this section of the report.

Table 2.1: Revenue Definitions

Term	Definition
OMAFRA Agreement	The portion of the total Agreement funding recognized for eligible expenses (net of program revenues) in the University fiscal year (May 1, 2018-April 30, 2019).
OMAFRA Other	These revenues include OMAFRA funding designated for specific activities (e.g. $500K in support of the Laboratories).
Sales of Goods and Services	Sales of services or goods from the Agreement operations to external organizations and clients. This category records revenues for testing services provided by the two Laboratories and sale of produce from the Research Stations.
Investment Income	Investment earned on the net cash flow in accordance with section 10.7 of the Agreement.
Other Revenue	Miscellaneous revenues generated from Agreement operations. The major component of this category is facility rental income for space managed within the Property Management program. Other Revenue may also include sponsorship revenues, recoveries from the disposal of surplus equipment or other miscellany. Other Revenues are typically irregular activities and projects that don't necessary recur annually.

Table 2.2: Expense Definitions

Term	Definition
Salary and Wages	All salary and wage costs for UofG employees excluding transfers for Research and VCP faculty costs (refer to faculty pool costs definition).
Non-Salary Benefit Costs	Includes non-salary costs for statutory and negotiated employee benefit programs and eligible pension costs. Non-salary benefit costs are allocated using the standardized pooled costing method applied to all University sponsors and funding sources.

Term	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 VCP Programs.
Travel	Travel includes eligible expenditures for approved travel on Agreement supported program activities.
Operating	Expenses for all costs other than salary, benefit and travel costs.
Internal Recoveries	Recovery of costs between units within the University for goods and services provided such as Lab Testing performed by AHL and AFL or research station recoveries from researchers. Internal Charges are recorded under Operating.

Table 2.3: Column Definitions

Term	Definition
2018/19 Agreement	The core operations and activities of the Agreement funded by the annual transfer payment and revenues from the sales of goods and services related to the Program Activities for the current University fiscal year.
2018/19 Results	Actual revenue or expenses recorded for the period of May 1, 2018 to April 30, 2019.
2018/19 Budget	Annual Budget allocated for that category, excluding carry forwards.
Variance	Difference between budget and results.
% Variance > 5%	Where the results differed from the budget by greater than 5% and the variance was greater than $10K.

2.2 Agreement Financial Summary

Table 2.4 provides the Agreement Financial Summary which includes all expenditures and revenues by Standard Accounts for the Agreement. The table includes the 2018/19 Results, 2018/19 Budget, Variance, and Percentage Variance when greater than 5%. This summary does not include ARIO Minor Capital. In 2018/19, the net Agreement results was a positive balance of $2,515K, which was added to the carry forward.

Table 2.4: Agreement Financial Summary (in thousands of dollars)

Standard Accounts	2018/19 Results	2018/19 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Agreement	(68,785)	(71,300)	(2,515)	
OMAFRA Other	(500)	(500)	0	
Sales Goods and Services	(20,296)	(19,730)	566	
Investment Income	(629)	(300)	329	110%
Other Revenue	(1,492)	(1,185)	307	26%
Revenue Total	**(91,701)**	**(93,014)**	**(1,313)**	
Expenses				
Salaries and Wages	33,405	33,749	344	
Non-Salary Benefit Costs	8,487	8,771	284	
Faculty Pool Costs	13,045	13,045	0	
Travel	795	918	123	13%
Operating	40,817	40,869	52	
Internal Recoveries	(4,847)	(4,337)	510	12%
Expenses Total	**91,701**[1]	**93,015**	**1,313**	
Grand Total	**0**	**0**	**0**	

OMAFRA Agreement Revenue	**71,300**
Change in Carry Forward	**2,515**

Carry Forward into 2018/19	39,842
Carry Forward into 2019/20	42,357

Figure 2.1 illustrates the Agreement Revenue by Standard Accounts, while Figure 2.2 illustrates the Agreement Expenses.

[1] The Agreement Financial Summary does not include the ARIO Minor Capital Expenses of $6,241K. If these were included, the Expense Total would be $97,943K, which matches the 2018/19 Audited Financial Statements.

Figure 2.1: Agreement Revenue for 2018/19 by Standard Accounts

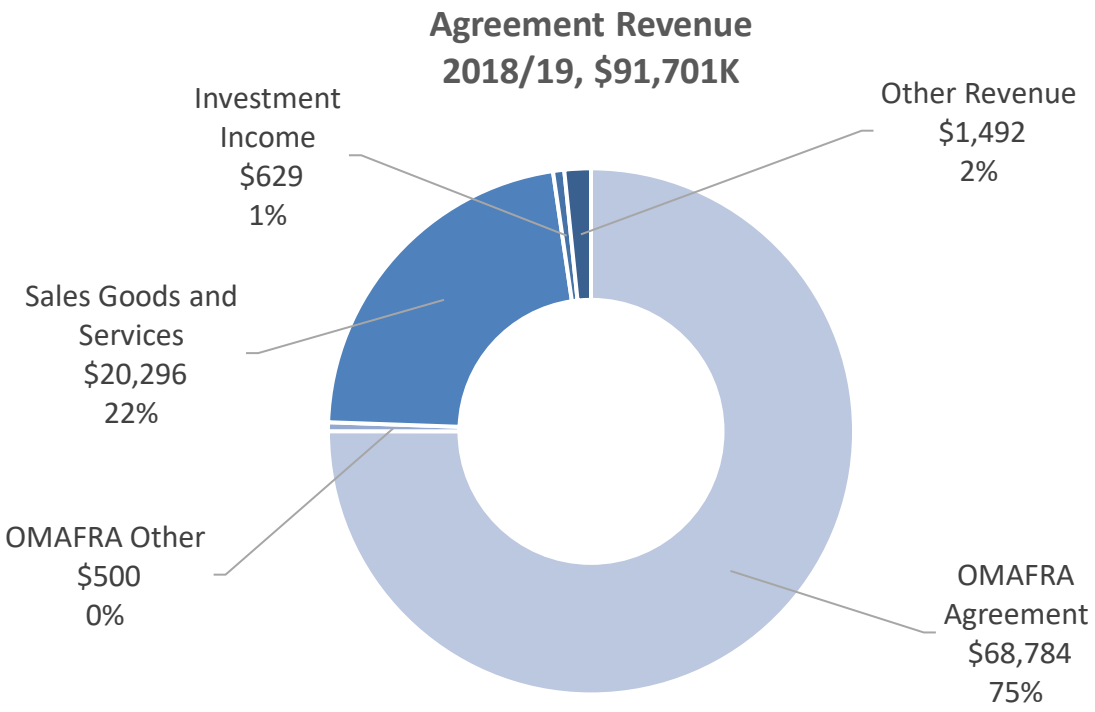


Figure 2.2: Agreement Expenses for 2018/19 by Standard Accounts

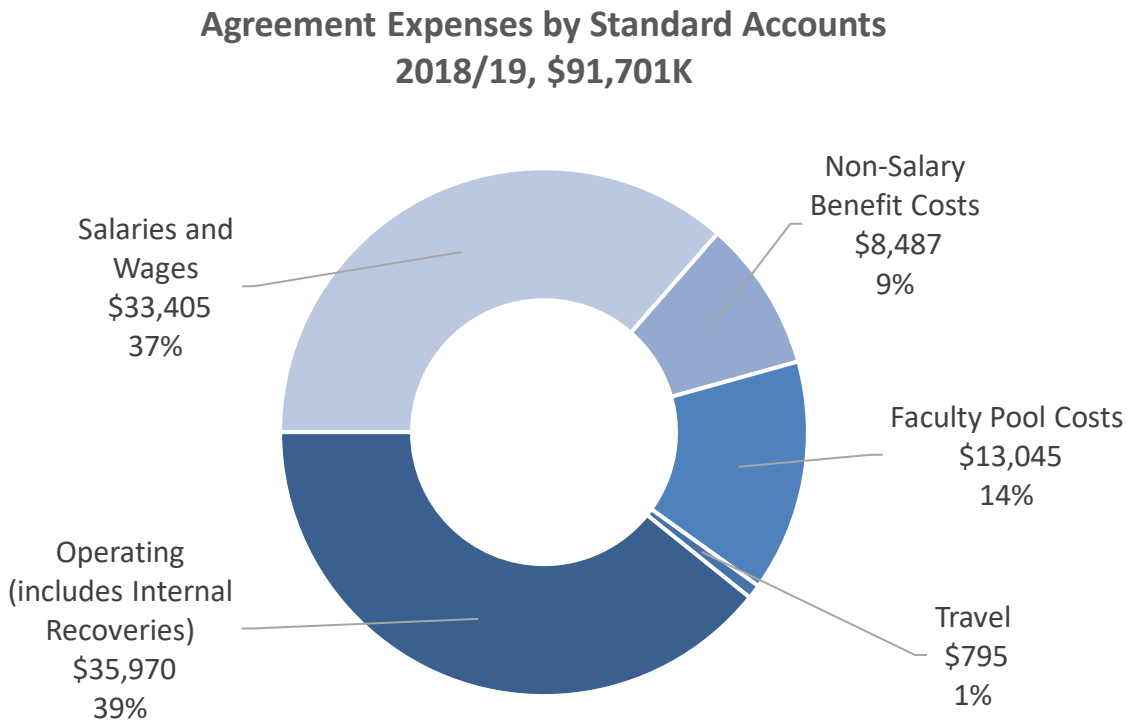


Table 2.5 shows the Agreement Financial Summary by Program for 2018/19.

Table 2.5: Agreement Financial Summary by Program (in thousands of dollars)

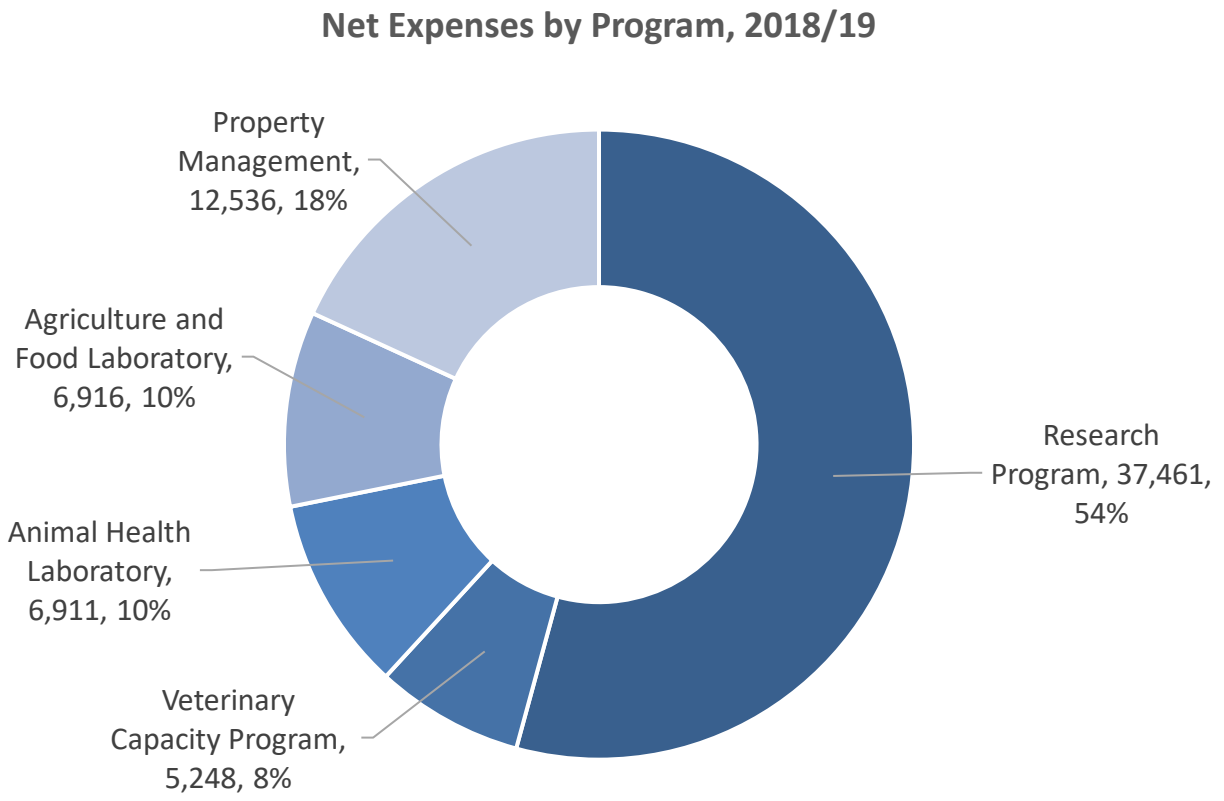
Standard Accounts	Research Program	VCP	AHL	AFL	Property Management	Exigency Fund	Uncommitted Central Reserve	Total
Revenue								
OMAFRA Agreement	(37,461)	(5,248)	(6,911)	(6,916)	(12,536)	287		(68,785)
OMAFRA Other				(500)				(500)
Sales Goods and Services	(158)	-	(6,999)	(8,557)	(4,582)			(20,296)
Investment Income						(629)		(629)
Other Revenue	(90)	-	(4)	(14)	(1,384)			(1,492)
Revenue Total	**(37,709)**	**(5,248)**	**(13,914)**	**(15,987)**	**(18,501)**	**(342)**	**-**	**(91,701)**
Expenses								
Salaries and Wages	9,680	173	7,750	8,198	7,262	342		33,405
Non-Salary Benefit Costs	1,888	28	2,144	2,417	2,010			8,487
Faculty Pool Costs	11,145	1,900	-	-	-			13,045
Travel	399	208	99	56	33			795
Operating	15,091	2,938	5,940	5,863	10,985			40,817
Internal Recoveries	(493)	-	(2,019)	(546)	(1,788)			(4,847)
Expenses Total	**37,709**	**5,248**	**13,914**	**15,987**	**18,501**	**342**	**-**	**91,701**
Grand Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
2018/19 Budget	**37,926**	**5,248**	**7,549**	**5,610**	**12,978**	**-**	**1,990**	**71,300**
Change in Carry Forward (Budget - OMAFRA Agreement)	**465**	**-**	**637**	**(1,306)**	**441**	**287**	**1,990**	**2,515**
Carry Forward in 2018/19	**17,062**	**-**	**1,561**	**3,539**	**-**	**-**	**17,680**	**39,842**
Carry Forward in 2019/20	**17,527**	**-**	**2,198**	**2,233**	**441**	**287**	**19,670**	**42,357**

Table 2.6 illustrates the Net Expenses by Program for 2018/19 compared to budget. Figure 2.3 shows the Net Expenses in graphical format. It does not include the Exigency Fund or the Uncommitted Central Reserve.

Table 2.6: Net Expenses by Program (in thousands of dollars)

Program Schedule	2018/19 Results	2018/19 Budget	Variance	% Variance >5%
Research Program	37,461	37,926	465	
Veterinary Capacity Program	5,248	5,248	0	
Animal Health Laboratory	6,911	7,549	637	8%
Agriculture and Food Laboratory	6,916	5,610	(1,306)	-23%
Property Management	12,536	12,978	441	
Exigency Fund	(287)	0	287	
Uncommitted Central Reserve	0	1,990	1,990	
Total	**68,785**	**71,300**	**2,515**	

Figure 2.3: OMAFRA Agreement Net Expenses by Program (in thousands of dollars)



2.3 Program Summaries

The program summaries are presented in the five subsections below. They include an analysis of the significant variances against budget, as well as the description of any surpluses or shortfalls.

2.3.1 Research Program

The Research Program summary is presented in Table 2.7. The 2018/19 Results of $37,461K are $465K less than the 2018/19 budget of $37,926K, a variance of 1%. Revenue has a positive variance of $201K. This is due to small amounts of annual sales (e.g. parking revenue at Ridgetown, testing services, etc.), labour recoveries (e.g. typically funds received as an offset for a portion of summer student labour costs) and other revenues in the Research Support and the Research Project program activities. They are highly variable year to year and difficult to budget for. Travel costs are $82K under budget. The positive variance is related to lower than expected expenditures in KTT, Gryphon's LAAIR and Tier I Research Projects.

Internal recoveries are $107K under budget, with a negative variance of 18%. This relates mainly to the HQP Scholarship program and the requirement for matching funding, which is new in 2018/19. The program will eventually reach steady state, where the actuals will match the budgeted value of $250K. This will take some time, as the scholarships are given out over two to four years and the matching funds are recorded over the same time frame. The full matching amount ($250K) was committed to in 2018/19.

Table 2.7: Research Program (in thousands of dollars)

Standard Accounts	2018/19 Results	2018/19 Budget	Variance	% Variance >5%
Revenue				
Sales Goods and Services	(158)	(30)	128	428%
Other Revenue	(90)	(17)	73	428%
Revenue Total	**(248)**	**(47)**	**201**	**428%**
Expenses				
Salaries and Wages	9,680	9,861	181	
Non-Salary Benefit Costs	1,888	1,861	(27)	
Faculty Pool Costs	11,145	11,145	0	
Travel	399	481	82	17%
Operating	15,091	15,225	134	
Internal Recoveries	(493)	(600)	(107)	-18%
Expenses Total	**37,709**	**37,973**	**264**	
Grand Total	**37,461**	**37,926**	**465**	

Carry Forward into 2018/19	17,062
Carry Forward into 2019/20	17,527

Table 2.8 provides the 2018/19 Results for the Program Activities in the Research Program, as well as the related carry forwards.

Table 2.8: 2018/19 Results for Program Activities in the Research Program (in thousands of dollars)

Standard Accounts	Research Faculty	Research Support	HQP Scholarship Program	Research Projects - Tier I	Research Projects - Special Initiatives	USEL	Research Innovation Office	Gryphon's LAAIR	KTT Program	Indirect Costs	Total
Revenue											
Sales Goods and Services	0	(158)	0	0	0	0	0	0	0	0	**(158)**
Other Revenue	0	(31)	0	(13)	(46)	0	0	0	0	0	**(90)**
Revenue Total	**0**	**(189)**	**0**	**(13)**	**(46)**	**0**	**0**	**0**	**0**	**0**	**(248)**
Expenses											
Salaries and Wages	0	4,963	0	4,300	9	44	191	(20)	193	0	**9,680**
Non-Salary Benefit Costs	0	1,429	0	403	1	4	32	(0)	19	0	**1,888**
Faculty Pool Costs	11,145	0	0	0	0	0	0	0	0	0	**11,145**
Travel	0	32	0	336	3	0	7	(1)	22	0	**399**
Operating	0	1,729	645	2,030	(102)	4	67	29	188	10,500	**15,091**
Internal Recoveries	0	(353)	(89)	(51)	0	0	0	0	0	0	**(493)**
Expenses Total	**11,145**	**7,800**	**556**	**7,017**	**(89)**	**53**	**297**	**9**	**422**	**10,500**	**37,709**
2018/19 Results	**11,145**	**7,611**	**556**	**7,004**	**(135)**	**53**	**297**	**9**	**422**	**10,500**	**37,461**
2018/19 Budget	**11,145**	**7,333**	**250**	**5,983**	**1,510**	**55**	**250**	**400**	**500**	**10,500**	**37,926**
Variance	**0**	**(278)**	**(306)**	**(1,021)**	**1,645**	**2**	**(47)**	**391**	**78**	**0**	**465**
Carry Forward into 2018/19	**0**	**3,424**	**723**	**12,585**	**0**	**0**	**45**	**(31)**	**316**	**0**	**17,062**
Carry Forward into 2019/20	**0**	**3,146**	**417**	**11,564**	**1,645**	**2**	**(1)**	**360**	**394**	**0**	**17,527**

The opening carry forward for Research Program was $17,062K. The closing carry forward for 2018/19 is $17,527K. More details about the carry forwards can be found in Section 2.5.

2.3.2 Veterinary Capacity Program

The VCP summary is presented in Table 2.9. The 2018/19 Results of $5,248K match the 2018/19 Budget, with a few minor variances by category. There is a slight variance of $20K in Salaries and Wages which relates to slightly higher than expected salary costs, including the hiring of a summer student, which were offset by a reduction in operating costs.

Table 2.9: Veterinary Capacity Program (VCP) (in thousands of dollars)

Standard Accounts	2018/19 Results	2018/19 Budget	Variance	% Variance >5%
Expenses				
Salaries and Wages	173	153	(20)	-13%
Non-Salary Benefit Costs	28	26	(2)	
Faculty Pool Costs	1,900	1,900	0	
Travel	208	200	(8)	
Operating	2,938	2,969	31	
Internal Recoveries	0	0	0	
Expenses Total	**5,248**	**5,248**	**0**	
Grand Total	**5,248**	**5,248**	**0**	

Carry Forward into 2018/19	0
Carry Forward into 2019/20	0

Table 2.10 provides the 2018/19 Results for the Program Activities in the Veterinary Capacity Program, as well as the related carry forwards.

Table 2.10: 2018/19 Results for Program Activities in VCP (in thousands of dollars)

Standard Accounts	VCP HSC Staff, Veterinarians, Operations; CPHAZ	VCP Faculty	VCP Externships; Summer Student Experience Placements	VCP Internships; Residency Programs	VCP Doctoral Programs	Total
Expenses						
Salaries and Wages	141	0	0	32	0	**173**
Non-Salary Benefit Costs	23	0	0	5	0	**28**
Faculty Pool Costs	0	1,900	0	0	0	**1,900**
Travel	7	0	202	0	0	**208**
Operating	2,263	0	47	133	495	**2,938**
Internal Recoveries	0	0	0	0	0	**0**
Expenses Total	**2,434**	**1,900**	**249**	**170**	**495**	**5,248**
Grand Total	**2,434**	**1,900**	**249**	**170**	**495**	**5,248**
2018/19 Budget	**2,434**	**1,900**	**249**	**170**	**495**	**5,248**
Variance	**0**	**0**	**0**	**0**	**0**	**0**
Carry Forward into 2018/19	**0**	**0**	**0**	**0**	**0**	**0**
Carry Forward into 2019/20	**0**	**0**	**0**	**0**	**0**	**0**

The opening carry forward for VCP was $0. The closing carry forward for 2018/19 is also $0.

2.3.2.1 Transfers to the OVC Health Sciences Centre

Table 2.11 provides a breakdown of transfers to the Ontario Veterinary College (OVC) Health Sciences Centre by resource type.

Table 2.11: Transfers to the OVC Health Sciences Centre

Resource	FTE	Total (in thousands of dollars)
Veterinarians	**1.2**	**165**
LAMC[2] - Swine Service	0.2	23
LAMC - Ruminant Service	1.0	142
Animal Housing Staff	**8.0**	**641**
Large Animal Housing	8.0	641
Technical Staff	**14.0**	**1,143**
LAMC - Ruminant Service	1.0	88
Large Animal Wards	11.0	904
Sterile Processing	1.0	68
Pharmacy	1.0	82
Administrative Staff	**3.5**	**293**
Business Office	1.8	152
Medical Records	0.7	46
Operations & Service Mgt	1.0	96
Total	**26.7**	**2,242**

[2] LAMC is the Large Animal Medicine Clinic.

2.3.3 Animal Health Laboratory

The AHL summary is presented in Table 2.12. The 2018/19 Results of $6,911K were $637K less than the 2018/19 Budget of $7,549K, a variance of 8%. There was a small variance of 7% in the Salaries and Wages category. This was due to staffing vacancies which took time to refill. This did not impact the overall capacity of the laboratory. Due to the same vacancies, as well as the utilization of temporary full-time staff to cover absences of the regular full-time incumbents, Non-Salary Benefit Costs were also down 7% compared to budget. In addition, Travel was 11% under budget. Due to the busyness of the laboratory, staff were not able to get away to conferences as planned.

Table 2.12: Animal Health Laboratory (AHL) (in thousands of dollars)

Standard Accounts	2018/19 Results	2018/19 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Other		0	0	
Sales Goods and Services	(6,999)	(7,163)	(164)	
Other Revenue	(4)	(2)	2	
Revenue Total	**(7,003)**	**(7,165)**	**(162)**	
Expenses			**0**	
Salaries and Wages	7,750	8,354	604	7%
Non-Salary Benefit Costs	2,144	2,303	159	7%
Travel	99	110	11	10%
Operating	5,940	6,047	106	
Internal Recoveries	(2,019)	(2,100)	(81)	
Expenses Total	**13,914**	**14,714**	**800**	**5%**
Grand Total	**6,911**	**7,549**	**637**	**8%**

Carry Forward into 2018/19	1,561
Carry Forward into 2019/20	2,198

Table 2.13 delivers the 2018/19 Results for the Program Activities in the Animal Health Laboratory, as well as the related carry forwards.

Table 2.13: 2018/19 Results for Program Activities in the Animal Health Laboratory (in thousands of dollars)

Standard Accounts	AHL Testing / Programs	Bee and Apiary Health Testing	AHL LSD Central Administration	OAHN Operations	OAHN Projects	Total
Revenue						
OMAFRA Other	0	0	0	0	0	**0**
Sales Goods and Services	(6,999)	0	0	0	0	**(6,999)**
Other Revenue	0	0	(4)	0	0	**(4)**
Revenue Total	**(6,999)**	**0**	**(4)**	**0**	**0**	**(7,003)**
Expenses						
Salaries and Wages	6,642	0	776	332	0	**7,750**
Non-Salary Benefit Costs	1,841	0	226	77	0	**2,144**
Travel	84	0	5	8	1	**99**
Operating	4,535	120	1,151	66	68	**5,940**
Internal Recoveries	(2,018)	0	(2)	0	0	**(2,019)**
Expenses Total	**11,084**	**120**	**2,157**	**484**	**70**	**13,914**
2018/19 Results	**4,086**	**120**	**2,152**	**484**	**70**	**6,911**
2018/19 Budget	**4,794**	**153**	**1,734**	**612**	**256**	**7,549**
Variance	**708**	**33**	**(418)**	**128**	**186**	**637**
Carry Forward into 2018/19	**0**	**0**	**1,561**	**0**	**0**	**1,561**
Carry Forward into 2019/20	**708**	**33**	**1,143**	**128**	**186**	**2,198**

The opening carry forward for the AHL was $1,561K. The closing carry forward for 2018/19 is $2,198K. This is comprised of $176K held in Ontario Animal Health Network (OAHN) Project accounts, $1,851K designated for future equipment renewal and $171K that will serve as a buffer against the multi-year scenario planning reductions occurring in future years.

2.3.3.1 OAHN Projects

Table 2.14 provides the details for the OAHN Projects program activity. This program activity functions similarly to the project-based activities in the Research Program. Awards are provided to investigators to aid in the completion of a surveillance project throughout the year. Expenditures are made against the project, and they may or may not occur in the same fiscal year. The budget for OAHN Projects was $256K in 2018/19. There were 15 projects awarded with a total value of $245K. The remaining $10K will be carried forward to future years to help to offset the reductions to this program activity through the multi-year scenario planning process.

Table 2.14: OAHN Projects Program Details (in thousands of dollars)

	2018/19 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects
OAHN Projects	70	176	10	**256**	15
Total	**70**	**176**	**10**	**256**	**15**

2.3.4 Agriculture and Food Laboratory

The AFL summary is presented in Table 2.15. The 2018/19 Results of $6,916K were $1,306K more than the 2018/19 Budget of $5,610K, a variance of 23%. AFL achieved their revenue target, even in the challenging environment with significant variability in client contracts. Travel was also 42% under budget. Due to the busyness of the laboratory, staff were not able to attend as many conferences and trade shows as planned.

The most significant variance was in the Operating category, with an over expenditure of $1,713K. This was due to equipment reinvestment costs of $1,530K. This amount differs slightly from the 2018/19 Capital Strategy plan which indicated that purchases related to AFL would be approximately $1,579K. This is connected to minor variations in purchase price, as well as fluctuations in timing (e.g. some items that were planned for purchased in 2018/19 were delayed). Equipment purchases are drawn from the program carry forwards. In addition to the equipment purchases, there was supplementary operational spending on computer software (upgrades to the Laboratory Information Management System (LIMS) and one-time costs related to Oracle licensing), which also contributed to the negative variance.

Finally, there was a positive variance of 41% related to internal recoveries which represent testing services provided to University departments and projects. These activities are highly variable, as they are driven by faculty research. The AFL experienced higher than normal recoveries in 2018/19, driven by increased internal use of testing services in the Chemistry and Analytical Biology groups. It is difficult to predict if this trend will continue in the future.

Table 2.15: Agriculture and Food Laboratory (AFL) (in thousands of dollars)

Standard Accounts	2018/19 Results	2018/19 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Other	(500)	(500)	0	
Sales Goods and Services	(8,557)	(8,297)	260	
Other Revenue	(14)	(6)	8	
Revenue Total	**(9,072)**	**(8,803)**	**269**	
Expenses			**0**	
Salaries and Wages	8,198	8,041	(157)	
Non-Salary Benefit Costs	2,417	2,512	95	
Travel	56	97	41	42%
Operating	5,863	4,150	(1,713)	-41%
Internal Recoveries	(546)	(387)	159	41%
Expenses Total	**15,987**	**14,413**	**(1,574)**	**-11%**
Grand Total	**6,916**	**5,610**	**(1,306)**	**-23%**

Carry Forward into 2018/19	3,539
Carry Forward into 2019/20	2,233

Table 2.16 provides the 2018/19 Results for the Program Activities in the Agriculture and Food Laboratory, as well as the related carry forwards.

Table 2.16: 2018/19 Results for Program Activities in the Agriculture and Food Laboratory

(in thousands of dollars)

Standard Accounts	AFL Testing / Programs	AFL LSD Central Administration	Total
Revenue			
OMAFRA Other	0	(500)	**(500)**
Sales Goods and Services	(8,522)	(35)	**(8,557)**
Other Revenue	0	(14)	**(14)**
Revenue Total	**(8,522)**	**(549)**	**(9,072)**
Expenses			
Salaries and Wages	6,736	1,462	**8,198**
Non-Salary Benefit Costs	1,986	431	**2,417**
Travel	37	19	**56**
Operating	3,128	2,735	**5,863**
Internal Recoveries	(540)	(6)	**(546)**
Expenses Total	**11,346**	**4,642**	**15,987**
2018/19 Results	**2,823**	**4,092**	**6,916**
2018/19 Budget	**3,033**	**2,577**	**5,610**
Variance	**210**	**(1,515)**	**(1,306)**
Carry Forward into 2018/19	**0**	**3,539**	**3,539**
Carry Forward into 2019/20	**210**	**2,024**	**2,233**

The opening carry forward for this program activity was $3,539K. The closing carry forward for 2018/19 is $2,233K. These funds are committed to future equipment purchases.

2.3.4.1 Third Party Revenue

Table 2.17 illustrates the amount and percentage of revenues generated by third party testing contracts on annual basis. Approximately 91% of AFL's revenue comes from third party testing contracts, which compares to 89% of revenue received from third party testing contracts last year.

Table 2.17: Revenues Generated by Third Party Testing Contracts (in thousands of dollars)

	Revenue	Percentage
Third Party Testing Contracts	7,752	90.6%
OMAFRA	805	9.4%
Total	**8,557**	

2.3.5 Property Management

The Property Management summary is presented in Table 2.18. The original 2018/19 Property Management Schedule budget was $15,024K and included a surplus of $2,046K predominantly related to the early sale of the main campus portion of the Kemptville property to the Municipality of North Grenville, which occurred one year earlier than expected. The net Budget was reduced to $12,978K for 2018/19. The 2018/19 Results of $12,536K were $441K less than the revised 2018/19 Budget.

Sales of Goods and Services were 8% over budget. This was mainly due to better than expected sales of crops and dairy produced at the Research Stations. Other Revenue was 19% over budget. This was related to increased rental revenues from the external tenants triggered by higher operating costs, as well as increased revenue from clients using growth facilities. Operating costs were 8% over budget. This was due to a number of factors including: higher than budgeted utility costs; increased input costs related to the growth in sales of goods and services; increased maintenance costs; and increased cost transfers for external tenants offset by the increased recoveries. Internal recoveries were 43% over budget. This was due to higher than expected revenues from internal clients (e.g. animal sales, research stations recoveries, usage of growth facilities) and increased recoveries related to the cost transfers for external tenants noted above.

Table 2.18: Property Management (in thousands of dollars)

Standard Accounts	2018/19 Results	2018/19 Budget	Variance	% Variance >5%
Revenue				
Sales Goods and Services	(4,582)	(4,240)	342	8%
Other Revenue	(1,384)	(1,160)	224	19%
Revenue Total	**(5,965)**	**(5,399)**	**566**	**10%**
Expenses			**0**	
Salaries and Wages	7,262	7,340	78	
Non-Salary Benefit Costs	2,010	2,068	58	
Travel	33	29	(3)	
Operating	10,985	10,189	(796)	-8%
Internal Recoveries	(1,788)	(1,250)	538	43%
Expenses Total	**18,501**	**18,377**	**(124)**	
Grand Total	**12,536**	**12,978**	**441**	

Carry Forward into 2018/19	0
Carry Forward into 2019/20	441

Table 2.19 delivers the 2018/19 Results for the Program Activities in the Property Management Program, as well as the related carry forwards.

Table 2.19: 2018/19 Results for Program Activities in Property Management (in thousands of dollars)

Standard Accounts	Maintenance and Repairs	Personnel and Operating Costs	Vineland Employees	Vineland Operations and Maintenance	Total
Revenue					
Sales Goods and Services	0	(4,582)	0	0	**(4,582)**
Other Revenue	(1,141)	(242)	0	0	**(1,384)**
Revenue Total	**(1,141)**	**(4,824)**	**0**	**0**	**(5,965)**
Expenses					
Salaries and Wages	687	6,314	261	0	**7,262**
Non-Salary Benefit Costs	201	1,731	79	0	**2,010**
Travel	12	21	0	0	**33**
Operating	5,790	4,421	0	774	**10,985**
Internal Recoveries	(755)	(1,027)	(6)	0	**(1,788)**
Expenses Total	**5,934**	**11,459**	**334**	**774**	**18,501**
2018/19 Results	**4,793**	**6,635**	**334**	**774**	**12,536**
2018/19 Budget	**4,745**	**7,111**	**347**	**775**	**12,978**
Variance	**(48)**	**475**	**13**	**1**	**441**
Carry Forward into 2018/19	**0**	**0**	**0**	**0**	**0**
Carry Forward into 2019/20	**(48)**	**475**	**13**	**1**	**441**

The opening carry forward related to the Property Management program was $0. The closing carry forward for 2018/19 is $441K.

2.3.5.1 Revenues and Expenditures by ARIO Property

Table 2.20 provides the annual financial breakdown of total revenues and total expenditures for each of the ARIO Properties. Of note, the Ridgetown Campus, overall, had a deficit of $323K. Much of this was related to the operating and maintenance costs of the campus, especially cleaning. Cleaning costs have been impacted by the increase in minimum wage and the renewal of the cleaning contract. The Ridgetown – Dairy is also showing a large deficit. This was related to a decrease in revenue and higher than expected feed and operating costs. Discussions are occurring with Ridgetown staff to address these situations.

Table 2.20: Annual Financial Breakdown by ARIO Property (in thousands of dollars)

	Expenses	Revenue	2018/19 Results	2018/19 Budget	2018/19 Balance
Research Stations					
Alma	678	(135)	542	606	63
Arkell	2,073	(225)	1,848	1,927	80
Equine	*285*	-	*285*	*283*	*(3)*
Feed Mill	*61*	-	*61*	*63*	*2*
Poultry	*703*	*(224)*	*479*	*501*	*21*
Swine	*1,023*	*(1)*	*1,022*	*1,081*	*59*
Bradford	316	(26)	289	273	(17)
Cedar Springs	47	-	47	47	0
Elora	3,756	(1,794)	1,962	1,984	22
Beef	*902*	*(1)*	*902*	*842*	*(60)*
Crops	*326*	*(0)*	*326*	*343*	*17*
Dairy	*2,527*	*(1,792)*	*735*	*800*	*65*
Emo	56	(11)	45	41	(4)
Guelph	347	(8)	339	264	(75)
Huron	120	(49)	71	49	(22)
New Liskeard	1,063	(245)	818	872	55
Beef	*444*	*(173)*	*272*	*301*	*30*
Crops	*49*	*(68)*	*(19)*	*2*	*21*
General	*569*	*(4)*	*565*	*569*	*4*
Ponsonby	516	(3)	513	514	1
Sheep	*274*	*(3)*	*271*	*290*	*20*
General Animal Facility	*242*	-	*242*	*224*	*(18)*
Research Station Operations	2,291	(608)	1,684	1,777	93
Ridgetown	2,430	(452)	1,978	1,656	(323)
Beef	*19*	*(23)*	*(4)*	*(5)*	*(0)*
Dairy	*405*	*(298)*	*106*	*(13)*	*(119)*
General	*1,951*	*(110)*	*1,841*	*1,647*	*(194)*
Swine	*56*	*(20)*	*36*	*27*	*(9)*
Simcoe	797	(58)	739	709	(29)
University	426	(118)	308	473	165
Isolation Unit	*242*	-	*242*	*298*	*56*
Growth Facilities	*183*	*(118)*	*66*	*175*	*109*
Winchester	322	(135)	187	185	(2)
Woodstock	238	(118)	120	93	(27)
Total Research Stations	**15,474**	**(3,985)**	**11,489**	**11,470**	**(19)**

Table 2.21 shows the revenues and expenditures directly related to ARIO and University Tenants.

Table 2.21: Annual Financial Breakdown by Tenants (in thousands of dollars)

	Expenses	Revenue	2018/19 Results	2018/19 Budget	2018/19 Balance
Tenants - ARIO					
Alfred	503	(501)	1	46	45
Elora/Arkell	7	(7)	(0)	-	0
Guelph	6	(6)	1	-	(1)
Kemptville	314	20	334	288	(46)
New Liskeard	406	(383)	22	-	(22)
Education Centre	*351*	*(357)*	*(6)*	-	*6*
OPP	*54*	*(27)*	*28*	-	*(28)*
Ridgetown	19	(20)	(1)	-	1
Simcoe	23	(26)	(3)	-	3
Vineland	6	(6)	1	-	(1)
Total Tenants - ARIO	**1,284**	**(929)**	**356**	**334**	**(22)**
Tenants - University					
New Liskeard	-	(13)	(13)	-	13
Research Station Operations	43	(59)	(15)	-	15
Ridgetown	12	(25)	(13)	-	13
Total Tenants - University	**55**	**(97)**	**(42)**	**-**	**42**

Finally, Table 2.22 delivers an overall summary by property type, including information about Vineland, which corresponds to the overall Property Management program.

Table 2.22: Annual Financial Breakdown by Property Type (in thousands of dollars)

	Expenses	Revenue	2018/19 Results	2018/19 Budget	2018/19 Balance
Research Stations	15,474	(3,985)	11,489	11,470	(19)
Tenants - ARIO	1,284	(929)	356	334	(22)
Tenants - University	55	(97)	(42)	-	42
Vineland	1,108	-	1,108	1,122	14
Other[3]	579	(955)	(375)	51	426
Total	**18,501**	**(5,965)**	**12,536**	**12,978**	**441**

[3] Other includes the Livestock Research Fund (LRF), the Veterinary Field Services account and any other central management accounts.

2.3.5.2 ARIO Properties Revenue

Table 2.23 provides a report on all revenues and recoveries resulting from the activities of each of the ARIO Properties, including the sales of farm products, rental revenues and recoveries for station usage. It is presented by year over a five-year period.

Table 2.23: ARIO Properties Revenues and Recoveries by Year (in thousands of dollars)

	2014/15	2015/16	2016/17	2017/18	2018/19
Revenue	**5,995**	**5,537**	**4,787**	**6,199**	**5,965**
Sales of Farm Products	4,980	4,457	3,597	4,756	4,583
Other	241	213	216	212	204
Rentals	774	867	975	1,231	1,178
Recoveries	**836**	**813**	**810**	**771**	**876**
Animal Purchases (net)	264	229	237	27	150
Research Station Fees	316	355	15	553	426
Facility Usage (net)	256	229	258	191	301
Total	**6,830**	**6,350**	**5,597**	**6,970**	**6,841**

Table 2.24 provides the summarized revenue and recoveries by property type for 2018/19.

Table 2.25 shows the revenue and recoveries by type for each of the Research Stations.

Table 2.24: Revenue and Recoveries by Property Type (in thousands of dollars)

	Revenues				Recoveries				
	Sales	Other	Rentals	Total	Animal Purchases	Research Station Fees	Facility Usage	Total	Grand Total
Research Stations	3,743	89	153	**3,985**	12	426	301	**739**	**4,724**
Tenants - ARIO			929	**929**					**929**
Tenants - University			97	**97**					**97**
Other[3]	840	115		**955**	138			**138**	**1,092**
Total	**4,583**	**204**	**1,178**	**5,965**	**150**	**426**	**301**	**876**	**6,841**

Table 2.25: Revenue and Recoveries for Each Research Stations (in thousands of dollars)

	Revenue				Recoveries				
	Sales	Other	Rentals	Total	Animal Purchases	Research Station Fees	Facility Usage	Total	Grand Total
Alma	117	18		**135**	0	6		**6**	**142**
Arkell	224	1		**225**	12	163		**176**	**400**
Equine				*-*		*8*		***8***	***8***
Poultry	*224*			***224***	*6*	*130*		***136***	***360***
Swine		*1*		***1***	*6*	*25*		***32***	***32***
Bradford	15	11		**26**		9		**9**	**36**
Cedar Springs				-				-	-
Elora	1,792	1		**1,794**		159		**159**	**1,953**
Beef		*1*		***1***		*40*		***40***	***41***
Crops		*0*		***0***		*51*		***51***	***52***
Dairy	*1,792*			***1,792***		*68*		***68***	***1,860***
Emo		11		**11**				-	**11**
Guelph		8		**8**		5		**5**	**12**
Huron	33	0	16	**49**				-	**49**
New Liskeard	228	17		**245**		25		**25**	**270**
Beef	*163*	*9*		***173***		*20*		***20***	***192***
Crops	*65*	*4*		***68***		*5*		***5***	***74***
General		*4*		***4***				-	***4***
Ponsonby	3	0		**3**		4		**4**	**7**
Sheep				*-*		*4*		***4***	***4***
General Animal Facility	*3*	*0*		***3***		*1*		***1***	***4***
Research Station Operations	606	2		**608**		8		**8**	**616**

Ridgetown	451	1		**452**		11		**11**	**463**
Beef	*23*			***23***				**-**	***23***
Dairy	*298*			***298***				**-**	***298***
General	*109*	*1*		***110***		*11*		***11***	***122***
Swine	*20*			***20***				**-**	***20***
Simcoe	32	7	19	**58**		22	1	**22**	**81**
University		0	118	**118**		5	300	**305**	**423**
Isolation Unit				**-**		*5*	*67*	***72***	***72***
Growth Facilities		*0*	*118*	***118***			*233*	***233***	***351***
Winchester	124	11		**135**				**-**	**135**
Woodstock	118			**118**		8		**8**	**126**
Total Research Stations	**3,743**	**89**	**153**	**3,985**	**12**	**426**	**301**	**739**	**4,724**

2.4 OMAFRA Agreement Fund Balances

2.4.1 Agreement Carry Forward Funds

Table 2.26 shows the Committed and Uncommitted Agreement Carry Forward Funds on April 30, 2019.

Table 2.26: OMAFRA Agreement Carry Forward Funds (in thousands of dollars)

Program	Carry Forward, May 1, 2018	2018/19 Results	Carry Forward, April 30, 2019
Research Program	17,062	465	17,527
Veterinary Capacity Program (VCP)	-	-	-
Animal Health Laboratory (AHL)	1,561	637	2,198
Agriculture and Food Laboratory (AFL)	3,539	(1,306)	2,233
Property Management Program	-	441	441
Total Committed Funds	**22,162**	**238**	**22,400**
Uncommitted Central Reserve	17,680	1,990	19,670
Exigency Fund	-	287	287
Total Uncommitted Funds	**17,680**	**2,277**	**19,958**
Total OMAFRA Agreement Carry Forward Funds	**39,842**	**2,515**	**42,357**
ARIO Minor Capital and Repairs	1	(1)	-
Total OMAFRA Related Carry Forward Funds	**39,843**	**2,514**	**42,357**

2.4.2 Agreement Account

The University of Guelph receives and holds quarterly cash advances for the Agreement on the Provincial year basis. The cash balances are drawn down on a monthly basis as expenses for each month, net of any program revenues received, are processed. The monthly cash balance is then credited with interest, per the Agreement, based on the cash balance. The amount of cash held is reported on in the notes attached to the Quarterly reports and in the Audited Financial statements for the Agreement. The balance in the Agreement Account on April 30, 2019 is $37,756K, as shown in Table 2.27.

Table 2.27: Balance in the Agreement Account (in thousands of dollars)

Fiscal Year	Opening Balance	Advances	Net Expenses[4]	Change [5]	Ending Balance
2018/19	**35,242**	71,300	(68,786)	2,514	**37,756**

There is a difference in the total cash balance compared to the total carry forward balance as a result of the quarterly advances being received for the provincial year (April 1 to March 31) and the approved budget expenditures recorded on the University's fiscal year (May 1 to April 30).

[4] This includes Net Expenses of $1K from the ARIO Minor Capital Program.

[5] This includes the planned elimination of the $1K long-standing carry forward related to the ARIO Minor Capital Program as seen in Table 2.26.

2.4.3 Interest Earned on Agreement Account and Exigency Fund

The University of Guelph pays the Agreement interest on the monthly cash balance in the Agreement Account at the 91 Day Treasury Index Rate. The interest earned is held in the Exigency Fund which is part of the uncommitted carry forward funds. Table 2.28 summarizes the interest earned for 2018/19.

Table 2.28: Interest Earned on Agreement Account (in thousands of dollars)

Fiscal Year	Average Monthly Cash Balance	Average Interest Rate (%)	Interest Earned in 2018/19
2018/19	36,499	1.62%	592

In previous years of the Agreement, interest was credited in the month after it was earned. In 2018/19, this was changed to the month when it was earned. This led to thirteen months of interest being credited to the Agreement Account in 2018/19. The actual interest recorded in 2018/19 was $629K.

In 2018/19, the Executive Committee approved the use of the interest income from the Exigency Fund to cover the costs related to a Labour Arbitration Award. Based on accounting principles, the full cost of the Labour Arbitration Award was accrued in fiscal 2018/19. Actual expenditures are expected to occur in 2019/20 and more information will be provided in the 2019/20 Annual Report. Table 2.29 shows the balance in the Exigency Fund on April 30, 2019.

Table 2.29: Exigency Fund (in thousands of dollars)

Fiscal Year	Opening Balance, May 1, 2018	Interest Earned	Expenses	Change	Ending Balance, April 30, 2019
2018/19	-	629	(342)	287	**287**

2.4.4 Uncommitted Central Reserve and Exigency Fund

Table 2.30 provides an updated plan, including the 2018/19 Results, for the Uncommitted Central Reserve. On April 30, 2023, it is expected that the Uncommitted Central Reserve will have a balance of $1,851K. It is estimated that there will be an additional $1,765K in the Exigency Fund for use as directed by the Executive Committee. This amount is strongly dependent on interest rates. The total unallocated/uncommitted funds are expected to be $3,617K at the end of 2022/23.

Table 2.30: Uncommitted Central Reserve and Exigency Fund (in thousands of dollars)

	2018/19	2019/20	2020/21	2021/22	2022/23
Opening Bal. - Uncommitted Central Reserve	17,680	19,670	15,453	11,375	7,070
Change - Annual Surplus or Deficit	1,990	(4,217)	(4,079)	(4,305)	(5,219)
Uncommitted Central Reserve (balance)	**19,670**	**15,453**	**11,375**	**7,070**	**1,851**
Opening Balance - Exigency Fund	0	287	811	1,224	1,540
Change - Estimated Net Interest	287	523	413	316	226
Exigency Fund (balance)	**287**	**811**	**1,224**	**1,540**	**1,765**
Uncommitted Cent. Reserve + Exigency Fund	**19,958**	**16,264**	**12,599**	**8,610**	**3,617**
Interest Rate (estimated)	**1.6%**	**1.5%**	**1.4%**	**1.3%**	**1.2%**

2.5 Costs for Research Projects

Research Project costs, both spend and committed, are presented in the sections below by program activity.

2.5.1 Research Projects – Tier I

Table 2.31 shows the final division of the Research Projects budget into the Tier I, Special Initiatives and Undergraduate Student Experiential Learning (USEL) programs. The values changed slightly during 2018/19, due to a Tier I Research Project being declined by the Principal Investigator. The balance for that project was shifted to Special Initiatives.

Table 2.31: Final Division of the Research Projects Budget (in thousands of dollars)

	Final 2018/19 Budget
Tier I	5,983
Special Initiatives	1,510
USEL	55
Total	**7,548**

The final 2018/19 budget for Tier 1 Research Projects was $5,983K, which provided funding for 54 projects. Table 2.32 shows the breakdown by Theme. Table 2.33 illustrates the amount spent in 2018/19 by theme, the balance in the project accounts, and the amounts committed to future years.

Table 2.32: Tier I Research Projects Budget (in thousands of dollars)

Research Theme	Number of Projects[6]	2018/19 Budget
Agri-Food and Rural Policy	8	843
Bioeconomy – Industrial Uses	6.25	871
Emergency Management	2.3	190
Environmental Sustainability	7	950
Food for Health	4	522
Products and Value Chains	3	565
Production Systems - Animals	12.5	904
Production Systems - Plants	10.95	1,136
Total	**54**	**5,983**

[6] Six projects were attributed to two different themes, leading to fractional numbers of projects. Both the number of projects and the budget reflect the proportional thematic allocations.

Table 2.33: Tier I Research Project Financial Details (in thousands of dollars)

Research Theme	2018/19 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects
Agri-Food and Rural Policy	161	123	560	**843**	8
Bioeconomy – Industrial Uses	107	94	669	**871**	6.25
Emergency Management	59	35	96	**190**	2.3
Environmental Sustainability	102	259	589	**950**	7
Food for Health	15	177	330	**523**	4
Products and Value Chains	126	91	347	**565**	3
Production Systems - Animals	191	106	607	**904**	12.5
Production Systems - Plants	286	88	763	**1,136**	10.95
Subtotal - Tier I Projects Awarded in 2018/19	**1,048**	**973**	**3,962**	**5,983**	**54.0**
Agri-Food and Rural Policy	696	1,023	430	**2,148**	25
Bioeconomy – Industrial Uses	574	412	208	**1,194**	21
Emergency Management	412	422	215	**1,048**	24
Environmental Sustainability	869	284	251	**1,404**	28
Food for Health	579	273	358	**1,211**	18
Products and Value Chains	608	301	179	**1,088**	15
Production Systems - Animals	1,071	936	574	**2,582**	46
Production Systems - Plants	1,146	300	463	**1,909**	46
Subtotal – Tier I Projects Awarded in Previous Years	**5,956**	**3,952**	**2,678**	**12,585**	**223**
Total – All Active Tier I Projects	**7,004**	**4,924**	**6,639**	**18,568**	**277**

2.5.2 Research Projects – Special Initiatives

The final Special Initiatives budget for 2018/19 was $1,510K. Table 2.34 shows the amount spent in 2018/19 by activity, the balance in the project accounts, and the amounts committed to future years.

Table 2.34: Special Initiatives Financial Details (in thousands of dollars)

	2018/19 Results	Balance in Project Accounts	Committed to Future Years	Un-allocated	Total	Number of Projects
Special Initiatives - Projects	10	24	266		**300**	1
Special Initiatives - Unallocated				1,210	**1,210**	
Subtotal – SI Projects Awarded in 2018/19	**10**	**24**	**266**	**1,210**	**1,510**	**1**
Other Projects (formerly Schedule F)	(34)	34			-	2
Return from a Closed Project	(111)			111	-	
Subtotal - Other	**(145)**	**34**		**111**	**-**	**2**
Total	**(135)**	**58**	**266**	**1,321**	**1,510**	**3**

2.5.3 Highly Qualified Personnel (HQP) Scholarship Program

The HQP Scholarship Program has a net budget of $250K per year. This amount must be matched by the University of Guelph from third-party funds. Thus, the total scholarships awarded on an annual basis are $500K per year. The expenditures related to these scholarships occur over two to four years, with the matching funds being recorded over the same time frame. The actual expenditures in 2018/19, related to new awards, were $178K. This required $89K in matching funds. Table 2.35 shows financial details related to the HQP Scholarship Program, including the number of scholarships awarded in 2018/19, the number of active scholarship holders, the amounts spent, and the commitments to future years.

Table 2.35: HQP Scholarship Program Financial Details (in thousands of dollars)

	2018/19 Results	Committed to Future Years	Total	Number of Scholarship Holders
2018/19 Award Winners	178	322	**500**	12
Matching Requirement	(89)	(161)	**(250)**	
Subtotal - HQP 2018/19	**89**	**161**	**250**	**12**
Previous Award Winners	467	256	**723**	35
Subtotal - Other	**467**	**256**	**723**	**35**
Total	**556**	**417**	**973**	**47**

2.5.4 Gryphon's LAAIR

The Gryphon's LAAIR budget is fixed at $400K per year and includes funding for an event, as well as project-based activities. In 2018/19, six Market Validation projects with a total funding of $120K, and three Product Development projects with a total funding of $214K, were awarded. Table 2.36 shows the amount spent in 2018/19 by activity, the balance in the project accounts, and the amounts committed to future years. Due to delays in the award process, awardees received notification of their awards on January 29, 2019, so there was limited spending in 2018/19 fiscal period.

Table 2.36: Gryphon's LAAIR Financial Details (in thousands of dollars)

	2018/19 Results	Balance in Project Accounts	Committed to Future Years	Un-allocated	Total	Number of Projects
Market Validation	6	90	24		**120**	6
Product Development	28	36	150		**214**	3
Impact Pitch Event	5	45			**50**	
Underspend from Year 1				16	**16**	
Subtotal - GLAAIR Projects Awarded in 2018/19	**40**	**170**	**174**	**16**	**400**	**9**
Pre-2018/19 Projects	(31)	(0)	-		**(31)**	23
Return from a Completed Project				0	**0**	
Subtotal – GLAAIR Projects Awarded in Previous Years	**(31)**	**(0)**	**-**	**0**	**(31)**	**23**
Total	**9**	**170**	**174**	**16**	**369**	**32**

2.5.5 Knowledge Translation and Transfer (KTT) Program

The KTT budget is fixed at $500K per year and includes allocations for the Agri-Food and Rural Link program, the KTT Funding program and KTT Mobilization Initiatives. Since there were no awards in 2018/19 under the KTT Funding program, the budget for that activity has been allocated over the next four years.

Table 2.37 shows the amount spent in 2018/19 by activity, the balance in the project accounts, and the amounts committed to future years.

Table 2.37: KTT Program Financial Details (in thousands of dollars)

	2018/19 Results	Balance in Project Accounts	Committed to Future Years	Un-allocated	Total	Number of Projects
Agri-Food and Rural Link	117			73	**190**	
KTT Funding Program				280	**280**	
KTT Mobilization Initiatives	2			28	**30**	
Subtotal - KTT 2018/19	**119**	**-**	**-**	**381**	**500**	**-**
Pre-2018/19 Projects	259	(0)			**259**	21
Agri-Food and Rural Link from the Previous Agreement	57				**57**	
Return from Completed Projects	(13)			13	**-**	
Subtotal - Other	**303**	**(0)**	**-**	**13**	**316**	**21**
Total	**422**	**(0)**	**-**	**394**	**816**	**21**

2.6 ARIO Properties - Special Projects

Information about special projects, such as major renovations, repairs or capital projects/needs of ARIO Properties can be found in Section 7.1.

2.7 Allocation of Shared Services for the Laboratory Services Division

Table 2.38 shows the allocation of shared services for the Laboratory Services Division (LSD) including a breakdown by area.

Table 2.38: Allocation of Shared Services for LSD (in thousands of dollars)

Area	Total	Allocation to AHL		Allocation to AFL	
		%	Amount	%	Amount
Human Resources	175	50%	88	50%	88
Facility Management	1,264	25%	316	75%	948
Sample Reception	333	5%	17	95%	316
Information Technology	1,023	50%	511	50%	511
Business Development	316	0%	-	100%	316
Sales	(12)	0%	-	100%	(12)
Customs	12	50%	6	50%	6
Finance	470	50%	235	50%	235
Co-Executive Directors	43	50%	22	50%	22
Quality Assurance	574	50%	287	50%	287
Staff Activities	1	0%	-	100%	1
Reinvestments (Equip.)	2,045	variable[7]	671	variable[7]	1,374
Total	**6,245**		**2,152**		**4,092**

[7] Reflects actual laboratory expenditures.

2.8 Summary of Third-Party Funding Obtained

Third-party funding and revenues generated by the UofG in support of the Programs under this Agreement are critical for ensuring that enough capacity exists so that the Alliance is successful in developing solutions to real-world agri-food issues. Table 2.39 provides a summary of all third-party funding and revenues generated by the University in 2018/19. The University was able to leverage the Province's $71.3M investment, attracting $76.2M in third-party funding and revenue.

Table 2.39: Summary of Third-Party Funding and Revenue (in thousands of dollars)

Program	Description	Total
Agriculture and Food Laboratory	Testing Revenue	8,557
Animal Health Laboratory	Testing Revenue	7,003
Property Management	Sales of Farm Products and Rental Revenues	5,965
Research Program	Miscellaneous Revenue	248
	Subtotal External Revenues	**21,773**
Agriculture and Food Laboratory	Internal Testing Revenue	365
Animal Health Laboratory	Internal Testing Revenue	1,814
Property Management	Internal Revenue for Animal Purchases, Growth Facility Usage and Research Station Access Fees	876
	Subtotal Internal Revenues (Recoveries from Outside of the Agreement)	**3,055**
Research Program	HQP Scholarship Program Matching	250
Research Program	Third-Party Funding for Tier I Projects (cash)	3,538
Research Program	Third-Party Funding for Tier II and III Projects	7,624
Research Program	Support for Data Initiatives	191
Research Program	External Research Dollars Awarded to the University related to Ministry Priorities	39,738[8]
	Subtotal Leverage Funding	**51,341**
	Total Third-Party Funding and Revenue	**76,169**

[8] The total value of External Research Dollars Awarded to the University related to Ministry Priorities is $53.365M. The HQP Scholarship Program Matching, the Third-Party Funding for Tier I Projects, the Third-Party Funding for Tier II and III Projects, the Support for Data Initiatives and a portion of the Internal Recoveries are subsets of the External Research Dollars. To prevent double counting, the External Research Dollars have been reduced by those amounts. However, $1,031K of the Internal Testing Revenue in AHL is related to the HSC in OVC and is funded through the Ministry of Training Colleges and Universities. This is not included in the External Research Dollars and, therefore, has not been removed.

2.9 Asset Inventory Changes

Changes in the Asset Inventory for each program are described in the following sections. This includes purchases, sales, leases and dispositions of assets with a value of $10K or more.

2.9.1 Research Program

No assets with a value over $10K were purchased, sold, leased or disposed of in 2018/19.

2.9.2 Veterinary Capacity Program

No assets with a value over $10K were purchased, sold, leased or disposed of in 2018/19.

2.9.3 Animal Health Laboratory

Table 2.40 shows the Asset Inventory changes, over $10K, for the Animal Health Laboratory.

Table 2.40: Asset Inventory Changes for the Animal Health Laboratory (in thousands of dollars)

Area	Description	Amount	Action
Virology	Centrifuge	$14	Purchase
Parasitology	Trio 48 Combi	$13	Purchase
Virology	Eclipse Microscope Platform	$13	Purchase
Clin Path	Cell Washer	$14	Purchase
Virology	Centrifuge	$11	Purchase
OAHN	Microscope	$15	Purchase
OAHN	Microscope	$15	Purchase
Clin Path	Hematek 3000 Stainer Instrument	$19	Purchase
Histology	Tissue-Tek Cassette Printer	$21	Purchase
Clin Path	Micro-Osmometer Single-Sample	$23	Purchase
Virology	Centrifuge (5)	$26	Purchase
Toxicology	Microwave Accelerated Reaction System	$32	Purchase
Virology	Light Cycler	$43	Purchase
Histology	Microtome Histocore Autocust Full Motorized	$25	Purchase
Histology	Technoclean Fractional Solvent Recycler - Class 1	$26	Disposal, $0

2.9.4 Agriculture and Food Laboratory

Table 2.41 shows the Asset Inventory changes, over $10K, for the Agriculture and Food Laboratory.

Table 2.41: Asset Inventory Changes for the Agriculture and Food Laboratory (in thousands of dollars)

Area	Description	Amount	Action
Dairy	Bactoscan FC+	$514	Purchase
Chemistry	HPLC	$104	Purchase
Food Micro	-20 degree C Freezer	$10	Purchase
Soil & Nutrient	ICP	$100	Purchase
Chemistry	Automated SPE unit	$91	Purchase
Soil & Nutrient	CN828 Carbon/Nitrogen Determinator	$86	Purchase
Facility	Glassware dishwasher	$60	Purchase
Chemistry	GC	$54	Purchase
Food Micro	Computerized Microscope	$52	Purchase
Food Micro	Anaerobic chamber	$46	Purchase
Food Micro	Spiral Plater for Enumerating Microorganisms	$39	Purchase
Dairy	Cryoscope	$36	Purchase
Microscopy	X-ray spectrometer	$33	Purchase
Food Micro	Water Activity Meter	$27	Purchase
Food Micro & Pest Diagnostic Clinic	PCR thermocyclers	$25	Purchase
Food Micro	Colony Counter	$23	Purchase
Analytical Micro	Eclipse Microscope	$22	Purchase
Food Micro	Kingfisher Processor	$20	Purchase
Chemistry	-80°C Freezer - Chemistry	$18	Purchase
Food Micro	Refrigerator	$17	Purchase
Food Micro	Centrifuge	$17	Purchase
Chemistry	Roto-Vap Units	$14	Purchase

2.9.5 Property Management Program

Table 2.42 shows the Asset Inventory changes funded through the Property Management Program.

Table 2.42: Asset Inventory Changes for the Property Management Program (in thousands of dollars)

Station	Description	Amount	Action
Huron	Used John Deere Loader Tractor Stock # E82012	$21	Purchase
Woodstock	9106 Corn Planter, 6 rows	$34	Purchase
Guelph	2018 Subaru Forester 2.5i	$31	Purchase
Simcoe	2019 Dodge RAM 1500 Crew Cab 4x4	$38	Purchase

Table 2.43 provides the total asset value, value of acquisitions and value of dispositions for the ARIO Properties on a station by station basis. Most equipment is purchased using ARIO Minor Capital funds and, thus, is not listed in the table above. Actual inventory lists by station are available on request.

Table 2.43: Total Asset Value, Acquisitions, and Dispositions for each of the ARIO Properties

(in thousands of dollars)

Station	Opening Balance (May 1, 2018)	Acquisitions in 2018/19	Dispositions in 2018/19	Closing Balance (April 30, 2019)	Value for Dispositions
Alma	425	32	0	456	
Arkell - Equine	37	0	0	37	
Arkell - Feedmill	832	0	0	832	
Arkell - Poultry	1,271	54	0	1,326	
Arkell - Swine	1,179	0	0	1,179	
Bradford	244	5	0	249	
Elora - Beef	1,380	110	0	1,490	
Elora - Crops	2,664	50	0	2,714	
Elora - Dairy	4,897	83	33	4,948	
Emo	70	0	0	70	
Guelph Turfgrass	236	0	0	236	
New Liskeard	806	391	0	1,197	
Office of Research	0	31	0	31	
Ponsonby - Dairy	254	0	0	254	
Ponsonby - GAF	57	20	0	77	
Ponsonby - Sheep	26	0	0	26	
Research Station Operations	3,634	355	204	3,785	
Ridgetown	5,605	50	42	5,612	29 (trade)
Simcoe	546	38	36	547	
Vineland	939	0	44	895	
Winchester	1,056	0	0	1,056	
Woodstock	397	34	0	431	
Total	**26,554**	**1,252**	**359**	**27,448**	**29**

2.10 Non-Salary Benefit Costs

For the purposes of allocating Non-Salary Benefit Costs, the Ministry acknowledges that the University uses a pooled costing method, whereby all costs associated with an activity or cost type are aggregated and subsequently allocated to users of the activity or cost type using consistent methods or bases for all users.

Employer benefit costs for employees are charged to departments and programs using standard benefit allocation rates that are fixed for each fiscal year. Adjustments are not made to individual rates if they are relatively minor and reflect annual variances that are not considered structural or material in nature. Annual variances between recovered (allocated costs) and actual costs in the benefit cost pool are absorbed centrally to avoid relatively minor changes being made in the rates each year. Historically these allocations have been very accurate, and the carry forward adjustment is relatively small.

Table 2.44 shows the Salaries and Wages and Non-Salary Benefit Costs by Program for 2018/19. Table 2.45 provides the total Salaries and Wages, the Benefit Allocation Rate and Non-Salary Benefit Costs by Object Code.

Table 2.44: Salaries and Wages and Non-Salary Benefit Costs by Program
(in thousands of dollars)

Program	Salaries and Wages	Non-Salary Benefit Costs
Research Program	9,680	1,888
Veterinary Capacity Program	173	28
Animal Health Laboratory	7,750	2,144
Agriculture and Food Laboratory	8,198	2,417
Property Management Program	7,262	2,010
Total	**33,405**	**8,487**

Table 2.45: Salaries and Wages and Non -Salary Benefit Costs by Object Code

(in thousands of dollars)

Object Code	Salaries and Wages	Benefit Allocation Rate	Non-Salary Benefit Costs
61103-P&M - RFT	6,055	28.35%	1,717
61108-OVERTIME - RFT	351	6.50%	23
61109-SHIFT PREMIUMS - RFT	71	6.50%	5
61112-FACULTY - VETERINARIANS - RFT	2,112	23.25%	491
61124-COLLEGE PROFS UGFA2 - RFT	16	29.75%	5
61130-USW - RFT	10,343	33.30%	3,444
61133-EXEMPT- RFT	70	33.80%	24
61134-HONORARIUMS	82	3.60%	3
61135-OSSTF - RFT	5,759	32.00%	1,843
61203-P&M - TFT	1,134	17.00%	193
61207-SUPPORT STAFF - TFT UNREP	904	15.70%	142
61212-CL - FACULTY - VETERINARIANS	66	16.05%	11
61221-POST DOCTORAL - TFT	630	17.20%	108
61230-USW-TFT	676	15.70%	106
61234-HONORARIUMS TEMPORARY	101	3.60%	4
61235-OSSTF - TFT	371	15.70%	58
61252-VETERINARIAN - TEMPORARY	145	16.05%	23
61253-CONTRACTUALLY LIMITED P&M	58	17.00%	10
61305-SUPPORT STAFF - RPT	31	16.70%	5
61307-SUPPORT STAFF - TPT UNREP	606	14.70%	89
61335-OSSTF - TPT	107	14.70%	16
61417-STUDENT LABOUR - TPT	1,552	9.00%	140
61419-GRADUATE RESEARCH ASSISTANT	1,721	0.50%	9
61420-GRADUATE SERVICE ASSISTANT	80	8.25%	7
61552-LUMP SUM PAYMENTS	362	variable	14
Total	**33,405**		**8,487**

2.11 Summary of Intellectual Property Costs

IP costs, expenditures related to IP development and revenues are reported on separately by the Research Innovation Office (RIO) to ARIO.

2.12 Attestation by a Duly Authorized Signing Authority

I confirm that the University of Guelph has followed its internal financial controls when managing the OMAFRA/UofG Agreement.

Lori Kimball
Associate Vice-President, Finance
University of Guelph

2.13 Externally Audited Financial Statements

The financial statements were audited by Ernst & Young and are provided in Appendix A of this document.

3 Research Program

As described in the Agreement, the Research Program is responsible for developing and managing a research and innovation system that:

a) Sustains and generates new, core capacity needed to undertake world class research and scientific, economic and data analysis;
b) Maximizes the use of research infrastructure in a manner that provides benefits to all of Ontario's regions;
c) Informs evidence-based public policy and drives public awareness and fact-based dialogue;
d) Supports the commercialization of new technologies;
e) Fosters frequent and quality collaboration among the agri-food and rural research community, the University, the agri-food sector and rural Ontario; and
f) Increases access and sharing of data to facilitate new agri-food and rural research and data analytics to inform decision making.

The Agreement's Research Program achieves these goals by addressing the innovation continuum comprehensively, from funding market-driven innovative research, to mobilizing these 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, subsequently maximizing the return on public investment.

3.1 Program Activities and Achievements from 2018/19

The University of Guelph leads the country in all of agriculture, agri-food, veterinary and rural sciences:

- UofG ranks 1st in Canada and 7th in the world for veterinary medicine[9].
- UofG ranks 1st in Canada and 12th in the world for agricultural sciences[10].

The University reaffirmed its commitment to agricultural and associated sciences with the renewal of its five-year Strategic Research Plan (SRP) in 2017. Seven of the eight research signature areas identified in the plan directly support OMAFRA Priorities. These areas differentiate UofG's research focus relative to other institutions and include: food, agriculture and the bioeconomy, veterinary medicine, One Health, environmental stewardship and biodiversity, community-engaged scholarship, and data science and informatics. Operationalizing this SRP in 2018/19 has included the establishment of three research institutes

[9] https://www.topuniversities.com/university-rankings-articles/university-subject-rankings/top-universities-veterinary-science-2019

[10] https://www.usnews.com/education/best-global-universities/agricultural-sciences?page=2

at the University, each of which will enhance the delivery of new knowledge which addresses the Ministry's research priorities:

- The Centre for Advancing Responsible and Ethical Artificial Intelligence (CARE-AI). This interdisciplinary centre will help foster partnerships among UofG researchers and experts in private and public organizations, all looking to address real-world issues and challenges of implementing artificial intelligence (AI) using a range of applications. With a focus on humanistic aspects of AI at the facility, it is an excellent example of how UofG looks to improve life. The centre will involve almost 90 researchers and scholars from across campus and include an advisory panel of academic and industry leaders. It will focus on applying machine learning and AI to UofG strengths, including human and animal health, environmental sciences, and agri-food and the bioeconomy.
- The One Health Institute (OHI) advances an interdisciplinary approach to promote health and curbing infectious diseases. One Health aims to tackle problems at the intersection of people, animals and the environment. Looking at how those three components interact is key to stemming many emerging vector-borne ailments such as Lyme disease or combatting the growing health threat posed by drug-resistant microbes, through professionals working together, bringing their perspectives on animals, humans and environmental sciences.
- The Guelph Institute for Environmental Research (GIER) is a new research institute that spans all seven colleges. It aims to stimulate and support interdisciplinary research, foster a sense of community among UofG researchers and raise the profile of environmental research at Guelph. Most importantly, it will provide a new source of funding for Guelph researchers.

The UofG works hard to leverage the OMAFRA/UofG Agreement to grow agri-food research and innovation in Ontario. The Arrell Food Institute and Food from Thought continue to contribute to the $53.4M in non-Agreement funding awarded to UofG for research projects that are supportive of OMAFRA priorities. Together, these investments enhance Guelph's position as a nexus of agri-food innovation, where academia, government and industry come together to support our provincial, national and international agri-food sectors, and our rural communities.

In the first year of the new Agreement, the University of Guelph updated Key Performance Indicators (KPIs) to reflect language around added, removed and modified metrics. As well, for some maintained metrics, the calculation methodology has been updated to reflect new data availability and understanding.

At the direction of the Executive Committee, an OMAFRA/UofG working group explored options for Research Program efficiencies and continuous improvement in overall Agreement processes. For example, the Tier I Research Program has typically been administered as a two-stage call, with Letter of Intent and Full Proposal stages. The OMAFRA/UofG working group identified that this call process typically led to late notification of awards, which delayed the natural start of most projects relative to field-planting and graduate student recruitment. This in turn increased the elapsed time between the Ministry identifying a particular line of

research as a priority, and the delivery of new knowledge to address that priority. For 2019/20, the Alliance will move to a one-stage call process for the Tier I Research Program. Depending on the timing of the review process, the one-stage call will result in time-savings of approximately two to three months, allowing award notifications to occur at a more appropriate time. Other improvements stemming from the OMAFRA/UofG working group include a revised proposal review process and revised report review process.

The first year of the new Agreement includes the implementation of the Next-Generation RMS, scheduled to be operational in time for the 2019/20 call for research proposals. As with the implementation of any new software system for process and paper management, there are uncertainties as to how smoothly the inauguration will proceed, and thus the Next-Gen RMS implementation team is preparing alternate business flows to mitigate the risks. The implementation process has provided an excellent opportunity to document processes and procedures, as well as look for opportunities to improve efficiency.

The University has been working to identify third party incremental leverage for the research programs and in support of infrastructure projects. This is being accomplished through allocation of some of the University's CFI envelopes (Infrastructure Fund and John Evans Leadership Fund) to purchase equipment for Guelph and Ridgetown Campuses, as well as ARIO Research Stations. This enhances UofG's research capacity in support of Ministry Priorities. These awards to researchers are adjudicated on the bases of excellence of the researcher, novelty and leading-edge nature of the proposed research, and the benefit to civil society. Thus, these sources of funding are complementary to minor capital and research stations operations. Specifically, a submission from the University of Guelph to the 2020 CFI-IF competition will ask for a state-of-the art sensor networks for the livestock and agronomy research at Elora Research Station, with an anticipated budget of about $7M. The vision of Ag 5.0 is that these data will enable solutions to the large challenge posed by reconciling the increase in food production needed to feed a growing global population, with sustainability of that production. The data from these sensors will become part of the Agri-Food Data Canada platform (which is being developed in Food from Thought), allowing an unprecedented scale, degrees of resolution, speed and complexity of enquiry previously not available. This platform will train HQP to meet Ontario's labour needs in the agricultural-high-tech sector, as well as support the development of innovative technologies that will provide jobs for Ontarians.

Finally, the success of the Research Program is clearly demonstrated in Table 3.1, which provides a summary of key performance metrics. More details about the achievements and outcomes of the Research Program follow.

Table 3.1: Key Performance Metrics for the Research Program

Performance Metric	2018/19 Results	Target
Intellectual Capacity		
Research Faculty FTE	78.8	67.8
Number of Faculty Members Involved in Agreement-funded Research	246	N/A
Research Technician Agreement FTE	87.6	42.4
Number of Research Technicians Involved in Agreement-funded Research	164	N/A
Research Support Agreement FTE	22.8	22.5
Research Faculty FTE effort engaged in Research Supportive of Ministry Priorities	153.0	97
Number of Faculty Members Involved in Research Supportive of Ministry Priorities	364	N/A
Highly Qualified Personnel Engaged in Research Projects per $1M Invested	17.1	14
Partnership and Leverage		
Ratio of Third-Party Funding and In-Kind Contributions for Tier I Projects	1.00:1	1:1
Value of Third-Party Funding and In-Kind Contributions for Tier I Projects	$6.3M	N/A
Ratio of Third-Party Funding of all University Research, Not Funded by this Agreement, but Supportive of Ministry Priorities	1.05:1	0.7:1
Value of Third-Party Funding of all University Research, Not Funded by this Agreement, but Supportive of Ministry Priorities	$53.4M	N/A
Third-Party Funding Directed at Tier II and III Research Projects	$7.6M	N/A
Collaborations per $1M Invested	41.5	35
Number of Third-Party Organizations Supporting Research Projects per $1M Invested	19.2	20
Commercialization		
Intellectual Property - Patents Filed	10	17
Intellectual Property - Patents Granted	4	5
Intellectual Property - Licenses	22	19
Intellectual Property - Revenue	$1.68M	$1.5M

3.1.1 Research Faculty

Ontario needs a critical mass of world-class researchers to ensure its agri-food sectors and rural communities are poised to address current challenges and meet future opportunities. The University leverages investments made through the Agreement to ensure Ontario has the intellectual capacity to support sustainable, globally competitive agri-food sectors, and vibrant rural communities.

In 2018/19, the University of Guelph attracted financial investments and recruited research leaders to faculty positions, enhancing capacity to meet OMAFRA priorities and position Ontario as a global leader in agri-food innovation. Over the last year, 25 new faculty members began in agri-food or agri-food related positions at the University, some resulting from philanthropic gifts and federal research investments:

- Three Arrell Chairs supported through a gift from the Arrell Foundation
    - Dr. Simon Somogyi - Business of Food
    - Dr. Maria Corradini – Food Quality
    - Dr. Philip Loring - Food, Policy and Society
- Six new faculty positions in support of big data in the agri-food value chain, funded by the Food from Thought (FfT) initiative
    - Dr. Elizabeth Mandeville – Bioinformatics and Computational Biology
    - Dr. Khurram Nadeem - Computational Statistics
    - Dr. Nicole Ricker - Pathogenomics
    - Dr. Mike Steele - Animal Physiology
    - Dr. John Sulik - Precision Agriculture
    - Dr. Dan Tulpan - Computational Biology
- Two named positions, made possible through external support
    - Dr. Lawrence Goodridge - Leung Family Professor in Food Safety
    - Dr. Joshua Nasielski - MacSon Professorship in Agronomy for Eastern and Northern Ontario
- Additional positions, either new capacity or replacement capacity for resignations/retirements
    - Dr. Genevieve Ali - Environmental Microbiology
    - Dr. Ataharul Chowdhury – Capacity Development and Extension
    - Dr. Leith Deacon – Rural Planning and Development, Development of Sustainable Communities
    - Dr. Giannina Descalzi – Comparative Biomedical Science
    - Dr. Jennifer Ellis – Animal Systems Modelling
    - Dr. Jennifer Geddes-McAlister - Mechanisms of pathogenesis, adaptation, and survival in fungal and bacterial microbes from a systems biology perspective
    - Dr. Adam Gillespie – Soil biochemistry
    - Dr. Dave Guyadeen – Rural planning and development, climate change

- Dr. Faisal Moola - Forest conservation and management, ecology and ethnoecology of plants, environmental policy, indigenous-led conservation
- Dr. Eric Nost - Political ecology; digital governance; environmental planning, markets, and justice; web mapping; agri-food systems; wetlands
- Dr. Jane Parmley - One Health
- Dr. Rebecca Shapiro - Microbial fungal pathogens
- Dr. Charlotte Winder - Health and performance of ruminant species, primarily dairy cattle and small ruminants
- Dr. Wei Zhang - Structure-based protein engineering (used to develop novel biologics to fight viral infections in plants and livestock)

In addition, the University of Guelph also received $2.4M from the federal government for two new Canada Research Chairs (CRC) and the renewal of an existing chair:

- Dr. Emma Allen-Vercoe, Department of Molecular and Cellular Biology, new Tier 1 Chair in Human Gut Microbiome Function and Host Interactions;
- Dr. Christine Baes, Department of Animal Biosciences, new Tier 2 Chair in Livestock Genomics; and
- Dr. Amy Greer, Department of Population Medicine, existing Tier 2 Chair renewed in Population Disease Modelling.

This latest investment from the CRC program highlights the research excellence of the University's faculty and emphasizes UofG's reputation as a top comprehensive, research-intensive university in Canada. All three CRCs are in support of OMAFRA's research priorities. They elevate the University's strengths in One Health, as these researchers are involved in cutting-edge initiatives at the intersection of human, animal and environmental health. Their research will lead to ground-breaking discoveries and fuel impactful innovations that address some of the world's most pressing challenges.

Finally, the University was also pleased to announce the first Barrett Chair in Sustainable Food Engineering, supported by a $5M gift from the Barrett Family Foundation. The Chair is intended to develop innovative ways to improve food processing and production. Dr. Kevin Keener will begin his appointment on October 1, 2019. He will be improving processes and practices to reduce food waste, increasing the use of food and fibre, and ensuring sustainable food manufacturing processes. These aspects help ensure global transport of safe, nutritious, high-quality food that benefits consumers, food manufacturers and government agencies.

3.1.2 Research Support

Research support provides the critical mass of technicians and other support personnel to provide knowledge and expertise which optimize the use of research infrastructure to achieve Agreement outcomes. This provides benefits to all of Ontario's regions and increases access to and sharing of data to facilitate new agri-food and rural research and data analytics to inform decision-making.

Research support, as a program activity, remains relatively stable year to year. In 2018/19, the University began a process to better identify the use of research technicians in projects related to the OMAFRA priorities, which will continue during 2019/20. The University is also mapping technical expertise to existing and emerging OMAFRA priorities and working with Departments to identify and address technical or support staff changes that would impact the Agreement.

In 2018/19, seven new Research Program Directors (RPDs) were appointed, providing regeneration and increased diversity; as well, three RPDs were re-appointed providing continuity for the Alliance managers as well as leadership for the new RPDs. RPDs play a vital leadership role in the delivery of the research program and the achievement of KPIs. Specifically, RPDs help to ensure that Agreement-funded research meets the priorities set by OMAFRA, that research results are disseminated, and that partnerships are built with stakeholders. As leaders in their field of research, RPDs also act as ambassadors for the Ontario Agri-Food Innovation Alliance, both locally and globally. Promoting Alliance priorities to UofG researchers, while encouraging and fostering collaboration with leading researchers from around the world, helps ensure that the University can develop and maintain the capacity to respond to emerging agri-food related research problems and opportunities. Table 3.2 provides a list of the RPDs.

Long-term trials will also be a component of the Research Support program activity in the future. Over the last year, discussions were started regarding the management and optimal operation of long-term trials. A separate budget was set aside in 2019/20 to support the trials.

Table 3.2: Research Program Directors

Theme	Name	Department	Term
Agri-Food and Rural Policy	Kate Parizeau	Department of Geography, Environment and Geomatics	September 1, 2018 to August 31, 2021
Bioeconomy – Industrial Uses	Manjusri Misra	School of Engineering	September 1, 2018 to August 31, 2021
Emergency Management	Zvonimir Poljak	Department of Population Medicine	September 1, 2018 to August 31, 2021
Environmental Sustainability	Laura Van Eerd	School of Environmental Sciences, Ridgetown Campus	July 1, 2018 to June 30, 2021
Food for Health	Alison Duncan	Department of Human Health and Nutritional Sciences	July 1, 2018 to June 30, 2021
Products and Value Chains	Paul Spagnuolo	Department of Food Science	July 1, 2018 to June 30, 2021
Production Systems – Animals	Stephen LeBlanc	Department of Population Medicine	July 1, 2018 to June 30, 2021
Production Systems - Plants	Mary Ruth McDonald	Department of Plant Agriculture	July 1, 2018 to June 30, 2021
Data Director	Rozita Dara	School of Computer Science	September 1, 2018 to August 31, 2021
Highly Qualified Personnel Scholarship Program	Keith Warriner	Department of Food Science	July 1, 2018 to June 30, 2021

3.1.3 Research Projects – Tier I

Committed to excellence in research and guided by the core values of impartiality, fairness, and integrity, the processes supporting the research funding programs administered by the University of Guelph provide rigor and accountability in proposal review, according to best practices in research program administration.

Upon receipt of OMAFRA's research priorities for 2018/19, the University launched a call for proposals in September 2017 for projects beginning in May 2018. Eight review committees (including two for Production Systems, namely Animals and Plants) were assembled that comprised of OMAFRA staff (including the OMAFRA Director Champion or alternate and RIB Research Analyst), academics (including the UofG Research Program Director), and other representatives from industry and government.

The response to the call generated 128 Letters of Intent (LOIs), which were evaluated against defined criteria that included alignment with priorities, benefits, value for money, quality of the science, sector engagement and the research team. Seventy-five of the submitted LOIs were invited to develop Full Proposals (FPs). Full Proposals were discussed using the same criteria as the LOIs, and numerically ranked based on reviewer scores. Final recommendations were made by consensus. Of the 73 FPs that were ultimately submitted, 55 projects were awarded funding of $6,075,496. One project was subsequently declined, resulting in the total amount awarded being reduced to $5,982,886. Six of the 54 approved projects addressed priorities in more than one theme area. Table 3.3 provides the breakdown of proposals by status and ministry priority, with proposals included only in their primary theme. The amount awarded, however, is divided by theme for the proposals addressing priorities in more than one theme. A list of the 54 research projects awarded in 2018/19 is included in Table 3.4.

Table 3.3: Number of Proposals by Status and Ministry Priority

Ministry Priority	Number of Letters of Intent	Number Invited to Full Proposal	Number Awarded	Number Declined	Total	Amount Awarded
Agricultural and Rural Policy	13	9	8		8	$843,403
Bioeconomy	12	7	7		7	$871,046
Emergency Management	2	1	1		1	$190,325
Environmental Sustainability	18	12	7		7	$950,020
Food for Health	10	4	4		4	$522,500
Products and Value Chains	15	6	3		3	$564,700
Production Systems - Animals	32	20	13	1	12	$904,399
Production Systems - Plants	26	16	12		12	$1,136,494
Total – Tier I Research	**128**	**75**	**55**	**1**	**54**	**$5,982,886**

Table 3.4: 2018/19 Research Projects

Principal Investigator	Project Title	Theme	Amount Awarded
Ryan Gibson	Building for the future: rural infrastructure and regional economic development	Agricultural and Rural Policy	$142,303
Glenn Fox	Spatial stochastic bioeconomic modeling of crop climate resilience in Ontario	Agricultural and Rural Policy	$110,000
Richard Vyn	An economic evaluation of cover crops and ecosystem services	Agricultural and Rural Policy	$58,000
Wayne Caldwell	Measuring farmland loss: quantifying the conversion of designated farmland to non-farm land uses across Ontario and assessing the relevance of farm severance policies	Agricultural and Rural Policy	$97,500
Wayne Caldwell	Aggregate and agriculture: understanding the impacts of aggregate production on agriculture and identifying mitigating strategies	Agricultural and Rural Policy	$142,500
Getu Hailu	Trade and competitiveness: productivity, innovation, and product differentiation	Agricultural and Rural Policy	$151,600
Ken McEwan	The impact of business risk management programs on swine farm investment tendencies	Agricultural and Rural Policy	$52,500
John Smithers	Linking farm and school in new regional agri-food value chains: practices and prospects	Agricultural and Rural Policy	$89,000
Rene Van Acker	Assessing the tolerance of *Euphorbia lagascae* to select herbicides and fungicides	Bioeconomy	$36,428
Amar Mohanty	Exposing circular economy in advanced biocarbon manufacturing from chicken feather wastes for light-weight auto-parts uses	Bioeconomy	$178,000
Manju Misra	Highly graphitized biocarbon from biomass for automotive and smart material applications	Bioeconomy	$170,000
Animesh Dutta	Hybrid hydrothermal carbonization (HTC) and slow pyrolysis of agricultural biomass to produce bio-carbon for Canadian iron and steel industry	Bioeconomy	$172,000
Amar Mohanty	High biomass-filled affordable and cost-competitive green composites for compostable food packaging applications	Bioeconomy	$180,000
Katarina Jordan	Assessment and integrated management of switchgrass (*Panicum virgatum*) headsmut in Ontario	Bioeconomy / Emergency Management	$106,000
John Lumsden	Detection of a B-proteobacteria associated with epitheliocystis in farmed Ontario rainbow trout	Emergency Management	$40,000

Principal Investigator	Project Title	Theme	Amount Awarded
Jana Levison	Groundwater-surface water interactions and agricultural nutrient transport in a Great Lakes Basin clay plain system	Environmental Sustainability	$164,980
Laura Van Eerd	Soil organic carbon and total nitrogen storage due to long-term tillage system, crop rotation, cover crop and fertilizer nitrogen	Environmental Sustainability	$128,310
Jon Warland	Process-based crop modelling for managing climate change impacts on agroecosystems	Environmental Sustainability	$84,000
Claudia Wagner-Riddle	Net carbon balance dynamics of diverse and non-diverse crop rotations at the farm scale	Environmental Sustainability	$99,000
Prasad Daggupati	A decision support tool for evaluating BMPs that reduce greenhouse gas (N_2O) emission and improve water quality under changing climate	Environmental Sustainability	$163,000
Asim Biswas	Ontario Soil Information System (OSIS): digital soil mapping of Ontario soils at 100-m resolution (SoilGrid100)	Environmental Sustainability	$198,730
Erica Pensini	Natural, cost-effective and reusable adsorbents for the removal of phosphorus from drainage water	Environmental Sustainability	$112,000
Al Lauzon	Food insecurity and rural seniors living independently: an exploratory study in Huron, Perth, Bruce and Grey Counties	Food for Health	$134,000
Michael von Massow	Evaluating the potential to change behaviour in restaurants through menu labeling	Food for Health	$60,500
Yu Na Lee	Experimental evidence on the effectiveness of front-of-package labeling for healthy food choices	Food for Health	$88,000
Andreas Boecker	Facilitation and economic impact of local/Ontario food purchasing in long-term care homes	Food for Health	$240,000
George van der Merwe	Building capacity through innovation in the Ontario craft cider sector	Products and Value Chains	$203,300
Leonardo Susta	Prevalence and early detection of wooden breast syndrome and white striation in Canadian broilers	Products and Value Chains	$221,400
Mostafa Elsharqawy	Sustainable refrigeration and defrost system for frozen food industry	Products and Value Chains	$140,000
Trevor DeVries	Impact of dry off management in robotic milking systems on risk of intramammary infection	Production Systems Animals	$35,300
David Kelton	Evaluating precision agriculture technologies for disease risk characterization of calves entering veal production.	Production Systems Animals	$52,000

Principal Investigator	Project Title	Theme	Amount Awarded
Todd Duffield	Establishing evidence-based pain management protocols for disbudding neonatal dairy calves	Production Systems Animals	$77,500
Robert Friendship	The relationship between iron nutrition status and immunity in weaned pigs	Production Systems Animals	$33,000
Brandon Lillie	Equine Herpes Virus (EHV) and EHV-associated disease in the Ontario equine industry - disease prevalence and prevention	Production Systems Animals	$63,600
Katie Wood	Alternative trace mineral supplementation strategies for improved beef cow performance	Production Systems Animals	$174,500
Lee-Ann Huber	Insect products: providing novel proteins to weanling pigs, while improving gut health and development, pig health, and the sustainability of pork production	Production Systems Animals	$70,500
John Cant	Using a computer model of nutrient flow for precision feeding of individual cows in a dairy herd	Production Systems Animals	$118,800
Trevor DeVries	Validation of a dairy cow illness detection model using behaviour and production data from precision technologies	Production Systems Animals	$62,250
Brandon Gilroyed	Effect of methane mitigating additives utilized in dairy manure lagoons on microbial ecology	Production Systems Animals	$60,000
Eduardo De Souza Ribeiro	Using basic science to improve fertility in dairy cattle: development of an endometrial receptivity test for genetic selection	Production Systems Animals	$45,949
John Barta	'In-barn metagenomics': Development and application of a rapid molecular assay for identifying parasite diversity and numbers in mixed *Eimeria* species infections in commercial poultry	Production Systems Animals	$57,500
Brandon Gilroyed	Reducing pathogens and greenhouse gas emissions from swine manure using anaerobic digestion	Production Systems Animals / Bioeconomy	$107,000
Mike Dixon	Conditioning of nursery plants using irrigation management and mycorrhizae for improving post transplant success rates	Production Systems Plants	$88,026

Principal Investigator	Project Title	Theme	Amount Awarded
David Wolyn	Association mapping of traits and development of a freezing tolerance seedling screen in asparagus	Production Systems Plants	$106,500
Rene Van Acker	Subsurface drip irrigation for enhanced asparagus production	Production Systems Plants	$108,688
Hugh Earl	Optimizing quinoa production systems for Ontario - A physiology-based approach to improved agronomics	Production Systems Plants	$101,900
John Zandstra	Investigations into variables affecting tomato solids	Production Systems Plants	$105,000
Manish Raizada	Discovery of corn silk-associated probiotics to combat Fusarium disease and mycotoxins: An exciting new frontier in an old battle	Production Systems Plants	$55,000
John Zandstra	Development of cropping systems for hazelnut in Ontario	Production Systems Plants	$72,000
John Lauzon	Determining prevalence of sulfur deficiency and a soil test method that will inform sulfur fertilizer recommendations for Ontario field crops	Production Systems Plants	$149,252
Brandon Gilroyed	Evaluation of cup plant (*Silphium perfoliatum*) as a new perennial biomass and forage crop for Ontario	Production Systems Plants / Bioeconomy	$112,470
Mary Ruth McDonald	Distribution and management of carrot cyst nematode in Ontario	Production Systems Plants / Emergency Management	$131,000
Mary Ruth McDonald	Management of clubroot on canola and Brassica vegetables in Ontario	Production Systems Plants / Emergency Management	$134,000
Cynthia Scott-Dupree	Developing sustainable pest management strategies for Brown Marmorated Stink Bug	Production Systems Plants / Emergency Management	$98,100
		Total (54 projects)	**$5,982,886**

In addition to the process of awarding 54 new projects addressing important Ministry research priorities in 2018/19, the University continued to manage the post-award compliance and reporting requirements of 160 continuing research projects.

Several initiatives aimed at continuous improvement for efficient and high quality research program administrative systems and processes were also accomplished in 2018/19, including: a revised Conflict of Interest Policy and Guidelines, an updated report review process, improvements to the LOI and FP scorecards and review process, as well as updates to application and reporting templates to incorporate new reporting and compliance requirements under the 2018 Agreement. The University also began working closely with OMAFRA on the development of the Next Generation Research Management System (Next Gen RMS), the database used to administer all OMAFRA/UofG funded research projects and awards.

In the initial phase of developing an evaluation framework for assessing and reporting research impact, OMAFRA and UofG worked with consultants to develop a *Theme Based Research Review* report, summarizing OMAFRA/UofG funded projects under the 2008-2018 Agreement. Citing interviews with OMAFRA, UofG, and stakeholders, the report concluded, “it is clear that the [OMAFRA/UofG] Partnership Research Program has been instrumental in terms of driving improvements in agri-food production, environmental stewardship, rural policies, and economic development of the sector”. Also, the “capacity to conduct collaborative and applied research specifically targeted at the Ontario agri-food sector facilitates continuous improvement across this industry.” Going forward, the report will inform the approach to implementing the new Research Impact Case Study requirement under the 2018 Agreement.

3.1.4 Special Initiatives

There are provisions under the 2018 Agreement to support research and science needs outside of the annual call for proposals process. These Ministry needs, for various reasons, do not fit well into the annual call for proposals cycle. Some examples include research proposals that address modelling, research synthesis projects, and plant breeding research.

In 2018/19, the University worked closely with OMAFRA in developing an approach to administer Special Initiatives (SI) projects in RMS, leverage existing program processes and templates, and ensure that all information necessary to support KPIs and other reporting requirements are readily captured for SI projects.

In 2018/19, one SI project was awarded as shown in Table 3.5 below. An additional $1,510K of the Research Project Operating budget was set aside for Special Initiatives in 2018/19. OMAFRA launched an internal call for projects. Projects and suitable University Project Leads have been identified and, pending Ministry approval, are expected to begin in 2019/20.

If Special Initiatives continue to be delayed and/or unallocated, the University's future performance on many of the KPIs will ultimately be impacted.

Table 3.5: 2018/19 Special Initiatives Projects

Principal Investigator	Title	Theme	Amount Awarded
Alan Ker	Commodity-specific economic modeling	Special Initiatives	$300,000

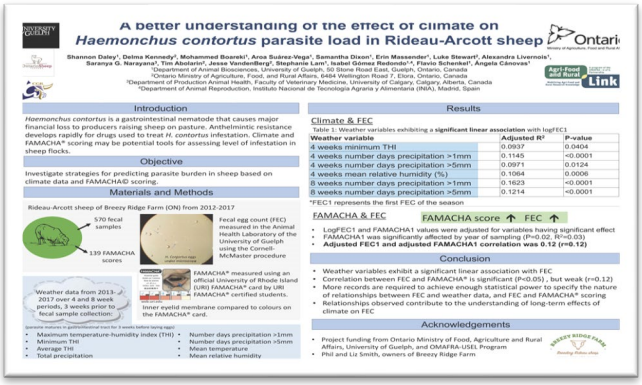
3.1.5 Undergraduate Student Experiential Learning (USEL) Program

The University of Guelph is responsible for administering and managing the Undergraduate Student Experiential Learning (USEL) program which supports students in the development of leadership skills, enhanced written and verbal communication skills, and project planning and management to better equip them to engage in effective agri-food knowledge mobilization.

The USEL program gives third-year undergraduate students work experience in the agri-food sector. In 2018/19, the USEL program supported five students who were partnered with mentors to complete an agri-food research project that will support producers and rural communities. Table 3.6 provides the project titles, the student names and the mentors.

Table 3.6: Summer 2018 USEL Student Projects

Project Title	Student Name	UofG Mentor	OMAFRA Mentor
Diversity and abundance of pollinator communities in Ontario apples	Eden Gerner	Nigel Raine, Environmental Sciences	Hannah Fraser, Entomologist (Horticulture)
Managed ornamental container crops versus native flowering plants: pollinator attraction, pollen resources, and consumer preference	Lauren VanDerlingen	Al Sullivan, Plant Agriculture	Sarah Jandricic, Greenhouse Floriculture IPM Specialist
Studying the effect of photoperiod response genes on environmental adaptation of winter wheat	Rebecca Francolini	Ali Navabi, Plant Agriculture	Joanna Follings, Cereals Specialist
Out-of-season breeding strategies for dairy goat producers in Ontario	Oluwatimileyin Abolarin	Eduardo Ribeiro, Animal Biosciences	Marlene Paibomesai, Dairy Specialist
Collect information to investigate the effect of climate on gastrointestinal parasite load in sheep	Shannon Daley	Angela Canovas, Animal Biosciences	Delma Kennedy, Sheep Specialist


A better understanding of the effect of climate on *Haemonchus contortus* parasite load in Rideau-Arcott sheep

Introduction

Haemonchus contortus is a gastrointestinal nematode that causes major financial loss to producers raising sheep on pasture. Anthelmintic resistance develops rapidly for drugs used to treat *H. contortus* infestation. Climate and FAMACHA© scoring may be potential tools for assessing level of infestation in sheep flocks.

Objective

Investigate strategies for predicting parasite burden in sheep based on climate data and FAMACHA© scoring.

Materials and Methods

Rideau-Arcott sheep of Breezy Ridge Farm (ON) from 2012-2017

570 fecal samples

139 FAMACHA scores

Fecal egg count (FEC) measured in the Animal Health Laboratory of the University of Guelph using the Cornell-McMaster procedure

FAMACHA© measured using an official University of Rhode Island (URI) FAMACHA© card by URI FAMACHA© certified students.

Inner eyelid membrane compared to colours on the FAMACHA© card.

Weather data from 2013-2017 over 4 and 8 week periods, 3 weeks prior to fecal sample collection:

- Maximum temperature-humidity index (THI)
- Minimum THI
- Average THI
- Total precipitation
- Number days precipitation >1mm
- Number days precipitation >5mm
- Mean temperature
- Mean relative humidity

Results

Climate & FEC

Table 1: Weather variables exhibiting a **significant linear association** with logFEC1

Weather variable	Adjusted R^2	P-value
4 weeks minimum THI	0.0937	0.0404
4 weeks number days precipitation >1mm	0.1145	<0.0001
4 weeks number days precipitation >5mm	0.0971	0.0124
4 weeks mean relative humidity (%)	0.1064	0.0006
8 weeks number days precipitation >1mm	0.1623	<0.0001
8 weeks number days precipitation >5mm	0.1214	<0.0001

*FEC1 represents the first FEC of the season

FAMACHA & FEC

FAMACHA score ↑ FEC ↑

- LogFEC1 and FAMACHA1 values were adjusted for variables having significant effect
- FAMACHA1 was significantly affected by year of sampling ($P=0.02$, $R^2=0.03$)
- **Adjusted FEC1 and adjusted FAMACHA1 correlation was 0.12 (r=0.12)**

Conclusion

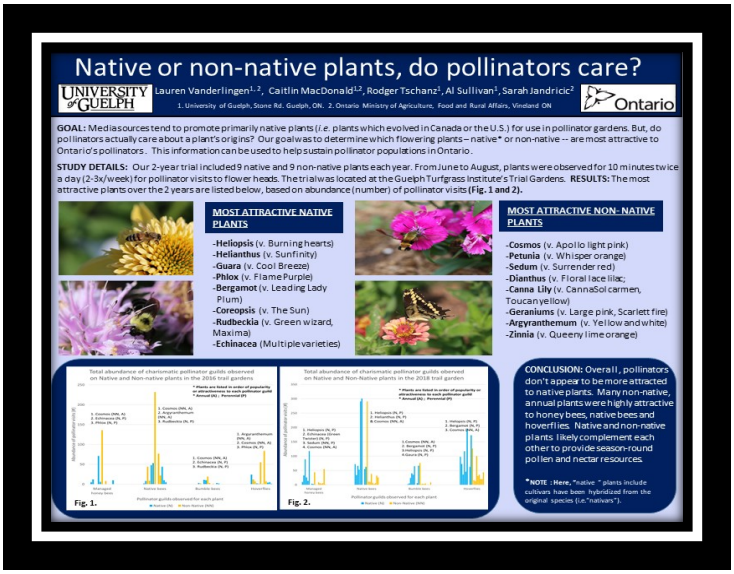
- Weather variables exhibit a significant linear association with FEC
- Correlation between FEC and FAMACHA© is significant ($P<0.05$) , but weak ($r=0.12$)
- More records are required to achieve enough statistical power to specify the nature of relationships between FEC and weather data, and FEC and FAMACHA© scoring
- Relationships observed contribute to the understanding of long-term effects of climate on FEC

Acknowledgements

Project funding from Ontario Ministry of Food, Agriculture and Rural Affairs, University of Guelph, and OMAFRA-USEL Program
Phil and Liz Smith, owners of Breezy Ridge Farm

Students led the projects from start to finish and participated in industry events to present project findings (e.g. Southwest Crop Diagnostic Day, Small Ruminant Forum, etc.). In addition, most students developed several KTT products, such as articles and posters. Overall satisfaction with the program was 100%.

Student feedback received on the program included:



"I gained valuable career insight, research and government work experience, industry connections and practical skills."

"Connections and experience in a field I wouldn't have had the chance to work within otherwise."

"A lot of industry experience, including working with producers and other OMAFRA staff, learning the ins-and-outs of the industry for my species, and practice in written and verbal communication skills."

"I gained fantastic insight into the work done by OMAFRA, the University of Guelph, and the farming industry. I got hands-on farm experience and the chance to apply what was found on farm to written mediums that will be transferred to the industry through conferences and a magazine article. I also got the opportunity to speak to many different people including producers, OMAFRA staff, UofG staff, and UofG grad students, all of whom had a wide variety of knowledge and skills to share with me."

3.1.6 Highly Qualified Personnel (HQP) Scholarship Program

The Agreement supports the next generation of agri-food innovators by providing training opportunities for graduate students dedicated to Ontario's agri-food sector through the Highly Qualified Personnel (HQP) Scholarship Program. The number of HQP applications in 2018/19 was the largest ever, with demand at twenty times the amount of program funding available (more than $4M). HQP Scholarships were awarded to nine new Masters and three new Doctoral students. Table 3.7 outlines information about the new award winners. These 12 new students add to the 21 continuing Masters and 14 continuing Doctoral students, bringing the total cohort registered in 2018/19 to 47 students.

Over its existence, the HQP Scholarship Program has supported the development of 175 students who are the future researchers, policymakers and innovators in government, academia, the agri-food sector and rural economic development.

Multiple changes occurred in the HQP Scholarship Program in 2018/19. Under the Agreement, the University has an annual requirement to find $250K in matching funding for the HQP Scholarship Program. To meet this requirement, a new partnership was developed with the Canada First Research Excellence Fund (CFREF) Food from Thought (FfT) Program. Food from Thought has committed the $250K in matching funds for the 2018/19 scholarships and will provide the match until 2023, for a total matching commitment of $1.25M. In addition to the matching, FfT has also agreed to partner on additional awards starting in 2019/20 and will bring a further $1.2M to the table for scholarships.

This novel partnership provides significant benefits to both parties, including the ability to attract and retain the best and brightest talent for the agri-food sector and the ability to mobilize knowledge for the benefit of both society and the economy. To acknowledge FfT as an HQP Scholarship Program funding partner, the tagline "Developing leaders for the agri-food and rural sectors, supported by OMAFRA and Food from Thought" will be added to HQP Scholarship Program communications.

Table 3.7: HQP Scholarship Program Award Winners

Student Name	Project Title	Faculty Advisor	Department Name	Degree
Varsha Jayasankar	Identifying *Curcuma amada*'s use and applications as a "Food for Cure"	Paul Spagnuolo	Food Science	MSc
Jade Muileboom	Testing of corn silk-derived probiotics to suppress Western bean cutworm and *Fusarium*	Manish Raizada	Plant Agriculture	MSc
Theodore Vanhie	Integrated control of Canada Fleabane (*Conyza canadensis* (L.) Cronq.) using Rye (*Secale cereale* L.)	François Tardif	Plant Agriculture	MSc
Michaela Chalmers	How amino acid profile stimulates milk fat yield and its interaction with effects of insulin and/or CLA	John Cant	Animal Biosciences	MSc
Sydney Moore	Supplementing liquid feed to transition dairy cows to improve productivity, behaviour and metabolic status	Trevor DeVries	Animal Biosciences	MSc
Kortney Acton	Investigation of the effects of probiotics on production and health in dairy cows during the transition period	Katie Wood	Animal Biosciences	MSc
Emily Hehl	Impacts of aggregate extraction on agricultural land protection and evaluation of best management practices in conserved areas of farmland in rural Ontario	Wayne Caldwell	Environmental Design and Rural Development	MSc
Sarah Drury	Integrated management of clubroot on canola and vegetables	Mary Ruth McDonald	Plant Agriculture	MSc
Danielle St Jean	Assessment of data analysis methods to estimate appropriate sampling sizes of various wild species	Daniel Gillis	Computer Science	MSc
Scott Gardner	Groundwater-surface water interactions and agricultural nutrient transport in a Great Lakes Basin clay plain system	Jana Levison	Engineering	PhD
Alexandra Ficht	Integrating genomic selection and accelerated generation advancement to improve genetic gain in a winter wheat breeding program	Alireza Navabi	Plant Agriculture	PhD
Victoria Asselstine	Dairy cows host defense to infection associated with microbiome profile of mastitis causing agents and climate change	Angela Canovas	Animal Biosciences	PhD

Since joining the Ontario Agri-Food Innovation Alliance in 2018 in his capacity as HQP Program Director, Dr. Keith Warriner has been working with University and OMAFRA staff to identify HQP program improvement opportunities. These include review of the HQP course, the program requirements, and the operational procedures, seeking to align the HQP Scholarship Program with standard UofG policies and procedures for scholarships and awards. Specific changes include:

- Bringing the HQP Work Semester requirement in-line with the average time commitment of a Graduate Research Assistantship (GRA) or a Graduate Teaching Assistantship (GTA), which is 8-10 hours per week for 14 weeks or equivalent (minimum 100 hours).
- Merging the HQP workplace experience program requirement into the HQP course (UNIV*6050), which provides specialized workplace-readiness training about business, commercialization and societal interactions with the agri-food system. Students will have the following options:
    - A semester placement in industry of government that can be paid or unpaid;
    - A job shadowing or work placement at an agri-food-related, government/industry/organizational partner; or
    - A team challenge project in collaboration with industry.
- Opening enrollment in the HQP course to all graduate students enrolled at the University working on thesis topics directly related to agri-food, providing workforce-readiness for more students as they enter careers in agri-food-related business, government or academia.
- Adding an option for in-course students to apply in Semesters 1, 2, or 3 while retaining the entrance scholarship option for new students. In-course applicants would be eligible for up to three semesters of Masters funding or six semesters of Doctoral funding, enabling previously left-out students who do not have a faculty advisor upon admission to participate in the program. This will also allow program dollars to stretch further by enabling shorter-term, less costly awards for in-course students.
- Eliminating the annual Departmental top-up funding requirement ($4,000 for Masters and $5,000 for Doctoral students), enabling Departments with little discretionary funding to participate in the program (e.g., faculty in the Social Sciences) and freeing up research operating dollars in other Departments to invest in the students' projects.
- Updating the scholarship amounts, helping to ensure that the program continues to attract outstanding graduate students:
    - Masters applicants eligible for support up to an annual maximum of $20,000 from the program for up to 6 semesters ($17,300 previously).
    - Doctoral applicants eligible for support up to an annual maximum of $25,000 from the program for up to 9 semesters ($21,000 previously).
- Implementing an A- (80%) average minimum transcript requirement, making the selection process more efficient and ensuring top-performing student participants. This is both for entrance and in-course applicants.
- Limiting the number of HQP awards a student may hold to one in their academic career. Permit program conversions, limiting HQP funding to the maximum number of eligible semesters in the degree type the student converts into.

3.1.7 Research Innovation Office (RIO)

The Research Innovation Office (RIO) is responsible for managing and administering research innovation and commercialization programming. It had a successful year in the development, commercialization and advancement of technologies and projects that will benefit the Ontario agri-food economy. The Ontario Agri-Food Innovation Alliance supported University of Guelph inventions which had impact at the farm gate; in industrial manufacturing; in food products; in the health and welfare of Ontario's livestock; and in the creation of new start-up companies. Fiscal 2019 was an exciting period of growth for RIO as it was the first year for which full responsibility for the management of the germplasm portfolio was transferred from ARIO to RIO. To manage this portfolio, the University hired a full-time germplasm manager (Rattan Gill) and increased the financial officer role from a 0.4 FTE to 1.0 FTE. Since starting, Rattan has worked diligently to strengthen and create relationships in the seed industry in Ontario and worldwide to increase the scope and opportunity for plant varieties created at Guelph.

During 2018/19, RIO also hired a senior technology transfer manager (Martin Ciuk) who is dedicated to increasing opportunities for non-germplasm inventions. New Alliance-supported inventions that have been disclosed and have real potential in the agri-food industry. These include a dual port airlift pump from Dr. Wael Ahmed (Engineering) that is already being marketed by the start-up company FloNergia. As well, a novel molecule has been developed by Dr. Loong-Tak Lim (Food Science), which is capable of releasing a food-grade insect fumigant that may have great benefit for food safety with reduced environmental impact.

The Gryphon's LAAIR program, administered by RIO, continued to help early stage ideas advance to the point where they can contribute to the economy. A great example is a collaboration between Dr. Praveen Saxena and Ferrero Rocher for the micropropagation of large numbers of hazelnut trees. The project has already led to five new industry jobs and $1.5M in follow-on funding. LAAIR funding helped to enable the creation of the company Escarpment Labs, which enabled them to work with the IL team to develop a $350,000 research project. More detail is provided in Section 3.1.8.

The RIO Industry Liaison team had a very successful year, with 31 projects receiving more than $7M from non-OMAFRA sources, most of which was in support of Ministry research priorities. For example, David Wright was awarded an OCE VIP I project with global company Trouw Nutrition, part of a larger strategic relationship with Trouw in the area of animal nutrition and health. Overall, Ontario companies were able to access University of Guelph expertise and leverage their funds with a variety of government programs to create large and meaningful projects that will contribute solutions to their business problems and create new markets.

In 2019/20, RIO looks forward to continuing the work as well as finding new ways to both increase and communicate research impact.

3.1.8 Gryphon's Leading to Accelerated Adoption of Innovative Research (Gryphon's LAAIR)

In 2018/19, the Gryphon's LAAIR program funded nine new projects for development totalling $334K. Six early stage projects with technology readiness levels 3-4, were funded to support the validation of a new technology using market research and customer feedback to better understand the product-market fit for the technology's current minimum viable product (MVP) based on end-users in Ontario. Three long term (2-3 years) projects with technology readiness levels 4-6 were funded to support the development and optimization of a defined minimum viable product and to conduct collaborative product development of a high potential commercial prototype with an end user (industry partner in Ontario). These are shown in Table 3.8.

Table 3.8: New Gryphon's LAAIR Projects

Principal Investigator	Title	Theme	Amount Awarded
Market Validation			
Ian Tetlow	Market validation and cost analysis of scale up methods for production of industrial enzymes used for starch modification	Bioeconomy	$20,000
Ali Dehghantanha	Security and resiliency of smart farming systems	Emergency Management	$20,000
Richard Heck	Assembly for multi-spectral optical imaging of large format soil and rock thin-sections	Environmental Sustainability	$20,000
Rafael Santos	Market assessment of farmer's needs and opportunities for a carbon-sequestering slow-release nitrogen fertilizer	Production Systems Plants	$20,000
Helen Fisher	Market testing of new UG table grape varieties in a farm market context	Production Systems Plants	$20,000
Michele Oliver	Market validation of smart whole-body vibration attenuating cushion	Products and Value Chains	$20,000
		Subtotal – Market Validation	**$120,000**
Product Development			
Praveen Saxena	Microhazels: A novel industry for Ontario agriculture	Production Systems Plants	$70,000
Wael Ahmed	Smart pumping technology for vertical farming	Products and Value Chains	$72,000
George van der Merwe	Expanding sour beer production in Ontario	Products and Value Chains	$72,000
		Subtotal – Product Development	**$214,000**
		Total	**$334,000**

This year's projects predominantly supported the following Themes: Products and Value Chains; Production Systems Plants; and Bioeconomy-Industrial Uses.

The focus of the fiscal 2018/19 projects was modified and updated to more accurately mirror the typical steps of industrial commercialization. This resulted in the creation of two main grant/funding streams, namely i) Market Validation and ii) Product Development. Market Validation is the first and most important step for any new technology to verify that market conditions favour and desire a new technological solution in the form created by the researchers. Markets change continually and new entrants and technologies emerge, therefore it is crucial to understand how an academic solution fits into the real world, before too much additional funding is applied to building a workable commercial product. Product Development projects are the next logical step, awarded to help the faculty member work directly with an industry partner to optimize, scale and build the first commercial prototype or even a commercially viable product.

These changes improved the clarity of the purpose of the Gryphon's LAAIR program and generated better and more focused applications for funding from the academic community. It reduced the number of applications for basic or discovery research which is not the target of the GLAAIR programs, and which can obtain funding from other sponsors. This change attracted more applicants with projects that were further along the path to commercialization, which in the coming years should improve the overall number of projects that result in industry adoption of the MVP. No negative impact has been detected by adopting a Market Validation and Product Development focus.

Selected Highlights

Most notable from this year's projects is the strong industrial collaboration and current progress between Dr Praveen Saxena and Ferrero Rocher to propagate hazel nut trees (Microhazels) at industrial scale. This project is making excellent progress and should have industrial adoption sooner than previously planned. In previous years, related technology in the apple tree propagation space created a new industry segment in Ontario (micropropogation-based agri-food industry); founded a dedicated industrial tree micropropogation laboratory (Upper Canada Growers); resulted in five new full time jobs in this lab; generated over $1.5M in follow-on research funding for this technology (OCE and NSERC) and stimulated the researchers/inventors to develop new plant propagation equipment to enable greater production efficiencies for the industry. These researchers, with the support of Gryphon's LAAIR funding, have strongly impacted apple tree, hazel nut tree and hops production in Ontario and enabled greater domestic production (and reduced imports) of high quality, locally adapted, commercially valuable plants for the Ontario agri-food sector.

Also progressing ahead of schedule is the development of improved air-lift pumps capable of moving fluids (most often water) to greater heights, a need in vertical farming applications. These pumps which offer huge energy savings are badly needed in vertical farming because the cost of production and operations is one of the biggest hurdles to the survival of this new plant

production method. Air-lift pumps could make these urban vertical farms more viable and profitable. The design (dual-port air-lift pump) is being patented and managed by the Research Innovation Office. This invention builds on previously funded Gryphon's LAAIR projects which supported the development of simpler versions of air-lift pumps produced by the Ontario start-up company FloNergia, which was created by an Ontario serial entrepreneur/investor specifically for these new products. The greatest demand for new air-lift pumps is from industrial fish farming industry (open water trout and salmon and all fish in tanks on land). The older design is attracting significant attention in the aquaculture fields worldwide, and we anticipate that the newer version will build on this market.

The market research for a novel fertilizer using locally produced Wollastonite has been very insightful and although it does help control and slow down nitrogen release, it appears customers are more interested in its smaller carbon footprint.

Phytospherix, a commercial nanoparticle from sweet corn is in full production and is being sold for use in cosmetics and other moisturizers by Mirexus, a local start-up company. This technology was funded by Gryphon's LAAIR back in 2014, and it was crucial to the survival of Mirexus which to date, has raised over $20M dollars in investment, built a new manufacturing building in Guelph, ON, employs 34 full time employees, has three subsidiary companies (new uses) and annual sales revenue over $1M (2019).

On a similar timeline, another project, "Creating a competitive advantage for Ontario craft beer through the use of novel regional yeast strains" was funded in 2015, has been commercialized by Escarpment Labs who launched 10 new products based on this project, are quadrupling their manufacturing facility in Guelph, ON, have grown their customer base from 2 to 350+ brewing companies in just 2 years and have leveraged an additional $700,000 in follow-on research funding due to the results achieved by LAAIR funding.

3.1.9 Knowledge Translation and Transfer (KTT) Program

The Knowledge Translation and Transfer (KTT) Program and Agri-Food and Rural Link (AFRL) are complementary programs designed to enable, enhance and communicate the impact of Alliance research.

Three objectives drive the design and delivery of KTT and AFRL programming. In 2018/19, the KTT and AFRL programs delivered targeted activities to advance the programs' objectives and support Ontario's agri-food and rural sectors. Below is a description of 2018/19 program activities and achievements organized by program objectives.

Objective 1: Explore the science of KTT and deliver end-user focused services and advice to create positive impact for research and innovation.

Core to this objective is the delivery of a flexible, nimble KTT Funding Program to support researchers in creating additional impact from their completed research and advancing the science of KTT through research.

In 2018/19, the University focused on modernizing the funding program to increase efficiency and enhance the quality of applications submitted to the KTT Funding Program. The outcomes of this initiative include the following:

- Enhanced efficiency by successfully designing and delivering a one-stage application and review process.
- Modernized communications strategy to promote the funding program: combination of social media and web-based communications plan with in-person and online townhall meetings to engage researchers. For the first time, the University also offered a webinar for prospective applicants and developed a video explaining the application process.
- Diversified available KTT funding to respond to researcher and Alliance needs. The University designed and deployed a new grant program – KTT Mobilization Initiatives – that awards one-time funding of up to $5,000 to support dissemination of relevant agri-food and rural research.
- Enhanced researcher interest in the KTT Funding Program: In 2018/19, 25 funding applications from across the University of Guelph (applicants represented five of the seven collages at the University) were received. Eleven projects were approved for funding and will be reported in the 19/20 Consolidated Annual Report.

Objective 2: Drive knowledge into action by advancing the synthesis, exchange, application and dissemination of knowledge resulting from Agreement funded research.

Core to this objective is providing training, networking and skills development opportunities and programming for UofG researchers, graduate students, and members of the wider agri-food and rural community in Guelph-Wellington. The following targeted activities were designed and

deployed in 2018/19 to help stakeholders improve on the skills and networks necessary to enhance research impact.

Discovery and Dialogue Days: Networking and education event designed to bring UofG researchers and sector partners together to learn about research priorities and design impactful research proposals. KTT staff supported the delivery of three discovery and dialogue days in 2018/19, including:

- Emergency Management Discovery and Dialogue Day – September 2018;
- Environmental Sustainability Discovery and Dialogue day – September 2018; and
- Agri-Food and Rural Policy Discovery and Dialogue workshop: Bringing policy staff and researchers together – September 2018.

KTT training for Highly Qualified Personnel: KTT staff delivered five training events focused on skills development to enhance HQP competency in KTT. These included:

- 2018 Arrell Food Summit infographic training workshop;
- Growing Agri-Food KTT infographic training workshop;
- KTT skills workshop;
- Agri-Food Excellence Symposium infographic workshop; and
- Dairy donor day scientific poster development.

KTT tools and training opportunities for researchers, students and the wider agri-food community.

In April 2019, KTT program staff, in collaboration with UofG's Research Innovation Office and OMAFRA's Research and Innovation Branch hosted a knowledge exchange and skills development event. The event was designed to i) disseminate outcomes of projects supported by the KTT Funding Program, and ii) support KTT skills development for researchers, students and members of the wider agri-food community. See the case study in Section 3.4.6.1 to learn more about the event and outcomes and the case study in Section 3.4.6.3 for an example of research funded by the KTT Funding Program.

Knowledge exchange events provide an opportunity for researchers to engage with community partners to exchange knowledge and network. These events support both dissemination of research findings and build opportunities for future collaboration. In collaboration with key government and university partners, program staff delivered the following knowledge exchange events:

- Growing Agri-Food KTT in Ontario: Best Practices for Mobilizing Knowledge, April 2019;
- Dairy Research and Innovation Day, November 2018; and
- WebGIS Based Modelling Tool for Examining Cost Effective BMPs, September 2018.

Objective 3: Evaluate and use KTT methods and best practices to support awareness and impact of research

We employ a two-pronged approach to address this key objective: 1. Deploy targeted communications activities to increase awareness of the Alliance and its research among key audiences; 2. Evaluate and promote KTT best practices to help researchers enhance the impact of their Alliance-funded research. Taken together, this approach positions the Alliance as a provincial, national and global leader in agri-food innovation and makes it a recognized, respected partner of choice for the agri-food and rural innovation.

1. 2018/19 Communications Activities

In 2018/19, program staff collaborated with partners across the UofG and OMAFRA to deliver targeted communications activities—ranging from web- and print-based media to targeted events – to increase awareness of how Alliance-funded research and programming supports Ontario solutions with global impact.

- 2017-18 Agri-Food Yearbook: Released in the Spring/Summer of 2018, the 48-page Agri-Food Yearbook profiled outcomes of Alliance-funded research and programming. The print publication was sent to approximately 24,000 producers across Ontario via Ontario Farmer and distributed to key partners across the UofG, OMAFRA and wider agri-food sector.
- Elora Research Station – Dairy Facility: Two-page publication summarizing research at the Dairy Facility, distributed to tour participants at the Dairy Facility.
- Ontario's Agricultural Research Stations: Four-page summary of Ontario's network of 15 research stations, promoting the network as a vital bridge for agri-food innovation in Ontario.
- Environmental Sustainability Synthesis: Products from the Environmental Sustainability Synthesis were shared via the Yearbook, highlighted during the Growing Knowledge Translation and Transfer in Ontario day and used by the Research Program Director to communicate the outcomes of the Environmental Sustainability theme. The project is now complete, and the full publication will be released in 2019/20.
- Agri-Food and Rural Link twitter account: Social media account covers agriculture, food and rural sectors in Ontario, with an exclusive focus on Alliance-and UofG-related content to enhance awareness and dissemination of research. The AFRL twitter feed has 3,504 followers. In 2018/19, program staff successfully enhanced the reach of this social media platform: impressions increased by 21.4% and engagements by 61.6% in 2018/19 compared to the same period in 2017/18.

- Virtual tour of the Elora Research Station – Dairy Facility: Program staff produced five 360-degree videos profiling the Dairy Facility and the research conducted therein. These videos opened the doors of this world-class research facility to hundreds in the agri-food sector to promote the importance of research and infrastructure to the health and vitality of Ontario's dairy sector. The 360-degree videos were featured at:
    - Canada's Outdoor Farm Show, 2018;
    - The Royal Agricultural Winter Fair, 2018;
    - College Royal, 2018; and
    - Canadian Dairy Expo, 2019.
- Exhibit at Canada's Outdoor Farm Show, 2018: A collaboration among Food from Thought, the Arrell Food Institute and University of Guelph profiled Alliance-funded projects on soil health, agronomy, and dairy science.
- Exhibit at Royal Agricultural Winter Fair, 2018: The Ontario Agri-Food Innovation Alliance was officially introduced at the 2018 Royal Agricultural Winter Fair. The Alliance was profiled as part of the joint, 2,700 square foot OMAFRA/University booth. Thirty-five per cent of the 270,000 total visitors reported visiting the attraction (approximately 94,500 people). A one-minute video profiling the Alliance was produced and played to the 70,000 people who attended the Royal Horse Show.
- Tours of Elora Research Station – Dairy Facility: In 2018/19, the UofG hosted more than 700 people from seven countries at the Dairy Facility. Hosting tours highlights the facility's role in promoting education and training and helps strengthen important partnerships with industry and government.

2. Evaluate and Promote KTT Best Practices

In 2018/19, program staff collaborated with UofG and government partners to publish a manual of best practices in agri-food and rural KTT based on the analysis of 88 projects supported by the KTT Funding Program between 2010 and 2018. The manual was unveiled as part of the event Growing Agri-Food KTT in Ontario. The manual is available online via the UofG's digital repository, The Atrium, for easy storage and access. The manual includes profiles of five funded KTT projects to provide on-the-ground success stories in agri-food and rural KTT. See the case study in Section 3.4.6.3 for details of the impact of this manual and associated event.

3.1.10 Data

Enhancing data capture, storage, and access are the core of two out of six desired outcomes of the Agreement. In 2018/19, the University focused on designing and deploying data management plans (DMPs) as a new requirement for all Research Projects funded under the Agreement. Program staff, in consultation with OMAFRA and UofG partners, designed an Alliance-specific DMP and deployed it as a requirement for Alliance-funded projects. Details about the DMP process, resources and template can be found on the DMP webpage of the Alliance website (https://www.uoguelph.ca/alliance/dmp). The following is a brief summary of activities conducted in 2018/19 to achieve the design and delivery of the Alliance DMP:

- A draft data management plan template and associated preamble was completed in September 2018 based on existing resources and best practices.
    - DMP questions were selected from the Portage Data Management Plan based on the definition of DMP in the Agreement; the DMP preamble was drafted using details from the Agreement, the University of Guelph DRAFT data management strategy, and the DRAFT Tri-Agency Statement of Principles on Digital Data Management.
- The University completed a consultation phase during October – December of 2018, during which time OMAFRA staff and UofG researchers provided feedback on the proposed plan and preamble.
- DMPs were deployed as a requirement of Alliance funding in January 2019.
- In collaboration with the Office of Research, Agri-Food Partnership, the Library hosted five workshops to support researchers in completing their DMPs.
- All researchers receive feedback on their DMP from a Librarian.
- A DMP resource manual was developed and provided to researchers.
- In May 2019, Food from Thought adopted the Alliance DMP template and process. This streamlines the user experience and allows the UofG Library to continue its enhanced support of the DMP initiative.

In 2018/19, the UofG also began scoping a strategy to support enhanced capture and access to research station data. This initiative was enabled by the appointment of Dr. Rozita Dara, Department of Computer Science, as the Data Strategy Program Director for the Ontario Agri-Food Innovation Alliance. In addition, Dr. Karen Hand assumed the role of Director of Research Data Strategy, Agri-Food Data Canada (ADC) which is being developed in FfT. These appointments were a significant step towards the management and curation of research station data, and in 2018/19, a gap/resource analysis and strategy for development/deployment of the ADC platform were advanced. ADC is envisioned to be an efficient and flexible IT platform capable of complex data integration and analytics. A proposed approach was developed that will begin to build the data platform via the scaling of an initial case study of the Elora dairy data. An agile approach will facilitate communication, collaboration and flexibility, within the University, OMAFRA and the Canadian agriculture and food communities.

3.2 Mandatory Compliance Requirements

3.2.1 Human Capacity

3.2.1.1 Research Faculty

Ontario needs a critical mass of world-class researchers to ensure its agri-food sectors and rural communities are poised to address current challenges and meet future opportunities. The Agreement contributes $11,145,000 for the research faculty pool which supports a minimum of 67.8 faculty full-time equivalent (faculty FTE) positions. The University's performance is tracked by calculating the amount of faculty time engaged in research projects funded through the Agreement's Research Program, projects which respond directly to OMAFRA-identified research priorities. The amount of faculty research time varies from year-to-year depending on the number and type of projects funded.

In 2018/19, the University of Guelph has met and exceeded its target of delivering 67.8 faculty FTEs dedicated to Agreement-funded research by 16%. The 78.8 faculty FTEs is the cumulative effort of 246 faculty in six Colleges leading and collaborating on Agreement-funded projects. Table 3.9 provides the total cumulative engagement of faculty in Research Projects, reported on at the College and Department level.

Table 3.9: Total Engagement of Faculty in Research Projects, reported by College and Department

Department and College	Faculty FTE
Lang School of Business (formerly College of Business and Economics)	**1.4**
Department of Management	0.2
Department of Marketing and Consumer Studies	1.1
School of Hospitality, Food and Tourism Management	0.1
College of Biological Sciences	**5.5**
Department of Human Health and Nutritional Sciences	1.5
Department of Integrative Biology	1.4
Department of Molecular and Cellular Biology	2.6
College of Engineering and Physical Sciences	**7.8**
Department of Chemistry	0.2
Department of Mathematics and Statistics	0.1
School of Computer Science	0.6
School of Engineering	6.9
College of Social and Applied Human Sciences	**1.4**
Department of Family Relations and Applied Nutrition	0.4
Department of Geography, Environment and Geomatics	1.1
Ontario Agricultural College	**48.3**
Department of Animal Biosciences	11.9
Department of Food Science	3.9
Department of Food, Agricultural and Resource Economics	4.6
Department of Plant Agriculture	11.1
Ridgetown Campus	6.3
School of Environmental Design and Rural Development	2.2
School of Environmental Sciences	8.3
Ontario Veterinary College	**14.5**
Department of Biomedical Sciences	1.1
Department of Clinical Studies	1.6
Department of Pathobiology	5.6
Department of Population Medicine	6.1
Total	**78.8**
Target	**67.8**

3.2.1.2 Research Technicians

The Agreement also supports technical capacity which is critical to the success of the University in fulfilling the outcomes of the Research Program.

The University reports on the engagement of scientific and technical FTE allocations (non-faculty) against all Research Projects, as well as any additional technical support capacity in the Research Support Program Activity beyond the Research Projects (for example, technical support assigned to a Research Station).

In 2018/19, the University of Guelph exceeded its target of delivering a minimum of 42.4 research technical FTEs by 106%. The 87.6 technical FTEs reported on is the cumulative effort of 164 people working in Agreement-funded research. Table 3.10 provides the total cumulative engagement of research technician FTEs, reported on by Program.

Table 3.10: Total Engagement of Research Technician FTEs by Program

Program	Research Technician FTEs
Tier I Research	35.9
KTT Program	0
Gryphons LAAIR	2.1
Special Initiatives	0.9
Tier II/III Research	18.2
Other Technical Support (not Research Project specific)	30.5
Total	**87.6**
Target	**42.4**

3.2.1.3 Research Support

The Agreement provides funding for administrative support within academic units who ensure the efficient and effective operation of the Research Program.

In 2018/19, the University of Guelph met its target of delivering a minimum of 22.5 research support FTEs with a measurement of 22.8 research support FTEs. Table 3.11 provides the total cumulative engagement of research support FTEs, reported on by Type.

Table 3.11: Total Engagement of Research Support FTEs, by Type

Type	Research Support FTEs
Department Administrative Support	16.7
Ridgetown Campus Support	6.1
Total	**22.8**
Target	**22.5**

3.2.2 Research Project Requirements

The University confirms that it is working towards administering all Research Projects as per the research project requirements outlined in the Agreement.

With respect to progress reporting, there is currently no way to track how long reports remain at different review statuses, until the implementation of Next Gen RMS is complete. Therefore, reporting on this item will begin in the next annual report, with reports that are submitted through the Next Gen RMS system.

With respect to post project verification (PPV), a risk-based approach is being developed to select and validate completed Research Projects. The methodology will include verification of Research Faculty FTE effort and Agreement FTE effort, level of third-party funding, timelines, project objectives, execution of Data Management Plans and KTT Plans, and compliance with requirements of the Agreement. PPV templates will be incorporated into Next Gen RMS. The University will report on this requirement in the next annual report.

3.2.3 USEL/HQP Projects

The University confirms that it is working towards administering the USEL/HQP Projects as per the Ministry's reporting requirements. There have been a number of delays in 2018/19 in implementation, some as a result of the conversion to Next Gen RMS. The University will be fully compliant in 2019/20.

3.2.4 Research Call Process

The University confirms that it has advised the Ministry at least ten (10) Business Days in advance of the University's intent to launch a call for proposals and has launched the calls through a process determined by the Ministry, which includes Ministry approval of all successful proposals or applications where all or part of the proposals or applications will be funded in whole or in part using Research Funds.

3.2.5 Third Party Funding

The University confirms that it has secured third party funding of $250,000 in 2018/19 to meet the objectives of the HQP Scholarship Program from the Food from Thought – Agricultural Systems for a Healthy Planet program under the Canada First Research Excellence Fund (CFREF). This funding will flow as the scholarships to the 2018/19 award winners are paid out.

3.2.6 Research Project Administration

The University confirms that it is working towards administering all Research Projects listed within RMS consistent with Section C.11 of the Program Schedule. There have been a number

of delays in 2018/19 in implementation, some as a result of the conversion to Next Gen RMS. The University will be fully compliant in 2019/20.

3.2.7 Website

The University confirms that a public facing, up to date website for the Agreement exists at: https://www.uoguelph.ca/alliance/.

3.2.8 Capacity Strategy Plan Acknowledgement

The University maintains a Capacity Strategy Plan to ensure that the necessary faculty and staff resources are available to support the capacity needs of the Research Program. The University's strategy to address continued capacity in OMAFRA's priority areas, and to address emerging issues, is congruent with its institutional goal of remaining the top-ranked agriculture and veterinary medicine university in Canada. Each College and the academic units therein have strategic plans that identify discipline priorities for faculty hiring, which maps onto the demographic of the faculty. These College priorities reflect emerging issues in Ontario's agri-food sectors, which also reflect Ministry priorities. In general, the University strives to be an employer of choice, through competitive salary and start-up funding for new researchers; as well, achieving equity and diversity throughout the ranks of employees is of priority.

3.2.9 Resources to Administer the Research Program

The University confirms that the necessary resources, including faculty and support staff, are available to administer the Research Program. Dr. Beverley Hale continues to provide outstanding leadership in support of the governance structure as a R/PM PMC Co-Chair.

The Office of Research, Agri-Food Partnership also provides direct support to the Research Program. In 2018/19, the Office hired some additional capacity to assist with delivering the OMAFRA/UofG Agreement, supported by University funds. An Agreement Governance Officer started in January 2019 to coordinate the implementation of all University of Guelph obligations with respect to the on-going governance processes, performance measures, and reporting related to the Agreement. A Communications and Marketing Manager began in March 2019 and will support the Agri-Food and Rural Link aspects of the KTT program, including increasing awareness of Agreement-funded research and its contribution to Ontario's agri-food and rural sectors.

3.2.10 Mitigation of Labour Dispute, Emergency or Force Majeure

The University confirms that it will take all the necessary actions to mitigate the effects of such force majeure, labour dispute or emergency to ensure that the University continues to fulfil its obligations, covenants and responsibilities to the greatest extent possible under this Program Schedule and the Agreement.

3.3 Key Performance Indicators

3.3.1 Faculty Engaged in Research Supportive of Ministry Priorities

The University leverages investments made through the Agreement to ensure Ontario has the intellectual capacity to support sustainable, globally competitive agri-food sectors, and vibrant rural communities.

In 2018/19, there were 153.0 faculty FTEs engaged in research supportive of Ministry Priorities. This exceeds the target of 97 research faculty FTEs. It involved 364 individuals (44% of all UofG faculty[11]) conducting research supportive of Ministry Priorities. Table 3.12 provides a listing by College.

Table 3.12: Faculty Engaged in Research Supportive of Ministry Priorities

College	Number of Faculty Members	Total FTEs Engaged in Research Supportive of Ministry Priorities
College of Arts	2	0.8
College of Business and Economics - Lang School of Business	16	4.2
College of Biological Sciences	41	15.1
College of Engineering and Physical Sciences	49	17.0
College of Social and Applied Human Sciences	14	5.0
Ontario Agricultural College	171	82.6
Ontario Veterinary College	71	28.3
Total	**364**	**153.0**
	Target	**97**

[11] 823 Full-Time Faculty at the University of Guelph on October 1, 2018 as per the Office of Institutional Analysis and Research (https://www.uoguelph.ca/iar/data-statistics/data-portal/full-time-faculty/full-time-faculty-reports).

3.3.2 Highly Qualified Personnel

The Agreement supports the future agri-food workforce through a variety of programs. This investment allows undergraduate students, graduate students and postdoctoral fellows to contribute to Ontario's agri-food and rural sectors while also building the future agri-food workforce.

Table 3.13 below illustrates the number of Masters, Doctoral and Post-Doctoral Fellows engaged in Research Projects by Program and Ministry Priority. A target of 14 HQP per $1M invested has been set. In 2018/19, the University exceeded the target by 19% and reached 17.1 HQP per $1M invested for all in-scope Programs.

The University has identified from market analysis that there are currently more than two jobs in Ontario for every agri-food graduate. The number of graduate students with projects addressing Ministry priorities is increasing. This growth reflects the University's added financial support for programs that demonstrate market need, as planned in the University's Strategic Mandate Agreement with the Government of Ontario.

Table 3.13: Number of Highly Qualified Personnel (HQP) Engaged in Research Projects by Program and Ministry Priority for 2018/19 Awards

Program and Ministry Priority	Masters	PhD/DVSC	Post-Doctoral Fellows	Total	Agreement Investment	HQP per $1M invested
Agricultural and Rural Policy	14	4	1	19	$843,403	22.5
Bioeconomy	5.3	4	4.5	13.8	$871,046	15.8
Emergency Management	1.3	0	1.5	2.8	$190,325	14.7
Environmental Sustainability	5	7	2	14	$950,020	14.7
Food for Health	7	1	0	8	$522,500	15.3
Products and Value Chains	5	1	1	7	$564,700	12.4
Production Systems - Animals	10.5	7	6.5	24	$904,399	26.5
Production Systems - Plants	9.0	1	1.5	11.5	$1,136,494	10.1
Total – Tier I Research	**57**	**25**	**18**	**100**	**$5,982,886**	**16.7**
KTT Program	No Awards Allocated in the KTT Program in 2018/19					
Gryphons LAAIR	3	3	2	8	$334,000	24.0
Total – All Programs	**60**	**28**	**20**	**108**	**$6,316,886**	**17.1**
Special Initiatives	0	0	0	0	$300,000	N/A
Tier II/III Research	16	8	4	28	-	N/A
					Target	**14**

Table 3.14 provides the number of undergraduate students engaged in Research Projects by Program and Ministry Priority for the 2018/19 Awards.

Table 3.14: Number of Undergraduate Students Engaged in Research Projects

Program and Ministry Priority	Number of Undergraduate Students
Agricultural and Rural Policy	5
Bioeconomy	10
Emergency Management	4
Environmental Sustainability	16
Food for Health	7
Products and Value Chains	11
Production Systems - Animals	24
Production Systems - Plants	23
TOTAL – Tier I Research	**100**
KTT Program	N/A
Gryphons LAAIR	2
Total – All Programs	**102**
Special Initiatives	0
Tier II/III Research	2

3.3.3 HQP Employment

The HQP Employment performance metric helps to assess the impact of the HQP Scholarship Program and the USEL Program in preparing students for future careers in government, academia or industry upon graduation. It is measured as the percentage of HQP Scholarship Program and USEL Program graduates employed by the agri-food sector or directly related industries or in rural economic development at post-program/post-graduation. The first survey will be completed in 2019/20, with the results to be reported in the next annual report. The target will also be established once the baseline data is available from the 2019/20 survey.

3.3.4 Ratio and Value of Third-Party Funding and In-Kind Contributions

OMAFRA's investment in the Agreement's Research Program is leveraged through external third-party funding. This leverage enables a larger critical mass of resources to be directed to a specific line of enquiry, which speeds delivery of results in response to OMAFRA's priorities. The leverage validates the importance of the research to stakeholders including industry, other government agencies and civil society, thus helps to set priorities. Through the leveraging relationships, KTT is more targeted and timelier. Finally, the leveraging partners often become engaged with the HQP that are part of the project, thus providing valuable training opportunities and relationship building.

In 2018/19, OMAFRA's $6.317M of research operating funding leveraged $6.318M of third-party contributions. Table 3.15 below illustrates the amount of cash and in-kind leverage, as well as the ratio, by Program and Ministry Priority. A target of a ratio of 1:1 has been set. The University achieved the target in Tier I Research Projects with a ratio of 1.04:1, as well as achieving the target overall with a ratio of 1.00:1. It is suspected that the total leverage is underreported, as many of the sources of financial support for technical expertise funded outside of the Agreement do not appear in the project budgets. This will be addressed in 2019/20.

Table 3.15: Ratio and Value of Third-Party Funding and In-Kind Contributions for Research Projects

Program and Ministry Priority	Cash Leverage	In-Kind Leverage	Total Leverage	Agreement Investment	Leverage Ratio
Agricultural and Rural Policy	$95,375	$27,500	$122,875	$843,403	0.15:1
Bioeconomy	$247,458	$1,082,375	$1,329,833	$871,046	1.53:1
Emergency Management	$60,500	$71,625	$132,125	$190,325	0.69:1
Environmental Sustainability	$455,827	$261,305	$717,132	$950,020	0.75:1
Food for Health	$87,000	$113,400	$200,400	$522,500	0.38:1
Products and Value Chains	$39,000	$768,000	$807,000	$564,700	1.43:1
Production Systems - Animals	$1,460,885	$162,300	$1,623,185	$904,399	1.79:1
Production Systems - Plants	$1,086,610	$204,500	$1,291,110	$1,136,494	1.14:1
Total – Tier I Research	**$3,532,655**	**$2,691,005**	**$6,223,660**	**$5,982,886**	**1.04:1**
KTT Program	No Awards Allocated in the KTT Program in 2018/19				
Gryphons LAAIR	$5,000	$89,500	$94,500	$334,000	0.28:1
Total – All Programs	**$3,537,655**	**$2,780,505**	**$6,318,160**	**$6,316,886**	**1.00:1**
Special initiatives	N/A	N/A		$300,000	N/A
				Target	**1:1**

3.3.5 Total Third-Party Funding of University Research Supportive of Ministry Priorities but not funded by the Agreement

The University works hard to leverage the OMAFRA/UofG Agreement to grow agri-food research and innovation in Ontario.

In 2018/19, Agreement investments helped researchers attract another $53.4M in non-Agreement funding for research projects supportive of OMAFRA priorities. This leveraged value represents funding for 572 projects. This funding enhances Guelph's position as a nexus of agri-food innovation, where academia, government and industry come together to support the provincial, national and international agri-food sectors, and rural communities.

Table 3.16 shows the value of non-Agreement funding in research supportive of Ministry Priorities by Type and the Agreement Research Investment. A target ratio of 0.7:1 has been set. In 2018/19, the University exceeded the target by 50% with a ratio of 1.05:1.

Table 3.16: Value of Non-Agreement Investment in Research Supportive of Ministry Priorities by Type compared with the Agreement Research Investment (in thousands of dollars)

College	Academic	Government	Business / Industry / NGOs	Total Investment
College of Arts		19	10	29
College of Business and Economics – Lang School of Business		21	662	683
College of Biological Sciences	91	2,413	1,178	3,681
College of Engineering and Physical Sciences	300	1,865	1,909	4,074
College of Social and Applied Human Sciences		758	984	1,743
Ontario Agricultural College	512	10,670	14,857	26,039
Ontario Veterinary College	27	2,330	2,081	4,438
University		12,602	76	12,678
Total non-Agreement Investment in Research Supportive of Ministry Priorities	**930**	**30,678**	**21,757**	**53,365**
			Agreement Investment in Research	**50,904**
			Leverage Ratio	**1.05:1**
			Target	**0.7:1**

3.3.6 Number and Type of Third-Party Organizations Supporting Research Projects

Financial support comes from a variety of third-party organizations in the agri-food sector (Co-Funders). Their interest in the University's research demonstrates the value of the research outcomes to the agri-food sector.

Table 3.17 below illustrates the number and type of third-party organizations supporting research projects, by Program and Ministry Priority. A target of 20 Co-Funders per $1M invested has been set. In 2018/19, the University fell 4% short of the target with 19.2 Co-Funders per $1M. It is suspected that the number of Co-Funders is also underreported, like the Third-Party Funding KPI. As mentioned previously, many of the sources of financial support for technical expertise funded outside of the Agreement do not appear in the project budgets. This oversight will be addressed in 2019/20. More importantly than this small shortfall, it is notable that by far, most of the financial partners are in the Business / Industry / NGOs type, which clearly indicates that the University is addressing the economic prosperity of the agri-food sector priority of the Ministry.

Table 3.17: Number and Type of Third-Party Organizations Supporting Research Projects

Program and Ministry Priority	Academic	Government	Business / Industry / NGOs	Total	Agreement Investment	Co-Funders per $1M invested
Agricultural and Rural Policy		1	3	4	$843,403	4.7
Bioeconomy	1	3.5	11	15.5	$871,046	17.8
Emergency Management	0.3	1.6	6.2	8	$190,325	42.0
Environmental Sustainability	5	9	4	18	$950,020	18.9
Food for Health		2	6	8	$522,500	15.3
Products and Value Chains			8	8	$564,700	14.2
Production Systems - Animals	2	7.5	15.5	25	$904,399	27.6
Production Systems - Plants	0.8	4.5	21.3	26.5	$1,136,494	23.3
Total – Tier I Research	**9**	**29**	**75**	**113**	**$5,982,886**	**18.9**
KTT Program	No Awards Allocated in the KTT Program in 2018/19					
Gryphons LAAIR			8	8	$334,000	24.0
Total – All Programs	**9**	**29**	**83**	**121**	**$6,316,886**	**19.2**
Special Initiatives				0	$300,000	N/A
					Target	**20.0**

3.3.7 Number and Type of Collaborations

The Alliance brings together academia, government and industry to address a common goal – advancing the health, sustainability and productivity of the agri-food and rural sectors in an increasingly complex world. The Alliance fosters collaboration, investment, and engagement for the benefit of Ontario.

Table 3.18 illustrates the number and type of research collaborators engaged in Agreement funded research by Program and Ministry Priority. A target of 35 Collaborators per $1M invested has been set. In 2018/19, the University exceeded the target by 19% with an outcome of 41.5 Collaborators per $1M invested for all in-scope Programs.

Table 3.18: Number and Type of Research Collaborations by Program and Ministry Priority

Program and Ministry Priority	Academic	Government	Business / Industry / NGOs	Total	Agreement Investment	Collaborators per $1M invested
Agricultural and Rural Policy	8	13	7	28	$843,403	33.2
Bioeconomy	12.5	5.8	3.5	21.8	$871,046	25.0
Emergency Management	2.9	4.2	1.8	8.8	$190,325	46.2
Environmental Sustainability	25	17	4	46	$950,020	48.4
Food for Health	12	5	6	23	$522,500	44.0
Products and Value Chains	5	1	5	11	$564,700	19.5
Production Systems - Animals	36	6	4	46	$904,399	50.9
Production Systems - Plants	31.6	20.1	8.8	60.5	$1,136,494	53.2
Total – Tier I Research	**133**	**72**	**40**	**245**	**$5,982,886**	**41.0**
KTT Program	No Awards Allocated in the KTT Program in 2018/19					
Gryphons LAAIR	5	3	9	17	$334,000	50.9
Total – All Programs	**138**	**75**	**49**	**262**	**$6,316,886**	**41.5**
Special Initiatives	0	0	0	0	$300,000	N/A
Tier II/III Research	33	1	14	48	-	N/A
					Target	**35**

3.3.8 Intellectual Property

The Research Innovation Office supports the Agreement through expertise in the management of Intellectual Property (IP) generated from the commercialization of Agreement-funded program activities. The 2018/19 performance measure outcomes for the commercialization of Agreement-funded program activities are illustrated in the tables below.

Table 3.19 illustrates the commercialization of Agreement-funded program activities by reporting the number of OMAFRA-related patent applications filed and issued in the 2018/19 year, broken out by Ministry Priority. A target of 17 patents filed has been set. Fewer patent applications than normal were filed for during 2018/19, due primarily to fewer-than-normal foreign patent applications. The number of patents issued in 2018/19 was 4, which is slightly below the target of 5 patents issued. The Research Innovation Office does not have control over the schedule of evaluations/issuances by CIPO or USPTO, or other patent offices around the world.

Table 3.19: Patents Filed and Issued by Ministry Priority

Ministry Priority	Number of Patents Filed	Number of Patents Issued
Agricultural and Rural Policy	0	0
Bioeconomy	3	0
Emergency Management	0	0
Environmental Sustainability	0	0
Food for Health	0	0
Products and Value Chains	5	3
Production Systems - Animals	0	0
Production Systems - Plants	2	1
Total	**10**	**4**
Target	**17**	**5**

Table 3.20 provides the number of OMAFRA-related licenses granted in 2018/19 year, broken out by Ministry Priority. Nineteen licenses granted was established as the target. The University exceeded the annual target with 22 licenses granted, two of which were with University of Guelph start-up companies, FloNergia and WeVitro, respectively.

Table 3.20: Licenses and Amending Agreements by Ministry Priority

Ministry Priority	Number of Licenses
Agricultural and Rural Policy	0
Bioeconomy	3
Emergency Management	0
Environmental Sustainability	0
Food for Health	0
Products and Value Chains	3
Production Systems - Animals	0
Production Systems - Plants	16
Total	**22**
Target	**19**

Table 3.21 shows the total dollar value of revenue generated from licenses associated with OMAFRA-supported research. The annual revenue target is $1.5M. The University exceeded this target, with $1.68M revenue generated from licenses associated with OMAFRA-supported research.

Table 3.21: Value of License Revenue Generated

Type	Total - License Revenue Generated
Non-seed	$354,988
Seed	$1,320,716
Total	**$1,675,704**
Target	**$1,500,000**

Table 3.22 reports the number of potential and relevant Intellectual Property (IP) of which the University is aware for the 2018/19 year. The IP disclosures and technology assessments in the table are broken out by Ministry Priority. The total number of 2018/19 OMAFRA-related disclosures are 183. The overall number of IP disclosures has been increasing in recent years, largely due to increased disclosures of plant varieties.

Table 3.22: Intellectual Property Disclosures

Ministry Priority	Number of IP Disclosures
Agricultural and Rural Policy	0
Bioeconomy	1
Emergency Management	0
Environmental Sustainability	0
Food for Health	0
Products and Value Chains	4
Production Systems - Animals	0
Production Systems - Plants	178
Total	**183**

3.4 Reporting Requirements

3.4.1 KTT Activities

The purpose of Knowledge Translation and Transfer (KTT) Activities is to advance knowledge into action through synthesis, exchange, application and dissemination of knowledge resulting from Agreement funded research. Activities build on a foundation of agricultural extension to support collaboration, technology transfer, and implementation of research results. KTT Activities result from interactions among one or more of the University, University researchers, the Ministry, various internal and external stakeholders, and members of the public.

Table 3.23 below provides the number and type of KTT Activities in Agreement funded Research Projects by Program and Ministry Priority. This metric was changed from a Key Performance Indicator to a Reporting Requirement, so no target has been set. In 2018/19, 920 unique KTT Activities were reported on by faculty members.

Table 3.23: Number and Type of Research Collaborations by Program and Ministry Priority[12]

Program and Ministry Priority	Peer-Reviewed Publications	Presentations at Scientific Conferences	Presentations to Stakeholders[13]	Popular Press Articles and Media Citations	Extension Activities[14]	Other[15]	Total
Agricultural and Rural Policy	7	2	17	3	18	1	**48**
Bioeconomy	9	18	6	2	3	15.3	**53.3**
Emergency Management	12	35	22.5	16	1	9	**95.5**
Environmental Sustainability	10	19	12.5	0.5	6	2	**50**
Food for Health	8.5	18	8.5	4	8	16	**63**
Products and Value Chains	3	4	10	15	10.5	8	**50.5**
Production Systems - Animals	19.5	39.8	26.8	5.8	14	14	**120**
Production Systems - Plants	28.5	44.5	53.7	13.5	28	17	**185.2**
Total – Tier I Research	**97.5**	**180.3**	**157**	**59.8**	**88.5**	**82.3**	**665.5**
KTT Program	11	28.3	25.3	13.8	20	10.5	**109**
Gryphons LAAIR	4.5	8	5.8	0.5	0	5.2	**24**
Special Initiatives	0	2	2	0		1	**5**
Tier II/III Research	16.5	54.3	18.8	6.3	7	13.5	**116.5**
Total – All Programs	**129.5**	**273**	**209**	**80.5**	**115.5**	**112.5**	**920**

[12] Each KTT Activity is only counted once. Fractional counts are the result of KTT Activity being allocated to more than one Program.

[13] Presentations to Stakeholders includes presentations at stakeholder/industry/public meetings, as well as committee work in a research, advisory and/or expert capacity.

[14] Extension Activities includes extension and continuing education activities, training modules, videos, non-academic technical publications and summaries for the public.

[15] Other includes awards and recognitions, theses produced, and any other KTT activities, which were not included in any other classification.

3.4.2 Research Innovation Office – Liaison Activity

The Industry Liaison team in the Research Innovation Office (RIO) had a busy and productive year helping industry partners and University faculty engage in successful projects. The dollar value of successfully awarded projects was very high this year, in large part due to success with Ontario Genomics programming.

Table 3.24 below provides the number of clients helped, number of projects initiated, the number of deals made and the value of the closed projects. Table 3.25 provides the list of closed projects. This metric was changed from a Key Performance Indicator to a Reporting Requirement, so no target has been set.

Table 3.24: Research Innovation Office – Liaison Activity Details

Activity	Results
Number of Clients Helped (New)	42
Number of Clients Helped (Total)	98
Number of Projects Initiated	40
Number of Closed Projects (Deals Made)	31
Value of Closed Projects	$7,964,202

Table 3.25: Project Listing for Closed Projects (Deals Made)

Primary Investigator	Title	College	Industry Partner	Program	Total Value
John Barta	Analysis of *Coccidia* strains	OVC	Zoetis	-	$17,472
Bonnie Mallard	Translating High Immune Response (HIR) genomics to improve beef cattle health and welfare	OVC	Semex Alliance	Genome Canada GAPP	$1,072,000
Jonathan LaMarre	Small RNA profiles as fertility indicators in bovine semen	OVC	Semex Alliance	NSERC Engage	$24,900
John Zandstra	Field evaluation of Domtar's bio based Agrifilm - extruded films	OAC	Domtar	OCE VIP I	$25,000
Ataharul Chowdhury	Improving the effectiveness of advisory services	OAC	LRIC	OMAFRA KTT	$68,912
Max Jones	Developing fertilization and lighting strategies for greenhouse Cannabis production	OAC	Up Cannabis	OCE VIP II	$250,000
Max Jones	Development of a modular micropropagation system for commercial plant propagation	OAC	Research Innovation Office	NSERC I2I	$125,000

Primary Investigator	Title	College	Industry Partner	Program	Total Value
Praveen Saxena	Introducing Cold Tolerance in Hazelnut	OAC	Ferrero Canada Ltd.	Ontario Genomics RP3	$405,000
Milad Eskandari	Using new emerging genomic tools to Improve Soybean Yield and Seed Compositions in Ontario	OAC	SeCan	Ontario Genomics RP3	$150,000
Alireza Navabi; Elizabeth Lee	Application of genomic-based technologies to improve the rate of genetic gain in Ontario winter wheat breeding	OAC	Grain Farmers of Ontario	Ontario Genomics RP3	$334,000
Claudia Wagner-Riddle	Climate Smart Soils (Create-CSS)	OAC	various	NSERC CREATE	$1,650,000
Art Schaafsma	Management of *Fusarium graminearum* in Corn and Wheat	OAC	Syngenta Canada Inc.	NSERC CRD	$599,725
Manish Raizada	Developing climate change resilient corn and wheat to combat Fusarium Disease by enhancing the plant microbiome	OAC	Metagenom Bio Inc.	NSERC Strategic Project	$304,300
Lisa Duizer	Developing high quality 3D printed foods	OAC	Structur3D	NSERC Engage	$25,000
Giselle LaPointe	Impact of exopolysaccharide production by microbial inoculants on the quality and digestibility of silage	OAC	Lallemand Specialties Inc	NSERC CRD	$335,201
Richard Heck	Quantifying the structural deformation of agricultural soil compacted by deflated tractor tires using X-Ray CT	OAC	AgriBrink	NSERC Engage	$25,000
Neil Rooney	Effects of netcage aquaculture on local ecosystems in Lake Huron	OAC	Northern Ontario Aquaculture Association	NSERC CRD	$65,000
Lee-Anne Huber	Means to improve the robustness of newly weaned pigs exposed to Mycotoxin-contaminated feeds	OAC	Canadian Bio-Systems	NSERC Engage	$25,000
Wendy Pearson	In vitro and in vivo evaluation of equine probiotics	OAC	Selected Bioproducts Inc	NSERC Engage	$65,000

Primary Investigator	Title	College	Industry Partner	Program	Total Value
Christine Baes	Precision fertility and resiliency phenotyping in dairy cattle	OAC	Semex Alliance	Ontario Genomics RP3	$416,667
Elijah Kiarie	Broiler feed additive study (OCE Project # 31279)	OAC	Bio-Ag Consultants & Distributors Inc.	OCE VIP I	$25,000
Neil Karrow	Assessment and genetics of stress resilience in dairy cattle	OAC	Semex Alliance	NSERC CRD	$390,500
Linda Parker	Olgly and other fatty acids and addiction	CSAHS	PlantExt Ltd	-	$309,192
Christopher Collier	Microfluidic dairy device	CEPS	Norwell Dairy Systems	OCE VIP I	$25,000
Mario Martinez	Study of compositional and biophysical factors of different bean varieties and optimization of hydro-thermal processing	CEPS	Bonduelle America	NSERC CRD	$270,000
Christopher Collier	Microfluid sensors for detecting antibiotics	CEPS	Norwell Dairy Systems	NSERC Engage	$25,000
David Wright	The effects of calcium gluconate administration on indices of glucose and fatty acid metabolism in dairy cows	CBS	Trouw Nutrition Agresearch	OCE VIP I	$25,000
Ray Lu	Genomics tools to reduce sow stress and improve piglet survival and overall performance	CBS	Alliance Genetics Canada	Ontario Genomics RP3	$408,000
George Van der Merwe	Development of an omics-driven beer yeast performance database to support the Ontario craft brewing industry	CBS	Escarpment Laboratories	Ontario Genomics RP3	$353,333
Andreas Heyland	Novel hemolymph biomarkers for Pacific white shrimp health	CBS	Planet Shrimp Inc	OCE VIP I	$25,000
Manish Raizada	Towards commercialization of crop probiotics	OAC	Research Innovation Office	NSERC I2I	$125,000
				Total	**$7,964,202**

3.4.3 Intended Benefit

The Intended Benefit reporting requirement identifies, from an end-user perspective, the primary beneficiary and benefit or impact of a Research Project. For Intended Benefit, Research Projects are classified as: 1) discovery research; 2) public policy research; 3) applied research – new technology development; 4) applied research – new technology assessment; 5) applied research – new technology demonstration; 6) applied research – not involving technology development; 7) IP protection; 8) adoption of new technologies, products, practices and processes; and 9) knowledge translation and transfer. Table 3.26 below provides the Intended Benefit for the 2018/19 Research Projects.

Table 3.26: Intended Benefit by Program and Ministry Priority

Program and Ministry Priority	Public Policy Research	Applied Research: Technology Development	Applied Research: Technology Assessment	Applied Research: Technology Demonstration	Applied Research: Not Technology	Total
Agricultural and Rural Policy	8					
Bioeconomy		4			2	6
Emergency Management					1	1
Environmental Sustainability	1	1	1		4	7
Food for Health	4					4
Products and Value Chains			3			3
Production Systems - Animals			4	2	7	13
Production Systems - Plants					12	12
Total – Tier I Research	**13**	**5**	**8**	**2**	**26**	**54**
KTT Program	No Awards Allocated in the KTT Program in 2018/19					
Gryphons LAAIR			6	3		**9**
Total – All Programs	**13**	**5**	**14**	**5**	**26**	**63**
Special Initiatives	1					1

3.4.4 Impact Case Study

The Impact Case Study is a qualitative assessment and accompanying narrative which will illustrate the longer-term cumulative impact of research and KTT activities on the end-user audience. The Impact Case Study will be an important contributor to the five-year review of the overall Agreement. The case study approach will involve assessment across multiple elements and will require the use of mixed methodologies (e.g. document review, publication and citation analysis, interviews with researchers and end users etc.).

Impact, for this purpose, is defined as any type of output of research activities which can be considered a net "positive return" for the scientific community, end users (government policy and program development, business and industry etc.) or civil society. Six broad categories have been identified for the case studies to assess and describe impact, which recognize the multi-dimensional nature of benefits of research - from traditional knowledge generation and capacity building through to broader sector and societal benefits. These are: advancing knowledge; capacity building; informing decision-making; sector benefits; broad socio-economic benefits; and factors influencing the utilization of research.

Over the next two years, three discrete case studies will be completed in time for the review of the Agreement. These will cover reasonably broad topic areas to illustrate the diversity of funded research, with more specific topic areas (“vignettes”) selected for deeper assessment to demonstrate longer-term impact

3.4.5 Agri-Food and Rural Link – KTT activity

Agri-Food and Rural Link (AFRL) is the program delivery and training arm of the Alliance’s KTT program. AFRL programming is designed to improve KTT capacity among researchers, graduate students and regional agri-food partners to enhance the impact of research. Program staff, in collaboration with OMAFRA and UofG partners, also design and execute targeted communication strategies and events to enhance knowledge exchange and dissemination.

In 2018/19, KTT program staff worked with OMAFRA representatives to define the parameters of the Agri-Food and Rural Link-KTT activity reporting requirement identified in the Agreement. Subsequent annual reports will report the percentage of completed AFRL KTT activities relative to commitments made in the annual business plan. AFRL program activities were detailed in the 2019/20 business plan and the corresponding annual report will detail the actual versus projected activities.

A summary of Agri-Food and Rural Link and KTT activities for 2018/19 is contained in section 3.1.9 of this report.

3.4.6 Agri-Food and Rural Link and Research Innovation Office Outcomes

Both Agri-Food and Rural Link and the Research Innovation Office deliver programming to enhance the impact of research outside academe. Three case studies are included on the following pages to illustrate the impact of effective knowledge mobilization / innovation / commercialization activities delivered by Agri-Food and Rural Link and the Research Innovation Office. In selecting these case studies, the University identified opportunities to a) demonstrate and describe the impact of standard program delivery on target audiences (case studies i and ii), and b) demonstrate the impact of program support on the development and delivery of a specific Research Project (iii). Taken together, these case studies profile the breadth of activity undertaken by AFRL and RIO to increase capacity of both researchers and stakeholders to extend and receive research results and demonstrate how program capacity enhances the impact of Research Projects on the target audiences.

i. Growing KTT in Ontario: This case study profiles the outcomes of two AFRL 2018/19 programming initiatives – the completion of the Growing Agri-Food KTT in Ontario manual and deployment of the manual at a workshop and knowledge exchange event held in April 2019. The target audience/end-user audience for both of these projects were KTT practitioners, including researchers, graduate students, and agri-food community stakeholders. The event and manual were designed to increase KTT capacity amongst researchers and the wider agri-food sector and provide networking opportunities to enhance connections between researchers and community agri-food partners.
ii. Building Long-Lasting Research Partnerships: This case study profiles the Industry Liaison (IL) team at the Research Innovation Office and their capacity to assist researchers across colleges with partnership building and proposal development. This case study demonstrates the multiple ways in which the IL team assisted at various stages in developing the relationship between five researchers and Trouw Nutrition, a division of Nutreco. The target audience for this program is researchers and industry as the IL team builds global connections while providing benefits to Ontario's agri-food sector by helping faculty be more successful in funding competitions.
iii. Building Rural Social and Economic Development Capacity: This case study showcases Professor Wayne Caldwell's KTT funding Program project "The Application of Innovative Web-Based Engagement for Community Projects." This project was one of the 88 KTT projects used in the development of the Growing KTT in Ontario best practices manual. Professor Caldwell was also a featured researcher at the April 2019 event where he shared the lessons learned from this project with researchers, graduate students, and agri-food community stakeholders. The project was designed to connect rural southwestern Ontario municipalities with knowledge and expertise to support local projects.

3.4.6.1 Growing KTT in Ontario

GROWING KTT IN ONTARIO

Manual and event support training for research impact

On April 17 2019, staff from the University of Guelph and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) presented Growing Agri-Food KTT in Ontario, a collaborative knowledge exchange event. The purpose of the event was to share best practices for Knowledge Translation and Transfer (KTT) in agri-food and rural research with a broad range of stakeholders, including researchers, OPS staff, industry collaborators and innovation partners. These best practices can be used to advance synthesis, dissemination and exchange of research knowledge to relevant audiences to enhance impact.

The Ontario Agri-Food Innovation Alliance's KTT Program supports researchers to maximize the impact of research. In collaboration with OMAFRA's Research and Innovation Branch, the KTT team develops practical tools and resources and funds projects that advance research in the field of KTT and accelerate the transfer of research knowledge into use.

The Alliance developed *Growing KTT in Ontario*, a practical manual of best practices in agri-food and rural KTT based on a review of the 88 KTT projects funded between 2010 and 2018. A strategic event and social media campaign were executed to promote this tool as a leading resource for KTT planning and to encourage broad dissemination and use by researchers.

BY THE NUMBERS

156 Attendees from **33** organizations across **3** provinces at the April 17 event

18 Students trained in research communications

12 Organizations showcasing innovative KTT work

163 Downloads of *Growing KTT in Ontario* manual materials over two months

820 Engagements with Growing KTT in Ontario tweets[1]

1 Includes retweets, likes, quotes, replies, URL clicks and more; any interaction other than scrolling past the tweet is counted as an engagement.

BUILDING SPACES TO MAKE CONNECTIONS

The Alliance hosts strategic events to help disseminate research findings, engage stakeholders across the agri-food sector and train the next generation of agri-food innovators. The Growing Agri-Food KTT in Ontario event was designed to target government, industry and academics, supporting training to enhance networks and research impact.

These types of events attract such a diverse range of stakeholders all interested in agriculture and rural issues, and ignite opportunities for collaboration. It's the perfect avenue for me to make connections."
Danielle Collins, Economic Development Policy Analyst, Ontario Federation of Agriculture

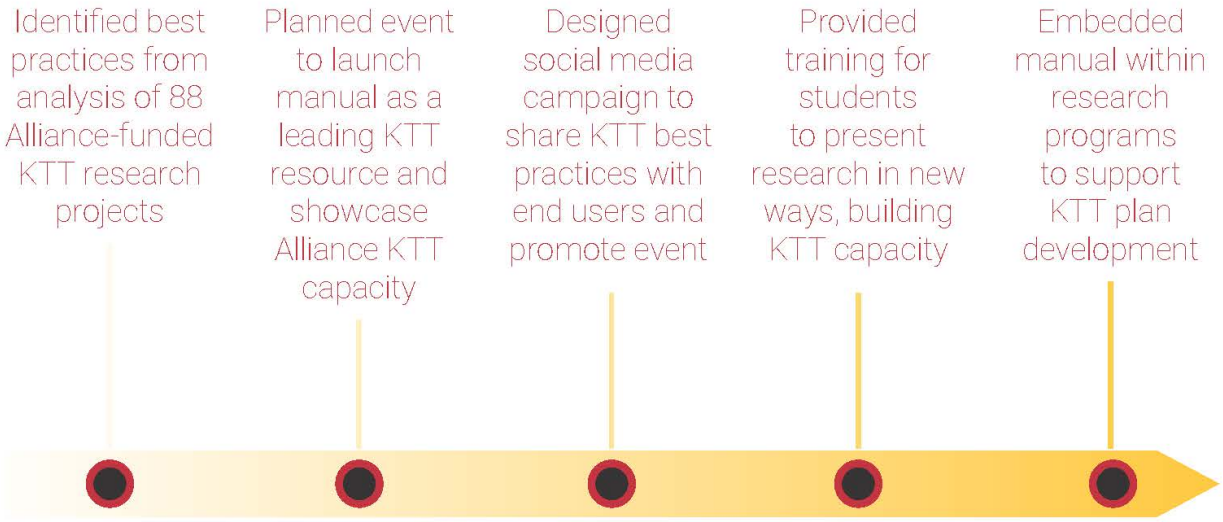
The Growing Agri-Food KTT in Ontario event profiled the best practices manual and was a platform to share insights for designing, implementing and measuring successful KTT. This event included a combination of research updates, skills workshops and an expo for Ontario organizations to showcase their own KTT resources and successes.

The Ontario Federation of Agriculture (OFA) booth in the expo provided the opportunity to network with attendees. OFA's participation led to a connection with Prof. Adam Gillespie, School of Environmental Sciences. As a direct result of this conversation, OFA helped sponsor the conference Pedometrics 2019, and the OFA president took part in an industry round table.

"OFA wouldn't have had a presence at Pedometrics 2019 or had the opportunity to network if not for the Growing Agri-Food KTT in Ontario event." **Danielle Collins, Economic Development Policy Analyst, OFA**

Pictured: Students created infographics of their research using lessons from training before the event.

PATH TO IMPACT



IMPACTS

KTT training for the next generation of agri-food innovators

Events often feature student training to build capacity. Students were trained in clear language and design, developing skills to effectively mobilize their research findings. Connections made during this event resulted in further training sessions for 36 students.

> "This [workshop] helped in visualizing the amount of content that can be included [in an infographic] and gave an idea of how to more effectively use visuals." **Student feedback in post-training evaluation**

KTT manual supports researchers and government in research and program planning

The best practices summarized in *Growing KTT in Ontario* and the associated presentations at the event had a substantial impact on researchers and OMAFRA staff. It reminded experienced practitioners how to do KTT and provided helpful guidelines for novices.

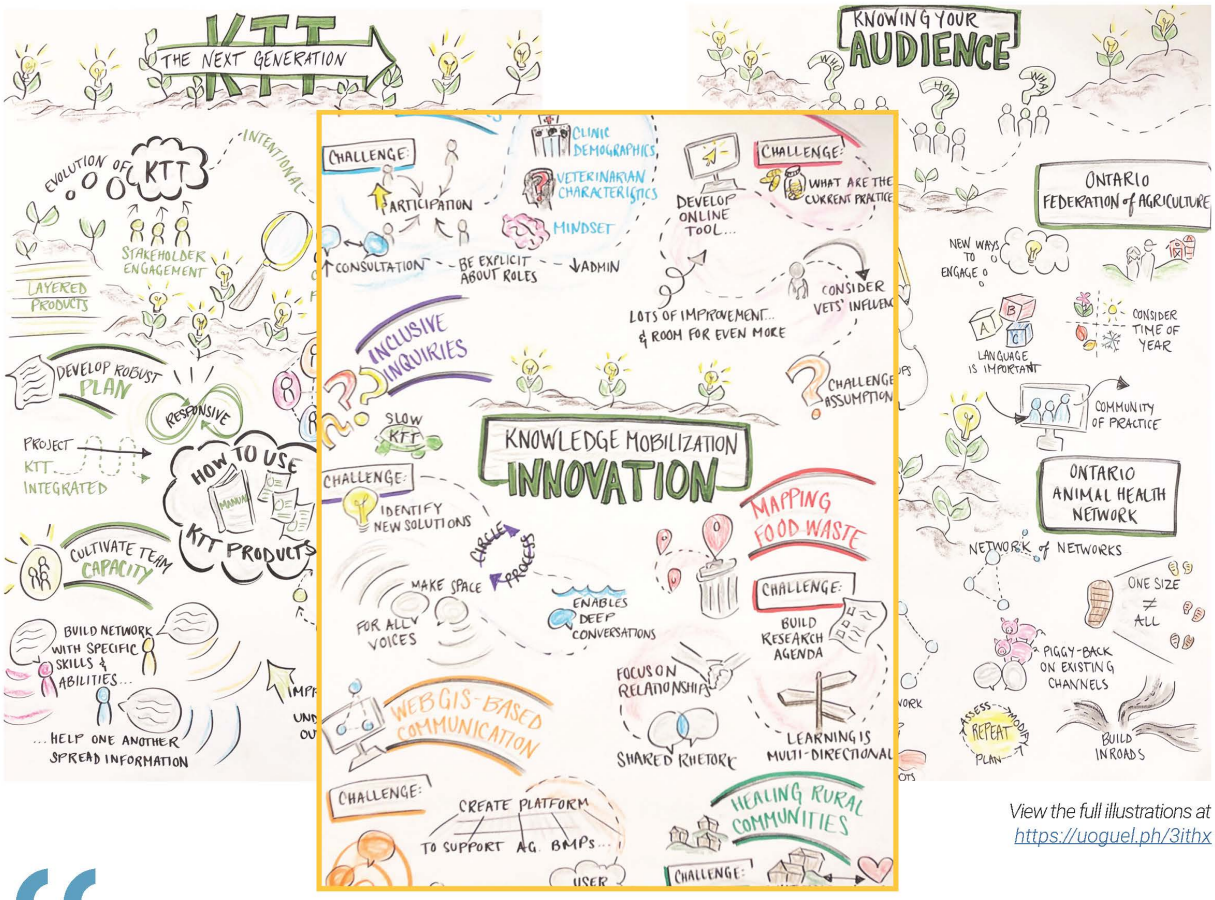
> "[The manual] provides a helpful reminder of key things to keep in mind...Even if you are quite familiar with the process, it is still helpful to be reminded about the key steps – and the examples triggered new ways of looking at them." **Adrienne De Schutter, Education Coordinator, OMAFRA**

KTT helps engage end users and stakeholders in the research process by increasing dissemination, uptake and application of research. Participants gained an appreciation for how and why a KTT plan should be included in research projects and how to make their findings more accessible, and received the necessary resources to help develop a KTT plan.

> "This [event and manual] made me really excited about how I can integrate [KTT] more in my work and get colleagues to do a better job of this. It's also nice to know there's a resource out there to point people to." **Therese Festin, Certification and Education Coordinator, OMAFRA**

GRAPHIC RECORDING ILLUSTRATIONS

Visual communications expert Alex Sawatzky captured key ideas from the day in a series of illustrations, demonstrating how complex ideas can be communicated in different ways. She also discussed when and how to use visuals to support communication.



View the full illustrations at *https://uoguel.ph/3ithx*

4

Having the illustrator there to visually take notes got me really excited. I'd love to explore ways that we can incorporate this more into the work that we do – both internally and externally." Therese Festin, Certification and Education Coordinator, OMAFRA

3.4.6.2 Building Long-Lasting Research Partnerships

BUILDING LONG-LASTING RESEARCH PARTNERSHIPS

Industry Liaison connects faculty and industry

Connecting researchers and industry helps facilitate research that has real-world impact. The Industry Liaison (IL) team at the University of Guelph Research Innovation Office plays a key role in connecting companies and University of Guelph researchers, creating mutually beneficial partnerships to address environmental, societal and sectoral challenges.

Trouw Nutrition, a division of Nutreco, is a global leader in innovative feed specialties, premixes and nutritional services for the animal nutrition industry. Trouw Nutrition has more than 100 collaborations with top universities around the world, including longstanding relationships with many researchers at the University of Guelph. The company has funded animal health and nutrition research by seven faculty across campus between 2012 and 2019.

The IL team assists in partnership development through relationship management and keeps key partners, such as Trouw Nutrition, up to date on further opportunities for collaboration related to their priorities.

What our partners say:

"Engaging university researchers is critical for finding innovative solutions. The Industry Liaison team helps connect us with scientific experts at the University of Guelph, navigate University administration, and identify opportunities to further leverage funding for collaborative research."

Marjan Beerthuis, Manager, Grants and Contracts, Trouw Nutrition

CREATING PARTNERSHIP OPPORTUNITIES

In addition to managing relationships with industry partners and identifying opportunities for collaboration, the Industry Liaison team provides researchers with grant proposal support. This support helps foster academic-industry partnerships as researchers apply their expertise to a company-specific problem.

Coccidiosis is a disease in broiler chickens caused by the parasite *Eimeria*. Worldwide, the infection costs poultry producers $6 billion a year in production losses. Conventionally, coccidiosis is prevented through antibiotics. However in chickens raised without antibiotic feeding programs, the disease is prevented through vaccination, which can cause gut inflammation and lower weight gain.

Prof. David Wright, Department of Human Health and Nutritional Sciences, teamed up with Trouw Nutrition to investigate how its Selko® Elarom® Poultry feed additive could help improve intestinal functioning in vaccinated birds.

Following grant proposal assistance from the IL team, Wright and Trouw Nutrition were awarded $25,000 from the Natural Sciences and Engineering Research Council (NSERC) to examine the effects of Selko® Elarom® Poultry on indices of intestinal inflammation and gut integrity.

Wright's team worked with scientists from Trouw Nutrition to demonstrate that supplementation with Selko® Elarom® Poultry helped reduce intestinal inflammation compared to a commercially used antibiotic, giving producers more information to keep their flocks healthy and productive.

> **"The IL team is very helpful in expediting the grant application process. They really help highlight linkages between the research and the benefit to industry and end users."** Prof. David Wright, Department of Human Health and Nutritional Sciences

PATH TO IMPACT

HOW INDUSTRY LIAISON CREATES OPPORTUNITIES

Introducing new faculty to industry contacts

Providing strategic grant-writing advice

Helping to navigate research contracts

Organizing in-person meetings with key partners

The IL team provides input about what the funding agencies are truly looking for, and offer good, sound advice that improves our chances to do research relevant to the wider community" Prof. Michael Steele, Department of Animal Biosciences

IMPACTS

Ongoing research partnerships

The IL team helped Wright to secure NSERC funding to study Trouw Nutrition's Selko® Elarom® Poultry feed additive. This work has led to continued collaboration between his laboratory and Trouw Nutrition on new projects.

Introductions to potential collaborators

The Industry Liaison Officer – OMAFRA Programs recently coordinated meetings with Trouw Nutrition's global research and development team, providing updates on ongoing research and explaining new U of G initiatives and capabilities to meet the company's priorities. This meeting also included a tour of the world-class Elora Research Station – Dairy Facility, and facilitated introductions between Trouw Nutrition and five researchers from U of G's agricultural and veterinary colleges.

Building connections between researchers and industry

By providing a single point of access for inquiries, the Industry Liaison team creates a simple, effective way to build new partnerships and develop ongoing relationships between researchers and industry partners. As a result of the introductions made during the Elora Research Station tour, two researchers are in direct contact with Trouw Nutrition's R&D team in the Netherlands, identifying opportunities for collaboration.

"There is a difference between when an individual researcher approaches industry compared with the University as an institution. [The latter] is more effective and helps promote the ongoing relationships we have with industry partners. It's very important that someone at the University is leading this engagement with industry as opposed to doing this individually. It can be a very big change in the way universities and industry engage." **Vahab Farzan, Adjunct Professor, Department of Pathobiology**

CASE STUDY CREATING PARTNERSHIP OPPORTUNITIES

BUILDING LONG-LASTING RESEARCH PARTNERSHIPS

The Industry Liaison (IL) team at the Research Innovation Office plays a key role in connecting researchers and industry, helping facilitate research with real-world impact. The IL team has helped develop a long-standing partnership between Trouw Nutrition and U of G faculty through relationship management, grant proposal support and keeping Trouw Nutrition up-to-date on further opportunities for collaboration.

"Engaging university researchers is critical for finding innovative solutions. The Industry Liaison team helps connect us with scientific experts at the University of Guelph, navigate University administration, and identify opportunities to further leverage funding for collaborative research"

— Marjan Beerthuis, Manager, Grants and Contracts, Trouw Nutrition

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3.4.6.3 Building Rural Social and Economic Development Capacity

BUILDING RURAL SOCIAL AND ECONOMIC DEVELOPMENT CAPACITY

How KTT can change communities

The Ontario Agri-Food Innovation Alliance funds research to identify and improve on best practices in Knowledge Translation and Transfer (KTT). Prof. Wayne Caldwell, School of Environmental Design and Rural Development, led a project designed to leverage student skills and funding to connect 12 rural municipalities in southwestern Ontario with knowledge and expertise in support of local projects. This is one of the 88 KTT projects funded from 2010 to 2018 and was used in developing the 2018 *Growing KTT in Ontario* best practices manual. Caldwell also discussed lessons learned during this project at the Growing Agri-Food KTT in Ontario event on April 17, 2019.

Student consultants applied knowledge from a graduate-level rural planning and community development course to create planning and communications strategies for municipalities. These strategies generated engagement, investment and innovation in communities across southwestern Ontario.

> **"We had this group of young people coming into our community, fresh eyes. Hands-down, it was really the catalyst for the change that we've seen today, because the report was so comprehensive. It kept coming up that it was the report putting Vanastra on the map, and it did. It put Vanastra on the map."**
>
> Jan Hawley, Business Development Office, Huron East

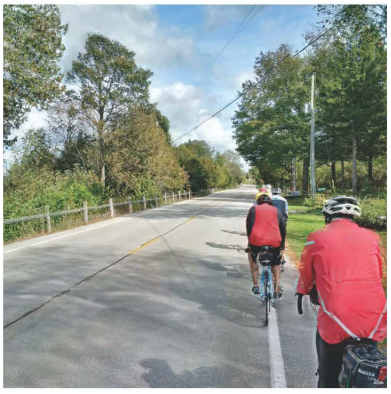
PUTTING RURAL COMMUNITIES ON THE MAP

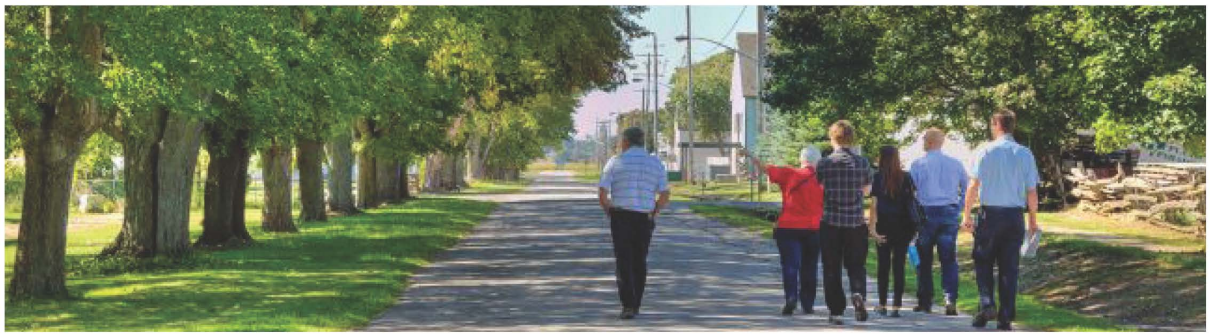
The student consultations and projects reflected diverse community development and planning needs. In particular, the collaborative efforts of the student consulting teams and the community project teams identified and documented local, district-specific ways to promote and meet the social and economic needs of rural communities.

"[We] really didn't know how to tackle the issues, the challenges, of Vanastra, because it was so unique...[now] we have a game plan and we have a focus, [an] objective. Your program allowed me to take those objectives and formulate an even more comprehensive plan." Jan Hawley, Business Development Office, Huron East

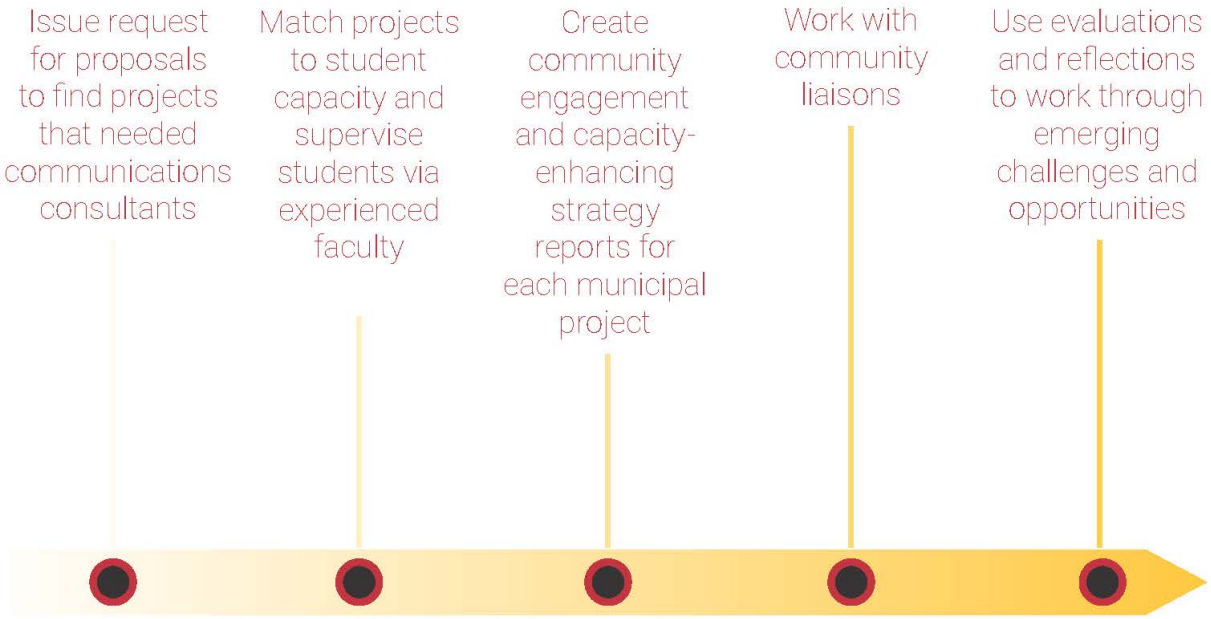
Located in Huron County, Vanastra (pop. 650) was one of the 12 project sites matched with student consultants. Working with local business owners and other community members, the graduate student consultant team developed a plan to communicate the benefits of living and working in the community. The resulting report, *Putting Vanastra on the Map*, is credited with "galvanizing the community" and triggered a positive cascade of attention and investment, including more than $2M in infrastructure funding, according to Jan Hawley, an economic development officer with Huron East.

The resulting report triggered a positive cascade of investment, including more than $2M in infrastructure funding.





PATH TO IMPACT



IMPACTS

Social and economic impacts from small-scale consultation projects

The projects had a substantial impact on participating communities. The student consultants' communication and strategy products, tailored to the needs of local municipalities, created social and economic impacts. Project partners reported that fresh perspectives helped them solve real-world municipal challenges and enabled projects that would not otherwise have been possible. The final reports were also useful KTT products that were leveraged for further funding and planning.

Students gained real-world experience and skills

Students gained real-world consultation and KTT practitioner skills in a supported and collaborative environment. They gained a sense of responsibility from being entrusted with completing the process planning and implementation.

3.4.7 Third-Party Investment in Tier II and Tier III Projects

Tier II and Tier III Projects receive support from the Agreement through subsidized Research Station Access Fees. Their operating funding comes from non-Agreement programs, while their research predominately supports Ministry Priorities. Table 3.27 shows the value of third-party research operating funding directed at Tier II and III Research Projects. Only cash contributions have been included. For projects beginning in 2018/19, the total third-party leveraged funding for Tier II and III projects was $7.62M. Notably, this is similar to leverage achieved for Tier I projects, thus demonstrating that the operations of the Research Stations have a far greater reach than simply the Agreement programs.

Table 3.27: Third-Party Operating Funding Directed at Tier II and III Research Projects

	Academic	Government	Business / Industry / NGOs	Total
Operating Funding	$76,804	$5,526,551	$2,020,470	**$7,623,824**
Number of Co-Funders	2	23	21	**46**

3.4.8 HQP Scholarship Program and USEL Program

The HQP Program provides scholarships for University of Guelph graduate students to enhance their skills and knowledge of the agri-food sector. This has a direct benefit to the students, their future employers and the agri-food sector. In 2018/19, scholarships were awarded to nine new Masters and three new Doctoral students. In addition, there were 21 continuing Masters students and 14 continuing Doctoral students, for a total complement of 47 students.

The Undergraduate Student Experiential Learning (USEL) program supports the mobilization of agri-food research findings and the Ministry's ability to source qualified talent for branch positions, leveraging resources to deliver on industry and Ministry priorities. In 2018/19, the USEL program supported five students who completed their projects during Summer 2018.

3.4.9 Status of the University's Project to Create a Platform for Agri-Food Data in Accordance with D.2 of the Program Schedule

Dr. Karen Hand assumed the role of Director of Research Data Strategy, Agri-Food Data Canada (ADC) at the University of Guelph on April 30, 2018. This appointment was a significant step for the University towards the realization of a platform for agri-food data as Dr. Hand is responsible for leading the strategic design, development and management of the University's vision for an integrated, cross-University big data management strategy and platform for agri-food data research.

During 2018/19, important progress was made to enable the development of the platform including a gap/resource analysis and strategy for the development and deployment of the platform. ADC is envisioned to be an efficient and flexible IT platform capable of complex data integration and analytics. The University has developed an agile project approach that will begin to build the data platform via the scaling of an initial case study. An agile approach will facilitate communication, collaboration and flexibility; within the University of Guelph community, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the Canadian agriculture and food communities.

This iterative phased approach will incorporate specific, well-defined, requirements-driven pilot projects (use cases); where each pilot can be used to build out and refine the platform and add functionality while simultaneously providing value to participants. The pilot projects will be implemented using the processes defined in the ADC roadmap to ensure step-by-step compatibility.

3.4.10 Administration of the Germplasm Bank

Total net revenue for the Germplasm Bank was $1.32M for 2018/19, a 4.7% increase over the previous year. Table 3.28 provides additional details by crop.

Soybean, asparagus, edible beans, cereals, and tomatoes account for more than 90% of net royalties. Some crops are generating small amounts of revenue, most notably apple rootstocks, hemp, tree fruits, forages, and canola, these are from older varieties; there are no new technologies under development for any of these crops. As well, it was noted that hemp royalties were overpaid by about $10,000, which will be deducted from future royalties.

Soybean revenues have remained strong and the seed sales in new territories, such as eastern Europe, are a significant contributor. Expansion to these new regions has helped breathe new life in older varieties such as OAC Prudence (registered in Canada in 1999) considered past their prime in Canada. Asparagus also generates considerable revenue, despite a decrease in sales last year. Revenues from edible beans have grown by 42% since the previous year, largely attributed to the widespread adoption of a dark red kidney bean variety, Dynasty.

The University has seen a continued interest from licensees to seek Plant Breeders' Rights (PBR) protection for new varieties. In an effort to meet the growing demand for PBRs for soybean varieties, the University has entered into a pilot agreement with BioFlora Inc., a third-party service provider. BioFlora's services include setting up PBR trials, data collection, and PBR application submission for a few soybean varieties on behalf of the University. This service outsourcing offers huge time and labour savings for the breeding program and increased efficiency in successful PBR applications. For other crop species, including tree fruits and cereals, RIO provides consultation services to the respective breeding programs and leads the application preparation and submission.

Table 3.28: Germplasm Revenue by Crop

Crop	2018/19 Revenue	% of Total	2017/18 Revenue
Field Crops			
Beans-White & Coloured	$137,178	10.4	$96,687
Canola	$3,577	0.3	$2,310
Cereals-Guelph	$37,834	2.9	$36,505
Cereals-Ridgetown	$27,900	2.1	$11,137
Forages	$6,443	0.5	$5,423
Maize Inbreds	$-	0.0	$-
Soybeans-Guelph	$557,824	42.2	$465,042
Soybeans-Ridgetown	$267,824	20.3	$369,221
Subtotal – Field Crops	**$1,038,579**	**78.7**	**$986,325**
Horticultural Crops			
Apple rootstocks	$13,348	1.0	$7,478
Asparagus	$173,169	13.1	$194,127
Hemp	$15,364	1.2	$18,501
Mint	$-	0.0	$-
Strawberries	$833	0.1	$898
Tomatoes	$71,213	5.4	$39,312
Tree Fruits	$8,210	0.6	$15,298
Subtotal – Horticultural Crops	**$282,137**	**21.4**	**$275,614**
Total	**$1,320,716**	**100.1**	**$1,261,939**

4 Veterinary Capacity Program (VCP)

The Veterinary Capacity Program (VCP) supports the development of future skilled capacity to be ready for employment opportunities offered by the agri-food sector and rural Ontario, including having highly qualified veterinary capacity in place to meet Ontario's needs.

4.1 Program Activities and Achievements from 2018/19

The VCP is a well-established, stable program. The VCP contributes to the development of Ontario's veterinary capacity, providing students with the knowledge and skills needed to meet the needs of the Ministry, the agri-food sector, veterinary public health and rural economic development. Areas to highlight include the funding to the Health Sciences Centre which provides students with hands- on, experiential learning in an innovative, clinical environment as well as the funding to support approximately 11 faculty FTEs, that are a subset of the 54 faculty that engage in areas of interest to OMAFRA. Over the past year, the Ontario Veterinary College (OVC) has maintained its faculty complement through the hiring of two ruminant health management faculty to fill two vacant positions.

OVC is once again celebrating a top ten ranking among veterinary schools in the world through the Quacquarelli Symonds (QS) university rankings. The QS World University Rankings by Subject 2019 ranked OVC seventh worldwide, as well as first in Canada and third in North America. OVC has consistently placed in the top 10 since QS first included veterinary science in their rankings in 2015. Ranking is based on academic and employer reputation as well as how often faculty research is cited within academic publications (Quacquarelli Symonds (QS) World Rankings, https://www.topuniversities.com/university-rankings/university-subject-rankings/2019/veterinary-science).

The VCP continues to provide all Doctor of Veterinary Medicine (DVM) students with: experience in and exposure to Priority Species; knowledge of livestock production practices and the intersection between animal and human health; opportunities to develop practical competency through experiential learning and field experience; opportunities to gain awareness in emerging animal health issues; and awareness of veterinarians' roles in areas of practice including government, public health, public policy and regulatory roles. Candidates for the Doctor of Veterinary Science (DVSc) or Doctor of Philosophy (PhD) degrees and other post-graduate trainees are provided with research opportunities for priority species and ministry priorities.

4.2 Mandatory Compliance Requirements

4.2.1 OVC Accreditation

Veterinary colleges in Canada, the United States, and all of the top schools throughout the rest of the world, are accredited by the Council on Education (COE) of the American and Canadian Veterinary Medical Associations (AVMA; CVMA).

During its March 2019 meeting, the COE reviewed OVC's 2018 interim report and voted to grant continued full accredited status for the next year. The accreditation status of the OVC is reviewed annually based on the annual report submission.

4.2.2 Capacity Strategy Plan Acknowledgement

OVC maintains a Capacity Strategy Plan to ensure that they have the faculty and staff necessary to service VCP and support capacity needs for priority species and Ministry priorities. The recruitment and retention of faculty and staff is of critical importance to OVC. In fact, OVC's strategic plan (https://ovc.uoguelph.ca/strategic-planning/) identifies a key objective to attract and retain the very best talent. When hiring, OVC continues to reflect on the priority species and the Ministry's priorities.

In addressing emerging areas, during 2018/19, OVC hired two new faculty members (Drs. Jane Parmley and Katie Clow, both in the Department of Population Medicine) to increase capacity in the area of One Health. One Health is the term applied to the connections among the health of humans, animals and the environment. As stated by the American Veterinary Medical Association: "veterinary medicine is the only profession that routinely operates at the interface of the three components of One Health." OVC is intent on formalizing leadership in this area, with the goal of becoming an internationally recognized champion for the veterinary science link in One Health research.

Over the past year, OVC also augmented its faculty complement through the hiring of two ruminant health management faculty, Drs. Charlotte Winder and Dave Renaud into vacant positions.

4.2.3 Resources to Administer VCP

OVC confirms that the necessary resources, including faculty and support staff, are available to administer the program. Dr. Kerry Lissemore continues to support the governance structure as the VCP PMC Co-Chair.

4.3 Key Performance Indicators

4.3.1 NAVLE Results

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 obtain licensure to practice anywhere in the world. As noted in Table 4.1 below, OVC graduates continue to demonstrate a high success rate on the NAVLE based on the percentage passing rate and in the overall score obtained, which is consistently higher than average results for the North American cohort. The comparison group is all other candidates who took the examination at all other accredited veterinary schools. For the 2018/19 global cohort, the passing percentage was 94%. Thus, for 2018/19, OVC's NAVLE results of 99% are 5% higher than the global cohort.

Table 4.1: NAVLE Results

Graduation Year	OVC Student Exam Score[16]	North American Cohort Exam Score	% Pass Rate for OVC	% Pass Rate for North American Cohort
2019	525	507	99%	94%
2018	515	509	97%	95%

[16] Exam is scored out of 800.

4.3.2 Student Alignment with Priorities

This key performance indicator measures the number of students enrolled in post graduate studies aligned with Ministry Priorities. The target is fifteen (15) graduate students. OVC achieved the target in 2018/19. Table 4.2, below, provides the project titles for the fifteen doctoral students receiving stipend support.

Table 4.2: Number and Status of Students receiving funding by Ministry Priority

Name of Study	Student Type	Entry Semester	Comple-tions
Animal Health			
Detection and surveillance of significant pathogens in Ontario small poultry flocks	DVSc	S16	
N-acetyl cysteine as a potential treatment for equine persistent breeding-induced endometritis	DVSc	F16	
Crimean-Congo hemorrhagic fever DNA vaccine trial: pilot safety and toxicity study in cattle and sheep	DVSc	S17	
Effect of prevention of hypocalemia on health and performance in dairy cows	DVSc	F17	
Exercise-induced pulmonary hemorrhage in horses	DVSc	F16	
Intestinal T cell responses during early experimental enteric Mycobacterium avium subspecies paratuberculosis (Map) infection in calves	DVSc	S14	Graduated
Saccharomyces boulardii: a potential biotherapy for horses with acute enterocolitis	DVSc	F18	
Investigating kid mortality in Ontario dairy goat farms	DVSc	F15	Graduated
Investigating the dynamics of Johne's disease on Ontario Dairy farms	DVSc	F15	Graduated
Evaluating the impact, management practices and prevalence of coccidiosis caused by Eimeria species in Ontario sheep and goats	DVSc	F16	
Host factors and co-pathogens as determinants of disease outcomes in M. bovis pneumonia in beef cattle	DVSc	S16	
Animal Welfare			
Electroencephalographic and behavioural evaluation of physical methods for on-farm euthanasia of poultry	DVSc	F17	
Bioavailability and efficacy of NSAIDs when compounded (mixed) with iron dextran on pain relief following castration in piglets	PhD	F18	
Public Health			
A prudent approach to antibiotic treatment of high-risk calves	PhD	W18	
Evaluating the knowledge, attitudes, and behaviours toward radiation safety in the veterinary field and the impact of specific training methods on improving current practices	PhD	W19	

4.4 Reporting Requirements

4.4.1 Graduate Survey

This metric includes data from three surveys: the Graduate Survey, which surveys new program graduates 6 months to 1 year after graduation, the Employer Survey, which surveys employers of new graduates 6 months to 1 year after graduation, and the Alumni Survey, collected 5 years after graduation. To facilitate comparisons across years, percentages are reported as a function of survey respondents, not total students in the cohort.

Results of Graduate and Employer Surveys

Tables 4.3 to 4.5 and Figure 4.1 display results from the Graduate Survey of the OVC 2018 cohort (i.e., students who graduated in June 2018).

Fifty of the 118 graduates responded to some or all of the survey questions, representing a 42% response rate. Responses were received from ten employers. Response rates varied for each survey question, and the number of respondents for each question is indicated in brackets after the table or figure title. During 2019/20, OVC has planned a number of initiatives to increase survey response rates for both graduates and employers.

Table 4.3: Practice Type (*N* = 41)

Clinical Practice Type					Non-Clinical Practice	
Equine	**Food Animal**	**Rural Community Practice/ Mixed**	**Small Animal**	**Other Private Clinical Practice**	**Graduate School**	**Internship**
1 (2%)	10 (24%)	2 (5%)	22 (54%)	1 (2%)	1 (2%)	4 (10%)

Table 4.4: Stream Area and Number of Respondents in Each Stream (*N* = 39)

Stream	Number of Respondents (%)
Equine	1 (3%)
Food Animal	7 (18%)
Rural Community Practice	7 (18%)
Small Animal	24 (62%)

Readiness for Employment Upon Graduation

Graduates (N = 36) and employers (N = 10) rated the graduates' overall preparation for their first job using the following 7-point scale:

1	2	3	4	5	6	7
Absolutely unprepared			Adequately prepared			Very prepared

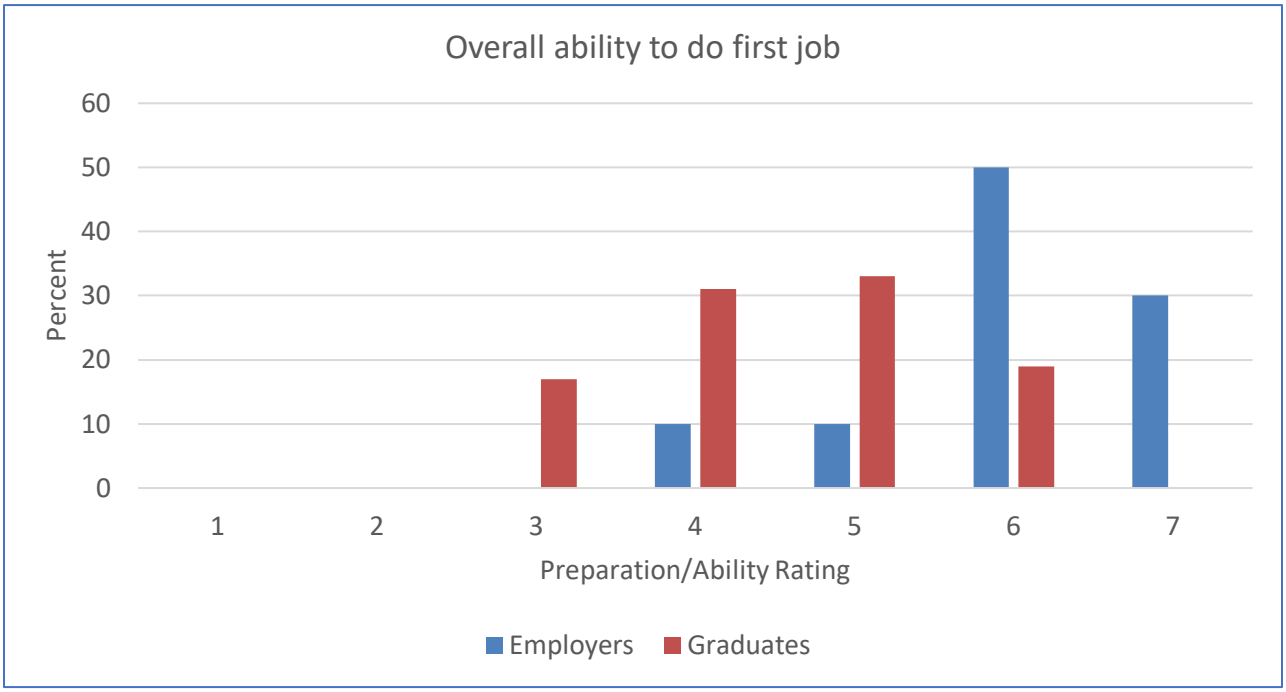


Figure 4.1: Preparation to Perform First Job According to Employers (*N* = 10) and Graduates (*N* = 36)

Table 4.5: Location of Employment as a Percentage of Respondents (*N* = 28)

Ontario: Central South	Ontario: South West	Ontario: Central West	Ontario: Central	Ontario: Central East	Ontario: East	Ontario: North	Canada (Not Ontario)	United States
1 (4%)	12 (43%)	2 (7%)	1 (4%)	2 (7%)	5 (18%)	2 (7%)	1 (4%)	2 (7%)

Feedback Provided in Comments from Students

Strengths of the Program

Thirty (30) students provided written feedback about the strengths of the DVM program at the Ontario Veterinary College. Qualitative comments were coded and the most commonly occurring of these are listed below, with quotations to illustrate each theme.

Effective Instruction of Hands-On Skills

Fourteen (14) students commented that the hands-on experience practicing hands-on skills, especially surgical skills, is a strength of the OVC program. Students also mentioned the Phase 4 rotations as an effective way to gain hands-on skills.

“Phase 4 Rotations - The hands-on experience during clinical rotations in Phase 4 was excellent.”

“Hands on surgical labs were done well and should be grown, especially to include dental surgery.”

Effective Instruction of Communication Skills

Thirteen (13) students commented that they received helpful training in communications skills at OVC.

“Communication in art of veterinary medicine has proven useful. Consistent practice with history gathering and writing records has also been helpful.”

“Communication! So much of our job is getting the client on board with our diagnostic and treatment plan and having them actually understand how to carry out treatments.”

Recommendations to Improve the DVM Program

Thirty students provided recommendations to improve the DVM program at the Ontario Veterinary College. Qualitative comments were coded and the most commonly occurring these are listed below, with quotations to illustrate each theme.

Increase Focus on Practical Everyday Skills and Reduce Focus on Specialized Skills (10)

Ten students suggested that there should be an increased focus on common skills needed in clinical practice, and a reduced focus on specialized skills.

“I wish we had more experience with everyday things. We didn't really get a ton of opportunities to do exams on healthy animals, I don't even think I ever looked in an ear until I started practice. I wish we got more of the every-day things, specifically dentistry, skin, and nutrition.”

"We don't need to know the ins and outs of treating rare and difficult diseases that will become referral cases when we start to practice. This can be learned with years of experience, if and when we decide to take on that challenge after learning to manage the basics. Exposure is good so we know what clients can expect; but very few grads will specialize."

Feedback Provided in Comments from Employers

Strengths of the Program

Five employers provided feedback on the strengths of the DVM program.

Communication Skills

Four employers described the strong development of **communication skills** as a strength of the OVC graduates

"communication skills - excellent being aware of the importance this makes to the care of our patients"

Recommendations to Improve the Program

Six employers provided recommendations to improve the program.

Increase Dentistry Training

Three employers suggested that students need more dentistry training in the program.

Results of Alumni Survey

Table 4.6 displays results from the Alumni Survey of the OVC '14 cohort (i.e., students who graduated in June 2014).

Thirty-four of the 122 graduates responded to some or all of the survey questions, representing a 28% response rate. Response rates varied for each survey question, and the number of respondents for each question is indicated in brackets after the table or figure title.

Table 4.6: Type of Practice – First Position After Graduation (*N* = 34)

Clinical Practice Type					Non-Clinical Practice	
Equine	**Food Animal**	**Rural Community Practice/ Mixed**	**Small Animal**	**Other Private Clinical Practice**	**Graduate School**	**Internship**
2 (6%)	2 (6%)	3 (9%)	25 (74%)	1 (3%)	0 (0%)	1 (3%)

Feedback Provided in Comments from Alumni

Comments from Alumni were similar to comments from new graduates. Alumni commented that they needed more experience with treating common illnesses, injuries, and symptoms (e.g., vomiting, diarrhea, ear infections, vaccine appointments, how to unblock a cat, fix a simple laceration, reduce a prolapsed globe).

“I believe for basic surgical procedures (spay/neuter), wellness and more simple medical cases (diabetes, cushings, addisons etc.) that my education and training at OVC prepared me well. I did not feel that I was prepared for dental or more complicated surgical procedures such as cystotomies, complex mass removals and GI surgery without mentorship.”

“I feel my clinical skills were honed well, the information that was learned in the AVM Phase III has helped with the business aspect of things, but I don't feel I was thoroughly prepared.”

4.4.2 Curricular Requirements (Years 1 to 3) and Examples of Co-Curricular Opportunities

The DVM curriculum is managed by the OVC Curriculum Committee and addresses changes to the program in an evolving, on-going basis with input from external stakeholders (including OMAFRA), students and faculty.

DVM Program Core Curricular information

Phase 1:

Health Management I

The overall goal of this course is to present the students with an integrated approach to the disciplines of medicine, epidemiology, ethology, public health and animal husbandry. This course will also provide the foundation for more in-depth coverage of these topics in subsequent courses (Phase 2-Health Management II and Phase 3- Health Management III).

Clinical Medicine I

The Clinical Medicine courses presented in Phases 1, 2 and 3 represent a continuum of learning intended to foster student mastery of seven main learning outcomes by the end of

Phase 3 of the DVM program; Animal handling and restraint, History taking, Physical examination of common domestic species, Diagnosis, Clinical problem solving, Treatment and planning, Medical records.

Phase 2:

Health Management II

Emphasis will be placed on relevant epidemiological tools for understanding disease causation, evidence-based medicine and critical appraisal of the literature, surveillance, and outbreak investigation. Animal behaviour, and animal welfare issues, will be presented in a species/ industry context. The public health section will focus on regulatory matters, food safety, and zoonotic disease issues.

Clinical Medicine II

The course is a continuation of Clinical Medicine I. It will contribute to students' achievement of selected elements of graduating competency in the areas of clinical examination of specific organ systems of various species.

Theriogenology

A lecture and laboratory course covering the normal and abnormal reproductive systems of domestic animals. The course will include mammalian reproductive physiology and histology, diagnosis and treatment of reproductive disorders, including infertility, and management of breeding programs of the common domestic species.

Phase 3:

Health Management III

The course will contribute to students' achievement of greater depth in the context of health management in species of their choice. The primary emphasis is directed towards developing species-specific skills, knowledge and attitudes that will permit the entry-level veterinarian to assess and advise on animal production and performance and evaluate the necessity for, and implementation of, health management programs. The course is a series of species-based modules including; beef, companion animals, dairy, equine, laboratory animals, poultry, small ruminants, swine, and wildlife.

Clinical Medicine III

The overall objective of Clinical Medicine III is to facilitate the integration of course material from all phases into a practical approach to case evaluation.

Food Animal Medicine and Surgery

The goal of this course is to introduce the student to the diagnosis and management of common diseases (& the recognition of uncommon diseases) of ruminants and swine.

Equine Medicine and Surgery

The goal of this course is to introduce the student to the diagnosis & management of common diseases (& the recognition of uncommon diseases) of horses.

Comparative Medicine

This course will cover strategies to deal with common and uncommon diagnoses in the context of pet birds, commercial poultry and non-traditional species (fish, amphibians, reptiles, rabbits, rodents, ferrets, non-domestic carnivores and non-domestic ungulates).

DVM Co-Curricular Opportunities

Examples provided through the OVC Food Animal Club include:

- Small Ruminant reproduction (seminar);
- Lambing assisting (supervised on-farm experience);
- Poultry euthanasia (wet lab);
- Calf disbudding (supervised on-farm experience);
- Perinatal care of beef calves (seminar); and
- Swine pregnancy exams and back fat ultrasounds (wet lab).

4.4.3 Curricular Requirements (Year 4)

Phase 4:

The stream counts for the class of 2019 are shown in Table 4.7.

Table 4.7: Stream Counts for the Class of 2019

Stream	Number of Students	Percentage of Students
Food Animal	13	11%
Rural Community Practice	15	13%
Equine	9	8%
Small Animal	78	68%
Total	**115**	

The curricular requirements for the streams relevant to VCP are presented below.

Food Animal Stream:

Students in the Food-Animal Stream will have the following rotations:

- Core: Veterinary Externship (8 weeks)
- NAVLE Study Week (1 week)
- Anatomic Pathology (1 week)
- Diagnostic Pathology & Laboratory Medicine (1 week)
- Small-Animal Primary Veterinary Care (3 weeks)
- Theriogenology (1 week)
- Ruminant Health Management I (2 weeks)
- Swine Health Management (2 weeks)
- Approved External Practices, Food Animal (6 external weeks)

Stream-Priority: (4 of the following 10 rotations)
Dairy Cattle Welfare: 1
Heartland Dairy Practice: 1 external
Poultry Health: 2
Ruminant Health Management II, Beef: 2
Ruminant Health Management II, Small Ruminants: 1
Ruminant Health Management II, Dairy: 2
Ruminant Health Management III, Dairy Nutrition: 1
Ruminant Health Management III, Dairy-Herd Problem Solving: 2
Ruminant Surgery: 2
Swine Health Management, Production: 1
Electives: Variable (internal or external rotations): 4-8
Total = 38

Rural Community Practice Stream:
Students in the **Rural Stream** will have the following rotations:

- Core: Veterinary Externship (8 weeks)
- NAVLE Study Week (1weeks)
- Anatomic Pathology (1 weeks)
- Diagnostic Pathology & Laboratory Medicine (1 weeks)
- Small-Animal Primary Veterinary Care (3 weeks)
- Theriogenology (1 weeks)
- Anesthesia (2 weeks)
- Radiology (2 weeks)
- Small-Animal Internal Medicine (2 weeks)
- Large-Animal Medicine (2 weeks)
- Ruminant Health Management I (2 weeks)
- Swine Health Management (1weeks)
- Approved External Practices, Rural mixed species (4 external weeks)

Electives: Variable (internal or external rotations) (8weeks)
Total: 38 weeks

Equine Stream:
Students in the **Equine Stream** will have the following rotations:

- Core: Veterinary Externship: (8 weeks)
- NAVLE Study Week: (1 week)
- Anatomic Pathology (1 week)
- Diagnostic Pathology & Laboratory Medicine (1 week)
- Small-Animal Primary Veterinary Care (3 weeks)
- Theriogenology (1 week)
- Anesthesia (2 weeks)
- Radiology (2 weeks)
- Neurology (1 week)
- Large-Animal Medicine I (2 weeks)
- Large-Animal Surgery I (2 weeks)
- Large-Animal Medicine II or Large-Animal Surgery II (2 weeks)

Stream-Priority: (2-3 of the following 3 rotations)

- Equine Anesthesia & Surgery: 1
- Equine Lameness: 2
- Equine Primary Care: 1
- Electives: Variable (internal or external rotations): 8-10

Total = 38

4.4.4 Faculty and Staff Capacity

Table 4.8 below show the key faculty and veterinarian positions in the Ontario Veterinary College (OVC) contributing to the Veterinary Capacity Program.

Table 4.8: Faculty and Veterinarians in OVC contributing to the Veterinary Capacity Program

Name	Rank and Department	Specialty
Luis Arroyo	Associate Professor, Clinical Studies	Large Animal Medicine
John Barta	Professor, Pathobiology	Parasitology
Cathy Bauman	Assistant Professor, Population Medicine	Epidemiology and Applied Clinical Research
Janet Beeler-Marfisi	Assistant Professor, Pathobiology	Clinical Pathology
Dorothee Bienzle	Professor, Pathobiology	Clinical Pathology
Patrick Boerlin	Associate Professor, Pathobiology	Bacteriology
Byram Bridle	Associate Professor, Pathobiology	Anatomic Pathology
Jeffrey Caswell	Professor, Pathobiology	Anatomic Pathology
Tracey Chenier	Associate Professor, Population Medicine	Theriogenology
Nathalie Cote	Assistant Professor, Clinical Studies	Large Animal Surgery
Anne Deekert	Veterinarian, Health Sciences Centre	Veterinarian
Cate Dewey	Professor, Population Medicine	Swine Health Management
Marie-Soleil Dubois	Assistant Professor, Clinical Studies	Large Animal Surgery
Todd Duffield	Professor, Population Medicine	Ruminant Health Management
Robert Foster	Professor, Pathobiology	Anatomic Pathology
Robert Friendship	Professor, Population Medicine	Swine Health Management
Jessica Gordon	Assistant Professor, Population Medicine	Ruminant Health Management
Michele Guerin	Associate Professor, Population Medicine	Epidemiology
Derek Haley	Associate Professor, Population Medicine	Animal Welfare
Joanne Hewson	Associate Professor, Clinical Studies	Large Animal Medicine
Claire Jardine	Associate Professor, Pathobiology	Comparative Pathology
Ron Johnson	Associate Professor, Biomedical Sciences	Pharmacology/Toxicology
Stefan Keller	Assistant Professor, Pathobiology	Pathology
David Kelton	Professor, Population Medicine	Epidemiology
Daniel Kenney	Veterinarian, Health Sciences Centre	Veterinarian
Thomas Koch	Associate Professor, Biomedical Sciences	Cellular/Molecular Biology

Name	Rank and Department	Specialty
Judith Koenig	Associate Professor, Clinical Studies	Large Animal Surgery
Stephen LeBlanc	Professor, Population Medicine	Ruminant Health Management
Brandon Lillie	Associate Professor, Pathobiology	Anatomic Pathology
Kerry Lissemore	Associate Professor, Population Medicine	Ruminant Health Management
John Sanderson Lumsden	Professor, Pathobiology	Anatomic Pathology
Pavneesh Madan	Associate Professor, Biomedical Sciences	Reproductive Biology
Bonnie Mallard	Professor, Pathobiology	Immunology
Stephanie Nykamp	Associate Professor, Clinical Studies	Radiology
Terri O'Sullivan	Associate Professor, Population Medicine	Swine Health Management
Andrew Papadopoulos	Associate Professor, Population Medicine	Public Health
Andrew Seaton Peregrine	Associate Professor, Pathobiology	Parasitology
Brandon Plattner	Associate Professor, Pathobiology	Anatomic Pathology
Zvonimir Poljak	Associate Professor, Population Medicine	Public Health
Jeffrey Rau	Veterinarian, Health Sciences Centre	Veterinarian
Nicole Ricker	Assistant Professor, Pathobiology	Pathogenomics and Disease Informatics
Janice Sargeant	Professor, Population Medicine	Public Health
Shayan Sharif	Professor, Pathobiology	Immunology
Henry Staempfli	Professor, Clinical Studies	Large Animal Medicine
Leonardo Susta	Assistant Professor, Pathobiology	Avian Virology
Jeffrey Thomason	Professor, Biomedical Sciences	Anatomy
Donald Trout	Associate Professor, Clinical Studies	Large Animal Surgery
Alexander Valverde	Associate Professor, Clinical Studies	Anesthesiology
Jeffrey Scott Weese	Professor, Pathobiology	Public Health
Charlotte Winder	Assistant Professor, Population Medicine	Ruminant Health Management
Robert Darren Wood	Associate Professor, Pathobiology	Anatomic Pathology
Geoffrey Wood	Associate Professor, Pathobiology	Anatomic Pathology
Robin zur Linden	Associate Professor, Clinical Studies	Radiology

In addition to faculty, there are a number of key support staff who contribute to VCP. These include:

- 14 FTE in Large Animal Veterinary Technicians;
- 8 FTE in Large Animal Agricultural Assistants; and
- 3.5 FTE in Administrative Support Staff who operate the Large Animal Hospital.

These represent a total of 25.5 FTE, which is approximately 18% of all Health Science Centre Staff.

5 Animal Health Laboratory (AHL)

The Animal Health Laboratory (AHL) has demonstrated capabilities of contributing expertise, diagnostic testing and analysis, test development, surveillance data, information and resource capacity to be prepared for and respond to animal disease outbreaks.

The AHL is a long-standing program that continues to evolve. Further to the transformation of the Veterinary Laboratory Services Branch of OMAFRA into the AHL within the Laboratory Services Division, Office of Research, the AHL continues to serve the province as the provincial veterinary reference laboratory.

5.1 Program Activities and Achievements from 2018/19

The AHL diagnostic system provides valuable and timely information that enables Ontario to remain competitive in national and international trade. Through accessions from veterinarians, the AHL provides data on new and emerging diseases affecting the health of livestock, poultry, and the public across the province. Many diseases are first recognized in Ontario through postmortem examinations and ancillary testing carried out in AHL laboratories in Guelph and Kemptville. Based on the laboratory infrastructure and expertise needed to detect disease hazards, the AHL is able to provide an efficient early warning system for a wide variety of diseases.

- AHL annually sends more than 100 samples to the Canadian Food Inspection Agency (CFIA) for confirmatory testing in suspect cases of reportable disease.
- AHL also plays an important role in public health by identifying pathogens common to animals and people. More than 1,000 occurrences of zoonotic pathogens are identified annually at the AHL.
- AHL also receives approximately 100 medicolegal cases annually from the police, OSPCA and humane societies, as part of investigations into animal neglect and abuse. The AHL also receives approximately 50 cases per year from the Alcohol and Gaming Commission of Ontario (formerly the Ontario Racing Commission). Through testing at the AHL, AGCO can assure the betting public that the racing industry is closely scrutinized, and that animal welfare is a priority.

Because AHL monitors trends in existing diseases and sends electronic real-time alerts to OMAFRA, the Ministry is able to respond rapidly and efficiently to health threats to the livestock and poultry industries. By providing information on disease trends, policy or decision makers have information readily available to perform risk assessments, evaluate control strategies, identify research needs, and facilitate planning.

Provide Animal Health Expertise

AHL vets/supervisors participated in a host of regional, provincial, and national veterinary organizations to the extent of 5.1% of available time. Both AHL and OMAFRA staff participate in and share information within OAHN. Vets/supervisors attended 1 court appearance, had 46 publications, 23 peer-reviewed articles, 46 scientific newsletter articles, 3 podcasts, 31 oral presentations, 7 poster presentations, and 31 tours of the AHL. AHL also maintained a total of 45 informational LabNotes. The quarterly AHL Newsletter, which is emailed/faxed to approximately 2,000 clients as well as posted on the AHL website, published eight Ruminant, four Swine, seven Avian/Fur/Exotic Species, five Horses, and five Companion Animal articles in 2018/19.

Any occurrence of one of the 119 immediately notifiable hazards named in the provincial Animal Health Act, 2009, is reported to the Office of the Chief Veterinarian of Ontario (OCVO) electronically at 0900 and 1500 hours daily. Table 5.1 illustrates the notifiable and alertable tests for 2018/19. New and emerging hazards are tabulated annually in an *Impact Table* (see Table 5.2), and these hazards and trends in endemic disease are reported in the quarterly AHL Newsletter. Disease trends are discussed in detail in each of the OAHN expert network quarterly calls.

Table 5.1: Notifiable and Alertable Tests – May 1, 2018 - April. 30, 2019

Reportable Disease Tests	**Number**
African swine fever	1
Avian chlamydiosis (*Chlamydophila psittaci*)	1
Avian encephalomyelitis	1
Avian infectious laryngotracheitis	7
Brucellosis	1
Fowl cholera (*Pasteurella multocida*)	10
Hog cholera (classical swine fever)	1
Koi herpesvirus disease	1
Listeriosis (*Listeria monocytogenes*)	3
Rabies	1
Small hive beetle (*Aethina tumida*)	30
Notifiable Tests Completed	**Number**
APMV-1 f rt-RT-PCR	9
ASF PCR	3
Bacillus anthracis - qPCR	2
CFIA African swine fever	5
CFIA Avian influenza	4
CFIA Classical swine fever	5
CFIA Newcastle disease	1
CSFV rt RT-PCR	21
FMDV rt RT-PCR	1
ISAV PCR	1
Influenza A H5 PCR	5

Influenza A H7 PCR	5
Koi herpesvirus qPCR	2
Rabies FA	35
Small hive beetle PCR	40
Notifiable E-Code Cases	**Number**
Chlamydia psittaci	1
Clostridium botulinum	1
Coxiella burnetii	16
Eastern equine encephalitis (EEE)	4
Listeria monocytogenes	27
Avian herpesvirus type 1 (AHV-1)/ ILT	10
Notifiable Alerts	**Number**
AEV rt-RT-PCR	3
APMV-1m rt-RT-PCR	12
Anaplasma ab cELISA	1
Botulism MIT (Serum)	5
Botulism MIT Ti/Fd	1
Brucella canis RSAT	21
Coxiella burnetii ELISA	14
Coxiella burnetii PCR v2	49
Chlamydia psittaci RT PCR	1
Culture Bact	356
EEEV IgM ELISA	1
EEEV rRt-PCR	6
EHV-1 A Non PCR	12
EHV-1 G Neuro PCR	3
Echinococcus Taenia PCR	1
Generic profile	1
HSFP environmental culture	28
IHC WNV	1
IHC *Listeria* food an	11
ILTV rt-RT-PCR	9
Influenza A vir MultiS-sc	12
Influenza A H1 PCR	71
Influenza A H3 PCR	32
Influenza A N1 PCR	52
Influenza A N2 PCR	54
Influenza A matrix PCR	132
Listeria monocytogenes Isolation	9
Porcine coronavirus PEDV	63
Porcine coronavirus PDCoV	23
Public health mycobacteria	1
Rabies FA	2
Salmonella Enteritidis PCR	13
Salmonella Pullorum-Typhoid tube	12
Salmonella Dublin Ab ELISA	8

Salmonella serotyping	809
Small hive beetle PCR	39
Sucrose wet mount	4
VTEC PCR Geno	16
WNV IGM ELISA-IOWA	6
WNV rRT-PCR	41

Table 5.2: Impact Table - 2018/19

Year identified; Outbreak	Species or Commodity	Disease, Hazard, or Pathogen	AHL Finding	Impact on Animal Health, Public Health, and/or Trade
Every year	All species	**New, emerging, and re-emerging zoonotic pathogens**	Annual summary of ~26 diseases or pathogens > 1,000 events per year	*Selected zoonotic pathogens and diseases from Ontario identified at the AHL* – Murray Hazlett, et al. Reported in the March issue of the AHL Newsletter every year.
2019 Mar	Horse	***Borrelia burgdorferi* infection**	Atypical cutaneous nodular lymphoid hyperplasia, aka pseudolymphoma	An unusual expression of Lyme disease, which is an emerging disease in Ontario. G19-017547
2019 Mar	Beef cow-calf herd	***Listeria monocytogenes***	8 abortions in a 300-cow herd.	Zoonotic pathogen. 19-023854; related cases 19-01771, 19-021953
2019 Feb	Sheep	***Neospora caninum* abortion**	2 ovine abortions	Unusual pathogen in sheep abortions. Negative for toxoplasmosis. G19-012367
2019 Feb	Rainbow trout	**Bacterial gill disease, & nodular gill disease**	Increased daily mortality in 25 g fingerlings.	*Flavobacterium* sp., not *F. branchiophilum*, uncommon in Ontario. NGD – likely *Cochliopodium* sp. K19-012728. Other recent cases: K19-025771, K19-020655, including Great Lakes salmonid.
2019 Feb	Sheep	***Helicobacter trogontum***	5 abortions in 52 ewes	Formerly *Helicobacter (Flexispira) rappini.* First identification in Ontario. Confirmed in 2 of 5 abortions. G19-014069, G19-016507
2019 Feb	Swine	**Metabolic bone disease**	Market hogs fracturing bones at slaughter.	Histology and bone ash confirmation. G19-009157
2018 Nov	Swine	**Multifactorial enteritis**	Diarrhea in 6-wk-old pigs	Pathogens identified were *Salmonella* Typhimurium, F5/K88 *E. coli*, porcine rotavirus A, B and C, and *Brachyspira pilosicoli.* G18-094539, G18-096214.
2018 Nov	Sheep	**Rumen acidosis**	Unexpected death, or death shortly after onset of diarrhea in 10 animals.	Confirmed by low pH and histology. G18-094197

Year identified; Outbreak	Species or Commodity	Disease, Hazard, or Pathogen	AHL Finding	Impact on Animal Health, Public Health, and/or Trade
2018 Sept	Cat	**Methomyl poisoning**	Identified by LC-MS	Broad-spectrum carbamate insecticide/acaricide. Used to kill flies; can be used maliciously. Highly toxic to humans and animals. G18-070627
2018 Sept	Swine	***Erysipelothrix* septicemia**	Unexpected mortality in nursing piglets, organic herd, no Rx - ~7 da-old	Diagnosis by lesions and isolation. G18-073930
2018 June	Bovine, Wagyu	**Malignant catarrhal fever**	Herd of 30; 1 neurologic case, blind.	MCF confirmed by OvHC-2 PCR in conjunction with compatible histologic lesions. BVDV was not detected by IHC.
2018 June	Sheep	**Copper toxicosis**	Multiple dead sheep, 2 more last night	Confirmed by toxicology and lesions. G18-045694
2018 May	Caprine	***Verotoxigenic E coli* enteritis**	10-d-old & kids scouring. 2 poor-doing kids brought in.	Verotoxigenic *E. coli* were identified in this case; compatible with histologic finding of small bacilli in close association with exfoliated enterocytes. G18-35509

According to the biennial client satisfaction survey of 2017, overall level of satisfaction of clients with AHL service was 93.3%. As a documented form of feedback on client service, minutes of the bi-monthly AHL/OVC-HSC/PBI liaison meetings (AHL, OVC Health Sciences Center, and Pathobiology) and the annual AHL Feedback Group meeting (of which a range of AHL clients attend) were reviewed. Meeting minutes are available upon request. Satisfaction is high with the timeliness of communications.

Conduct Testing and Analysis

The Animal Health Laboratory (AHL) accessioned 75,788 cases and performed 846,972 procedures (approximately 1,000,000 tests) in 2018/19 in support of disease surveillance. Compliance with published turnaround times from the AHL Laboratory Information Management Systems (LIMS) was 97.6%. Standards Council of Canada scope of accreditation was unchanged in 2018/19. Testing equipment in AHL's inventory was replaced in 2018/19 to improve efficiency and surge capacity of the lab. A major information technology initiative that began in 2016/17 was completed in 2018/19 to enhance data quality for OMAFRA and disease surveillance in Ontario. It included an enhanced client portal for case submissions, optimization of specimen reception accessioning, and improved data mining.

AHL developed or improved 28 tests in 2018/19.

Early Detection and Effective Response to Foreign Animal Diseases and/or other Diseases with Human/Animal Health and Economic Consequences

Three representative AHL pathology cases were submitted to OMAFRA for comment in order to monitor timeliness of testing, resulting, and communications. OMAFRA comments are quoted below:

Case 1. Chlamydiosis in imported budgies – Dr. Marina Brash

G18-095780, and 18-095782, 18-095848. Follow-ups = 19-010117, 19-013794, 19-017183.

"Dr. Marina Brash followed the required diagnostic steps and included all potential diagnoses. A full list of differential diagnosis was made, and all required diagnostic tests were performed to exclude avian influenza virus, exotic Newcastle disease, aspergillosis, psittacosis, and coccidiosis during her evaluation of this case.

The diagnostic techniques were accurate and timely, and reporting protocols were thoroughly followed.

The final diagnoses (Chlamydiosis) were timely reported to Dr. Corrente at CFIA and Dr. Filejski at MOHLTC, and to OMAFRA and CFIA through the OCVO email.

This case investigation highlights the importance of a complete diagnostic procedure, and by diagnosing *Chlamydia psittaci*, a potentially zoonotic disease agent, animal and human health was protected."

Case 2. Listeria abortion in a Black Angus cow – Dr. Andrew Brooks

Case G19-023854 (related cases: 19-021953, 19-021955, 19-017721)

"This is a comprehensive abortion investigation that responded to the abortion storm history on the farm, and systematically ruled out other common causes of infectious abortion including; Neospora, IBR, *Leptospira*, *Ureaplasma*, and BVD

The diagnosis of *Listeria* is confirmed by culture and positive IHC and is consistent with findings on histopathology.

Effort was made to corroborate the findings in this case with previous submissions from abortions on the farm and successfully confirmed *Listeria* in a previous submission using IHC.

The farm history of clinical neurologic animals is consistent with the abortion investigation findings and highlights the importance of a complete farm history and the submission of multiple fetuses in an abortion storm to improve the chance of determining a definitive diagnosis"

***Case 3. Confirmatory negative testing for African swine fever virus and classical swine fever virus* in pigs - Dr. Josepha DeLay**

G19-011787 (Subsequent cases 19-014728, 19-012863, 19-022321)

"This case description is atypical in that it is primarily concerned with testing procedures for African Swine Fever and Classical Swine Fever although the pathologist states that these were not considered to be likely differentials. The actual cause of death of this gilt was identified on gross postmortem examination by the submitting veterinarian (mediastinal hemorrhage) but tissues were submitted for additional testing apparently because of a suspicion that this case might provide insights into previous problems with unexpected mortalities on the farm. Histopathology revealed severe arteritis in spleen, kidney and heart. The pathologist states that, "The lesions and epidemiologic features of the case were not typical of African swine fever or Classical swine fever. However, given the heightened awareness of these foreign animal diseases (FADs) in North America, and due to the presence of vasculitis (arteritis), confirmatory negative testing for these viruses was carried out at the AHL, with the approval of CFIA."

"This case therefore was used to test the efficiency of confirmatory negative testing for African Swine Fever and Classical Swine Fever by the Animal Health Laboratory in Guelph which is one of the Canadian Animal Health Surveillance Network laboratories. This case demonstrated that such testing could be performed in a timely and accurate manner. The report states that, "The case also demonstrates the importance of effective communication networks among the AHL, CFIA, and OMAFRA." Because the report states that the epidemiologic features of the disease were considered in making the diagnosis, likely the communication networks mentioned here should include the submitting veterinarian."

"It is important that regional laboratories can quickly and effectively screen samples for foreign animal diseases when indicated. To this end it is hoped that similar testing for foreign animal diseases, even though the level of suspicion may be low, will continue to be performed on a regular basis at the AHL to ensure that the testing procedures in place continue to function at an acceptable level of performance. Demonstrating a single successful use of the confirmatory negative testing at the AHL should not be considered as demonstrating proficiency at an on-going basis over time. Please advise if you require additional feedback on this case evaluation."

AHL response: As noted in the Communication History on this case, Dr. Hancock, the referring DVM, received all results as soon as they were released.

Also, as noted "As of June 2019, CFIA is developing an ongoing surveillance plan for ASFV and CSFV", which will allow the AHL to perform scanning surveillance testing routinely without prior approval from CFIA.

We appreciate the support of OMAFRA in making the case for this change in CFIA policy.

Disease Surveillance and Ontario Animal Health Network

The Ontario Animal Health Network (OAHN) was embedded in the renewed OMAFRA/UofG Agreement, including funding for OAHN Operations as well as for OAHN Projects. The ten Ontario Animal Health Network (OAHN) expert networks were all functional in 2018/19. These networks are comprised of OMAFRA specialists, AHL personnel, Ontario Veterinary College and other UofG researchers, and private veterinarians working with bovine, equine, swine, poultry, aquaculture, small ruminant, companion animal, bee, wildlife, and alternative species. The networks have continued regular scheduled communications and information-sharing with the objective of baseline health monitoring and flagging of changes in disease trends, in order to mitigate the risk of epidemics before they arise. Most networks also began a project aimed at filling a gap in disease surveillance in their commodity.

Work continued in 2018/19 on the integration of Ontario animal health surveillance data with national databases, such as the Canadian Animal Health Surveillance System (CAHSS). AHL is an active participant in CAHSS governance and in various CAHSS committees, including swine, poultry, equine, and bovine species. AHL continues to collaborate in building a 'network of networks' that will best serve provincial and national interests.

5.2 Mandatory Compliance Requirements

5.2.1 Increase in Revenues

In 2018/19, AHL met the mandatory compliance requirement for 3.0% increase in revenues by achieving revenue of $6.999M, a growth of 6.0% over the baseline of $6.6M articulated in the Agreement.

5.2.2 Emergency Response Plan and Surge Capacity Plan

AHL has a comprehensive Emergency Response Plan and Surge Capacity Plan in place to ensure that AHL can fulfill the objectives of the Program Schedule. Some key notes are listed below.

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 days (the Guelph campus closed for three snow days in 2018/19) or labour disruptions.

Surge capacity is maintained year-round and has benefited from the acquisition of high-volume equipment funded by OMAFRA. The AHL performed 342,000 ELISAs and 89,000 PCR reactions in 2018/19 plus additional test development, and given the level of automation, can relatively easily accommodate additional testing on an emergency basis. The larger challenge usually exists in collection and transfer of large volumes of well-documented samples by CFIA to AHL.

5.2.3 Emergency Simulation Exercises

The University confirms that Emergency Simulation Exercises and Emergency Response Evaluations are done annually in accordance with the Emergency Response Plan. More details are provided in Section 5.3.5.

5.2.4 Capacity Strategy Plan

Capacity planning is dealt with for the Division as a whole in the LSD Essential Level Continuity Plan, v.3.0, 2017. Capacity for routine testing as well as for surge events is contingent on adequate staffing, which is an active process of needs assessment, recruitment, training, and retention. Human resource planning is supported by the various processes embedded in the Lab Services quality program.

5.2.5 Capital Strategy Plan

A capital expenditure program (CAPEX) has been a long-term activity of Laboratory Services, and this will continue in the future. Equipment repair costs are closely monitored, and equipment is replaced prior to failure or when no longer supported by manufacturers. New OMAFRA program initiatives and client demands drive planning around the purchase of

additional equipment to support new testing. Computer hardware and software are replaced on a planned basis in order to keep pace with management of increased volumes of data.

5.2.6 Fee Schedule

The up to date AHL Fee Schedule is provided to the Ministry annually and is also available on request.

5.2.7 Coordination of the Ontario Animal Health Network

AHL is responsible for coordinating the Ontario Animal Health Network (OAHN), which was embedded in the renewed OMAFRA/UofG Agreement with funding for OAHN Operations as well as for OAHN Projects. The ten Ontario Animal Health Network (OAHN) expert networks were all functional in 2018/19. The networks have continued regular scheduled communications and information-sharing with the objective of baseline health monitoring and flagging of changes in disease trends, in order to mitigate the risk of epidemics before they arise. Most networks also began a project aimed at filling a gap in disease surveillance in their commodity.

Work continued in 2018/19 on the integration of Ontario animal health surveillance data with national databases, such as the Canadian Animal Health Surveillance System (CAHSS). AHL is an active participant in CAHSS governance and in various CAHSS committees, including swine, poultry, equine, and bovine species. AHL continues to collaborate in building a ‘network of networks’ that will best serve provincial and national interests. Section 5.4.6 includes further information on OAHN communications.

5.2.8 AHL Accreditation

The University of Guelph maintains appropriate accreditations at the Animal Health Laboratory (AHL), including ISO/IEC 17025, AAVLD, and CFIA.

American Association of Veterinary Laboratory Diagnosticians (AAVLD) accreditation

AHL is audited every five years to maintain full AAVLD accreditation, all species. The latest AAVLD audit was May 6-9, 2019, and the report will be received in August 2019. The current AAVLD accreditation certificate expires in December 2019.

Canadian Food Inspection Agency (CFIA) accreditation

AHL is accredited by the CFIA – Retrovirology Centre for Expertise (RCE) for the equine infectious anemia virus (EIAV) ELISA. AHL was audited by CFIA on February 20-21, 2018, maintained accreditation for EIAV ELISA, and expects the next audit to be part of the October 2019 SCC audit.

As part of disease preparedness, and through membership in the CAHSN, the AHL has certified analysts (approved by CFIA) for screening testing for five high-consequence pathogens: foot-and-mouth disease virus (FMDV), classical swine fever virus (CSFV), African swine fever virus (ASFV), exotic Newcastle disease virus (ENDV), and highly pathogenic avian influenza virus (HPAIV). AHL's ten certified analysts participate annually in CFIA proficiency panels and continued to be certified in 2019/20.

ISO 17025 - Accreditation and Summary of ISO 17025 report
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 the scopes of accreditation. LSD's biennial audit is tentatively scheduled for October 2019. The ISO/IEC 17025 standard was revised in 2017, so LSD will be audited to ISO/IEC 17025:2017 this fall and must comply with the 2005 version until accredited to the 2017 version.

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-routine Testing (TMD/NRT). As of June 29, 2018, LSD's SCC fixed scope lists 98 accredited tests and five accredited AHL techniques. On LSD's SCC scope there are 83 AFL tests and 15 AHL tests, including one Soil and Nutrient lab test.

Since there can be a lag in applying for and adding a test to the SCC "fixed" scope, the AHL uses the "flexible scope" to accredit tests more rapidly. The Animal Health Laboratory (AHL) is accredited for five laboratory techniques listed under the Medical – Veterinary flexible scope.

In the past fiscal year, the AHL flexible scope was updated to remove one test that was already listed on AHL's SCC fixed scope (MOL-249) and to add the following two tests to the AHL flexible scope:

- Enzyme linked immunosorbent assay (ELISA):
  - Infectious bovine rhinotracheitis virus (IBRV, BoHV-1) antibodies
- PCR techniques:
  - IBRV (Infectious bovine rhinotracheitis virus, bovine herpesvirus 1) - PCR

See the current AHL flexible scope version 2018/Nov/02 below.

As of June 5, 2018, LSD is accredited by CALA for eight environmental tests (ten CALA appendices); seven AHL test methods, and one test done in the Soil and Nutrient lab (CHEM-114). The Soil and Nutrient lab were historically part of AHL but recently has been moved to AFL.

ISO/IEC 17025 Accredited Techniques (flexible scope)

The AHL is accredited for veterinary laboratory testing techniques (flexible scope) as listed on LS' SCC scope of accreditation https://www.scc.ca/en/system/files/client-scopes/826_e.pdf
The test methods listed below are under AHL flexible scope.
https://www.uoguelph.ca/ahl/sites/uoguelph.ca.ahl/files/AHLflexibleScopeApprovedTests_2018Nov02.pdf

ISO/IEC 17025 MEDICAL – Veterinary (flexible scope)

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, yeasts, 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 are listed in Table 5.3 to 5.7.

Table 5.3: Culture Detection of Microorganisms

Method Code	Method Name	Agent
MYC-100	Mycoplasma and Ureaplasma isolation	• *Mycoplasma, Ureaplasma, Acholeplasma*

Table 5.4: Inorganic Analysis by Inductively Coupled Plasma – Mass Spectroscopy (ICP-MS)

Method Code	Method Name	Elements
CHEM-162	ICP-MS analysis of trace metals in serum, plasma and blood	• Manganese, iron, cobalt, copper, zinc, selenium, molybdenum, lead

Table 5.5: Enzyme Linked Immunosorbent Assay (ELISA)

Method Code	Method Name	Agent
V-002	ELISA	• Anaplasma • *Coxiella burnetii* (Q fever) • Equine infectious anemia virus (EIAV) • Infectious bovine rhinotracheitis virus (IBRV, BoHV-1) antibodies • Porcine reproductive & respiratory syndrome virus (PRRSV) • Transmissible gastroenteritis virus (TGEV)

Table 5.6: Agglutination

Method Code	Method Name	Agent
V-008	Leptospira microscopic agglutination test (MAT)	• *Leptospira* spp.

Table 5.7: Polymerase Chain Reaction

Method Code	Method Name	Agent
BAC-018	PCR of fecal samples for *Mycobacterium paratuberculosis* (MAP)* *Only fecal samples are accredited	• *Mycobacterium avium* ssp. *paratuberculosis,* MAP (Johne's disease)
MOL-197	PCR detection of avian mycoplasmas	• *Mycoplasma gallisepticum* • *Mycoplasma iowae* • *Mycoplasma synoviae*
MOL-218	*Chlamydia* PCR	• *Chlamydia* species (*Chlamydia abortus* and *Chlamydia psittaci*)
MOL-251	Honey bee molecular testing	• Acute bee paralysis virus (ABPV) • Black queen cell virus (BQCV) • Chronic bee paralysis virus (CBPV) • Deformed wing virus (DWV) • Israeli acute paralysis virus (IAPV) • Kashmir bee virus (KBV) • Sacbrood virus (SBV) • *Crithidia mellificae* • *Spiroplasma apis* • *Spiroplasma melliferum* • *Tropilaelaps* screening *(T. clareae, T. koenigerum, T. mercedesae)* • *Varroa destructor* haplotyping
MOL-257	Chytrid PCR	• *Batrachochytrium dendrobatidis* • *B. salamandrivorans*
MOL-262	*Echinococcus* species PCR	• *Echinococcus multilocularis*
MOL-267	*Myxobolus cerebralis* (whirling disease	• *Myxobolus cerebralis*

Method Code	Method Name	Agent
	pathogen) PCR	
V-005	Polymerase chain reaction (PCR)	• IBRV (Infectious bovine rhinotracheitis virus, bovine herpesvirus 1) - PCR • Infectious laryngotracheitis virus (ILTV gallid herpesvirus 1 [GaHV-1[) • Porcine circovirus 2 (PCV-2) • Porcine coronavirus: (porcine epidemic diarrhea virus (PEDV), transmissible gastroenteritis virus (TGEV), porcine deltacoronavirus (PDCoV)) • Porcine parvovirus (PPV) • Porcine reproductive and respiratory syndrome virus (PRRSV) • Porcine respiratory coronavirus (PRCV)

Proficiency Testing (PT) Programs

AHL participated in 50 different proficiency test (PT) programs in 2018/19. PT programs are divided into 2 main categories:

1. Biological programs – a panel of samples are tested, or identification agrees with consensus ID and results are usually pass / fail.
2. Chemical programs – 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 2018/19, the chemical sections of AHL, Clinical Pathology and Toxicology/ Soil & Nutrient, participated in 22 different PT programs. Note that multiple sets of samples were tested within each PT program.

In 2018/19, AHL reported over 2,500 chemical PT results. Either the OMAFRA soil PT program results or NAPT proficiency sample results are included in these totals, since the OMAFRA soil PT program is based on NAPT proficiency samples, including results from both programs would double counts results. A summary of chemical PT results is available for on-site review.

Overall the chemistry results are as follows:

1. Satisfactory: 98.5% (96.1% acceptable and 2.4% questionable)
2. Unsatisfactory: 1.5%

Biological PT programs

In 2018/19, AHL reported 264 biological results or panels in 28 programs. The number of proficiency samples was similar to last year.

Overall the biology results are as follows:

1. Pass: 98.4%
2. Fail: 1.6%

5.2.9 AHL Testing Data

AHL Testing Data is held in compliance with Article 13.0 of the Agreement.

5.2.10 Resources to Administer AHL

The AHL confirms that it has the necessary resources, including technical and support staff, to administer the AHL. Dr. Grant Maxie has provided outstanding leadership and support of the governance structure of the AHL as the AHL PMC Co-Chair for 2018/19 year. With Dr. Maxie's retirement, Dr. Maria Spinato has been appointed as the new AHL Director and Co-Executive Director of Laboratory Services Division, as well as the AHL PMC Co-Chair.

5.3 Key Performance Indicators

5.3.1 Biennial Client Satisfaction Survey

The Biennial Client Satisfaction Survey measures the level of satisfaction of AHL clients with the services provided and leads to actions needed to address areas for improvement. This performance measure includes assessment of the effective communication of test results to AHL clients. The target is 100% of action requests to be considered by the AHL PMC, and, where appropriate, implemented by the University of Guelph within a year. The Biennial Client Satisfaction Survey was last completed in Fall 2017 and is due again in the Fall of 2019.
In 2017, Dr. Jim Fairles (AHL Client Services Veterinarian) presented an update at the Feedback Group meeting on the 2017 survey that was sent to 1,474 clients with 120 responses (good response rate for an email survey). Overall level of satisfaction with AHL service was **93.3%.**

Items suggested for client satisfaction improvement were in the areas of:

- Specific test turnaround times;
- Extended courier services;
- Use of diagnostic plans;
- Continuing to streamline reports;
- Communication of new tests, test use, and trends;
- Enhanced bacteriology susceptibility testing; and
- Continued enhancement of online submissions.

Overall, client feedback was that the AHL provided excellent service. Two example charts from the 2017 Biennial Client Satisfaction survey report are provided below.

The Biennial Client Satisfaction Survey overview of feedback and action taken were also addressed at the annual AHL Feedback Group meeting in December 2018 (AHL Feedback meeting documentation provided below).

Figure 5.1: Survey Results 2008-2017, Average Overall Level of Satisfaction with AHL Service

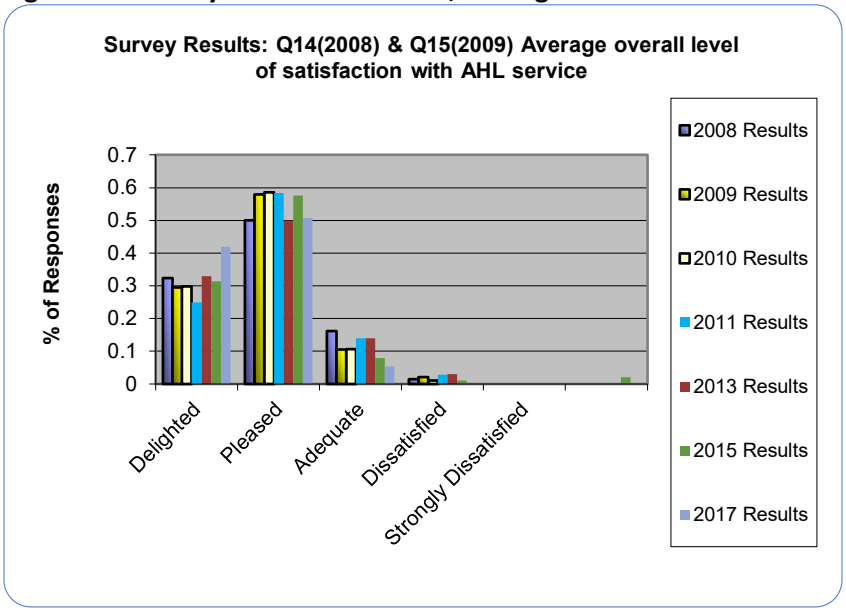
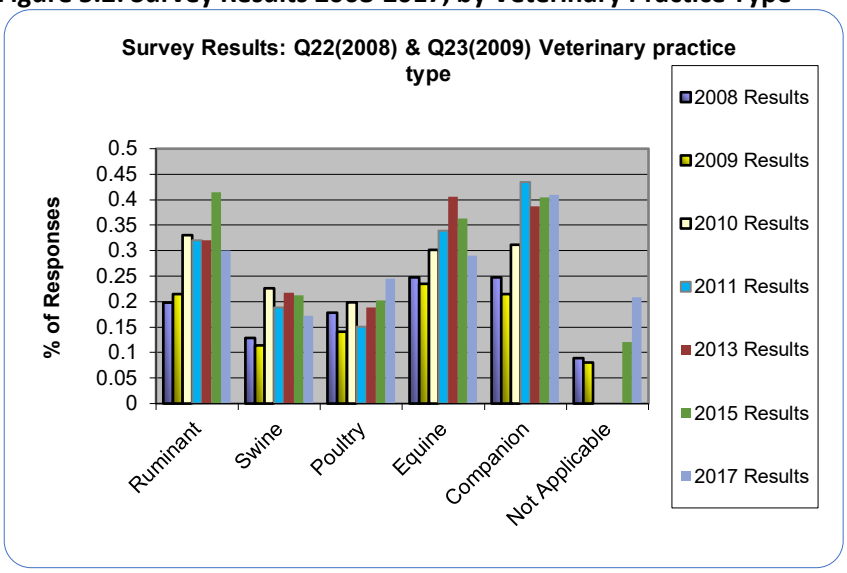


Figure 5.2: Survey Results 2008-2017, by Veterinary Practice Type



As a documented form of feedback on client service, minutes of the bi-monthly AHL/OVC-HSC/PBI liaison meetings (AHL, OVC Health Sciences Center, and Pathobiology) and the annual AHL Feedback Group meeting (of which a range of AHL clients attend) were reviewed. Meeting minutes are available upon request. Satisfaction is high with the timeliness of communications.

AHL Feedback Meeting, December 5, 2018
List of Participants:

OMAFRA – Dr Christa Arsenault

Species group presidents
- Small Ruminant vets (SRVO) – Dr. Amy Gaw
- Equine Vets (OAEP) – Dr. Tovah Caldwell (absent)
- Bovine Vets (OABP) – Dr. Jessica Gordon
- Swine Vets (OASV) – Dr. Ed Metzger
- Poultry Vets (OAPV) - Dr. Chanelle Taylor

Large volume clients
- Hendrix Genetics - Dr. Genevieve Huard
- South West Ontario Vets – Dr. Ed Metzger

Veterinarians from private practice
- Bovine veterinarian – Dr. Rob Swackhammer – unable to attend
- Small Ruminant Vet – Dr. Rex Crawford – unable to attend
- Poultry vet – Dr. Alex Weisz – unable to attend
- Equine vet – Dr. Keith Colquhoun
- Small Animal vet – Dr. Bianca Ferenczy and technician Brittany Tartaglia
- Swine vet – Dr. Ed Metzger

Ontario Veterinary College
- Pathobiology – Dr. Brandon Plattner
- Large Animal – Dr. Dan Kenney
- Small Animal – Drs. Luis Gaitero and Tom Gibson – unable to attend
- Ruminant Field Service – Dr. Stephen LeBlanc – unable to attend

AHL
- OAHN coordinator – Dr. Kate Todd
- Client Outreach tech – Josie Given
- Client Services tech – Rina Pigozzo
- Client Services Veterinarian – Dr. Jim Fairles
- Director – Dr. Grant Maxie

The 2017 Biennial Client Satisfaction Survey assessment and the 2018 Feedback Group meeting identified the following action items and the continuous improvement outcomes, as outlined in Tables 5.8 and 5.9.

Table 5.8: 2017 Biennial Client Satisfaction Survey Assessment Action Items and Outcomes

2017 Action Items	AHL Improvement Outcome Response
1. Work on diagnostic plans, and vet education re test requests	Ongoing – bovine and ovine completed
2. Sample receipt for meat inspection submissions	Done
3. LabNote on antimicrobial susceptibility testing in mastitis	In progress
4. Clin path: Revisit progesterone testing for bovine, skinny bovine metabolic profile	Discussed with Clin Path – usefulness? Have food animal price for prog? Research ongoing. Met profile would not come down much in price if fewer used (KR).
5. Promote milk QA program, more clinics should be participating	Ongoing (had drop off since user pay / voluntary) – continuing to provide info in newsletter and to OABP
6. e-forms/client portal, address ability to edit until samples physically received @ AHL	Partial – IT issue with implementing – currently not possible
7. Improve communication when testing delayed for any reason	Done - test in red – pending results
8. Extended antibiotic panel	BacT can set up extended panels if asked (nothing automatic yet) – continuing client education
9. Offer trending abilities	Addressed with client portal for some clients
10. Suggest offering ELISA testing for hemorrhagic enteritis virus for turkeys	On AHL priority testing list low priority
11. *Bordetella avium* PCR and *Ornithobacterium rhinotracheale* PCR	On AHL priority testing list low priority
12. *Pasteurella multocida* AGID	On AHL priority testing list low priority
13. Subsidize AI and NDV suspect-negative PCR testing to encourage veterinarians to submit more samples for surveillance	Surveillance issue – passed to OMAFRA - AIV testing was encouraged and subsidized by OMAFRA, but not NDV testing
14. Chicken Astrovirus – VN or other test	On AHL priority testing list low priority
15. Further comparison of viral sequencing would be useful in some cases, to supplement the use of GenBank reference virus evaluation	WGS coming online in the future
16. PHAC *Salmonella* serotyping delays	Discussed with PHAC – AHL has 2 PCRs for *S.* Enteritidis and Typhimurium
17. Faxing PM submissions and aligning with cases	Procedure is in place
18. Provision of OHSP sampling supplies	Ongoing discussions on availability in Spec room
19. Re-evaluating avian bacterial susceptibility panel	As far as AHL can go, following CLSI guidelines
20. Slow to wait for culture and susceptibility result	Interim results are being sent – advise if not being received

Table 5.9: 2018 Feedback Group Meeting Action Items and Outcomes

2018 Action Items	AHL Improvement Outcome Response
1. Milk culture into DairyComp, any chance for blood, Johne's, BLV to be auto-added? How difficult to program?	Ongoing – discussion with CanWest DHI
2. Look into expanding the susceptibility panels to include amoxicillin and enrofloxacin	Enrofloxacin added but still no CLSI guidelines for all bacteria
3. Brandon Plattner- data-mining of interest	Pathologists do have ability to do this – training from MH
4. Comment from OAPV: *Salmonella* testing, false-negative results, negative the next time (worried about cross-contamination). Get examples of *Salmonella* result discrepancies and address.	AHL has set up several mitigating procedures for all bacteriology testing re contamination. In cases where there are questions – AHL can follow up if issues.
5. investigate adding more information/pathologist comment on PCR Ct value results for greater understanding of *Coxiella* and *Chlamydia*	Future LabNote, and there is a notation on reports for all *Coxiella* and *Chlamydia* results
6. Investigate expanding in-house culturing QA to urine	Ongoing along with parasitology
7. InfoView search for all rabies and canine influenza results in given timeframe – investigate	This will work with the correct search criteria – more information needed
8. Is every 4 hrs still needed for OCVO reportable list, too many emails	Move to 9 AM and 3 PM daily - Done
9. Attempt to frame/work with beef industry to promote PIDs, make it a QA factor	Ongoing - starting with swine and dairy as easier wins
10. Investigate *Salmonella* sequencing and ways to find efficiencies in getting results back sooner	WGS validation in progress – this will be a future consideration
11. Peptone water – in glass bottles – break on farm, plastic bottles	Discussion with Linda Little – current large inventory of glass bottles
12. Trending solution needed in view of Hendrix LIMS delay	Ongoing – they currently use eform – reassess after LIMS upgrade
13. A mobile app with a searchable list of tests would be fantastic – it's difficult to have the lab submission book with you on the road / it's not the easiest to search through (but this is being very picky)	The future! – will continue to explore apps
14. Equine performance panel with appropriate vitamins and minerals for athletic horses, e.g., selenium	Exploring – more information needed. Toxi currently validating vitamins E and A
15. Starting to see slower turnaround times - free T4 is especially frustrating only being run once per week (on Monday) - that means we only have Tues, Wed and Thurs to get those samples to the lab (Friday won't work because they sit on the truck) and Monday means a 2-wk turnaround time - owners get frustrated with this	Lab resources issue – we can send out if quicker TAT needed

5.3.2 Relevant Test Results and Reporting Times

In 2018/19, AHL continued to provide excellence in meeting Service Level Standards and quality for routine tests, assessed through multiple measures: the number of tests, case and test load distribution by species, and compliance with Service Level Standards. The target is 95% of routine AHL tests meeting the published Service Level Standards. The AHL Service Level Standards reporting includes service levels from external testing facilities in the target reporting, which creates a potential unknown report variance. In 2018/19, the AHL exceeded the standard, with 97.6% of tests meeting the expected Service Level Standards.

AHL provides excellence in turnaround times on routine tests for all clients and Ministry testing needs. AHL responds to client needs through input collected from a number of sources, including: AHL feedback group meetings, the biennial client satisfaction survey, as well as direct daily feedback from AHL clients.

Turnaround Times (TAT)

Turnaround time is one of the most critical measures of a laboratory's effectiveness and efficiency. Client loyalty is often based on this one aspect of service. Given the large number of tests and services provided, it is often a challenge to maintain turnaround time and manage clients' expectations.

The AHL proactively measures and analyzes their TAT performance to identify areas needing improvement. A component of the AHL's AAVLD accreditation is an analysis of adherence to quoted TAT expectations as published in the AHL User's Guide and Fee Schedule. Compliance with published turnaround times from the AHL Laboratory Information Management Systems (LIMS) was 97.6%. A detailed explanation of the 2018/19 TAT statistics report is available upon request.

Tables 5.10 to 5.12 and Figures 5.3 to 5.4 provide additional information on the number of tests, the caseload and procedure distribution by Lab Section and the caseload and procedure distribution by Species.

Table 5.10: Overall AHL Caseload Distribution, May 1, 2018 – Apr 30, 2019

Number of Cases	75,788
Number of Procedures	846,972
Number of Tests	~1,000,000

Table 5.11: AHL Caseload Distribution, by Cases and Lab Section, May 1, 2018 – Apr 30, 2019

AHL Function	Number of Cases
Clinical Pathology	21,910
Virology	17,705
Bacteriology	14,671
Histotechnology	5,758
Toxicology	3,730
External	3,473
Parasitology	3,226
Anatomic Pathology	3,138
Mycoplasmology	2,177
Total Cases	**75,788**

Table 5.12: AHL Caseload Distribution, by Procedures and Lab Section, May 1, 2018 – Apr 30, 2019

AHL Function	Number of Procedures[17]
Virology	549,822
Clinical Pathology	83,472
Bacteriology	72,969
Toxicology	56,744
External	29,941
Histotechnology	26,345
Mycoplasmology	13,773
Parasitology	7,617
Anatomic Pathology	6,289
Total Procedures	**846,972**

[17] Procedures such as profiles include multiple tests.

Figure 5.3: AHL Caseload Distribution, by Cases and Species, 2018/19

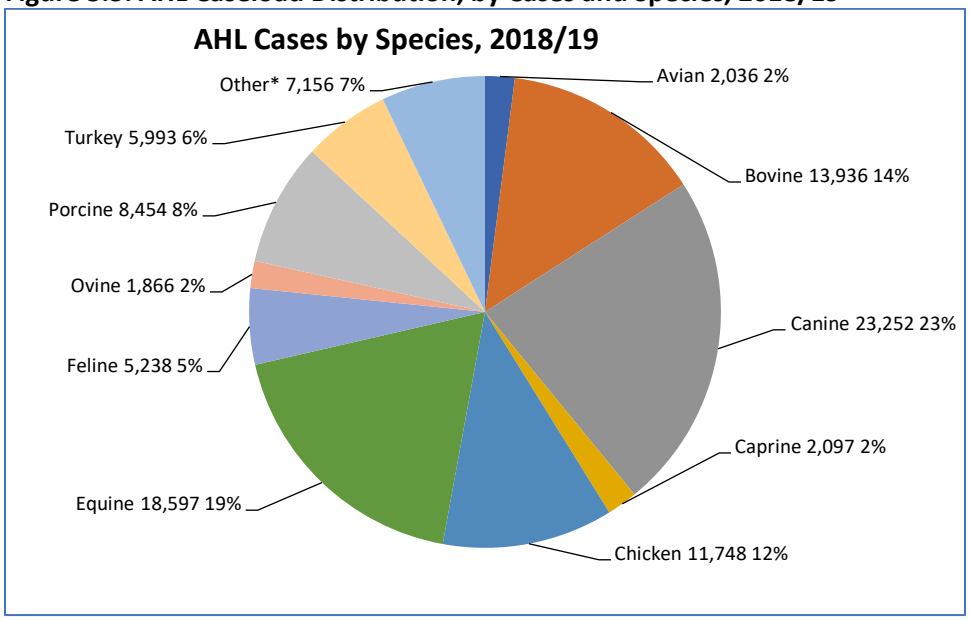
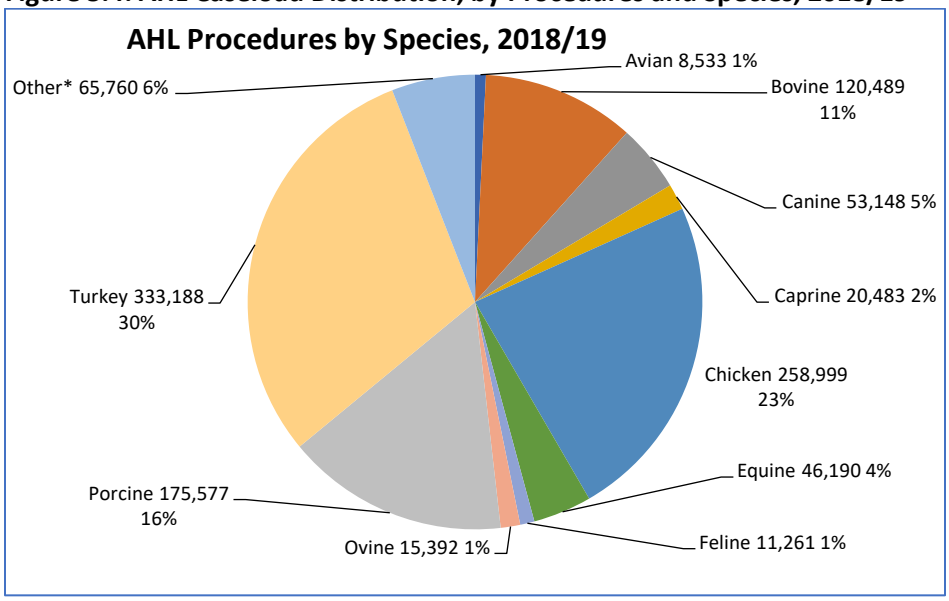


Figure 5.4: AHL Caseload Distribution, by Procedures and Species, 2018/19



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

5.3.3 Comprehensive Database

The AHL is responsible for uploading accurate and accessible data. Results of testing of Ontario food animal submissions are housed in a data warehouse accessible to OMAFRA. The AHL designs Web Intelligence (WebI) searches for OMAFRA to access disease events and disease trends within data stored in the warehouse. Dr. Tim Pasma, OMAFRA Epidemiologist, is an active member of the WebI Users Group.

The information below summarizes the number of cases reported by the AHL where data was inaccessible or system issues were encountered, and the portion of issues resolved. The target for this metric is 100% of issues resolved. AHL met this target in 2018/19.

Reported cases where data was inaccessible or issues with the system were encountered:

- 2018-05-08 – received an auto alert for a case with *Bordetella bronchiseptica* (which is not alertable), coded to prevent future occurrences – **Completed**
- 2018-07-05 – requested auto alerts for Influenza A, matrix PCR test, for all species (not just birds) – **Completed**
- 2019-03-27 – requested auto alerts for *Brucella canis* RSAT tests where 2ME-RSAT test is positive, also requested access in LabVantage – **Completed**

5.3.4 Premises Identification (PID)

The AHL performance indicator for the 2018/19 year for the provision of PID when available or equivalent information sufficient to identify and trace the source of the sample requested by the University, is measured by the number of PIDs in the database reported as a percentage for each species group. The target established in Year 1 was the 2018/19 Percentage of PIDs Available by Commodity. Table 5.13 shows the results and the newly established targets.

Table 5.13: Premises Identification, Percentage of PIDs Available by Commodity, 2018/19

Commodity	Percentage of PIDs Available (%)	Target (%)
Swine	53.7	53.7
Cattle	11.2	11.2
Small Ruminant	4.4	4.4
Camelids Cervids Rabbits	0.4	0.4
Avian (Chicken, Turkey, Other)	0.0	0.0
Fish / Bees	0.0	0.0

5.3.5 Emergency Simulation, Exercise and Response

This performance indicator addresses AHL's ability to effectively carry out its responsibilities for emergency simulation, exercise and response to effectively support the Ministry. It also looks at AHL's ability to develop continuous improvement action requests through simulation/exercise evaluation report. Areas of improvement are identified by the Ministry and the University in

response to AHL's participation in Incident Management System (IMS) simulation exercises. The target is 100% of action requests are implemented by the University within one year. Actions were developed, as agreed with the AHL PMC, to address recommendations in 2018/19, with an outcome of 100% of the action requests implemented by the University within the year, as reported below.

Summary Report: AHL Guelph Postmortem Laboratory
Foreign Animal Disease (FAD) Tabletop Exercise
Simulated diseases: "Bleeding Pig Disease" and "Rattling Chicken Disease"
April 24, 2019

The purpose of the exercise was to review responders' ability to manage an integrated emergency response to a FAD suspect at the University of Guelph. Overarching agency-specific objectives included:

1. Display the AHL's ability to rapidly identify and contain a FAD suspect carcass/sample, and to execute emergency notification of regulatory animal health agencies (CFIA and OMAFRA), Department of Pathobiology, OVC-HSC Teaching Hospital, and the University of Guelph Campus Control Group.
2. Display the ability of CFIA District Office staff to provide logistical support by transferring suspect samples to NCFAD for confirmatory testing, and to activate local CFIA FAD emergency response.
3. Display the ability of OMAFRA to activate FAD emergency response protocols for an immediately notifiable disease.
4. Display the ability of OVC to support the needs of DVM students and HSC clients in the event of a FAD event in Building 89.
5. Display the ability of the Campus Control Group to respond to the emergency by supporting the needs of staff and students working in PAHL Building 89, and to implement movement controls, as needed.

This emergency exercise format was selected as a response to the recommendations and action items from the 2018 FAD hot wash, at which time significant gaps in notification and co-ordination were identified among the various agency partners.

Other recommendations and action items arising from the 2018 FAD exercise:

1. It is recommended that all personnel (staff and students) that are not directly involved with the FAD investigation are asked to leave the PM suite and that no other individuals are permitted to enter from the change rooms. This will help avoid well-meaning individuals from inadvertently exposing themselves, reduce the potential contacts and trace back requirements.

   Completed: SOP AHL-002 Postmortem Procedures Manual revised to address containment and exposure risks: sections 9.3.3 and 9.3.14.

2. Directions to the client about the FAD, (possibly a handout about next steps and Biosecurity SOPs should be given). The SOPs should consider limiting potential spread of disease from their farm until there have been results either way. Discussion should include: why AHL may ask them to wait >1 hour while sampling is done, how to prevent disease spread by themselves, their vehicle or equipment, about whether or not they have a visitor log book to help with potential trace back and who will get back to them and on what timeline.

   Completed: Handouts and infographics related to poultry biosecurity and disease risk have been developed by OAHN and available at AHL to be supplied to producers: https://oahn.ca/resources/oahn-general-small-flock-resources-2019/.

3. When going through the CFIA hardcopy binder, Avian Influenza procedures were found but not one for Newcastle disease.

   Completed: Newcastle disease tissue collection procedure located and filed.

4. When the Pathologist was taking samples, there was not enough/adequate PPE in the truck bay for her to completely kit herself, (missing hairnets).

   Completed: PPE in truck bay stocked for emergency use.

5. When samples were taken in the truck bay, larger Ziploc bags were needed to double bag samples for shipping and 2 extra people are needed to hold bags open as the pathologist was putting samples in the bags to prevent cross contamination.

   Completed: Appropriate supplies stocked in truck bay for emergency use.

AHL Guelph Tabletop FAD Exercise
April 24, 2019

Participants
OMAFRA: Cathy Furness, Christa Arsenault
CFIA: Charanjit Talwar, David Orr
OVC: Brandon Lillie, Joanne Hewson
U of G Campus Control Group (EHS): Jennifer Wesley
AHL: Grant Maxie, Maria Spinato, Emily Martin, Megan MacAlpine, Jim Fairles, Jen Zoethout, Kate Todd, Andrew Brooks

A tabletop exercise handbook was prepared for the emergency simulation and was supplied to participants in advance of the exercise. The exercise consisted of a PowerPoint presentation by G. Maxie, M. Spinato and E. Martin that followed the path of a suspected case of "bleeding pig disease" and "rattling chicken disease" and the procedures AHL has established to manage the risk of a FAD event. Each partner agency (OMAFRA, CFIA, OVC, CCG) provided their anticipated response. Subsequently, the exercise was expanded to discuss potentially disruptive scenarios that included: quarantine of building 89, traceback/traceforward of potentially exposed external (producers, service providers) and internal (students, faculty, clinicians) personnel, in addition to communication strategies.

The following action items were developed in response to discussion arising from this tabletop exercise:

1. Tracebacks and Containment:
    a. Who is Victoria Wentzell's back-up at the OVC-HSC for electronic key card records should we need to review who entered/exited the postmortem suite and determine who was exposed to a FAD? She can also alter access to critical zones such as FAD lab hallway to limit entry to critical personnel only. Function out-of-hours? Also, who is the contact for PM suite ventilation should there be a need to alter air flow differentials? J. Wesley indicated that EHS also has access to swipe card records. **Action – AHL, OVC.**
    b. Clients may drop off samples and then go around the side of the building and enter the main high traffic areas to use the washroom or buy a coffee. How can this potential cross contamination be contained? **Action – AHL, OVC.**
    c. The Ag assistants drop off cases after hours and then return to the clinics. Is there a disinfection procedure they should follow? **Action – OVC, AHL.**
    d. To improve biosecurity at AHL, is it feasible to promote use of boot baths, hand disinfection, and washing truck tires of producers and vets that arrive with samples obtained on farm? **Action – AHL.**

2. Notifications:
    a. CFIA has requested that AHL ensure that the full address of the owner is entered into the case record before sending notification via LIMS. If low-risk FAD suspect, CFIA won't necessarily contact vet or producer. They will contact District Vet of submitting farm to provide a heads-up when case is sent for confirmatory negative testing. **Action – AHL.**
    b. CFIA indicated upon review of AHL-OMAFRA-CFIA-OMHLTC Animal Health Incident Reporting Protocol that it requires updating: Ontario Operational Specialist manager, Guelph Dr. Scott Barden needs to be replaced with Dr. Janine McLearon. **Action – AHL: Completed.**
    c. Dr. Talwar has promised that he will ensure that a back-up is identified on his e-mail message when his is out of the office. **Action – CFIA.**
    d. CFIA indicated that when arranging for pick-up of samples, their notification system includes a different list of contacts depending on the disease involved. Important to also notify the CFIA FAD specialist. **Action – CFIA, AHL.**
    e. OMAFRA emphasized that Ministry of Health and Long- Term Care needs to be notified in the event of an exposure to a potential zoonotic pathogen, such as high path avian influenza or novel influenza strains. This requirement is already included in the AHL-OMAFRA-CFIA-OMHLTC Animal Health Incident Reporting Protocol. **No Action Required.**
    f. OMAFRA staff indicated that Leslie Woodcock is not informed via OCVO notification; OMAFRA Animal Health Vets will inform her based upon risk assessment. Question: Is the e-mail notification of OMAFRA Animal Health Vets sufficient in the event of a rapidly-occurring FAD emergency? Any option of telephone access? Currently, only Dr. Woodcock's phone # is provided in the Reporting Protocol. **Action – OMAFRA.**
    g. OMAFRA has a flow chart indicating chain of command. It would be useful to draft a similar flow chart for communication within the University. J. Wesley of the Campus Control Group (CCG) indicated that there is an internal communications tree for the CCG so that information can be distributed quickly across campus. Once there is awareness of an outbreak on campus, there will be concerns regarding Human Health and Safety (in-contact staff and ancillary workers), and that having messaging prepared in advance would aid in speed of information distribution. There is an incident command system on campus that would ramp up in emergency situations. Ministry of Health is another partner that would talk to exposed students and staff. **Action - AHL, OVC, CCG.** The flow chart in the Emergency Management Plan provides information about the UofG plan: https://www.uoguelph.ca/police/sites/default/files/2016%20Emergency%20Management%20Plan.pdf . The emergency management plan also outlines the university's use of the incident command system and plan maintenance, review, and testing.
    h. Once a FAD is confirmed, OMAFRA provides support to CFIA in a joint incident command. Recommend that CFIA and OMAFRA work on drafting FAD message so it is ready in the event of an outbreak. **Action – CFIA, OMAFRA.**

i. Question: How to find an AHL on-call person? Phones are answered Mon-Fri 8:00-18:00 and Sat/Sun/Holidays 9:00-17:00. Does AHL require additional on-call capability in the event of a FAD emergency? **Action – AHL.**

j. Control of rumors spread via social media will be difficult. In the event of a FAD occurrence that has potential University-wide impact, the Campus Control Group would take the lead on communications. Jane Dawkins is the local OVC social media contact who will address questions specific to OVC. OMAFRA advised working on a blanket message in advance that can be immediately available for dissemination when rumors are spreading due to yellow-taped quarantine zones. These messages will need to be approved by CFIA prior to release and might need to be tailored to the specific disease (i.e., level of risk to same or other animal species, as well as zoonotic potential). **Action – AHL, OVC, CCG, CFIA.**

3. Postmortem Risk Assessment:
    a. Dr. Lillie indicated that it is unlikely that PBI would be involved in primary FAD identification, except perhaps for the higher risk posed by backyard poultry and pet pigs which are both increasing in popularity. Therefore, it may be advisable to perform postmortems on PBI backyard poultry cases in one of the restricted PM rooms to facilitate containment, if feasible and space is available**. Action – OVC and AHL**.
    b. B. Lillie and J. Hewson both agreed that PBI's primary focus should be on managing risk of exposure of students, clinicians, faculty, and researchers to FADs in the PM suite. Training for 1st year students entering the PM suite for labs should emphasize infection control, appropriate decontamination protocols. This training should be repeated in subsequent years to instill these critical principles. **Action – OVC**.

4. Business Continuity:
    a. Concern was expressed by OVC regarding the impact on teaching function if the PM suite, building 89, and/or OVC-HSC were closed due to quarantine because of an FAD outbreak. Closures that impact the curriculum would adversely affect the image of OVC and therefore, the Dean or Associate Dean should be informed ASAP should this occur. **Action – OVC, AHL.**

5. Miscellaneous:
    a. B. Lillie indicated that additional discussions will be required with CWHC as this is a separate entity (not involved in PBI operational discussions) whose staff use the postmortem suite daily. **Action – AHL.**
    b. J. Hewson indicated that representatives from OVC-HSC should be involved in future FAD emergency management discussions, as its mandate differs from that of the Dean's administrative office. **Action – AHL, OVC.**

AHL-Kemptville FAD Simulation
August 21, 2018

On August 21, 2018 the 8th annual foreign animal disease (FAD) exercise was held at AHL-Kemptville (AHL-Kv). The simulated disease was bovine foot and mouth disease.

AHL-Kv Participants:
Dr. Andrew Brooks (Pathologist/Lab head)
Dr. Jan Shapiro (Pathologist)
Tom McLean (Client Service Representative/PM Technician)
Debbie Scissons (Client Service Representative/PM Technician)

External Evaluators:
Dr. Ines Walther, National and OIE Reference Laboratory for Scrapie and CWD, Ottawa Laboratory Fallowfield, CFIA
Dr. Maria Pienkowski, Operations Branch, Ottawa District Office, CFIA

Objective:
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 SOP. Note: This SOP has been replaced by AHL-002 Postmortem procedures manual.

Overall Assessment:
The exercise was successful, and the objectives were completed. The exercise was a valuable training experience for AHL-Kv staff. The evaluators provided detailed and useful feedback.

The exercise began at 9:00 AM and ended at ~ 12:00 PM. Evaluators were distributed between the office, reception, and postmortem areas to observe the various activities during the exercise. Evaluators provided comments during the exercise followed by written reports.

General Comments from Evaluators:

Dr. Walther: "The Animal Health Laboratory–Kemptville is to be commended for their continued efforts in refining and adapting their processes with respect to the FAD SOP (AHL-K-016). The staff informed the auditors that both the Guelph and Kemptville campus will be establishing unified SOPs and that this is the final year that this specific SOP will be audited. My suggestions within the attached documentation (Excel spread sheet) are to be taken as such. They are based on my observations during the audit and will hopefully prove beneficial and useful as the staff adopts the new unified SOP. No major issues were identified, and the staff are well-versed in the steps of handling a suspected FAD case."

Dr. Pienkowski: "Overall your laboratory seems to be very efficient in completing the FAD exercise".

Action Items arising from the Exercise and Evaluator Comments:

1. Determine if specific instructions are required in *AHL-002 Postmortem procedures manual* for situations in which the pathologist suspects a reportable disease some time after the postmortem has been completed.
2. Repair as required the cracks in the wall near the PM room sink.
3. Investigate options for disease reporting and communications if the AHL-Kv PM phones are not working or if there is an interruption of internet service.
4. Review procedures for disinfection of the small stock room (containing supplies and electronic equipment) in the AHL-Kv postmortem room and revise SOP accordingly.
5. Investigate replacing Virkon with a peroxide disinfectant at AHL-Kv.
6. Review procedures for transferring sample containers out of the PM room and evaluate whether additional practice is required (i.e., more often than the annual exercise).
7. Investigate whether a work instruction is required in the AHL-Kv postmortem room to aid preparation of disinfectants at various concentrations and volumes.
8. Ensure filled soap dispensers are present at laboratory sinks.
9. Verify that all AHL pathologists are aware of how to report diseases to CFIA within the LIMS.

5.3.6 Emergency Response – After Action

AHL continued to support the Ministry effectively, carrying out responsibilities under the emergency simulations through the development of new tests required to address urgent incidents and improving response capability in the future. Additionally, AHL provides responsiveness to serious food safety events using existing testing methods, as well as working to improve response capabilities in the future.

The Ministry will evaluate AHL's response to, and management of significant, unanticipated or urgent situations or events of animal health emergencies. This includes any requirement for the development of new tests or test methods, against criteria, including timeliness, effective diagnoses, communication of test results monitoring and reporting. Areas of improvement are identified by the Ministry and the University in response to evaluation. The target is set at 100% of action requests meet implementation targets set by the AHL PMC.

In 2018/19, there were no major emergency incidents for AHL to respond to. AHL continues to undertake emergency preparedness in the event of a major emergency incident. Thus, there were no required after action evaluations, lessons learned or action requests after a major emergency incident. AHL continues to engage in effective scanning surveillance for animal health risks, as well as emergency simulation, exercises and simulation response evaluation, ensuring readiness for emergency responsiveness to a major incident.

5.4 Program Reporting Requirements

5.4.1 Biennial Client Satisfaction Survey

Biennial Client Satisfaction Survey information is provided in Section 5.3.1.

5.4.2 Emergency Simulation Exercise and Response Report

Reporting on the annual simulation exercise conducted at the AHL and response evaluation is provided in Section 5.3.5.

5.4.3 Emergency Response - After Action Report

Reporting on the Emergency Response – After Action report is provided in Section 5.3.6.

5.4.4 OAHN Reports

The OAHN expert networks report annually at the AHL PMC meetings. They are archived with meeting minutes and are available on request.

5.4.5 OAHN Projects

Each of the 10 OAHN expert networks could apply for up to $25,000 annually, to conduct a project on a perceived gap in surveillance in their commodity. Table 5.14 list the OAHN Projects funded in 2018/19. Results of some of these projects were presented at various industry meetings, published in journals, and on the OAHN website.

Table 5.14: 2018/19 OAHN Projects

OAHN Expert Network	Project Description	Project Leader	Amount
Poultry	Evaluating the prevalence of antimicrobial resistance in Salmonella, E. coli and Campylobacter isolates obtained from Ontario small poultry flocks	Csaba Varga	$21,450
Equine	*Neorickettsia risticii* in Ontario: Identifying emerging strains, their diagnosis and environmental risk factors for disease development	Memo Arroyo	$20,000
Small Animal	Update of guidelines for best practices for infection prevention and control in small animal clinics	Maureen Anderson	$10,000
Wildlife	Characterizing the spatial patterns of chronic wasting disease susceptibility in white-tailed deer	Alexandra Reid	$25,000

OAHN Expert Network	Project Description	Project Leader	Amount
Bees	Surveillance of resistant strains of varroa destructor in the population of Ontario honey bees	Paul Kozak	$25,000
Small Ruminant	Development and validation of a new diagnostic test for Toxoplasma identification in small ruminant abortions	Jocelyn Jansen	$10,000
Small Ruminant	Development and validation of a PCR test for small ruminant lentiviruses (CAEV and MVV)	Jocelyn Jansen	$15,000
Bovine	Surveillance of antimicrobial use and prescription practices of Ontario bovine veterinarians	Alexandra Reid, Jim Fairles	$25,000
Swine	Characterization of swine erysipelas isolates from abattoirs in Ontario	Christa Arsenault, Tim Pasma, Durda Slavic, Christine Pelland	$20,850
Wildlife	Rodenticide exposure in non-target wildlife	Alexandra Reid, Claire Jardine	$25,000
Small Animal	Veterinary infographics - antimicrobial stewardship quick references	Maureen Anderson, Emma Webster	$3,632
Poultry	Small poultry flock medicine workshop for Ontario veterinarians	Csaba Varga	$8,300
Equine	Research ON equine	Memo Arroyo	$10,000
Small Animal	Evaluation of pathogen shedding by recently imported dogs	Scott Weese, Maureen Anderson, Emma Webster	$24,700
		Total	**$245,292**

5.4.6 OAHN Communications

During 2018/19, AHL continued to facilitate an integrated and collaborative disease surveillance system in Ontario, through OAHN.

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

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

Most networks consist of an expert from each of OMAFRA, the AHL, OVC, 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 by most networks, combined with AHL and private laboratory data, plus OMAFRA abattoir condemnation data, and are discussed in teleconferences of the expert networks.

During 2018/19, all networks, with the exception of the alternative species network, were active. Networks included:

- Small Ruminants;
- Swine – the OAHN-swine network serves as the Ontario node in the Canadian Swine Health Information Network (CSHIN);
- Poultry;
- Equine;
- Bovine;
- Fish;
- Honeybees;
- Companion Animals;
- Wildlife, in concert with the Canadian Wildlife Health Cooperative (CWHC); and
- Alternative Species/Fur-Bearing Animals – inactive due to decreased activity within these industries.

The majority of networks met on a quarterly basis in 2018/19 to continue their regularly scheduled communications and information sharing. The exceptions include the bee network, which meets twice annually (working groups of the network meet more frequently on specific topics), and the alternative species network, which did not meet due to industry slowdowns in recent years.

Meetings were held every three to six months with OMAFRA co-leads to share and participate in educational programing to enhance network functionality. As well, each of the OMAFRA network co-leads provided an annual report at one of the monthly meetings of the AHL PMC (Leslie Woodcock, Grant Maxie, Jim Fairles, Cathy Furness, Susan Murray). Melanie

Barham/Kate Todd also provided quarterly updates on OAHN communications and collaborative activities, as well as key performance indicator updates.

The OAHN website (https://oahn.ca) has both a public/producer side and a password-protected veterinary side. Documents on the public side, such as quarterly producer/owner reports, are freely accessible on the Web. Quarterly veterinary reports are posted on the private side of the website for veterinarians and RVTs to access. Page views on oahn.ca totaled 56,513; with 189 new registered users this year. OAHN Newsletter subscribers include 1,073 veterinarians, with 1,356 subscribers in total. There were 971,147 social media post impressions (667,006 - Facebook, 304,141 - Twitter), three new podcasts, and 4,200 podcast listens this year. Infographics and factsheets created by the networks were viewed 12,353 times on the website and mailed out in print form to more than 1,000 pork producers. Veterinary medical listservs (bee, fish, and small flock poultry) had 101 new veterinarian members this year, and a total of 144 members.

Integration with National Surveillance

OAHN contributed to the Canadian Animal Health Surveillance System (CAHSS), which is a 'network of networks', in the following ways:

- Grant Maxie (AHL) and Tim Pasma (OMAFRA) are members of the Directors Group and the Core Team;
- Several from the AHL (Maxie, Barham/Kate Todd, Jim Fairles) rate pings for CEZD (Community for Emerging and Zoonotic Disease), which is now included under the CAHSS umbrella;
- Both OMAFRA and the AHL participate in various CAHSS committees – swine, poultry, equine, bovine, web development, infectious disease reporting, vector-borne diseases – that are under development, and are discussing next steps;
- Network Coordinator and Equine network co-lead participate in monthly disease surveillance calls with Equestrian Canada industry group to share OAHN information and support the initiative;
- AHL participates in national level laboratorian conferences to facilitate information and expertise exchange and laboratory enhancements (CAHLN 2018);
- Network coordinator communicates with other provincial surveillance networks every two months throughout the year; and
- Network projects are reviewed at CPHAZ conference and network members and co-leads attend to develop connections with public health and other medical professionals.

5.4.7 KTT and Learning Opportunities

AHL continues to engage in committee and scientific meetings, which contribute to increased knowledge and expertise, and contribute to a “One Health” approach to animal health.

The KTT Learning and Opportunities reporting illustrates the knowledge and expertise gained by AHL staff throughout the 2018/19 year. The measure for the reporting requirement outlines the number of opportunities for engagement and knowledge transfer that took place during the year.

AHL maintains a list of staff participation in national and provincial committees and scientific meetings. It also includes information regarding staff holding officer roles in these organizations. Two international organizations are included: American Association of Veterinary Laboratory Diagnosticians (AAVLD) and the American College of Veterinary Pathologists (ACVP), given that participating in these organizations contributes to international and thus national policy. This tabulation is otherwise limited to national and provincial bodies or committees to which AHL veterinary staff members belong. Many AHL staff are also ordinary members of various international organizations and local organizations, which have not been included.

Participation in the large number of provincial and national veterinary organizations provides an opportunity to interact with both private practitioner colleagues, as well as industry and brings a laboratory perspective to the issues of the day that impact or inform policy development. OMAFRA representatives are usually present at these meetings as well, and both AHL and OMAFRA staff participate in and share information within all of the OAHN expert networks.

KTT and Learning Opportunity Highlights

- 17 of 20 AHL vets/supervisors participated in 119 meetings of 34 international and 85 national organizations (total 1,041 hrs.). 18 of 20 AHL vets/supervisors participated in 179 meetings of 26 provincial organizations (total 600 hrs.).
- All 20 AHL vets/supervisors participated on federal and/or provincial animal health strategy committees, and 20 attended meetings or conferences for these committees in 2018/19.
- Average per staff member = 89.5 meeting hours per year spent on relevant committees, equivalent to 5.1% of available working time (4.8% in previous years).
- Vets/supervisors attended 1 court appearance, had 46 publications, 23 peer-reviewed articles, 46 scientific newsletter articles, 3 podcasts, 31 oral presentations, 7 poster presentations, and 31 tours of AHL.
- Quarterly AHL Newsletter published eight Ruminant, four Swine, seven Avian/Fur/Exotic Species, five Horses, and five Companion animal articles in 2018/19.

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 event at an enhanced level of preparedness – also a key feature of the OMAFRA/UofG Agreement. The AHL and OMAFRA exchange and integrate information from many sources through vehicles such as OAHN, and hence serve as a cornerstone for the larger Ontario Animal Health System and related public health bodies.

Cross-Canada representation is gained through participation in the Canadian Animal Health Laboratorians Network (CAHLN) annual meeting, which includes provincial, university, and federal laboratorians. Other annual meetings held concurrently are the Canadian Association of Veterinary Pathologists (CAVP), the Canadian Animal Health Surveillance Network (CAHSN), and the transmissible spongiform encephalopathy (TSE) Lab Network. This meeting was held in Winnipeg, Manitoba, June 10-13, 2018 and in St. Hyacinthe, Quebec, May 26-29, 2019.

AHL staff members are also 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 and Rina Pigozzo) actively markets the services of the AHL and is in regular contact with clients.

5.4.8 New Tests and/or Method Development

New tests and methods are developed and/or adapted in response to industry needs, and as a result of priorities determined by AHL PMC. Table 5.15 below provides, for 2018/19, a list of the development of new tests, the adoption of tests developed by other laboratories and any AHL PMC approved in-year modifications to tests and methods. Tests are developed in response to industry needs, as approved by AHL PMC.

Table 5.15: New or Improved Tests in 2018/19

Test Name - Method	Code	Species
Bacterial culture, non-food fish	cultfnf	Other
Bluetongue virus Ab - ELISA	btveli	Bov, Cap, Ov
Bluetongue virus/Epizootic hemorrhagic disease virus - PCR	btvehdv	Bov, Other
Bovine abortion panel - PCR (BoHV-1/IBR, *Leptospira, Neospora caninum*)	boabopc	Bov
Brucella ovis - antibody ELISA	xbrove	Cap, Ov
Canine transitional cell carcinoma - (CADET BRAF mutation detection assay)	xctcc	Can
Encephalitozoon cuniculi - PCR	EcuPCR	Bov, Can, Cap, Eq, Fel, Ov, Porc, Other
Encephalitozoon cuniculi - sequence typing	EcuTyp	Bov, Can, Cap, Eq, Fel, Ov, Porc, Other
Fish processing charge, non-food (up to 4 fish)	fpmmf	Other
Infectious hematopoietic necrosis virus (IHNV) - PCR	IHNVpcr	Other
Insulin (RIA) and glucose (photometric)	insgluc	Can, Eq, Fel
ITS rRNA - for fungal/parasite ID	itsseq	Av, Bov, Can, Cap, Eq, Fel, Ov, Porc, Oth
Koi herpesvirus (KHV) - PCR	khvpcr	Other
Lipid profile	lipprf	Av, Can, Eq, Fel, Other
Lymphocyte clonality (1 locus) - PCR	xclnkl1	Can, Fel
Lymphocyte clonality (2 loci) - PCR	xclnkl2	Can, Fel
Minnesota Easy Culture System II-Triplate	minntri	Bov
Neonatal isoerythrolysis - antibody screen (RR)	xnier	Eq
Pasteurella multocida toxin, swine - PCR	pmtpcr	Porc
Porcine circovirus 2,3 - PCR	pcv23rt	Porc
Potomac horse fever, research - rtPCR	xphfres	Eq
Ranavirus - PCR	ranapcr	Other
Salmonella Dublin - antibody ELISA	salmdel	Bov
Scrapie resistance PrP genotyping in deer (codon 96) - sequencing	prpdeer	Other
Scrapie resistance PrP genotyping in elk (codon 132) - sequencing	prpelk	Other
Selenium, blood - ICP-MS	Tsemsb	Av, Bov, Can, Cap, Eq, Fel, Ov, Porc, Oth
Trichomonas gallinae - PCR	tgalpcr	Av
Ureaplasma - PCR	UreaPCR	Bov, Can, Cap, Eq, Fel, Ov, Other

5.5 Conclusion

The Animal Health Laboratory provides a long-standing program that continues to evolve, providing high-value analytical and diagnostic services and expertise to local communities, industry, Canadian universities, provincial and federal government bodies for agricultural, food safety and animal health testing. AHL continues to act as a central source for provincial animal disease trend information and timely dissemination of knowledge to veterinarians, producers and industry groups.

Over the next year, new instrumentation will be brought on-line, and tests will be developed or improved in concert with OMAFRA to prioritize and optimize AHL's test spectrum, e.g. Illumina MiSeq for gene sequencing, Roche FLOW for PCR setup. Additional technical capacity will be hired to support the new instrumentation and test development.

Data quality improvements will continue through encouragement of clients to use the electronic client portal, and AHL will assist clients in capturing premises identification (PID) numbers from their agri-food clients. Emergency preparedness exercises will continue in order to test the level of readiness.

Evolution of the Ontario Animal Health Network (OAHN) expert networks will continue through involvement of the co-leads and sharing of information nationally, e.g., via the Canadian Animal Health Surveillance System (CAHSS).

6 Agriculture and Food Laboratory

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

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

Vision:

We will be a laboratory partner of choice for government and universities in Canada, for agriculture, food safety, and animal health testing. We will also be a leader in providing high-value laboratory services to the private sector in selected niche markets.

Mission:

Working together toward a healthier future … we provide high-value analytical and diagnostic services for the agricultural, food and veterinary sectors.

Taking a steady path strategically, the AFL will continue to leverage both its reputation and services, while aggressively containing costs and taking a targeted approach to increasing third party revenue. The AFL's contribution to its advanced-level technological expertise will continue to differentiate the AFL from its competition.

Leveraging of AFL services benefits both the AFL and OMAFRA through means such as:

Introducing efficiencies in economies of scale

e.g. scope expansion of residue detection methods in both veterinary drug and pesticide residues allows OMAFRA to retain its sampling levels, while receiving improved detection limits and increased compounds in the data. In addition, expanding AFL's current expertise through projects with third party clients allows this new expertise and/or technology to be readily applied to OMAFRA programs, e.g. a novel method for quantifying spotted wing drosophila (SWD) in an OMAFRA monitoring program.

Timely delivery of laboratory test results to allow for optimal regulatory response

e.g. the AFL has met performance indicator targets for over 20 years. Several updates to the results reporting process ensures that OMAFRA receives notification in person of any alertable results obtained by the lab, even if outside of normal working hours.

As the AFL enters the second year of the renewed contract with OMAFRA, insights gained by accomplishments and challenges from the past year will contribute to future direction. Facing the need to replace some significant contract work in the past year, the lab surpassed budgeted expectations in revenue generation while maintaining excellent client retention and a high level of service delivery to all clients. The AFL will continue to focus on client service excellence as a means to securing its current market share and reputation. The AFL will pursue targeted marketing activities to build revenue in identified niche areas. As always, the goal is to continue to build external revenues for reinvestment and sustainability. The AFL continues to develop and maintain partnerships throughout its regulatory partner and private sector organizations to secure its role as a “laboratory partner of choice” across Canada.

6.1 Program Activities and Achievements from 2018/19

The AFL is an active, contributing partner to OMAFRA in their objectives related to the protection of public health and food safety, plant health, the environment and the Ontario economy.

Through the provision of in-house scientific expertise, high-value laboratory services, applied research, method development, and provincially aligned emergency response programs, the AFL aims to support OMAFRA in securing public confidence in the quality and safety of the agriculture, environment and food sectors in Ontario.

Emergency Response procedures at the AFL have been developed to mirror the OMAFRA Emergency Response program. The AFL will continue to develop in the areas of staff training, and continuous updating and improving the program and documentation.

Although no formal exercises were performed in 2018/19, the testing interruptions from building closures due to maintenance issues with CBRE and sporadic power outages have required AFL to regularly communicate these force majeure incidents and negotiate adjusted turnaround times with OMAFRA.

The AFL routine testing, and other activities help to ensure OMAFRA receives reliable laboratory data, while supporting compliance to the regulatory standards and requirements of various Food Safety legislation e.g. Provincial Milk Act, the Food Safety and Quality Act, 2001.

The AFL meets and exceeds the requirement to ensure that all “alertable” test results are reported quickly and accurately to allow rapid response by OMAFRA for situations requiring regulatory action (see Performance Indicators below).

The AFL’s Method Development efforts are designed to meet the changing regulatory standards and requirements that OMAFRA faces in each of its program areas, often with distinct customization at OMAFRA’s request. For example, the Multi-Residue Detection method (2007) has now been replaced. With development and implementation completed, the customized Multiple Target Analytes (MTA) method (2018/19 ducks) will be applied in the coming year to all

target species. This method expands the number of detectable compounds from 35 to 67 depending on species tested.

The evaluation of multiplex PCR techniques to detect Shiga-Toxin-Producing E. coli organisms for the seven most common disease-causing serotypes has resulted in a validated method now available for use by OMAFRA and other clients.

Collaborative research and other projects also expand services available to OMAFRA. Analysis for the development and the expansion of the test panel delivered to the Dairy Farmers of Ontario (DFO) demonstrates the AFL's commitment to OMAFRA to support any program issues that may arise periodically in this industry. The AFL is pleased to be entering its fourth year of contract extension with the DFO and the Ontario Dairy Council (ODC).

A full list of the AFL's support to ensure that OMAFRA maintains public confidence through laboratory research and testing is provided in Appendix C. A few examples are included below:

- Anli Gao, Jennifer Fishcher-Jenssen, Colin Cooper, Honghong Li, Jiping Li, Shu Chen, and Perry Martos. Evaluation of a Multiplex PCR for Detection of the Top Seven Shiga Toxin-Producing *Escherichia coli* Serogroups in Ready-to-Eat Meats, Fruits, and Vegetables. Journal of AOAC International. 2018. 101:1828-1832. (Publication);
- The development of novel Multiple Target Analysis (MTA) for the detection of chemical residues in tissue customized for the Meat Inspection Program/OMAFRA. (Method Development program item); and
- Research project (grant) Development of a novel method for quantifying spotted wing drosophila (SWD) in a monitoring program in stone fruit, grapes and berries and determination of impact of SWD on stone fruit and grape varieties. May 1, 2018 – Present.

The AFL has been keeping OMAFRA updated on the current world-wide shortage of helium gas, particularly, the analytical grade stock used by carbon analysers and mass spectrometry. Throughout 2018/19, we continued to receive fewer tanks of helium than ordered. New instrumentation has been installed at 95 Stone Road that uses argon instead of helium as a carrier gas; specifically, a Leco CN828 carbon and nitrogen combustion analyser. The lab reduced its use of helium by 80%. The lab is confident their risk due to the helium shortage has been significantly reduced.

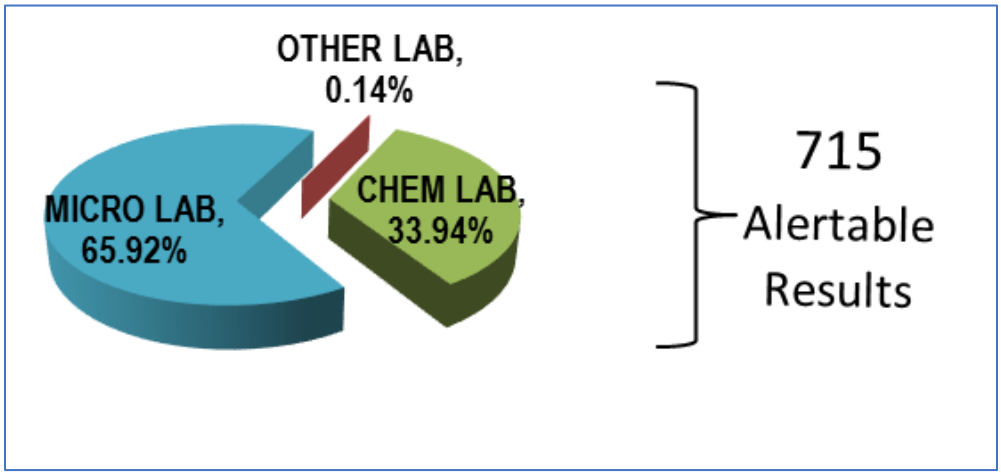
The AFL continues to work with stakeholders and external groups such as the Dairy Farmers of Ontario (DFO) and OMAFRA to protect the industry competitiveness in Ontario. The AFL is providing analysis to the DFO to address the current threat to dairy products for their loss of foamability. This threat has impacted the dairy market across Canada with the risk of lost market share due to alternative or imported products.

The AFL prioritizes maintaining an advanced level of technology (also see Capacity Strategy). By having and maintaining advanced technology in instruments, capacity and expertise, the AFL

is well positioned to respond to OMAFRA's needs, including urgent or emergency situations such as food-borne pathogen outbreaks and investigations (STEC testing protocol), detection of newly developed pesticides (continue to add to the current list of over 500 compounds) or off-label veterinary drug use (implementation of CHARM Quad tests and MTA method).For more than twenty years, the AFL has consistently met the performance measures laid out in the Ontario Agri-Food Innovation Alliance.

The AFL meets and exceeds the requirement to ensure that all "alertable" test results are reported quickly and accurately to allow rapid response by OMAFRA for situations requiring regulatory action. In the 2018/2019 Sampling Plan Year, 99.50% of all tests were reported accurately: 65,086 out of 65,416. The AFL met the **98%** performance target in effectively communicating actionable test results to OMAFRA.

Figure 6.1: 2018/19 AFL Alertable Results Reporting



The lab exceeded the established performance measures in delivering accurate, timely and usable results to OMAFRA. This is demonstrated in Table 6.1. More details can also be found in Section 6.3.

Table 6.1: 2018/19 AFL Performance Measures - High Quality Reliable Laboratory Results

2018-19 KPI Summary	% Tests Meeting TAT[18]	Corrected Reports[19]	Non-Conforming Samples[20]
Meat Inspection Program (MIP)	99.58%	0.31%	0.06%
Foods of Plant Origin (FOPO)	99.52%	0.40%	0.02%
Dairy Food Safety Program (DFSP)	99.53%	0.78%	0.13%
Food Safety Program (Total)	**99.55%**	**0.52%**	**0.08%**
Agriculture Development Branch	99.41%	0.26%	0.00%

Finally, Figure 6.2 on the next page provides an overview of selected performance indicators and accomplishments.

Method Development at the AFL

The Chemistry Research and Development (CRD) section is currently looking at various/new approaches to the analysis of a wide range of target analytes from a wide range of matrices: mycotoxins, pesticides, antibiotics, organometallic compounds, toxic proteins – using nanotechnology-based concepts with automated extraction systems. The goal is to secure an LC-q-TOF for open scan analyses for a wide range of compounds in one run; potentially more than 500 compounds in one injection. CRD is looking at 2020/21 to include a wide range of screened compounds using these new analytical chemistry approaches.

The CRD continues to research a myriad of simple to highly complex target analytes with a wide range of chemistries that can meet the needs of OMAFRA. CRD looks forward to developing new bench and instrument methods, with advanced approaches to data analysis, interpretation and summaries. CRD understands that this information may be of help to OMAFRA in establishing their future method development goals that provide direction and priorities for the AFL.

[18] Measurement: Compliance with the Quality and Service Level Standards and requirements as detailed in the Annual Testing Plan Agreement related to turnaround times (TAT) for screening and confirmation. Target is set at 98%.

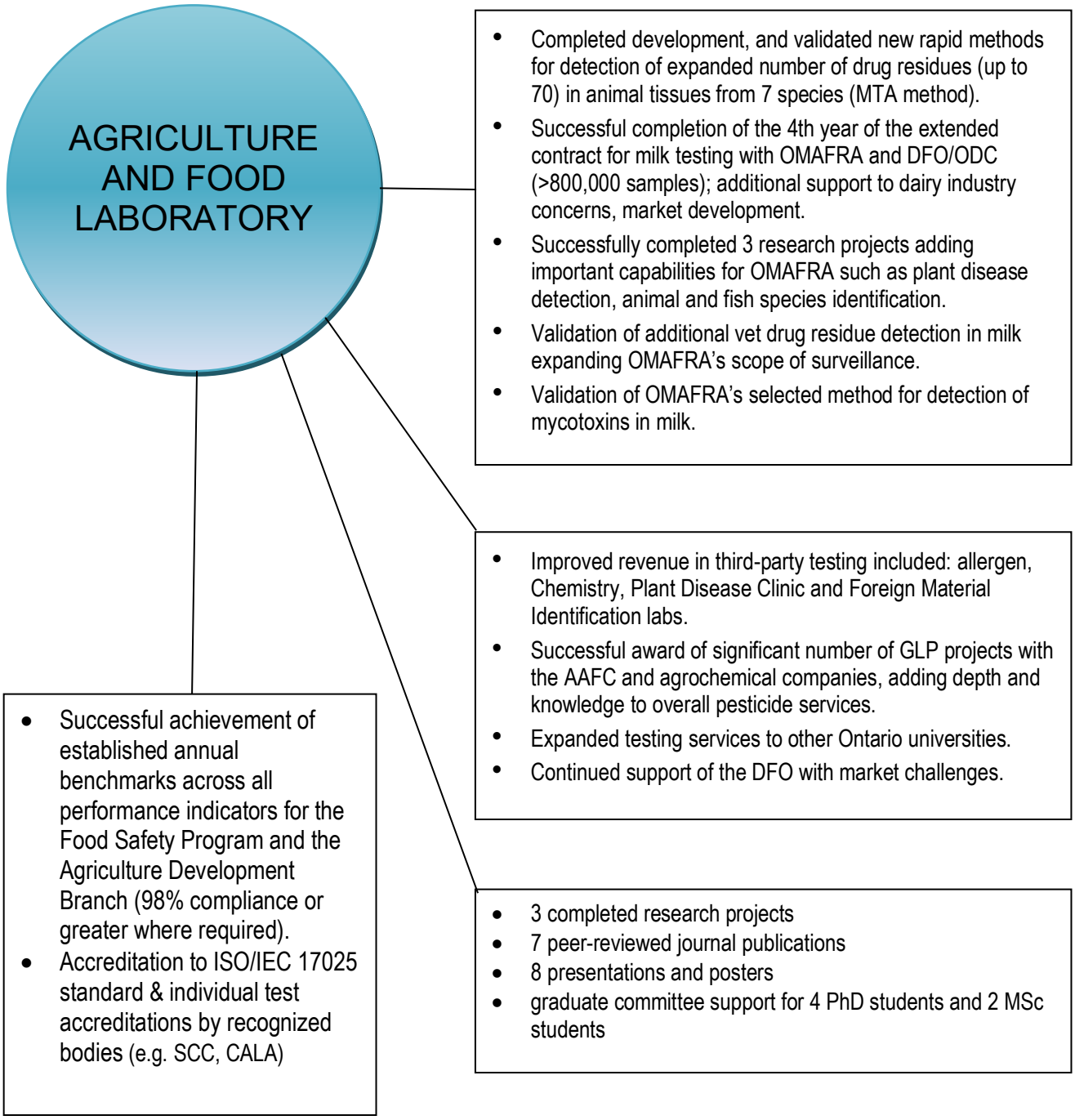
[19] Measurement: Compliance with the Quality and Service Level Standards and requirements as detailed in the Annual Testing Plan Agreement related to turnaround times for screening and confirmation of corrected reports. Target is set at 2%.

[20] Measurement: Compliance with the Quality and Service Level Standards and requirements as detailed in the Annual Testing Plan Agreement related to turnaround times for screening and confirmation for Samples which are unsuitable for testing. Target is set at 2%.

AGRICULTURE AND FOOD LABORATORY

Figure 6.2: 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.



6.2 Mandatory Compliance Requirements

6.2.1 Increase in Revenues

As stated in the 2018/19 Business Plan, to maintain the AFL's sustainability, the AFL will increase and diversify revenues from AFL services to third parties, year-over-year. Considerable work has been completed to determine what niche testing opportunities, have growth potential for the AFL. Moving forward, the AFL will drive growth in these areas, using an account-based marketing approach. In 2018/19, AFL met the mandatory compliance requirement for 2.5% increase in revenues by achieving revenue of $8.557M, a growth of 8.3% over the baseline of $7.9M articulated in the Agreement.

6.2.2 Emergency Response Plan and Surge Capacity Plan

AFL has a comprehensive Emergency Response Plan and Surge Capacity Plan in place to ensure that AFL can fulfill the objectives of the Program Schedule.

6.2.3 Emergency Simulation Exercises

Emergency Response procedures at the AFL have been developed to mirror the OMAFRA Emergency Response program. The AFL will continue development in the areas of staff training, and continuous updating and improving the program and documentation.

Although no formal exercises were performed in 2018/19, the testing interruptions from building closures due to maintenance issues with CBRE and the sporadic power outages required AFL to regularly communicate these force majeure incidents and negotiate adjusted turnaround times with OMAFRA.

6.2.4 Capacity Strategy Plan

To address existing and emerging expertise requirements, the AFL maintains human capacity at a high level of scientific expertise, develops in-house knowledge and skills, and provides further education and experience opportunities where feasible.

By maintaining very high-quality testing and program delivery, including emergency preparedness, the AFL Program outcomes are achieved, thus ensuring that these services continue to meet the changing needs of the agriculture, food processing, horticulture and plant health sectors in Ontario.

6.2.5 Capital Strategy Plan

As outlined in the AFL Business Plan, a capital expenditure program (CAPEX) has been a long-term activity of Laboratory Services, and this will continue in the future. Equipment is closely monitored for repair or replacement, or the need for additional equipment for testing to support

new methods. The Division follows a scheduled plan to replace computer hardware and software as the organization faces growing volumes of data.

In 2018/19, the AFL effectively met the annual challenge of maintaining capital intensive technology and infrastructure. LSD continues to reinvest in those capital items, strategically identified by its management team, in keeping with the available revenue. Ongoing support from OMAFRA's Capital Expenditure Fund (CAPEX), to provide direction and funds annually, for equipment purchases by the LSD is a critical part of this process, given the challenges in securing external revenue for reinvestment. OMAFRA's capital investment of $500,000 from CAPEX included the replacement of instruments integral to support the OMAFRA Meat Inspection and Foods of Plant Origin Programs. A new BactoScan instrument in support of the DFO/ODC/OMAFRA contract was purchased from reserved funds allocated for this purpose.

In 2018/19, investment into an update of the LIMS has resulted in improvements to the efficiency and accuracy of sample information inputs, and reduced transcription errors; ultimately providing improved service delivery to OMAFRA and all clients.

6.2.6 Resources and Capacity to Administer AFL

AFL confirms that it has the necessary resources, including technical and support staff to administer the AFL. John Melichercik, Co-Executive Director of Laboratory Services Division and Director of the AFL continues to provide outstanding leadership and support the governance structure of the AFL as the AFL PMC Co-Chair. The Director of Finance plus two additional positions are dedicated to managing all AFL activities related to the OMAFRA/UofG Agreement.

With the guidance of John Melichercik, and Finance Director John Mah, the AFL Program is supported by employing four operation managers: Dr. Shu Chen, Dr. Linda Lissemore, Dr. Perry Martos and Andrew Moore; as well as Karen Peer, Executive Assistant; Liz King, QA Manager; Lynne Fruhner, OMAFRA Agreement Manager; Pauline Nelson-Smikle, IT Manager; and Joel Jobin, Facility Manager. Together they lead the AFL's complement of 130 support and technical staff. The AFL has identified 117 of the total 130 positions to specifically support the Agreement on a day to day basis.

The AFL cross-trains within a discipline area as much as possible to allow for leveraging of skills for OMAFRA and third-party testing. This approach protects the organization from the risk of losing specific skills through staff turnover. Table 6.2 provides the AFL Staff Complement that provides support to the Agreement.

Table 6.2: 2018/19 AFL Staff Complement by Highest Degree Earned that Provides Support to the Agreement

Doctoral (e.g. PhD)	Advanced (e.g. MSc)	Undergraduate	Other	Total
9	17	64	27	**117**

The flexibility afforded in using cross-trained technicians and/or to add temporary positions, in cases of sudden or short-term capacity needs, allows the AFL to meet OMAFRA's needs when additional testing is required beyond the annual testing plan.

Each case is considered individually and includes an assessment of its impact on delivery of the annual testing plan.

6.2.7 Annual Summary of the ISO 17025 Accreditation Report

LSD, including the AFL, 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 (TMD/NRT)

Currently, LSD has 98 accredited tests listed on their SCC scope, 83 AFL tests and 15 AHL tests. LSD had the expected biennial audit by SCC in October 2017 and will be audited in the Fall of 2019. The ISO/IEC 17025 standard was revised in 2017 so LSD will be audited to ISO/IEC 17025:2017 in 2019 and must comply with 2005 version until accredited to the 2017 version. For a method to be accredited, competence must be demonstrated by submitting the method, forms, training records, validation/verification records, proficiency testing results and internal audit report for the method to SCC for inspection. Since May 2018, there have been no changes to the SCC accredited methods.

Currently, LSD is accredited by CALA for eight environmental tests (ten CALA appendices) - eight AFL tests. The CALA accredited tests include three AFL microbiology tests licensed under the Ontario Safe Drinking Water Act (OSDWA). Since May 2018, there have been no changes to the methods accredited by CALA.

Table 6.3 shows the number of accredited methods used in OMAFRA Programs.

Table 6.3: 2018/19 - Number of Accredited Methods Used in OMAFRA Programs

Branch	Number of Tests	SCC Accredited	CALA Accredited
Meat Inspection Program	33	27	2
Dairy Food Safety Program	52	40	3
Food of Plant Origin Program	39	25	1
Total – Food Safety Program	**124**	**92**	**6**

6.2.8 AFL Program Sample Testing Data

Quarterly reports are provided from the AFL to OMAFRA demonstrating compliance with the performance indicators assigned to sample testing data. The AFL and OMAFRA have integrated their information management systems to allow for seamless transfer of data between organizations. Please see Section 6.3.2 Testing and Program Delivery for the annual summary of the performance data.

6.2.9 Changes to Methods or Testing Protocols Used in Ministry Samples

The AFL acknowledges that communication to the Ministry of any program method changes is a mandatory requirement of this Agreement. Changes to methods/testing protocols within the OMAFRA program samples are verified and documented differently dependent on the required level of approvals at OMAFRA. The following verification methods are accepted by OMAFRA and AFL to enact a change:

- Authorized Interface protocol document;
- Authorized memo from the Director of the Food Safety Systems Development Branch;
- Officially distributed annual Sampling and Testing Requirements document; and
- Minuted meeting decisions.

The AFL remained in compliance throughout 2018/19.

6.2.10 Notifications to the Ministry

The OMAFRA Annual Sample and Testing Plan and the Sample and Testing Requirements documents provide the AFL with the number of tests allocated and the methods to be used, as well as test result levels at which the Ministry wishes to be contacted. OMAFRA and the AFL follow a standard operating procedure for making notifications for “alertable” results.

The AFL meets and exceeds the requirement to ensure that all “alertable” test results are reported quickly and accurately to allow rapid response by OMAFRA for situations requiring regulatory action.

While the Ministry tracks the number of samples that it has sampled each fiscal quarter, so too does the AFL track the number of samples received that are suitable for testing, unsuitable for testing or insufficient volume for testing. The AFL contacts the Ministry for further direction in the case of unsuitable or insufficient samples.

The AFL and the Ministry collaborate to ensure that only high integrity samples are used for Ontario’s regulatory testing program. In 2018/19 the AFL added the ability to report the number of days a sample has been in transit from the date and time of sample collection to date and time of sample receipt at the lab. This elapsed time is now reported for every submission of samples allowing OMAFRA to assess the quality of the test sample that is reported by the AFL. This allows OMAFRA to adjust the sampling training and/or collection process as needed to ensure the highest quality samples are obtained for testing.

6.3 Key Performance Indicators

6.3.1 Emergency Preparedness

AFL is prepared for future Emergency issues requiring laboratory services related to food, plant and environment and implements recommendations for improvement made by IMS during emergency simulation exercises.

In 2018/19, no formal exercises were performed, as it was a transition year. The target for future years is that 100% of action requests meet implementation targets set by the Program Management Committee (PMC).

AFL met the Ministry's requirements for prioritizing samples in cases of business interruptions. OMAFRA's support of these recovery activities was critical to the AFL's success.

6.3.2 Emergency Situations

AFL continues to successfully support the Ministry in response to, and management of, significant, unanticipated, or urgent situation or events of food safety, environmental, health and plant/pest emergencies. This includes any requirement for the development of new tests or test methods and against criteria including timeliness, effective diagnoses, communication of test results, monitoring and reporting of test results, monitoring and reporting of surveillance data, and participation with stakeholders. AFL appropriately carries out its responsibilities under Emergency simulations to support the Ministry effectively through: 1) the development of new tests required to address urgent incidents and to improve response capability in the future, and 2) response to serious food safety events using existing testing methods and improving future response capabilities.

In 2018/19, no incidents occurred that required the development of new tests required to address urgent incidents and improve response capability in the future, as per scenario one.

One situation in 2018/19 fell under Emergency Situation scenario two. This situation required AFL to inform OMAFRA of the potential impact on the work done in the laboratory.

In order to address the white residue issue, 95 Stone Road West continues to cooperate with CBRE by undergoing maintenance/restoration. On multiple occasions, CBRE arranged required maintenance/recovery activities requiring the AFL to suspend or delay some laboratory weekend activities and close the building to all staff. As a result, the ability of the lab to analyze some samples during these periods was affected specifically, Schedule D projects 1002 and 1045. OMAFRA was kept apprised of, and communicated with, throughout the temporary postponement of projects 1002 and 1045. OMAFRA accepted these delays as Force Majeure incidents. AFL successfully regained normal operations in the estimated timeframe.

These parameters are reported on quarterly at the PMC meetings. The University was able to meet the expectation that a 100% of action requests meet the implementation targets set by PMC.

6.3.3 High Quality Reliable Laboratory Results

Tables 6.4 to 6.6 show performance measures for the percentage of completed tests that comply with the quality and service level standards and requirements, as detailed in the Annual Testing Plan Agreement, related to turnaround times for screening and confirmation, corrected reports and samples which are unsuitable for testing. These parameters are used to assess the proportion of completed tests that meet quality, sample integrity and service level standards and requirements.

This parameter is reported quarterly at the PMC meetings.

The performance measurements are the percentage of completed tests that comply with the quality and service level standards and requirements, as detailed in the Annual Testing Plan Agreement related to turnaround times for screening and confirmation, corrected reports, and samples which are unsuitable for testing. The targets are set at Turnaround Times = 98%; Corrected Reports = 2%; and Unsuitable for Testing = 2%.

The Food Safety Program (Total) and Fiscal Year Summary are expressed as weighted averages. For 2018/19, there was 99.55% overall compliance for the Food Safety Program with respect to Turnaround Times, exceeding the service standard of 98%.

Table 6.4: 2018/19 Food Safety Program Compliance with Turnaround Times

	Q1	Q2	Q3	Q4	2018/19
Meat Inspection Program	99.75%	99.47%	99.32%	99.79%	99.58%
Foods of Plant Origin	99.71%	99.13%	100.00%	100.00%	99.52%
Dairy Food Safety Program	99.82%	100.00%	99.98%	98.26%	99.53%
Food Safety Program (Total)	**99.77%**	**99.59%**	**99.65%**	**99.14%**	**99.55%**
Agriculture Development Branch	98.95%	100.00%	100.00%	100.00%	99.41%
				Target	**98%**

In 2018/19, there was 0.52% rate of Corrected Reports for Food Safety Program. This exceeded the service standard of 2%.

Table 6.5: 2018/19 Food Safety Program Compliance for Corrected Reports

	Q1	Q2	Q3	Q4	2018/19
Meat Inspection Program	0.27%	0.16%	0.80%	0.00%	0.31%
Foods of Plant Origin	0.19%	0.50%	0.08%	1.15%	0.40%
Dairy Food Safety Program	0.32%	0.36%	0.23%	2.26%	0.78%
Food Safety Program (Total)	**0.27%**	**0.32%**	**0.51%**	**1.12%**	**0.52%**
Agriculture Development Branch	0.23%	0.38%	0.00%	0.00%	0.26%
				Target	**2%**

In 2018/19, there was 0.08% rate of Samples that were Unsuitable for Testing in the Food Safety Program. This exceeded the service standard of 2%.

Table 6.6: 2018/19 Food Safety Program Compliance for Samples Unsuitable for Testing

	Q1	Q2	Q3	Q4	2018/19
Meat Inspection Program	0.04%	0.12%	0.07%	0.03%	0.06%
Foods of Plant Origin	0.03%	0.00%	0.17%	0.00%	0.02%
Dairy Food Safety Program	0.26%	0.13%	0.09%	0.05%	0.13%
Food Safety Program (Total)	**0.12%**	**0.09%**	**0.09%**	**0.04%**	**0.08%**
Agriculture Development Branch	0.00%	0.00%	0.00%	0.00%	0.00%
				Target	**2%**

6.3.4 Effective and Timely Communication of Violative or Actionable Test Results

Table 6.7 presents the AFL performance measure of the consistency with which the AFL provides timely test results required for actionable response to stakeholders.

The Service Level Standard is all incidents of inconsistency in providing, or risk of not providing, timely test results require an actionable response. The measurement of the performance metric is in practice the AFL demonstrates compliance by documenting prevention and resolution (as available) of incidents of erroneous laboratory results, false positive or negative results, and Samples which are unsuitable for testing and spoiled samples (including "OMAFRA sampler error"). Incidents are tracked in the AFL's Corrective Action Preventive Action (CAPA) database. The performance target is set as continuous improvement and resolution initiatives based on review of incident reports.

Table 6.7: 2018/19 Trend Summary - Frequency

CAPA Classification[21]	Q1	Q2	Q3	Q4	2018/19
Administrative	3	3	3	8	17
Technical	1	1	2	3	7
Force Majeure	1	0	1	1	3
Schedule D (Total)	**5**	**4**	**6**	**12**	**27**

In the 2018/19, 99.50% of all tests were reported accurately (65,086 out of 65,416).

With the exception of one incident, all CAPAs in the 2018/19 Sampling Plan year were low risk. One incident began as high risk and was re-evaluated to medium after swift action by the AFL. The administrative activity corrective actions were data entry related and the technical activity corrective actions were addressed by workflow improvements.

The majority of incidents were administrative in nature. These types of incidents are either flagged by the quality checks within OMAFRA and the AFL information systems and do not impact human health or organizational reputation.

This parameter is also reported on quarterly at the PMC meetings. The University was able to meet the target of ensuring continuous improvement and resolving initiatives based on review of the incident reports.

[21] Corrective Action Preventive Action Classification

6.3.5 Effective Response to Incidents

In the 2018/19 year, AFL delivered excellence with regard to compliance with communication protocols, providing effective response to food contamination and other serious plant and environmental hazards with severe human health or economic consequences.

The performance measurement is the percentage of tests requiring an actionable report from the AFL that met communication criteria, Sampling and Testing Plan, or Standard Operating Procedure for Adverse Results Notification. The performance target is set at: 98%.

The AFL met the performance target 100% of the time. Overall for 2018/19, the AFL LIMS adverse result alert program generated 258 alert emails, reporting 716 alertable, adverse or presumptive positive test results for 512 samples. All actionable results were reported to OMAFRA per 95S-028.

The proportion of test results that are alertable, adverse or presumptive positive versus the total number of tests reported continues to trend at approximately 1% a year.

This parameter is reported quarterly at the PMC meetings.

6.3.6 Development of New/Improved Detection Methods

The key performance metric for the development of new and improved detection methods, provides the performance measurement of the estimate of timelines based on a list of methods provided by the Ministry. The performance target is set on a case-by-case or per method basis.

The Chemistry Research and Development Section at AFL concluded the validation and expansion of the MTA method detecting veterinary drugs in porcine, poultry, turkey and small ruminants in 2018/19.

All species-specific MTA methods were transferred to the Chemistry section for routine installation by April 1, 2019. Project 1002 and 1045 transitioned to MTA on April 29, 2019. Project 1001 transitioned to MTA on May 15, 2019.

Progress with method development timelines are reported quarterly at the PMC meetings.

This marks the completion of the current list of methods for development as provided by OMAFRA.

6.4 Reporting Requirements

6.4.1 Summary of the ISO 17025 Report

A summary of the ISO 17025 Report can be found in Section 6.2.7.

6.5 Conclusion

It is recognized that the Ontario Agri-Food Innovation Alliance agreement is a critical element in the Division's ability to maintain the balance between its capability and capacity for the leveraging of services and remaining a self-sustaining entity within the University of Guelph. The AFL has demonstrated its ability to leverage expertise and capacity by generating sufficient revenue from select commercial, government and research projects for over 20 years. The lab's reputation for high quality and expertise remains critical to its future success.

In the coming year, the lab is looking to continue to leverage its opportunities for growth in pesticide GLP testing, veterinary drug residue, agricultural soil and plant disease testing. Identified niche market opportunities, along with applied research projects with industry and government partners are also vital elements of the growth strategy for the division.

In consistently exceeding the target levels for each performance indicator, AFL demonstrates its commitment to providing timely support for urgent/emergency response initiatives as required, as well as ongoing scheduled testing programs for OMAFRA. AFL provides high value, impactful scientific support for OMAFRA as evidenced by:

- Applying expertise to expand existing pesticide methods to meet the changing needs of both the CFIA and OMAFRA;
- The development and implementation of a novel multiple target analyte method customized to the needs of the OMAFRA Food Safety Program;
- Twenty years of continuous contributions to knowledge and technology transfer that result in new methods being available for use by the Ministry e.g. Multiplex PCR method for Detection of the Top Seven Shiga Toxin-Producing Escherichia coli (STEC) Serogroups in various foods;
- Contributing to the health of the Ontario economy through scientific support for industry such as DFO, GLP testing for AAFC and agro-chemical companies, foreign material identification for food processors, plant disease diagnoses for growers, and producers;
- Collaborative research and sharing knowledge and expertise with scientific peers at the international level such as Dr. Chen's presentation in China titled: Microbiome: Food Testing Promises, Challenges and Opportunities; and
- Safeguarding the reputation of the University and the Ministry by adhering to a mature, well-developed quality assurance program, and maintaining multiple accreditations.

7 Property Management Program

The Property Management program supports the day-to-day operations and maintenance, repairs and use of ARIO Research Stations for the research and innovation that grow and improve Ontario's agri-food sector and stimulate economic development in Ontario. The University and OMAFRA have the shared goal of maximized use of research infrastructure available at the ARIO Research Stations in a manner that provides benefits to all of Ontario's regions.

7.1 Program Activities and Achievements from 2018/19

The Agreement supports places that enable research and innovation. The University's state-of-the-art research infrastructure – from controlled environment facilities to leading edge laboratories – complement these places to create a provincial platform for agri-food innovation.

There are 15 research stations across the Province that enable field-scale discovery and validation that support Ontario's agri-food sectors. The stations are owned by the Agricultural Research Institute of Ontario (ARIO) and managed by the University of Guelph through the Agreement.

Ontario's agri-food research stations enable research that is farm and field-tested. The stations are key outreach spaces where researchers and staff welcome producers, policy makers, international visitors, students and industry partners.

Management of station operations for the Northern and Eastern stations at Emo, New Liskeard and Winchester was successfully transferred from the Ontario Agricultural College (OAC) to the Office of Research, Agri-Food Partner under the Director of Research Facilities Management. With this change, the majority of stations now have the same staff reporting structure, which helps equitable treatment of staff and better enables opportunities for cross-training. Operations at these stations, and others within the portfolio remained stable during 2018/19.

The University continues to operate surplus properties at the former Alfred and Kemptville Campuses. The sale of the farm portion of the Alfred Campus to a francophone farm organization reduced operational demands on the Agreement somewhat. Also, the execution of a formal lease between ARIO and La Cité for the occupancy of the main campus buildings at Alfred provided an opportunity to recover some operations and maintenance costs in 2018/19. Le Cité vacated the property at the end of the year leaving the majority of the Alfred Campus buildings vacant once more.

7.1.1 ARIO Properties Infrastructure Update

The U of G is working closely with its partners to execute ARIO's Infrastructure Strategy, in that major construction projects are underway across the Province according to the long-term research objectives of the strategy.

7.1.1.1 Major Capital

In 2018/19, work continued or was initiated on several major capital projects across the research station portfolio. Except for the Winchester Agronomy Service Building, major capital projects are managed through project-specific transfer payment agreements between ARIO and the University which provide funding outside of the Agreement. Those agreements have separate reporting requirements; however, the project summaries are included below.

Elora Beef Research Facility

The Elora Beef Research Facility is currently under construction through a separate agreement with ARIO and funded in part by Beef Farmers of Ontario. The $15.5M initial phase of the project includes the construction of a new cow-calf housing and handling facility, plus new office and research spaces. These will allow the existing facilities to be demolished and further redevelopment to proceed. The new cow-calf facilities will be large enough to accommodate the combined Elora – New Liskeard breeding herd. Completion in late summer 2019 is anticipated with livestock occupancy in the fall. Other projects supporting beef research infrastructure renewal and funded through the minor capital program include improvements and expansion of pasture, feed storage and processing and feed lot housing facilities. These projects are expected to continue through the following three-year period.

Guelph Turfgrass Institute

Construction of new turf research plots was completed in 2018/19, on the University of Guelph campus. The new research plots, which will replace existing plots at the Guelph Research Station, will require a full growing season in 2019 to be completely ready for research in 2020. The contract to construct the new administration building at the location on campus was awarded at the end of the fiscal year, allowing construction to start in the spring of 2019 with completion expected in late fall of 2020. This $15M project will allow the University to vacate the current Guelph Research Station as directed by Infrastructure Ontario to OMAFRA / ARIO.

Winchester Agronomy Service Building

The new Winchester Agronomy Research Service Building was substantially completed in 2018/19. The 2019 field research season will operate solely from Winchester with the relocation from Kemptville complete. The new $3.5M facility provides administrative and staff spaces, seed and sample preparation and storage, workshop and equipment storage spaces. These new facilities combined with the existing machinery storage and pesticide storage buildings allow Winchester to operate as a stand-alone research station. Completion of the project and submission of final costs is expected by the second quarter of 2019/20.

New Liskeard Agronomy Service Building

New facilities similar in design to the ones completed at Winchester are proposed for the eastern portion of the New Liskeard Agricultural Research Station where most of the crop research plots are located. Design work for the layout of the new service, equipment and pesticide storage buildings was completed concurrently with the Winchester design project. Geotechnical investigation and analysis were completed in 2018/19, leading to a foundation design that accounts for the unstable clay within the project site. The first phase of the project will include the pre-loading of the site to allow for settlement and consolidation of the clay soils and will commence in the second quarter of 2019/20. The construction of the building will follow a suitable period of settlement, projected to last into the spring of 2020. Total completion of the $4M project and occupancy are projected to occur in the fall of 2021. Once built, ARIO will be able to dispose of a large portion of station property where several surplus and older buildings are located.

Elora Swine Research Facility

ARIO and the University executed a $15M Transfer Payment Agreement in December 2018 for the construction of a new swine research facility at the Elora Research Station. This will replace the existing aged facility at the Arkell Research Station. Confirmation of project scope, and tender to secure the services of a design consultant commenced in the fourth quarter of 2018/19. Construction will commence in the fourth quarter of 2019/20 following the design process, with an expected completion date in 2022. Like other livestock stakeholder groups on past redevelopment projects, Ontario Pork has committed 20% ($3M) of the project cost and have suggested they may pursue additional funding through the Federal Government.

7.1.1.2 Minor Capital

Under the minor capital program, $3.3M was recovered from ARIO (outside of Agreement Funds) for 38 projects supporting state of good repair and program capacity improvements. An updated five-year minor capital program priority list was submitted to OMAFRA in December 2018 focusing on the following areas:

- Health & safety;
- Code compliance;
- Animal care;
- Building integrity;
- Life cycle replacement;
- Efficiency and conservation; and
- Program capacity (maintain or improve).

An updated five-year priority list (covering the fiscal years 2020/21 to 2025/26) will be submitted in December 2019.

7.1.1.3 Design Initiatives through the Minor Capital Program

Minor Capital Program funds have been allocated to several design and planning projects that will be submitted for consideration of part of the Major Capital Program initiative once complete. Initiating design work through the Minor Capital Program allows the scope of infrastructure projects and associated budgets to be defined with sufficient detail to negotiate Transfer Payment Agreements, should the project be supported, with less risk of major scope or budget fluctuations. A summary of design initiatives active in 2018/19 follows.

Elora Research Station Operations and Crop Research Service Buildings Redevelopment

Land based research programs, general cropping and feed production operations at the Elora Research Station operate from a collection of buildings that are mostly 40 years old. Although most have been reasonably maintained over their service life, they no longer provide the types of spaces and features required to support operations in an efficient and safe manner. Planning has begun to consider the construction of new Research Station Operations (RSO) facilities and new or redeveloped Crop Research Support facilities in two separate areas that include the footprint of the former dairy research facility and the current RSO / Crops buildings. Program managers and Physical Resources project managers are working on defining requirements that will lead to a design service tender in 2019/20. A request for major capital consideration will be submitted in the third or fourth quarter of 2019/20, subject to progress by the selected design group.

Ridgetown Campus Field Research Service Building

Ridgetown Campus' extensive field crop and other land-based research programs are currently supported through a wide variety of buildings that are inefficient, and in many cases lack the features to provide for safe and effective operation of current programs. A new consolidated Field Research Service Building is currently in the design stages following a campus master plan process. It will include up to date support spaces for staff, seed and sample preparation, storage and processing, with appropriate health and safety features. It is anticipated that a request for major capital consideration will be submitted in the second quarter of 2019/20

Elora Feed Preparation and Storage Facilities

The feed storage facilities for Dairy and Beef will require expansion and improvements to support the anticipated increase in the size of the beef research breeding herd, and to provide for more precise formulations with the addition of supplements. In addition, the oldest feed storage bunks require replacing due to age and condition. As this facility must always remain functional, renovation and upgrades must be completed in phases over a number of seasons. Design work under the Minor Capital Program was almost complete at the end of 2018/19, and it is expected that a request for major capital consideration will be submitted in the second quarter of 2019/20. If approved, construction would commence shortly thereafter.

7.2 Mandatory Compliance Requirements

None

7.3 Key Performance Indicators

7.3.1 Station Revenue

Table 7.1 provides a report on all revenues resulting from the activities within the Property Management program, including the sales of farm products, rental revenues and recoveries for station usage and animal purchases. Property specific information can be found in Section 2.3.5.2. In 2018/19, the five-year rolling average for all revenues and recoveries related to the Research Stations was $6,518K. This exceeded the target of $4,871K by 34%.

Table 7.1: Total Station Revenues and Recoveries by Year (in thousands of dollars)

	2014/15	2015/16	2016/17	2017/18	2018/19
Revenue	**5,995**	**5,537**	**4,787**	**6,199**	**5,965**
Sales of Farm Products	4,980	4,457	3,597	4,756	4,583
Other	241	213	216	212	204
Rentals	774	867	975	1,231	1,178
Recoveries	**836**	**813**	**810**	**771**	**876**
Animal Purchases (net)	264	229	237	27	150
Research Station Fees	316	355	315	553	426
Facility Usage (net)	256	229	258	191	301
Grand Total	**6,830**	**6,350**	**5,597**	**6,970**	**6,841**
				Five Year Average	**6,518**
				Target	**4,871**

7.3.2 Research Station Capacity and Utilization

ARIO Property Use and Capacity will be measured through a percentage utilization calculation for each Research Station. For Livestock Research Stations, the unit of tracking is animal research day. Animal use is strictly controlled by Animal Use Protocols (AUPs) required under the Animals for Research Act and Canadian Council on Animal Care. Station management reports on actual number of days each animal is used under each trial. It is possible for animals to be used on concurrent trials, if the parameters of the trial do not interfere with each other. For Crop Research Stations, the unit of tracking is land area used for plots (hectares). Area is allocated on a seasonal basis, and there is generally no overlap of trials.

The percentage utilization is calculated by adding research utilization to the research preparation requirements and dividing the total by the capacity of the station. The research preparation requirement account for the requirement for crop rotation, replacement animals or cycle time in space-based animal facilities.

The Research Station capacity and utilization rates for 2018/19 are shown in Tables 7.2 and 7.3. In general, the utilization rates for Crop Stations are higher than those of the Livestock Stations. Crop trials, to some extent, can expand to better utilize available research plot areas to increase replications or increase the number of varieties being tested or evaluated for breeding or performance determination. Livestock trials, on the other hand, are more limited to the nature of the resident herd or available housing spaces or types, and therefore cannot be easily scaled to increase replication rates. For example, in the Beef Cow-Calf facilities at Elora and New Liskeard, calving occurs once per year in early spring. Trials looking at a short period of a calf's development can only occur for the short duration post calving. It is not possible to bring in additional calves into the closed herd throughout the year, even thought space may be available to conduct this type of work.

Livestock Stations had an average utilization rate of 48.9% in 2018/19. As this is the first year this methodology has been used to calculate utilization, this rate (49%) has effectively been set as the target for the Livestock Stations. Crop Stations had an average utilization rate of 78.1%. Similarly, the baseline for Crop Stations has been set at 78%. The University is pursuing opportunities to improve utilization rates through efficiency (allowing more trials to occur concurrently), infrastructure improvements (such as improved tile drainage allowing a greater number of trials to take place at stations), and efforts to streamline research program administration. Considering these efforts are in the early stages, modest improvements in utilization should be expected in the future.

Table 7.2: Livestock Research Station Capacity and Utilization

Livestock Research Station	Capacity (Animal Research Days)	Research Utilization (Animal Research Days)	Research Preparation (Animal Research Days)	Percentage Utilization (%)
Alma	111,690	12,327	28,105	36.2%
Arkell - Equine	11,680	9,490	1,095	90.6%
Arkell - Poultry	3,923,750	2,369,870	335,800	69.0%
Arkell - Swine	156,950	75,730	14,600	57.6%
Elora - Beef	206,995	45,777	38,895	40.9%
Elora - Dairy	173,010	44,629	83,950	74.3%
New Liskeard - Beef	164,250	22,604	27,375	30.4%
Ponsonby – General Animal Facility	100,375	8,434	21,900	30.2%
Ponsonby - Sheep	102,200	330	10,950	11.0%
Total - Livestock Stations	**4,950,900**	**2,589,191**	**562,670**	**48.9%[22]**
			Target	**49%**

Table 7.3: Crop Research Station Capacity and Utilization

Crop Research Station	Capacity (Plot Area (ha))	Research Utilization (Plot Area (ha))	Research Preparation (Plot Area (ha))	Percentage Utilization (%)
Cedar Springs	7.28	6.47	0.00	88.9%
Elora	154.31	61.76	81.83	93.1%
Emo	21.25	16.19	0.00	76.2%
Guelph	76.89	52.41	0.00	68.2%
Huron	42.90	22.26	18.21	94.3%
Muck	2.06	1.86	0.00	90.2%
New Liskeard	51.27	7.49	8.70	31.6%
Ridgetown	96.32	39.66	52.61	95.8%
Simcoe	69.40	16.79	26.30	62.1%
Winchester	36.42	11.61	20.60	88.4%
Woodstock	60.70	14.57	27.92	70.0%
Total - Crop Stations	**618.81**	**251.07**	**236.17**	**78.1%[22]**
			Target	**78%**

[22] This is an average of the percentage utilizations for each station.

7.4 Reporting Requirements

7.4.1 University Tenants on ARIO Research Stations

University Tenants at ARIO Research Stations are limited to private residents in houses located at the research stations. Tenants include:

- Alma Research Station (Station Residence): Neil MacBeth;
- Arkell Research Station (Cottage Residence): Tim Pineau;
- Arkell Research Station (Duplex upper): Chris Burroughs;
- Arkell Research Station (Duplex lower): Tom VanDusen;
- Cedar Springs Research Station (Station Residence): Greg Watt;
- Elora Crops / RSO Station (Station Residence): Chuck Endaman;
- Elora Dairy Station (Station Residence): Paul Cleghorn;
- Elora Beef Station (Station Residence): Mark Randall;
- Kemptville Campus (Farm Residence): Dalton Gilmer;
- New Liskeard Beef Station (Duplex North): Kaley Rodman;
- New Liskeard Beef Station (Duplex South): Albert Koekkoek;
- Ponsonby Station (Staff Residence): Monique Leveque;
- Ridgetown Campus (Duplex North): Chris McNaughton;
- Ridgetown Campus (Duplex Sough): Ron Oliver;
- Ridgetown Campus (Wilson Farmhouse Upper): Connie Reynolds;
- Ridgetown Campus (Wilson Farmhouse Lower): Gail Carpenter; and
- Simcoe Research Station (Station Residence): Amanda Green.

7.4.2 Repair Priority List

The University develops and submits, annually, an updated Repair Priority List for each ARIO Property for the subsequent fiscal year, plus an outlook for the four years beyond that. The last list was submitted to OMAFRA in December 2018. The next list will be submitted in December 2019.

Appendix A Audited Financial Statements

University of Guelph

OMAFRA Agreement

Financial information

Year ended April 30, 2019

Independent auditor's report

To the management of the **University of Guelph**

Qualified opinion

We have audited the accompanying Statement of Revenue and Expenses [the "Statement"] for the year ended April 30, 2019 and notes to the Statement, including a summary of significant accounting policies.

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

Basis for qualified opinion

Our verification of the actual total revenues and expenses is limited to the amounts recorded in the records of the University of Guelph, the completeness of which is not susceptible to satisfactory audit verification. We are, therefore, not able to determine whether any adjustments might be necessary that may result in an increase to total revenues and expenses for the year ended April 30, 2019.

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's responsibilities for the audit of the Statement* section of our report. We are independent of the University of Guelph in accordance with the ethical requirements that are relevant to our audit of the Statement in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our qualified opinion.

Emphasis of matter – basis of accounting and restriction on use

We draw attention to note 2 to the Statement, which describes the basis of accounting. This Statement is prepared to assist the University of Guelph to meet the reporting provisions of the agreement between the University of Guelph and the Ontario Ministry of Agriculture, Food and Rural Affairs ["OMAFRA"] effective April 1, 2008 and the replacement agreement effective April 1, 2018 [the "Agreement"]. As a result, this report may not be suitable for another purpose. Our report is intended solely for OMAFRA and the University of Guelph and should not be distributed to or used by parties other than OMAFRA and the University of Guelph. Our opinion is not modified in respect of this matter.

Responsibilities of management for the Statement

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

Auditor's responsibilities for the audit of the Statement

Our objectives are to obtain reasonable assurance about whether the Statement as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this Statement.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the Statement, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit 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 University of Guelph's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

We communicate with management regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Ernst & Young LLP

Waterloo, Canada
July 17, 2019

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

	Research $	Veterinary Capacity Program $	Animal Health Laboratory $	Agriculture and Food Laboratory $	Property Management $	Exigency Fund $	Minor Capital Repairs $	Total OMAFRA 2019	Total OMAFRA 2018
Revenue									
Provincial	37,461	5,248	6,911	7,416	12,536	(287)	6,241	75,526	74,356
Sales of Goods and Services	158	0	6,999	8,557	4,582	0	0	20,296	19,807
Investment Income	0	0	0	0	0	629	0	629	327
Other	90	0	4	14	1,384	0	0	1,492	2,024
Total Revenue	**37,709**	**5,248**	**13,914**	**15,987**	**18,502**	**342**	**6,241**	**97,943**	**96,514**
Expenses									
Salaries	9,680	173	7,750	8,198	7,262	342	0	33,405	33,920
Non Salary Benefits	1,888	28	2,144	2,417	2,010	0	0	8,487	8,519
Support for Faculty Costs	11,145	1,900	0	0	0	0	0	13,045	11,325
Travel	399	208	99	56	33	0	0	795	866
Operating	15,090	2,939	5,940	5,862	10,985	0	6,243	47,059	46,830
Internal Recoveries	(493)	0	(2,019)	(546)	(1,788)	0	(2)	(4,848)	(4,946)
Total Contract Expenses	**37,709**	**5,248**	**13,914**	**15,987**	**18,502**	**342**	**6,241**	**97,943**	**96,514**
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, 2019

1. Authority and purpose

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

In April 2008, a ten-year agreement [the "Agreement"] was signed between the University and OMAFRA [Ontario Ministry of Agriculture, Food and Rural Affairs], in April 2018, a new five-year agreement was signed. This financial statement has been prepared under the terms of the Agreements, which requires an audited financial statement of revenues and expenses 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.

	2019	2018
Opening Balance	35,242	33,414
Funds Received	71,300	71,840
Expenditure	(68,786)	(70,012)
Ending Balance	37,756	35,242

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, 2019

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. Comparative figures

Certain reclassification of April 30, 2018 amounts has been made to facilitate comparison with the current year.

Appendix B AFL KTT and HQP Contributions

The full list of the AFL 2018/19 publications, presentations, research projects and training of HQP, demonstrates the AFL's support to ensure that OMAFRA maintains public confidence through laboratory research and testing, is provided below.

B.1 KTT Contributions

B.1.1 Journal Publications

Rebecca K. Hylton, Alma F. Sanchez-Maldonado, Pooneh Peyvandi, Fatemeh Rahmany, Fadi Dagher, Carlos G. Leon-Velarde, Keith Warriner, And Amir M. Hamidi. Decontamination of Chia and Flax Seed Inoculated with Salmonella and Surrogate, *Enterococcus faecium* NRRL B-2354, Using a Peracetic Acid Sanitizing Solution: Antimicrobial Efficacy and Impact on Seed Functionality. **Journal of Food Protection**. 2019. 82:486-493.

Hanan R. Shehataa, Amanda M. Naauma, Shu Chen, Torie Murphy, Jiping Li, Kelly Shannon, David Awmack; Annie Locas, and Robert Hanner. Re-visiting the occurrence of undeclared species in sausage products sold in Canada. **Food Research International**, Jan. 2019. https://doi.org/10.1016/j.foodres.2019.01.030.

Gao, A., Jennifer Fischer-Jenssen, Colin Cooper, Honghong Li, Jiping Li, Shu Chen, and Perry Martos. Evaluation of a Multiplex PCR for Detection of the Top Seven Shiga Toxin-Producing Escherichia coli Serogroups in Ready-to-Eat Meats, Fruits, and Vegetables. **Journal of AOACInternational.** 2018. 101:1828-1832. https://doi.org/10.5740/jaoacint.18-0010

Shehata H., Bourque D., Steinke D., Chen S. and Hanner R. Survey of mislabelling in seafood supply chain reveals mislabelling both outside and within Canada. **Food Research International**. Dec. 2018. https://doi.org/10.1016/j.foodres.2018.12.047.

Emmanuelle M. Butty, Anne-Sophie Bua, Nick P. Vanstone, Marilyn E. Dunn. Retained laser fiber in the nidus of a recurrent cysteine urolith in an intact male bulldog. **Canadian Veterinary Journal.** 2019. 60:29-32.

M Melzer and X Shan. "Diseases diagnosed on plant samples submitted to the Plant Disease Clinic, University of Guelph in 2017". **Canadian Plant Disease Survey**, 2018.

Gao, A. and P. Martos. Log Transformation and the Effect on Estimation, Implication, and Interpretation of Mean and Measurement Uncertainty in Microbial Enumeration. **Journal of AOAC International.** 2018. 102: 233-238. https://doi.org/10.5740/jaoacint.18-0161

B.1.2 Oral Presentations

M Skurnik, MS Qasim, A Bhattacharjee, CG Leon-Velarde. Studies on bacteriophage-LPS interactions. 8th Baltic Meeting on Microbial Carbohydrates, September 9-12, 2018, Dublin, Ireland.

Shu Chen. Microbiome: Food Testing Promises, Challenges and Opportunities. Food Safety Symposium - Microbiomes: The Next Frontier of Food Safety and Quality. Jiangnan University, Wuxi, China. November 16, 2018.

B.1.3 Poster Presentations

Mst. Thangima Zannat, Saleema Saleh-Lakha, Carlos G. Leon-Velarde, Jiping Li, Honghong Li, Anli Gao, Roger Johnson, Shu Chen. Validation of a PCR-immunoblot method for the detection and isolation of Shiga Toxin-Producing *Escherichia coli* (STEC) in food samples. VTEC 2018, Florence, May 6-9, 2018.

Carlos G. Leon-Velarde, Saleema Saleh-Lakha, Nathan Larson, Zheng Wu, Shu Chen, Stephanie Bonneau, Ron Johnson, Stan Bailey. Evaluation of the GENE-UP® Real-time PCR Assay for the Detection of *Listeria* Species in a Variety of Environmental Surfaces. IAFP 2018. Salt Lake City, July 9-12, 2018.

Blyth, C., CG Leon-Velarde, S. Saleh-Lakha. Validation of the 3M™ Molecular Detection Assay 2 - Salmonella for the Detection of Salmonella in a Variety of Foods against Traditional Methods. IAFP 2018. Salt Lake City, July 9-12, 2018.

Amarsha Sodhi, Nicole Tabujara and Shu Chen. The Evaluation of Droplet Digital Polymerase Chain Reaction (ddPCR) Methods for the Quantification of Genetically Modified Content in Food. The 15th Annual GFSS Symposium - Food Fraud: Do you know what you're eating? Guelph, ON. Oct 24, 2018.

Gao, A., J. Fischer-Jenssen, C. Wroblewski, and P. Martos. 2019. Log Transformation and its Impact on the Interpretation of Linear Regression in the Assessment of Quantitative Microbiological Methods. 69th Conference of the Canadian Society of Microbiologists. Sherbrooke, Quebec. June 10-13, 2019, 2019.

Gao, A and P. Martos. 2018. Log-Transformation and the Effect on Estimation, Implication and Interpretation of Mean and Measurement Uncertainty in Microbial Enumeration. AOAC International 130th Annual Meeting. Toronto, ON. Aug. 26-29, 2018.

B.1.4 Research Projects (Grants)

Shu Chen (PI), Carlos Leon Velarde (Co-PI). Microbiological Survey of Sushi Sold in Ontario. OMAFRA Food Safety Research Program. August 2018-present.

Wendy McFadden-Smith (PI), Justin Renkema, Shu Chen, Jay Subramanian. Development of a novel method for quantifying spotted wing drosophila (SWD) in a monitoring program in stone fruit, grapes and berries and determination of impact of SWD on stone fruit and grape varieties. April 2018 – Present.

For the above project, a polymerase chain reaction (PCR) method to quantify SWD has been developed at the AFL in collaboration with OMAFRA and AAFC and is being validated for its implementation as a fee-for-service to growers. The project resulted in the following outreach articles:

DNA test could help growers battle spotted wing drosophila. November 30, 2018. Niagara this week. https://www.niagarathisweek.com/community-story/9060650-dna-test-could-help-growers-battle-spotted-wing-drosophila/

Spotted wing drosophila monitoring. July 12, 2018. The Grower. http://thegrower.org/news/spotted-wing-drosophila-monitoring

Shu Chen - Collaboration with Dr. Robert Hanner, BIO, U of G for animal and fish species testing. On-going.

B.1.5 Laboratory Tours

May 2018, Tour for Jeff Leal, MPP, Sanders MP, Greg Meredith, DM OMAFRA

January 2019, Tour for new DFO staff

January 2019, Tour for Michigan State University, Department of Entomology, Apiary Specialists: Meghan Milbrath and Ana Heck

November 2019, Tour for University of Guelph Plant Pathology Students

B.2 Highly Qualified Personnel (HQP) Training

The AFL contributed to training of 6 highly qualified personnel in 2018/19.

Shu Chen served on graduate committees for PhD candidates, Atinuke Olajide (Department of Food Science, University of Guelph), and Nicola Linton (Department of Environmental Biology, University of Guelph) and FSQA candidate Amasha Sodhi (Department of Food Science, University of Guelph).

Shu Chen provided orientation/training to M.Sc. candidate Kimberly Lyle from BIO, University of Guelph for microbiome analysis of soil samples by next generation sequencing.

Carlos Leon-Velarde provided training to PhD candidate Mohamed Melebari, Department of Food Science, University of Guelph for bacteriophage isolation and characterization.

Carlos Leon-Velarde provided training to PhD candidate Rafael Spurio, Department of Food Science, University of Guelph for measurement of bacteriophage activity against selected Salmonella spp. strains using Bioscreen-C instrument.