Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) / University of Guelph (UofG) Agreement Consolidated Annual Report Year 2 2019/20 Version 3

October 16, 2020

Approved By: Agreement Leadership Committee
Letter of Mutual Approval
December 2, 2020

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1 Introduction

This Consolidated 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 second 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 2019/20 fiscal year (May 1, 2019 to April 30, 2020). 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/).

COVID-19

Unlike other Ontario universities that completely shut down research, the University of Guelph is sustaining substantial research activities during the COVID-19 pandemic. This reflects the Province's identification of 'research' and 'agriculture and food' as essential activities during the state of emergency. Since March 17, 2020, 197 research projects were identified as critical and/or time-sensitive, enabling 144 faculty members to pursue research, engaging more than 500 highly qualified personnel (i.e., undergraduate, graduate, and post-doctoral researchers and research staff).

Some 350 Office of Research staff, most employed as part of the OMAFRA/UofG Agreement, have continued to work in place during the pandemic, running the substantial research facilities, as well as sustaining provincial testing that ensures Ontario's food supply is robust, safe, healthy and nutritious, and that livestock and other animals are well-cared for.

This exceptional level of research-related activities sets the University of Guelph apart from other Ontario universities, and underscores its unique, research-intensive, impactful, real-world-relevant nature.

More details about the impact of COVID-19 on the Agreement are outlined in each of the Program sections.

1.1 Report Structure

The structure of the second Consolidated Annual Report is consistent with the previous annual report. Section 1 is this Introduction. Section 2 is a Financial Summary. Sections 3 through 7 are reports on each of the Agreement's Programs. These sections include highlights, updates and performance information.

In addition to the formal Consolidated Annual Report, the University is also producing *Growing Ontario Solutions,* which delivers 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. *Growing Ontario Solutions 2019/20* will be available in September 2020.

Throughout the report, when numeric metrics are available, arrows have been added to provide a visual representation of how the 2019/20 Results compare to the Target and the 2018/19 Results, as applicable. The arrows have been placed beside the Target or the 2018/19 Results. A green arrow pointing up indicates achievement of the target or an increase over the previous year. A red arrow pointing down indicates that the target has not been achieved or a decrease over the previous year.

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 $47.3 billion to the Province's economy and directly employing more than 860,000 people[1]. 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 (the 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] http://www.omafra.gov.on.ca/english/stats/economy/index.html, 2019 data

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;
- Designing a unique platform for collaboration and innovation;
- Creating a transparent agri-food sector you can trust;
- Establishing a safe and secure agri-food sector; and
- Constructing an enhanced system for research 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.

1.5 Version Control

Version 3

Version 3 of the Annual Report includes the data, missing from Versions 1 and 2, related to third-party funding received by researchers at the University (the data impacts Sections 2.8, 3.1, 3.3.1 and 3.3.5). These data were delayed as a result of challenges with the Office of Research Services' database and issues with migration to a new database. There are still some known issues with the data being reported in this version. Specifically, there is the potential for projects to be missing that should be attributed to 2019/20. The impact would be a slight underestimation in the performance metrics of *Faculty Engaged in Research Supportive of OMAFRA Priorities* and *Total Third-Party Funding of University Research Supportive of Ministry Priorities but not funded by the Agreement*. As both performance metrics have been achieved, it was decided not to delay the completion of the Annual Report any longer. This will not be an issue next year, as the migration to the new database is expected to make data retrieval and quality control much more efficient.

Version 3 also includes a correction to the Total Leverage in the Tier I Research subtotal line in Table 3.22. The Leverage Ratio is correct, as are the Cash Leverage and In-Kind Leverage.

Version 2

The changes made in Version 2 of the Annual Report address the comments provided by OMAFRA in the Alliance Annual Report Review document.

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, 2019 to April 30, 2020).
OMAFRA Other	This revenue includes OMAFRA funding, outside of the Agreement, designated for specific activities (e.g. $500K in support of equipment purchases in the Laboratories).
Sales of Goods and Services	Sales of Goods and Services 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	This revenue includes Investment Income recognized 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 Revenue typically includes irregular activities and projects that do not necessary recur annually.

Table 2.2: Expense Definitions

Term	Definition
Salaries and Wages	All Salaries and Wages for University of Guelph 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.
Faculty Pool Costs	Agreement funds transferred to the University in support of the salaries 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 activities.
Operating	Expenses for all costs other than salaries, benefits and travel costs. Operating expenses include: utilities, fuel and energy costs; equipment lease costs; contracts for services (e.g. janitorial, garbage disposal, etc.); maintenance and repairs costs; laboratory supplies; research supplies; farm supplies (e.g. feed for animals, seeds, pesticides, fertilizer, etc.); telephone and computer costs; animal purchases; and scholarships.
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
2019/20 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.
2019/20 Results	Actual revenue or expenses recorded for the period of May 1, 2019 to April 30, 2020.
2019/20 Budget	Annual Budget allocated, excluding carry forwards.
Variance	Difference between Budget and Results.
% Variance > 5%	Where the Results differ from the Budget by greater than 5% and the variance is greater than $10K.

2.2 Agreement Financial Summary

Table 2.4 provides the Agreement Financial Summary which includes all revenues and expenditures by Standard Accounts for the Agreement. The table includes the 2019/20 Results, 2019/20 Budget, Variance, and Percentage Variance when greater than 5%. This summary does not include ARIO Minor Capital.

In 2019/20, the net Agreement results were a negative balance of $2,818K, due to an intentional draw down of $4,217K from the uncommitted carry forward.

Table 2.4: Agreement Financial Summary[2]
(in thousands of dollars)

Standard Accounts	2019/20 Results	2019/20 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Agreement	(68,918)	(66,100)	2,818	
OMAFRA Other	(500)	(500)	0	
Sales Goods and Services	(20,823)	(20,347)	476	
Investment Income	(6)	0	6	
Other Revenue	(1,276)	(785)	491	63%
Revenue Total	**(91,523)**	**(87,732)**	**3,791**	
Expenses			**0**	
Salaries and Wages	33,786	35,113	1,327	
Non-Salary Benefit Costs	8,639	9,078	439	
Faculty Pool Costs	13,045	13,045	0	
Travel	755	951	196	21%
Operating	40,616	37,929	(2,687)	-7%
Internal Recoveries	(5,317)	(4,167)	1,150	28%
Budget Adjustment	0	(4,217)	(4,217)	
Expenses Total	**91,523**	**87,732**	**(3,791)**	
Grand Total	**0**	**0**	**0**	
Carry Forward into 2019/20	42,070			
Change in Carry Forward	(2,818)			
Carry Forward into 2020/21	39,252			

[2] The Agreement Financial Summary does not include the ARIO Minor Capital Expenses of $9,857K. If these were included, the Revenue and Expense Totals would be $101,381K, which is consistent with the 2019/20 Audited Financial Statements.

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

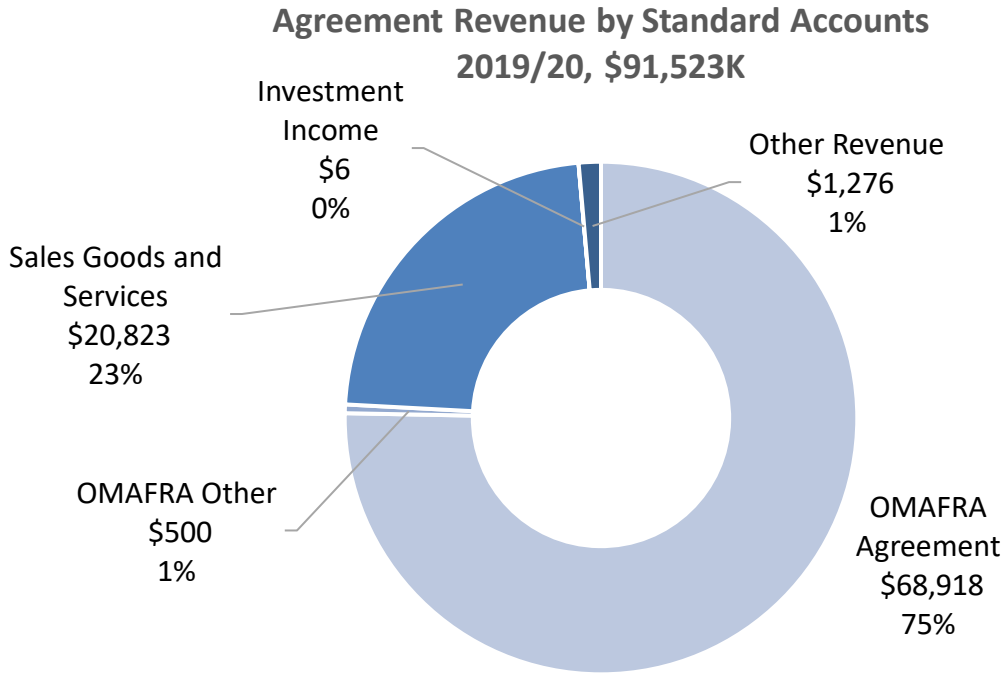


Figure 2.1: Agreement Revenue for 2019/20 by Standard Accounts
(in thousands of dollars)

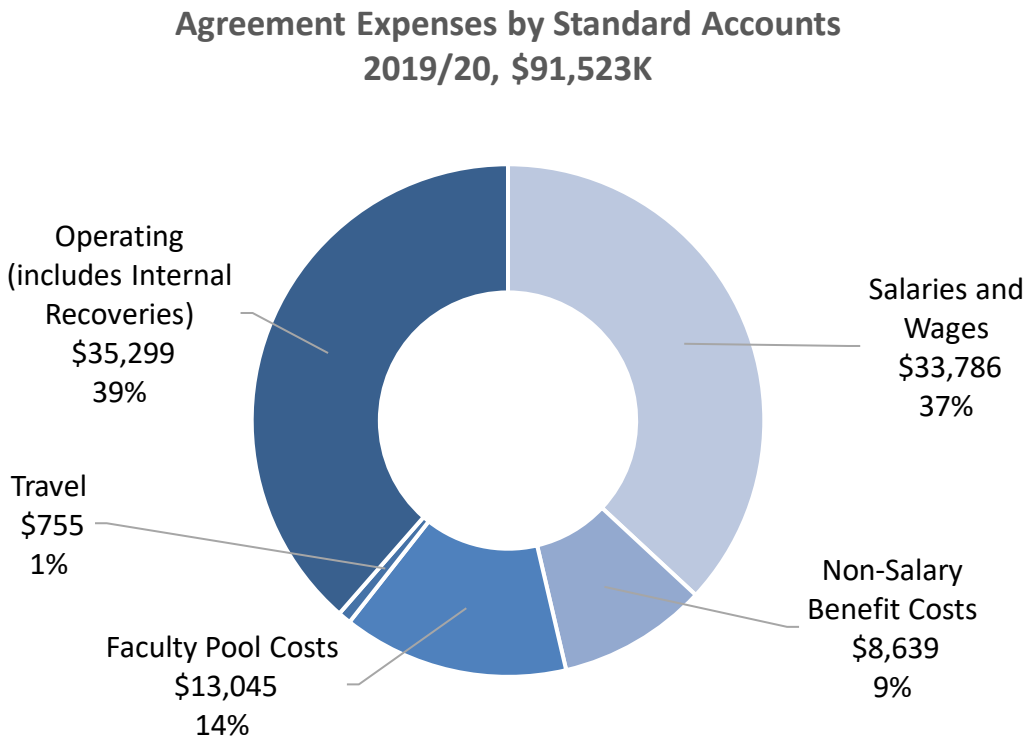


Figure 2.2: Agreement Expenses for 2019/20 by Standard Accounts
(in thousands of dollars)

Table 2.5 shows the Agreement Financial Summary by Program for 2019/20.

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

Standard Accounts	Research Program	VCP	AHL	AFL	Property Management	General & Inflation Reserve	Exigency Fund (Recognized)	Total
Revenue								
OMAFRA Agreement	(37,043)	(5,292)	(6,771)	(6,413)	(13,399)			(68,918)
OMAFRA Other	0	0	0	(500)	0			(500)
Sales Goods and Services	(99)	0	(7,762)	(8,715)	(4,248)			(20,823)
Investment Income	0	0	0	0	0		(6)	(6)
Other Revenue	(49)	0	(3)	(7)	(1,218)			(1,276)
Revenue Total	**(37,191)**	**(5,292)**	**(14,536)**	**(15,635)**	**(18,864)**	**0**	**(6)**	**(91,523)**
Expenses								
Salaries and Wages	9,516	162	8,098	8,418	7,586		6	33,786
Non-Salary Benefit Costs	1,824	27	2,209	2,471	2,108			8,639
Faculty Pool Costs	11,145	1,900	0	0	0			13,045
Travel	396	203	75	48	33			755
Operating	15,379	3,000	6,354	5,289	10,594			40,616
Internal Recoveries	(1,069)	0	(2,200)	(592)	(1,456)			(5,317)
Expenses Total	**37,191**	**5,292**	**14,536**	**15,635**	**18,864**	**0**	**6**	**91,523**
Grand Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2019/20 Budget	**38,223**	**5,296**	**7,700**	**5,722**	**13,376**	**(4,217)**	**0**	**66,100**
Change in Carry Forward (Budget - OMAFRA Agreement)	**1,180**	**4**	**928**	**(691)**	**(23)**	**(4,217)**	**0**	**(2,818)**
Carry Forward in 2019/20	**17,526**	**0**	**2,198**	**2,233**	**441**	**19,670**	**0**	**42,070**
Carry Forward in 2020/21	**18,706**	**4**	**3,127**	**1,543**	**418**	**15,454**	**0**	**39,252**

Table 2.6 illustrates the Net Expenses by Program for 2019/20 compared to budget. Figure 2.3 shows the Net Expenses in a visual format. It does not include the General & Inflation Reserve or the Exigency Fund (Recognized).

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

Program Schedule	2019/20 Results	2019/20 Budget	Variance	% Variance >5%
Research Program	37,043	38,223	1,180	
Veterinary Capacity Program	5,292	5,296	4	
Animal Health Laboratory	6,771	7,700	928	12%
Agriculture and Food Laboratory	6,413	5,722	(691)	-12%
Property Management	13,399	13,376	(23)	
General and Inflation Reserve	0	(4,217)	(4,217)	
Exigency Fund (Recognized)	0	0	0	
Grand Total	**68,918**	**66,100**	**(2,818)**	

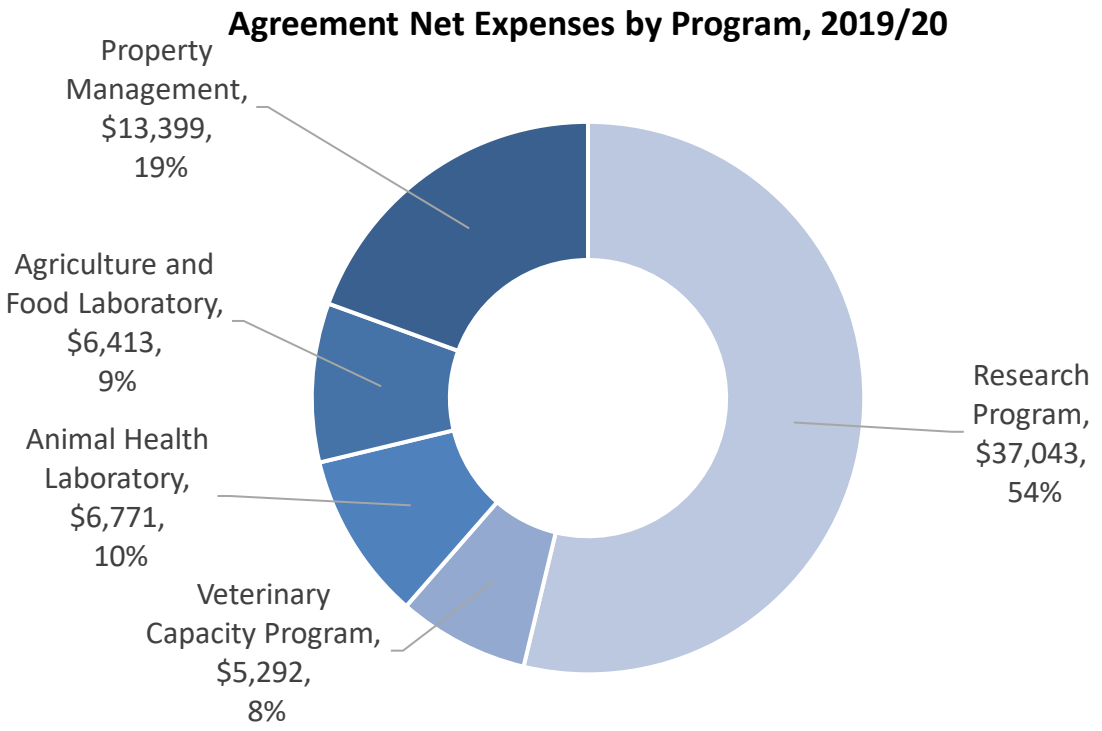


Figure 2.3: Agreement Net Expenses by Program
(in thousands of dollars)

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 2019/20 Results of $37,043K are $1,180K less than the 2019/20 budget of $38,223K, a variance of 3%. Revenue had a positive variance of $101K. This was due to small amounts of annual sales (e.g. parking revenue at Ridgetown, testing services, etc.) and other revenues in the Research Support and the Research Project Program Activities. These are highly variable year to year and difficult to budget for. Salaries and Wages were $987K or 9% under budget. This was related to delayed expenditures, mainly in Special Initiatives and KTT Projects. Benefits were also 6% under budget which related to the under expenditure in Salaries and Wages. Travel costs were $125K under budget. The positive variance was related to lower than expected expenditures mainly in Special Initiatives and KTT Projects. In addition, COVID-19 reduced the travel occurring in the last quarter of the year. Internal recoveries were $456K over budget, creating a positive variance of 74%. A portion of this related to the HQP Scholarship Program and the additional support, beyond the matching requirement, provided from Food from Thought. It also corresponded to a number of recoveries in Tier I Research Projects for work-study students and undergraduate research assistantships. Finally, the increase was also impacted by a significant amount of testing that was billed in Research Support at the Ridgetown Campus.

Table 2.7: 2019/20 Results for the Research Program
(in thousands of dollars)

Standard Accounts	2019/20 Results	2019/20 Budget	Variance	% Variance >5%
Revenue				
Sales Goods and Services	(99)	(30)	69	230%
Other Revenue	(49)	(17)	32	184%
Revenue Total	**(148)**	**(47)**	**101**	**213%**
Expenses				
Salaries and Wages	9,516	10,503	987	9%
Non-Salary Benefit Costs	1,824	1,932	107	6%
Faculty Pool Costs	11,145	11,145	0	
Travel	396	521	125	24%
Operating	15,379	14,783	(595)	
Internal Recoveries	(1,069)	(613)	456	74%
Expenses Total	**37,191**	**38,270**	**1,079**	
Grand Total	**37,043**	**38,223**	**1,180**	
Carry Forward into 2019/20	17,526			
Carry Forward into 2020/21	18,706			

Table 2.8 provides the 2019/20 Results for the Program Activities in the Research Program, as well as the related carry forwards.

Table 2.8: 2019/20 Results for Program Activities in the Research Program
(in thousands of dollars)

Standard Accounts	Research Faculty	Research Support	HQP Scholarship Program	Research Project Operating	Research Innovation Office	Gryphon's LAAIR	KTT Program	Indirect Costs	Total
Revenue									
Sales Goods and Services	0	(99)	0	0	0	0	0	0	**(99)**
Other Revenue	0	(26)	0	(23)	0	0	0	0	**(49)**
Revenue Total	**0**	**(125)**	**0**	**(23)**	**0**	**0**	**0**	**0**	**(148)**
Expenses									
Salaries and Wages	0	5,182	0	3,833	207	167	127	0	**9,516**
Non-Salary Benefit Costs	0	1,455	0	292	35	23	20	0	**1,824**
Faculty Pool Costs	11,145	0	0	0	0	0	0	0	**11,145**
Travel	0	28	0	326	1	29	12	0	**396**
Operating	0	1,590	788	2,159	6	207	129	10,500	**15,379**
Internal Recoveries	0	(601)	(378)	(89)	0	0	0	0	**(1,069)**
Expenses Total	**11,145**	**7,654**	**410**	**6,520**	**249**	**426**	**287**	**10,500**	**37,191**
2019/20 Results	**11,145**	**7,529**	**410**	**6,498**	**249**	**426**	**287**	**10,500**	**37,043**
2019/20 Budget	**11,145**	**7,479**	**250**	**7,699**	**250**	**400**	**500**	**10,500**	**38,223**
Variance	**0**	**(50)**	**(160)**	**1,201**	**1**	**(26)**	**213**	**0**	**1,180**
Carry Forward into 2019/20	**0**	**3,145**	**417**	**13,211**	**(1)**	**360**	**394**	**0**	**17,526**
Carry Forward into 2020/21	**0**	**3,096**	**257**	**14,413**	**0**	**335**	**606**	**0**	**18,706**

The opening carry forward for Research Program was $17,526K. The closing carry forward for 2019/20 is $18,706K. More details about the carry forwards can be found in Section 2.5.

2.3.1.1 Components of the Research Project Operating Program Activity

Table 2.9 provides the breakdown of the components of the Research Project Operating Program Activity, as well as the related carry forwards.

Table 2.9: 2019/20 Results for Components of the Research Project Operating Program Activity
(in thousands of dollars)

Standard Accounts	Research Projects - Tier I	Research Projects - Special Initiatives	USEL	Total
Revenue				
Sales Goods and Services	0	0	0	**0**
Other Revenue	(23)	0	0	**(23)**
Revenue Total	**(23)**	**0**	**0**	**(23)**
Expenses				
Salaries and Wages	3,624	134	76	**3,833**
Non-Salary Benefit Costs	264	21	7	**292**
Faculty Pool Costs	0	0	0	**0**
Travel	325	0	1	**326**
Operating	2,189	(36)	5	**2,159**
Internal Recoveries	(89)	0	0	**(89)**
Expenses Total	**6,312**	**119**	**89**	**6,520**
2019/20 Results	**6,289**	**119**	**89**	**6,498**
2019/20 Budget	**5,788**	**1,823**	**88**	**7,699**
Variance	**(501)**	**1,704**	**(1)**	**1,201**
Carry Forward into 2019/20	**11,564**	**1,645**	**2**	**13,211**
Carry Forward into 2020/21	**11,062**	**3,349**	**1**	**14,413**

2.3.1.2 Components of the Research Support Program Activity

Table 2.10 provides the breakdown of the components of the Research Support Program Activity, as well as the related carry forwards.

Table 2.10: 2019/20 Results for Components of the Research Support Program Activity
(in thousands of dollars)

Standard Accounts	Research Support - General	Long-Term Trials	Total
Revenue			
Sales Goods and Services	(99)	0	**(99)**
Other Revenue	(26)	0	**(26)**
Revenue Total	**(125)**	**0**	**(125)**
Expenses			
Salaries and Wages	5,078	103	**5,182**
Non-Salary Benefit Costs	1,441	14	**1,455**
Faculty Pool Costs	0	0	**0**
Travel	28	0	**28**
Operating	1,518	72	**1,590**
Internal Recoveries	(601)	0	**(601)**
Expenses Total	**7,465**	**189**	**7,654**
2019/20 Results	**7,339**	**189**	**7,529**
2019/20 Budget	**7,279**	**200**	**7,479**
Variance	**(60)**	**11**	**(50)**
Carry Forward into 2019/20	**3,145**	**0**	**3,145**
Carry Forward into 2020/21	**3,085**	**11**	**3,096**

2.3.2 Veterinary Capacity Program

The VCP summary is presented in Table 2.11. The 2019/20 Results of $5,292K are slightly less than the 2019/20 Budget, with a few minor variances by category. There was a slight variance of $14K in Salaries and Wages which related to some labour costs being recorded in Operating as a labour transfer rather than in Salaries and Wages.

Table 2.11: Veterinary Capacity Program (VCP)
(in thousands of dollars)

Standard Accounts	2019/20 Results	2019/20 Budget	Variance	% Variance >5%
Expenses				
Salaries and Wages	162	176	14	8%
Non-Salary Benefit Costs	27	29	2	
Faculty Pool Costs	1,900	1,900	0	
Travel	203	207	4	
Operating	3,000	2,983	(16)	
Internal Recoveries	0	0	0	
Expenses Total	**5,292**	**5,296**	**4**	
Grand Total	**5,292**	**5,296**	**4**	
Carry Forward into 2019/20	0			
Carry Forward into 2020/21	4			

Table 2.12 provides the 2019/20 Results for the Program Activities in the Veterinary Capacity Program, as well as the related carry forwards.

Table 2.12: 2019/20 Results for Program Activities in the Veterinary Capacity Program
(in thousands of dollars)

Standard Accounts	VCP HSC Staff, Vets, Operations : CPHAZ	VCP Faculty	VCP Externships; Summer Student Experience Placements	VCP Internships; Residency Programs	VCP Doctoral Programs	Total
Expenses						
Salaries and Wages	131	0	0	31	0	**162**
Non-Salary Benefit Costs	22	0	0	5	0	**27**
Faculty Pool Costs	0	1,900	0	0	0	**1,900**
Travel	3	0	200	0	0	**203**
Operating	2,326	0	45	134	495	**3,000**
Internal Recoveries	0	0	0	0	0	**0**
Expenses Total	**2,482**	**1,900**	**245**	**170**	**495**	**5,292**
Grand Total	**2,482**	**1,900**	**245**	**170**	**495**	**5,292**
2019/20 Budget	**2,482**	**1,900**	**249**	**170**	**495**	**5,296**
Variance	**0**	**0**	**4**	**(0)**	**0**	**4**
Carry Forward into 2019/20	**0**	**0**	**0**	**0**	**0**	**0**
Carry Forward into 2020/21	**0**	**0**	**4**	**0**	**0**	**4**

The opening carry forward for VCP was $0. The closing carry forward for 2019/20 is $4K.

2.3.2.1 Transfers to the OVC Health Sciences Centre

Table 2.13 provides a breakdown of transfers to the Ontario Veterinary College (OVC) Health Sciences Centre (HSC) by resource type. The transfers make up a significant portion of the Operating costs in the VCP HSC Staff, Vets, Operations: CPHAZ Program Activity.

Table 2.13: Transfers to the OVC Health Sciences Centre

Resource	FTE	Total (in thousands of dollars)
Veterinarians	**1.00**	**147**
Large Animal Medicine Clinic - Ruminant Service	1.00	147
Animal Housing Staff	**8.00**	**642**
Large Animal Housing	8.00	642
Technical Staff	**15.00**	**1,263**
Large Animal Medicine Clinic - Ruminant Service	1.00	89
Large Animal Wards	12.00	1,021
Sterile Processing	1.00	69
Pharmacy	1.00	83
Administrative Staff	**2.71**	**236**
Business Office	0.96	88
Medical Records	0.75	51
Operations & Service Mgt	1.00	97
Total	**26.71**	**2,289**

2.3.3 Animal Health Laboratory

The AHL summary is presented in Table 2.14. The 2019/20 Results of $6,771K were $928K less than the 2019/20 Budget of $7,700K, a variance of 12%. In AHL, Sales were $553K over budget, with a positive variance of 8%. Most laboratory activities were quite strong in 2019/20, especially Virology due to increased export testing. However, COVID-19 impacted the final quarter of 2019/20, leading to an estimated external revenue loss of $105K.

Non-Salary Benefits were under budget by 6%. This was mainly due to the savings in Salaries and Wages generated from time lags in filling vacancies. It was also partially due to the utilization of temporary full-time staff, who have a lower benefit rate, to cover absences of the regular incumbents. In addition, Travel expenses were 37% under budget. Key scientific staff need to attend conferences to remain current in their areas of expertise and to network with colleagues in their field. Due to the busyness of the laboratory, staff were not able to get away as planned. In addition, travel ceased in the fourth quarter due to COVID-19. Operating expenses were over budget by 6%. This was related to equipment reinvestment costs of $448K. This was less than the $943K approved in the 2019/20 Business Plan, as many items were deferred to 2020/21. Internal Recoveries had a positive variance of 9%, as AHL experienced higher than normal recoveries in the first three quarters of 2019/20. Internal Recoveries were also reduced in the fourth quarter due to COVID-19, which impacted activities at the OVC Health Sciences Centre and reduced research-related testing. The internal revenue loss due to COVID-19 was estimated at $45K.

Table 2.14: Animal Health Laboratory (AHL)
(in thousands of dollars)

Standard Accounts	2019/20 Results	2019/20 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Other		0	0	
Sales Goods and Services	(7,762)	(7,209)	553	8%
Other Revenue	(3)	(2)	1	
Revenue Total	**(7,765)**	**(7,211)**	**554**	**8%**
Expenses			**0**	
Salaries and Wages	8,098	8,489	391	
Non-Salary Benefit Costs	2,209	2,341	133	6%
Travel	75	119	44	37%
Operating	6,354	5,985	(370)	-6%
Internal Recoveries	(2,200)	(2,024)	177	9%
Expenses Total	**14,536**	**14,910**	**375**	
Grand Total	**6,771**	**7,700**	**928**	**12%**
Carry Forward into 2019/20	2,198			
Carry Forward into 2020/21	3,127			

Table 2.15 delivers the 2019/20 Results for the Program Activities in the Animal Health Laboratory, as well as the related carry forwards.

Table 2.15: 2019/20 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	(7,762)	0	0	0	0	**(7,762)**
Other Revenue	0	0	(2)	0	(1)	**(3)**
Revenue Total	**(7,762)**	**0**	**(2)**	**0**	**(1)**	**(7,765)**
Expenses						
Salaries and Wages	6,759	0	909	411	19	**8,098**
Non-Salary Benefit Costs	1,847	0	269	91	2	**2,209**
Travel	51	0	11	9	4	**75**
Operating	5,389	123	651	55	137	**6,354**
Internal Recoveries	(2,202)	0	(2)	0	3	**(2,200)**
Expenses Total	**11,845**	**123**	**1,838**	**565**	**165**	**14,536**
2019/20 Results	**4,083**	**123**	**1,836**	**565**	**164**	**6,771**
2019/20 Budget	**4,890**	**156**	**1,769**	**624**	**261**	**7,700**
Variance	**807**	**33**	**(67)**	**59**	**97**	**928**
Carry Forward into 2019/20	**1,851**	**33**	**0**	**128**	**186**	**2,198**
Carry Forward into 2020/21	**2,658**	**67**	**(67)**	**187**	**282**	**3,127**

The opening carry forward for AHL was $2,198K. The closing carry forward for 2019/20 is $3,127K.

Several adjustments to the individual Program Activity carry forwards were implemented, as shown in Table 2.16. The AHL LSD Central Administration carry forward was centralized to AHL Testing/Programs, as it related to the cost of shared IT equipment and a small operational deficit.

The Bee and Apiary Health Testing carry forward was also moved to AHL Testing/Programs. The Executive Committee approved a decision note on June 26, 2020 which removed the Bee and Apiary Health Testing Program Activity from the Agreement and rolled any related carry forwards to the AHL Testing/Programs budget for future additional testing capacity in emerging priority areas (e.g. Chronic Wasting Disease (CWD), Salmonella Dublin and African Swine Fever (ASF)). This change will also be reflected in the next Business Plan.

The funds in AHL Testing/Programs will also help to offset any operational deficits related to COVID-19, as well as support future equipment purchases.

Table 2.16: AHL 2020/21 Carry Forward Adjustments by Program Activity
(in thousands of dollars)

Program Activity	Opening Carry Forward	Adjust-ments	Final Carry Forward	Purpose
AHL Testing / Programs	2,658	(1)	2,657	Equipment Renewal, Operating Support
Bee and Apiary Health Testing	67	(67)	0	
AHL LSD Central Administration	(67)	67	0	
OAHN Operations	187		187	Program Support
OAHN Projects	282		282	Project Commitments
Total	**3,127**	**0**	**3,127**	

2.3.3.1 OAHN Projects

Table 2.17 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 $261K in 2019/20. There were 14 projects awarded with a total value of $245K. Three of these projects were completed in 2019/20, leaving 11 active projects. The remaining $16K will be carried forward to future years to help to offset the reductions to this Program Activity through the multi-year scenario planning process.

With respect to OAHN Projects from 2018/19, an additional $3K was allocated, in total, to two projects and ten projects were closed with their remaining cumulative balance of $30K being returned to the Committed to Future Years pool. Five projects are still being completed.

Table 2.17: OAHN Projects Program Details
(in thousands of dollars)

Description	Previous Results	2019/20 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects
2019/20 Projects	**0**	**68**	**177**	**16**	**261**	**14**
OAHN Projects		*68*	*177*	*0*	***245***	*14*
Unallocated				*16*	***16***	
2018/19 Projects	**70**	**96**	**53**	**37**	**256**	**15**
OAHN Projects	*70*	*96*	*53*	*0*	***218***	*15*
Unallocated				*37*	***37***	
Total	**70**	**164**	**229**	**53**	**516**	**29**

2.3.4 Agriculture and Food Laboratory

The AFL summary is presented in Table 2.18. The 2019/20 Results of $6,413K were $691K more than the 2019/20 Budget of $5,722K, a negative variance of 12%.

AFL fell $50K short of their revenue target. This shortfall was attributed to COVID-19 which impacted the final quarter of 2019/20, leading to an estimated external revenue loss of $105K. Non-Salary Benefits were under budget by 6%, due to the utilization of temporary full-time staff to cover absences of the regular incumbents, which have a lower benefit rate. Travel expenses were 33% under budget. Key scientific staff need to attend conferences to remain current in their areas of expertise and to network with colleagues in their field. AFL also budgets travel expenses for the business development staff to attend trade conferences to create awareness of the services offered and to meet with potential clients. Due to the busyness of the laboratory, staff were not able to get away as planned. In addition, travel ceased in the fourth quarter due to COVID-19. Operating expenses were $816K or 18% over budget. This was mainly due to equipment reinvestment costs of $1,129K. $500K of the equipment costs were included in the budget related to the CAPEX program, so the net impact of the equipment expenditures was $629K. The remainder was related to a greater than expected need for laboratory supplies and higher maintenance costs. Internal Recoveries had a positive variance of 17% this year. As with AHL, they were reduced in the fourth quarter due to COVID-19. The internal revenue loss was estimated at $15K.

Table 2.18: Agriculture and Food Laboratory (AFL)
(in thousands of dollars)

Standard Accounts	2019/20 Results	2019/20 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Other	(500)	(500)	0	
Sales Goods and Services	(8,715)	(8,765)	(50)	
Other Revenue	(7)	(7)	(0)	
Revenue Total	**(9,222)**	**(9,272)**	**(50)**	
Expenses				
Salaries and Wages	8,418	8,339	(79)	
Non-Salary Benefit Costs	2,471	2,616	145	6%
Travel	48	72	24	33%
Operating	5,289	4,473	(816)	-18%
Internal Recoveries	(592)	(505)	86	17%
Expenses Total	**15,635**	**14,994**	**(641)**	
Grand Total	**6,413**	**5,722**	**(691)**	**-12%**
Carry Forward into 2019/20	2,233			
Carry Forward into 2020/21	1,543			

Table 2.19 provides the 2019/20 Results for the Program Activities in the Agriculture and Food Laboratory, as well as the related carry forwards.

Table 2.19: 2019/20 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	(500)	0	**(500)**
Sales Goods and Services	(8,675)	(40)	**(8,715)**
Other Revenue	0	(7)	**(7)**
Revenue Total	**(9,175)**	**(47)**	**(9,222)**
Expenses			
Salaries and Wages	6,928	1,490	**8,418**
Non-Salary Benefit Costs	2,015	456	**2,471**
Travel	22	26	**48**
Operating	4,486	803	**5,289**
Internal Recoveries	(585)	(6)	**(592)**
Expenses Total	**12,867**	**2,768**	**15,635**
2019/20 Results	**3,692**	**2,721**	**6,413**
2019/20 Budget	**3,072**	**2,650**	**5,722**
Variance	**(620)**	**(71)**	**(691)**
Carry Forward into 2019/20	**2,233**	**0**	**2,233**
Carry Forward into 2020/21	**1,613**	**(71)**	**1,543**

The opening carry forward for AFL was $2,233K. The closing carry forward for 2019/20 is $1,543K. The AFL LSD Central Administration carry forward was centralized to AFL Testing/Programs, as it related to the cost of shared IT equipment and a small operational deficit. These funds are committed to future equipment purchases. They will also help to offset any operational deficits related to COVID-19.

2.3.4.1 Third-Party Revenue

Table 2.20 illustrates the amount and percentage of revenue generated by source on annual basis in the Agriculture and Food Laboratory. In 2019/20, 56.2% of AFL's revenue came from third-party testing contracts, which compares to 54.7% in 2018/19.

Table 2.20: 2019/20 Revenue Generated by Source in AFL
(in thousands of dollars)

Source	Revenue	Percentage
Revenue from the OMAFRA Agreement (shown as budget)	5,722	39.6%
Testing for OMAFRA outside of the Agreement	600	4.1%
Third-Party Testing Contracts	8,115	56.2%
Total	**14,437**	

2.3.5 Property Management

The Property Management summary is presented in Table 2.21. The original 2019/20 Property Management Schedule budget was $12,876K. The net Budget was increased to $13,376K for 2019/20 to account for the delayed sale of the farm portion of the Kemptville Property and the main campus portion of the Alfred Property. The 2019/20 Results of $13,399K were $23K over the revised 2019/20 Budget.

By category, Other Revenue was 60% over budget. This was due to a number of factors, including a significant increase in the rental revenue related to the growth facilities, additional funds received from ARIO to offset the cost of operating the Kemptville Campus from October 2019 to March 2020, and an increase in rental recoveries from external tenants, triggered by higher operating costs. Operating costs were 9% over budget. This was related to higher than budgeted maintenance, equipment rental and utility costs. There were also a few other notable items: Operating costs at the Alfred Campus were $68K over budget; the cost of establishing and operating the new turfgrass site in addition to operating the original site was $93K; and Research Station Operations (RSO) were $140K over budget due to higher input costs related to preparing for the increased needs (pasture, feed, straw) of Elora Beef. Internal Recoveries were 42% 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 labour recoveries, including recovery of a salary line due to a union leave.

Table 2.21: Property Management Program
(in thousands of dollars)

Standard Accounts	2019/20 Results	2019/20 Budget	Variance	% Variance >5%
Revenue				
Sales Goods and Services	(4,248)	(4,344)	(96)	
Other Revenue	(1,218)	(759)	459	60%
Revenue Total	**(5,465)**	**(5,102)**	**363**	**7%**
Expenses			**0**	
Salaries and Wages	7,586	7,606	20	
Non-Salary Benefit Costs	2,108	2,160	52	
Travel	33	32	(0)	
Operating	10,594	9,705	(889)	-9%
Internal Recoveries	(1,456)	(1,025)	431	42%
Expenses Total	**18,864**	**18,478**	**(386)**	
Grand Total	**13,399**	**13,376**	**(23)**	
Carry Forward into 2019/20	441			
Carry Forward into 2020/21	418			

Table 2.22 delivers the 2019/20 Results for the Program Activities in the Property Management Program, as well as the related carry forwards.

Table 2.22: 2019/20 Results for Program Activities in the Property Management Program
(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	(4,248)	0	0	**(4,248)**
Other Revenue	(853)	(365)	0	0	**(1,218)**
Revenue Total	**(853)**	**(4,613)**	**0**	**0**	**(5,465)**
Expenses					
Salaries and Wages	818	6,493	274	0	**7,586**
Non-Salary Benefit Costs	229	1,791	88	0	**2,108**
Travel	6	27	0	0	**33**
Operating	5,212	4,586	1	796	**10,594**
Internal Recoveries	(289)	(1,159)	(8)	0	**(1,456)**
Expenses Total	**5,975**	**11,738**	**355**	**796**	**18,864**
2019/20 Results	**5,123**	**7,125**	**355**	**796**	**13,399**
2019/20 Budget	**5,038**	**7,194**	**354**	**791**	**13,376**
Variance	**(85)**	**68**	**(1)**	**(5)**	**(23)**
Carry Forward into 2019/20	**(48)**	**475**	**13**	**1**	**441**
Carry Forward into 2020/21	**(133)**	**544**	**12**	**(4)**	**418**

The opening carry forward related to Property Management was $441K. The closing carry forward for 2019/20 is $418K.

2.3.5.1 Revenues and Expenditures by ARIO Property

Table 2.23 provides the annual financial breakdown of total revenues and total expenditures for each of the ARIO Properties. A discussion follows for the ARIO Properties that had a variance of more than 5% of the 2019/20 Expenses and greater than $15K.

Table 2.23: Annual Financial Breakdown by ARIO Property
(in thousands of dollars)

Research Stations	2019/20 Expenses	2019/20 Revenue	2019/20 Results	2019/20 Budget	2019/20 Balance
Alma	698	(149)	549	608	59
Arkell	2,085	(228)	1,857	1,962	105
Equine	*295*	*0*	*295*	*287*	*(9)*
Feed Mill	*78*	*0*	*78*	*67*	*(11)*
Poultry	*671*	*(223)*	*448*	*507*	*59*
Swine	*1,040*	*(5)*	*1,035*	*1,101*	*66*
Bradford	318	(47)	270	280	9
Cedar Springs	37	0	37	51	14
Elora	3,942	(1,862)	2,080	2,007	(73)
Beef	*1,007*	*(2)*	*1,005*	*878*	*(127)*
Crops	*403*	*0*	*403*	*356*	*(47)*
Dairy	*2,532*	*(1,860)*	*672*	*772*	*100*
Emo	55	(2)	53	41	(12)
Guelph	373	(6)	366	268	(98)
Huron	84	(59)	25	50	25
New Liskeard	1,148	(243)	905	905	0
Beef	*499*	*(193)*	*306*	*313*	*7*
Crops	*69*	*(50)*	*19*	*9*	*(10)*
General	*580*	*(0)*	*580*	*583*	*3*
Ponsonby	534	(6)	528	523	(5)
General Animal Facility	*237*	*0*	*237*	*230*	*(7)*
Sheep	*297*	*(6)*	*291*	*293*	*2*
Research Station Operations	2,396	(355)	2,041	1,878	(163)
Ridgetown	2,347	(478)	1,870	1,741	(129)
Beef	*11*	*(43)*	*(32)*	*(5)*	*27*
Dairy	*358*	*(322)*	*36*	*(9)*	*(45)*
General	*1,932*	*(104)*	*1,828*	*1,725*	*(103)*
Swine	*47*	*(9)*	*38*	*29*	*(9)*
Simcoe	853	(68)	785	714	(71)
University	546	(217)	329	482	153
Growth Facilities	*229*	*(217)*	*12*	*181*	*169*
Isolation Unit	*317*	*0*	*317*	*301*	*(16)*
Winchester	354	(142)	211	203	(9)
Woodstock	218	(114)	104	93	(11)
Total Research Stations	**15,987**	**(3,977)**	**12,011**	**11,804**	**(207)**

Of note, Elora Beef had a deficit of $127K. A portion of this was related to the start-up of the new facility and the operation of two facilities for a portion of the year. In 2020/21, there will need to be a budget adjustment to account for the increased costs of operating the new facility. Elora Crops had a deficit of $47K. This was mainly due to budget shortfalls in maintenance of facilities and field equipment of $23K, vehicle charges of $12K and station recoveries of $7K. These appear to be one-time costs, rather than ongoing budget issues.

Guelph Research Station was over budget by $98K. The majority of this was related to the one-time cost of establishing and operating the new turfgrass site in addition to the original site. Research Station Operations was over budget by $163K, much of this was due to higher input costs related to preparing for the increased needs (pasture, feed, straw) of Elora Beef. This is a mix of one-time and ongoing costs, thus some will need to be addressed in the 2020/21 budget.

The Ridgetown Campus, overall, had a deficit of $129K. Specifically, the Ridgetown Dairy had a deficit of $45K. This was mainly related to higher than expected feed costs, as well as some payouts of overtime banks; this was a significant improvement over 2018/19, where the deficit was $119K. The University continues to make changes to address the deficit in the Dairy, with improvements expected again in 2020/21. Ridgetown General had a deficit of $103K, a decrease from the 2018/19 deficit of $194K. This includes both the Farm, as well as the O&M costs of the Ridgetown Campus. Much of the deficit remains related to the operating and maintenance costs of the campus, especially cleaning. The University is continuing to work on creative ways to address the situation.

Finally, the Simcoe Research Station had a deficit of $71K. This was mainly attributable to budget shortfalls of $29K in maintenance and repairs and $24K in equipment rental and purchase. The University is working closely with the Station Manager to address the differentials.

Table 2.24 shows the revenues and expenditures directly related to ARIO and University Tenants.

Table 2.24: Annual Financial Breakdown by Tenants
(in thousands of dollars)

Tenants - ARIO	2019/20 Expenses	2019/20 Revenue	2019/20 Results	2019/20 Budget	2019/20 Balance
Alfred	328	(39)	289	220	(69)
Elora/Arkell	11	(12)	(1)	0	1
Guelph	7	(8)	(1)	0	1
Kemptville	292	(110)	182	280	98
New Liskeard	435	(396)	39	0	(39)
Education Centre	*377*	*(336)*	*41*	*0*	*(41)*
OPP	*57*	*(60)*	*(3)*	*0*	*3*
Ridgetown	20	(20)	(0)	0	0
Simcoe	23	(21)	2	0	(2)
Vineland	8	(6)	2	0	(2)
Total Tenants - ARIO	**1,123**	**(611)**	**511**	**500**	**(11)**
Tenants - University					
New Liskeard	11	(13)	(2)	0	2
Research Station Operations	64	(54)	11	0	(11)
Ridgetown	15	(23)	(8)	0	8
Total Tenants - University	**91**	**(90)**	**0**	**0**	**(0)**
Total Tenants	**1,214**	**(702)**	**512**	**500**	**(12)**

Finally, Table 2.25 delivers a summary by property type, including Vineland, which corresponds to the overall Property Management Program.

Table 2.25: Annual Financial Breakdown by Property Type
(in thousands of dollars)

Property Type	2019/20 Expenses	2019/20 Revenue	2019/20 Results	2019/20 Budget	2019/20 Balance
Research Stations	15,987	(3,977)	12,011	11,804	(207)
Tenants - ARIO	1,123	(611)	511	500	(11)
Tenants - University	91	(90)	0	0	(0)
Vineland	1,151	0	1,151	1,145	(6)
Other[3]	512	(787)	(275)	(72)	202
Total	**18,864**	**(5,465)**	**13,399**	**13,376**	**(23)**

[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 2.26 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 2.26: Station Revenues and Recoveries by Year
(in thousands of dollars)

Activity	2015/16	2016/17	2017/18	2018/19	2019/20
Revenues (External)	**5,537**	**4,787**	**6,199**	**5,965**	**5,465**
Sales-Farm Products, Services	4,461	3,634	4,777	4,600	4,266
Other	63	70	102	183	215
Facility Rentals	1,013	1,084	1,319	1,182	985
Recoveries (Internal)	**815**	**808**	**786**	**893**	**963**
Sales (net)-Animals, Farm Products	240	239	40	151	202
Research Station Fees	316	289	549	417	426
Facility Usage (net)	259	280	197	325	334
Grand Total	**6,352**	**5,596**	**6,985**	**6,858**	**6,428**

Table 2.27 provides the summarized revenues and recoveries by property type for 2019/20. In addition, Table 2.28 illustrates the revenues and recoveries by type for each of the Research Stations.

Table 2.27: Revenues and Recoveries by Property Type
(in thousands of dollars)

Property Type	Sales	Other	Facility Rentals	Total Revenues (Internal)	Sales (net)	Res. Station Fees	Facility Usage (net)	Total Recoveries (External)	Grand Total
Research Stations	3,587	107	283	**3,977**	14	426	334	**774**	**4,751**
Tenants - ARIO	0	0	611	**611**	0	0	0	**0**	**611**
Tenants – Univ.	0	0	90	**90**	0	0	0	**0**	**90**
Other	679	108	0	**787**	188	0	0	**188**	**975**
Total	**4,266**	**215**	**985**	**5,465**	**202**	**426**	**334**	**963**	**6,428**

Table 2.28: Revenue and Recoveries for Each Research Station
(in thousands of dollars)

Research Station	Sales - Farm Products, Services	Other	Facility Rentals	Total Revenues (Internal)	Sales (net) - Animals, Farm Products	Research Station Fees	Facility Usage (net)	Total Recoveries (External)	Grand Total
Alma	121	28	0	149	4	3	0	7	**155**
Arkell	224	4	0	228	4	188	(2)	190	**418**
Equine	*0*	*0*	*0*	*0*	*(1)*	*12*	*0*	*11*	***11***
Poultry	*223*	*0*	*0*	*223*	*4*	*136*	*(2)*	*139*	***362***
Swine	*0*	*4*	*0*	*5*	*0*	*40*	*0*	*40*	***45***
Bradford	16	31	0	47	0	7	0	7	**55**
Cedar Springs	0	0	0	0	0	1	0	1	**1**
Elora	1,860	2	0	1,862	6	132	0	138	**2,000**
Beef	*0*	*2*	*0*	*2*	*6*	*9*	*0*	*15*	***17***
Crops	*0*	*0*	*0*	*0*	*0*	*19*	*0*	*19*	***19***
Dairy	*1,860*	*0*	*0*	*1,860*	*0*	*104*	*0*	*104*	***1,964***
Emo	2	0	0	2	0	0	0	0	**2**
Guelph	0	4	2	6	0	6	0	6	**12**
Huron	42	1	16	59	0	0	0	0	**59**
New Liskeard	228	15	0	243	0	2	0	2	**245**
Beef	*181*	*11*	*0*	*193*	*0*	*2*	*0*	*2*	***194***
Crops	*47*	*4*	*0*	*50*	*0*	*0*	*0*	*0*	***50***
General	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	***0***
Ponsonby	6	0	0	6	0	9	0	9	**16**
General Animal Facility	*0*	*0*	*0*	*0*	*0*	*8*	*0*	*8*	***8***
Sheep	*6*	*0*	*0*	*6*	*0*	*1*	*0*	*1*	***8***
Research Station Operations	355	0	0	355	0	7	0	7	**362**
Ridgetown	470	7	0	478	(0)	23	0	22	**500**
Beef	*43*	*0*	*0*	*43*	*0*	*0*	*0*	*0*	***43***
Dairy	*315*	*7*	*0*	*322*	*0*	*0*	*0*	*0*	***322***

Research Station	Sales - Farm Products, Services	Other	Facility Rentals	Total Revenues (Internal)	Sales (net) - Animals, Farm Products	Research Station Fees	Facility Usage (net)	Total Recoveries (External)	Grand Total
General	*104*	*(0)*	*0*	*104*	*4*	*23*	*0*	*27*	***130***
Swine	*9*	*0*	*0*	*9*	*(4)*	*0*	*0*	*(4)*	***5***
Simcoe	53	0	14	68	0	21	20	40	**108**
University	0	0	217	217	0	18	316	334	**551**
Growth Facilities	*0*	*0*	*217*	*217*	*0*	*0*	*240*	*240*	***457***
Isolation Unit	*0*	*0*	*0*	*0*	*0*	*18*	*76*	*94*	***94***
Winchester	129	13	0	142	0	1	0	1	**144**
Woodstock	79	0	35	114	0	9	0	9	**123**
Total	**3,587**	**107**	**283**	**3,977**	**14**	**426**	**334**	**774**	**4,751**

2.4 OMAFRA Agreement Fund Balances

2.4.1 Agreement Carry Forward Funds

Table 2.29 shows the Committed and Uncommitted Agreement Carry Forward Funds. On April 30, 2020, there was $23,798K in Committed Carry Forward Funds and $15,454K in Uncommitted Carry Forward Funds.

Table 2.29: OMAFRA Agreement Carry Forward Funds
(in thousands of dollars)

Program	Carry Forward, May 1, 2019	2019/20 Results	Carry Forward, April 30, 2020
Research Program	**17,526**	**1,180**	**18,706**
Veterinary Capacity Program (VCP)	**-**	**4**	**4**
Animal Health Laboratory (AHL)	**2,198**	**928**	**3,127**
Agriculture and Food Laboratory (AFL)	**2,233**	**(691)**	**1,543**
Property Management Program	**441**	**(23)**	**418**
Total Committed Funds	22,399	1,399	23,798
General and Inflation Reserve	**19,670**	**(4,217)**	**15,454**
Exigency Fund (Recognized)	-	-	-
Total Uncommitted Funds	19,670	(4,217)	15,454
Total OMAFRA Agreement Carry Forward Funds	42,070	(2,818)	39,252

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 balance is drawn down 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. 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, 2020 is $34,651K, as shown in Table 2.30.

Prior to 2019/20, the Agreement Account included the interest from the Exigency Fund. In 2019/20, the University was asked to separate the Exigency Fund from the Agreement Account. To do this, an adjustment needed to be made to the opening balance. The audited closing balance of the Agreement Account in 2018/19 was $37,756K, which included the Exigency Fund closing balance of $287K. The opening balance in the Agreement Account was adjusted to $37,469K ($37,756K - $287K) to account for the separation of the Funds.

Table 2.30: Agreement Account Balance
(in thousands of dollars)

Fiscal Year	Opening Balance	Advances	Net Expenses	Change	Ending Balance
2019/20	37,469	**66,100**	**68,918**	**(2,818)**	34,651[4]

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] Unspent revenue, as per Note 3 in the 2019/20 Audited Financial Statements, includes both the Agreement Account and the Exigency Fund. For 2019/20, the balance in the Agreement Account is $34,651K and the Exigency Fund is $810K (Section 2.4.4), totaling $35,461K, which is consistent with the audited statements.

2.4.3 Interest Earned on Agreement Account

The University of Guelph pays the Agreement interest based 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.

Due to an accounting change in 2019/20, interest is no longer being recognized when it is allocated. Therefore, it does not appear in the Agreement Financial Summary. Instead, it is accrued and reported in a separate account (Exigency Fund). Revenue recognition of the interest will occur when the Executive Committee approves expenditures related to its use.

Table 2.31 summarizes the interest earned for 2019/20. The estimated interest is heavily dependent on the 91 Day Treasury Index Rate, so will vary as interest rates fluctuate. COVID-19 began to impact interest rates significantly at the end of 2019/20. This influence is expected to continue into the future.

Table 2.31: Interest Earned on Agreement Account
(in thousands of dollars)

Fiscal Year	Average Monthly Cash Balance	Average Monthly Interest Rate (%)	Interest Earned in 2019/20
2019/20	36,060	1.47%	529

2.4.4 Exigency Fund

Table 2.32 provides the balance in the Exigency Fund on April 30, 2020 and estimates the balances beyond that. The Exigency Fund is part of the Uncommitted Central Reserve. Assuming interest rates act as predicted, including COVID-19 impacts, the Exigency Fund is anticipated to grow to $1,245K at the end of 2022/23.

In 2018/19, the Executive Committee approved the use of interest income from the Exigency Fund to cover the costs related to a Labour Arbitration Award. Based on accounting principles, the estimated cost of the Labour Arbitration Award ($342K) was accrued in fiscal 2018/19. Actual expenditures of $348K occurred in 2019/20, creating an additional net cost of $6K.

Table 2.32: Exigency Fund
(in thousands of dollars)

Fiscal Year	Opening Balance, May 1	Interest Allocated	Approved Expenses	Change	Ending Balance, April 30
2018/19	-	629	342	287	**287**
2019/20	287	529	6	523	**810**
2020/21 (estimated)	810	126	-	126	**936**
2021/22 (estimated)	936	153	-	153	**1,089**
2022/23 (estimated)	1,089	156	-	156	**1,245**

2.4.5 General and Inflation Reserve

Table 2.33 provides the balance in the General and Inflation Reserve on April 30, 2020. It also illustrates the expected balance to the end of the five-year Agreement. The General and Inflation Reserve is part of the Uncommitted Central Reserve.

With the budgets identified in the 2020/21 Business Plan and assuming no other changes, the General and Inflation Reserve is expected to fall to $1,553K at the end of 2022/23.

Table 2.33: General and Inflation Reserve
(in thousands of dollars)

Fiscal Year	Opening Balance, May 1	Advances	Net Expenses	Net Agreement	Ending Balance, April 30
2018/19	17,680	71,300	69,310	1,990	**19,670**
2019/20	19,670	66,100	70,317	(4,217)	**15,454**
2020/21 (estimated)	15,454	66,100	70,479	(4,379)	**11,075**
2021/22 (estimated)	11,075	66,100	70,404	(4,304)	**6,771**
2022/23 (estimated)	6,771	66,100	71,318	(5,218)	**1,553**

2.4.6 Uncommitted Central Reserve

Table 2.34 illustrates the balance in the Uncommitted Central Reserve on April 30, 2020, as well as the estimated balance to the end of the five-year Agreement. The Uncommitted Central Reserve is expected to be $2,798K at the end of 2022/23. This has been reduced by $637K from the estimate in the 2020/21 Business Plan, due to the impact of COVID-19 on interest rates.

Table 2.34: Uncommitted Central Reserve
(in thousands of dollars)

Fiscal Year	General and Inflation Reserve, as of April 30	Exigency Fund, as of April 30	Total, as of April 30
2018/19	19,670	287	**19,958**
2019/20	15,454	810	**16,264**
2020/21 (estimated)	11,075	936	**12,011**
2021/22 (estimated)	6,771	1,089	**7,860**
2022/23 (estimated)	1,553	1,245	**2,798**

2.5 Costs of Research Projects

Research Project costs, both spent and committed, are presented in the sections below by Program Activity.

2.5.1 Research Projects – Tier I

Table 2.35 shows the final division of the Research Projects budget into the Tier I, Special Initiatives and Undergraduate Student Experiential Learning (USEL) programs.

Table 2.35: Final Division of the Research Projects Budget
(in thousands of dollars)

Description	2019/20 Budget Distribution
Tier I	5,788
Special Initiatives	1,823
USEL	88
Total	**7,699**

The final 2019/20 budget for Tier I Research Projects was $5,788K, which provided funding for 48 projects. Table 2.36 shows the breakdown by theme. In 2019/20, researchers were asked to pick a primary theme and thus, projects were no longer split between themes.

Table 2.36: Tier I Research Projects Budget
(in thousands of dollars)

Research Theme	Number of Projects	2019/20 Budget
Agricultural and Rural Policy	6	574
Bioeconomy - Industrial Uses	6	776
Emergency Management	4	240
Environmental Sustainability	7	1,498
Production Systems - Animal	11	890
Production Systems - Plant	12	1,491
Products and Value Chains	2	318
Total	**48**	**5,788**

Table 2.37 illustrates the amount spent in 2019/20 by theme, the balance in the project accounts, and the amounts committed to future years.

Table 2.37: Tier I Research Project Financial Details
(in thousands of dollars)

Year 2 - 2019/20	Previous Results	2019/20 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects
2019/20 Projects		**976**	**970**	**3,842**	**5,788**	**48**
Agri-Food and Rural Policy		*110*	*163*	*301*	***574***	*6*
Bioeconomy – Industrial Uses		*104*	*120*	*552*	***776***	*6*
Emergency Management		*22*	*48*	*170*	***240***	*4*
Environmental Sustainability		*122*	*342*	*1,034*	***1,498***	*7*
Food for Health					***0***	*0*
Products and Value Chains		*47*	*40*	*231*	***318***	*2*
Production Systems - Animals		*284*	*138*	*467*	***890***	*11*
Production Systems - Plants		*286*	*119*	*1,087*	***1,491***	*12*
2018/19 Projects	**1,048**	**1,784**	**1,225**	**1,925**	**5,983**	**54**
Agri-Food and Rural Policy	*161*	*284*	*213*	*186*	***843***	*8.0*
Bioeconomy – Industrial Uses	*107*	*208*	*121*	*434*	***871***	*6.3*
Emergency Management	*59*	*64*	*8*	*59*	***190***	*2.3*
Environmental Sustainability	*102*	*305*	*314*	*229*	***950***	*7.0*
Food for Health	*15*	*200*	*192*	*116*	***522***	*4.0*
Products and Value Chains	*126*	*144*	*175*	*120*	***565***	*3.0*
Production Systems - Animals	*191*	*196*	*192*	*151*	***730***	*11.5*
Production Systems - Plants	*286*	*383*	*11*	*456*	***1,136***	*11.0*
Unallocated				*175*	***175***	*1.0*
Subtotal - Current Agreement	**1,048**	**2,760**	**2,195**	**5,767**	**11,771**	**102**
Previous Agreement					**(12,585)**	
Agri-Food and Rural Policy	*696*	*595*	*715*	*125*	***2,131***	*20.0*
Bioeconomy – Industrial Uses	*574*	*397*	*128*	*94*	***1,194***	*14.7*
Emergency Management	*412*	*374*	*188*	*62*	***1,035***	*14.6*
Environmental Sustainability	*869*	*285*	*148*	*97*	***1,399***	*19.4*
Food for Health	*579*	*218*	*414*	*0*	***1,211***	*10.5*
Products and Value Chains	*608*	*324*	*153*	*0*	***1,084***	*11.5*
Production Systems - Animals	*1,071*	*691*	*542*	*110*	***2,414***	*31.9*
Production Systems - Plants	*1,146*	*645*	*279*	*0*	***2,070***	*27.5*
Unallocated				*47*	***47***	
Subtotal - Other	**5,956**	**3,529**	**2,566**	**534**	**0**	**150.0**
Grand Total	**7,004**	**6,289**	**4,761**	**6,301**	**11,771**	**252.0**

Table 2.37 illustrates the total amount awarded by year in the current Agreement ($5,788K in 2019/20 and $5,983K in 2018/19) and how those funds are currently distributed (spent, in project accounts or committed to future years of the projects (held in the Office of Research, Agri-Food Partnership)). It also shows the total spending for 2019/20 ($6,289K) which is consistent with the results for the Research Projects – Tier I Program Activity in Table 2.8. Within the Research Projects – Tier I, there is currently $221K in unallocated funds. $175K is related to the 2018/19 award cycle, where a researcher was unable to meet the conditions of funding so ultimately needed to decline the award. $47K is related to underspending in awards given out under the previous Agreement. The unallocated funds will be moved to Research Projects - Special Initiatives during 2020/21 to be reallocated to new projects. Finally, the carry forward can be determined by combining the balance in the project accounts with the amounts committed to future years. For Research Projects – Tier I, the carry forward is $11,062K ($4,761K + $6,301K), which matches Table 2.9.

The tables in the following sections can be read in the same fashion. Several of them contain an “Inter-year Project Adjustment”. This adjustment relates to the timing differential in spending compared to the budget allocations. A positive adjustment indicates an underspend related to budget, while a negative adjustment shows an overspend related to budget. These will approach zero by the completion of the Agreement, as demonstrated in the Business Plan. There is no Inter-year Project Adjustment for Research Projects – Tier I, as the under/overspend is recorded in Research Projects – Special Initiatives each year.

2.5.2 Research Projects – Special Initiatives

The final Special Initiatives budget for 2019/20 was $1,823K. Eleven Special Initiatives projects were approved, totalling $1,447K. $325K was also committed to the Impact Case Study. The remainder of the budget is planned for future use and noted in the Inter-year Project Adjustment.

Table 2.38 shows the amount spent in 2019/20 by activity, the balance in the project accounts, and the amounts committed to future years.

Table 2.38: Special Initiatives Financial Details
(in thousands of dollars)

Year 2 - 2019/20	Previous Results	2019/20 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects
2019/20 Projects		37	132	1,278	**1,447**	11
2018/19 Projects	10	89	(65)	266	**300**	1
Inter-year Project Adjustment				1,261	**1,261**	
Impact Case Study		28		297	**325**	
Subtotal - Current Agreement	**10**	**154**	**66**	**3,103**	**3,333**	**12**
Other Projects	(34)	15	19	0	**0**	2
Unallocated	(111)	(50)		161	**0**	
Subtotal - Other	**(145)**	**(35)**	**19**	**161**	**0**	**2**
Grand Total	**(135)**	**119**	**85**	**3,264**	**3,333**	**14**

Within Research Projects – Special Initiatives, there is currently $161K in unallocated funds, related to underspending in awards given out under the previous Agreement. The unallocated funds will be reallocated to new projects in future years or used to offset additional costs related to the COVID-19 pandemic.

2.5.3 Highly Qualified Personnel (HQP) Scholarship Program

The HQP Scholarship Program has a net activity budget of $250K per year. This amount must be matched by the University of Guelph from third-party funds. Thus, the total scholarships awarded are expected to be $500K per year. The expenditures related to each scholarship occurs over two to four years, with the matching funds being recorded over the same time frame.

In 2019/20, the University was able to award an additional $450K in scholarship support, beyond the required matching funds, through a strategic collaboration with Canada First Research Excellence Fund (CFREF) Food from Thought project. This significantly increased the number of scholarships that were awarded.

Table 2.39 shows financial details related to the HQP Scholarship Program. There were 20 scholarships awarded in 2019/20 and there were 50 active scholarship holders in total. The actual expenditures in 2019/20, related to awards from the current Agreement, was $584K. This generated $378K in matching funds from Food from Thought. In addition, $204K was paid to previous scholarship recipients. There is $241K (net) committed to future scholarship payments ($206K relating to the current Agreement and $35K from the previous Agreement). An additional $17K is unallocated. Unallocated funds are typically generated by a scholarship recipient finishing their degree program early. They will be used to offset any costs related to COVID-19 or to support scholarship recipients who transfer from a Masters degree to a Doctoral degree.

Table 2.39: HQP Scholarship Program Financial Details
(in thousands of dollars)

Year 2 - 2019/20	Previous Results	2019/20 Results	Committed to Future Years	Total	Number of Scholarship Holders
2019/20 Award Winners		365	585	**950**	20
2018/19 Award Winners	178	219	103	**500**	12
Matching Requirement	(89)	(378)	(483)	**(950)**	
Subtotal - Current Agreement	**89**	**205**	**206**	**500**	**32**
Previous Agreement				**(256)**	
Previous Award Winners		*204*	*35*	***239***	*18*
Unallocated			*17*	***17***	
Subtotal - Other	**0**	**204**	**52**	**0**	**18**
Grand Total	**89**	**410**	**257**	**500**	**50**

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.

Table 2.40 shows the amount spent in 2019/20 by activity, the balance in the project accounts, and the amounts committed to future years. In 2019/20, seven Market Validation projects with a total funding of $140K, and three Product Development projects with a total funding of $300K, were awarded. Within Gryphon's LAAIR, there is currently $74 in unallocated funds.

Table 2.40: Gryphon's LAAIR Financial Details
(in thousands of dollars)

Year 2 - 2019/20	Previous Results	2019/20 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects
2019/20 Projects		**214**	**31**	**195**	**440**	**10**
Market Validation		*70*	*51*	*19*	***140***	*7*
Product Development		*144*	*(19)*	*176*	***300***	*3*
2018/19 Projects	**35**	**160**	**36**	**103**	**334**	**9**
Market Validation	*6*	*81*	*23*	*10*	***120***	*6*
Product Development	*28*	*79*	*13*	*94*	***214***	*3*
Inter-year Project Adjustment				(74)	**(74)**	
Impact Pitch Event	5	51	44		**100**	
Subtotal - Current Agreement	**40**	**426**	**111**	**224**	**800**	**19**
Unallocated	(0)			0	**0**	
Subtotal - Other	**(0)**	**0**	**0**	**0**	**0**	**0**
Grand Total	**40**	**426**	**111**	**224**	**800**	**19**

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 Initiative projects.

Table 2.41 shows the amount spent in 2019/20 by activity, the balance in the project accounts, and the amounts committed to future years. In 2019/20, six Mobilization projects with a total funding of $213K, and four Research projects with a total funding of $189K, were awarded. Within KTT, there is currently $13K in unallocated funds. The unallocated funds will be reallocated to new projects in future years or used to offset additional costs related to the COVID-19 pandemic.

Table 2.41: KTT Program Financial Details
(in thousands of dollars)

Year 2 - 2019/20	Previous Results	2019/20 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects
2019/20 Projects		**81**	**156**	**165**	**402**	**10**
Mobilization		*44*	*65*	*105*	***213***	*6*
Research		*37*	*91*	*60*	***189***	*4*
Inter-year Project Adjustment				158	**158**	
KTT Initiative Projects	2	11	16	31	**60**	6
Agri-Food and Rural Link	117	195	67		**380**	
Subtotal - Current Agreement	**119**	**287**	**239**	**354**	**1,000**	**16**
Unallocated	(13)			13	**0**	
Subtotal - Other	**(13)**	**0**	**0**	**13**	**0**	**0**
Grand Total	**106**	**287**	**239**	**367**	**1,000**	**16**

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

Table 2.42: Allocation of Shared Services for LSD
(in thousands of dollars)

Area	Total	AHL %	AHL Amount	AFL %	AFL Amount
Human Resources	184	50%	92	50%	92
Facility Management	1,277	25%	319	75%	958
Sample Reception	357	5%	18	95%	339
Information Technology	1,141	67%	768	33%	373
Business Development	336	0%	0	100%	336
Sales	(15)	0%	0	100%	(15)
Customs	18	50%	9	50%	9
Finance	575	50%	287	50%	287
Co-Executive Directors	19	50%	9	50%	9
Quality Assurance	607	50%	304	50%	304
Staff Activities	(0)	0%	0	100%	(0)
Reinvestments (Shared Equip.)	59	50%	29	50%	29
Total	**4,557**		**1,836**		**2,721**

2.8 Summary of Third-Party Funding Obtained

Third-party funding and revenues generated by the University 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 2.43 provides a summary of all third-party funding and revenues in 2019/20. The University was able to leverage the Province's $66.1M investment, attracting $76.4M in third-party funding and revenue.

Table 2.43: Summary of Third-Party Funding and Revenue
(in thousands of dollars)

Program	Description	Total
Agriculture and Food Laboratory	Testing Revenue	8,722
Animal Health Laboratory	Testing Revenue	7,765
Property Management	Sales of Farm Products and Rental Revenues	5,465
Research Program	Miscellaneous Revenue	148
	Subtotal External Revenues	**22,100**
Agriculture and Food Laboratory	Internal Testing Recoveries	364
Animal Health Laboratory	Internal Testing Recoveries	1,666
Property Management	Internal Recoveries for Animal Purchases, Growth Facility Usage and Research Station Access Fees	963
	Subtotal Internal Recoveries (Recoveries from Outside of the Agreement)	**2,992**
Research Program	HQP Scholarship Program Matching	378
Research Program	HQP Scholarship Program Course Support	48
Research Program	Third-Party Funding for Tier I Projects (cash)	4,226
Research Program	Third-Party Funding for Tier II and III Projects	2,786
Research Program	Support for Data Initiatives	215
Research Program	External Research Dollars Awarded to the University related to Ministry Priorities	43,683[5]
	Subtotal Leverage Funding	**51,336**
	Total Third-Party Funding and Revenue	**76,428**

[5] The total value of External Research Dollars Awarded to the University related to Ministry Priorities is $53,064K. The HQP Scholarship Program Matching, HQP Scholarship Program Course Support, 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, $1,264K of the Internal Testing Revenue in AHL is related to the Health Sciences Centre in OVC and is funded through the Ministry of Colleges and Universities (MCU). 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 2019/20.

2.9.2 Veterinary Capacity Program

No assets with a value over $10K were purchased, sold, leased or disposed of in 2019/20.

2.9.3 Animal Health Laboratory

Table 2.44 shows the Asset Inventory changes, over $10K, for the Animal Health Laboratory.

Table 2.44: Asset Inventory Changes for the Animal Health Laboratory
(in thousands of dollars)

Area	Description	Amount	Action	Notes
Histology	Auto Stainer	78	Purchase	Purchase approved in the Business Plan. Replaced a 2000 model, which was a workhorse that needed replacement.
Virology	ELISA Washers	59	Purchase	Purchase approved in the Business Plan. Three washers were no longer supported by manufacturer as of 2019.
Toxicology	High Performance Liquid Chromatography (HPLC) unit (50% of costs shared with Soil and Nutrient Lab)	50	Purchase	Purchase approved in the Business Plan. Replacement of an aged unit.

Area	Description	Amount	Action	Notes
Virology	LightCycler 480	47	Purchase	Purchase approved in the Business Plan. Previous unit was a 2003 model, which needed replacement.
Kemptville	Replace Incinerator Refractory	47	Purchase	Purchase approved in the Business Plan. The refractory required replacement to allow for continued usage of the incinerator.
Facility	Enterprise Centron Environmental Monitor (50% of costs shared with AFL)	32	Purchase	Purchase approved through a Decision Note. The EMS monitoring system allows for remote and wireless monitoring of many laboratory conditions. The manufacturer has advised the existing version of the EMS will no longer be supported.
IT	LabVantage Upgrades and Dell Computers (50% of costs shared with AFL)	30	Purchase	Purchase approved in the Business Plan.
Post Mortem	Stretcher\Cadaver\SS\with cover	19	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
Clin Path	Hematek 3000 Stainer	19	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
Toxicology	Biological Safety Cabinet	12	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
Post Mortem	Hobart Meat Saw	12	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
Post Mortem	Autopsy Cart	11	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
Toxicology	Inductively Coupled Plasma - Optical Emission Spectrometer (ICP-OES)	150	Disposal, no value	Donated to the Department of Chemistry.

2.9.4 Agriculture and Food Laboratory

Table 2.45 shows the Asset Inventory changes, over $10K, for the Agriculture and Food Laboratory.

Table 2.45: Asset Inventory Changes for the Agriculture and Food Laboratory
(in thousands of dollars)

Area	Description	Amount	Action	Notes
Dairy	Bactoscan	519 (net)	Purchase, Net of Trade-in	Purchase approved in the Business Plan.
Dairy	Bactoscan	608	Disposal, Trade-in value of 215	Disposal of an old Bactoscan (purchased in 2010 at a price of $608K). The trade-in value of $215K was attributed to the Bactoscan listed above, reducing its net cost to $519K.
Microscopy	Scanning Electron Microscope	207	Purchase	Purchase approved in the Business Plan. Current instrument is 26 years old, which is more than 10 years past its normal lifespan. Parts are now very difficult to find, and it is becoming more unreliable. The instrument supports Foreign Material ID services and Canadian Veterinary Urolith ID service. It is very heavily used on daily basis.
Molecular	DNA Sequencer	131	Purchase	Emergency purchase in March 2020. To replace the 14-year-old and broken-down instrument that is used in many services. In the meantime, samples were being sub-contracted to other external labs.
Soil & Nutrient	High Performance Liquid Chromatography (HPLC) unit (50% of costs shared with Soil and Nutrient Lab)	50	Purchase	Purchase approved in the Business Plan. Replacement of an aged unit.
Chemistry	Upgrade of parts for Two LC/MS	33	Purchase	Manufacturer indicated they were no longer supporting the old models. (Miscellaneous items under $30K, up to $150K).
Facility	Enterprise Centron Environmental Monitor (50% of costs shared with AHL)	32	Purchase	Purchase approved through a Decision Note. The EMS monitoring system allows for remote

Area	Description	Amount	Action	Notes
				and wireless monitoring of many laboratory conditions. The manufacturer has advised the existing version of the EMS will no longer be supported.
IT	LabVantage Upgrades and Dell Computers (50% shared with AHL)	30	Purchase	Purchase approved in the Business Plan.
Dairy	FOSS CombiFoss Software Upgrades	27	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
Microscopy	Bruker EDS system	23	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
IT	HPE Server and Drive Tape Library	18	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).
Microscopy	Refrigerated Compressed Air Drier	14	Purchase	Purchase approved in the Business Plan (Miscellaneous items under $30K, up to $150K).

2.9.5 Property Management Program

Table 2.46 shows the Asset Inventory changes in the Property Management Program.

Table 2.46: Asset Inventory Changes for the Property Management Program
(in thousands of dollars)

Elora	2019 Chevrolet Silverado WT Crew 4WD	40	Purchase	Lifecycle replacement of an existing unit.
Bovey Growth Facility	Jamesway 28 Coolers Pro Series, Receptacles and Motors	17	Purchase	Replacement of end of life equipment.

Table 2.47 provides the total asset value, value of acquisitions and value of dispositions for the ARIO Properties. Most equipment is purchased using ARIO Minor Capital funds and, thus, is not listed in the Table 2.46. Actual inventory lists by station are available on request.

Table 2.47: Total Asset Value, Acquisitions, and Dispositions for each of the ARIO Properties
(in thousands of dollars)

Station	Opening Balance (May 1, 2019)	Acquisitions in 2019/20	Dispositions in 2019/20	Closing Balance (April 30, 2020)	Value for Dispositions
Alma	456	0	0	456	
Arkell - Equine	37	0	0	37	
Arkell - Feedmill	832	0	0	832	
Arkell - Poultry	1,326	109	0	1,435	
Arkell - Swine	1,179	15	0	1,194	
Bradford	249	0	0	249	
Elora - Beef	1,490	4,513	371	5,632	0 (scrap)
Elora - Crops	2,714	328	0	3,042	
Elora - Dairy	4,948	60	0	5,008	
Emo	70	0	0	70	
Guelph Turfgrass	236	0	0	236	
New Liskeard	1,197	0	15	1,182	3 (sold)
Office of Research	31	0	0	31	
Ponsonby - Dairy	254	0	0	254	
Ponsonby - GAF	77	0	0	77	
Ponsonby - Sheep	26	50	0	76	
Research Station Operations	3,785	47	0	3,832	
Ridgetown	5,612	436	15	6,033	2 (trade-in)
Simcoe	547	0	0	547	
Vineland	895	0	0	895	
Winchester	1,056	0	0	1,056	
Woodstock	431	0	0	431	
Total	**27,448**	**5,558**	**401**	**32,605**	

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 2.48 shows the Salaries and Wages and Non-Salary Benefit Costs by Program for 2019/20. Table 2.49 provides the total Salaries and Wages, the Benefit Allocation Rate and Non-Salary Benefit Costs by Object Code.

Table 2.48: Salaries and Wages and Non-Salary Benefit Costs by Program
(in thousands of dollars)

Program	Salaries and Wages	Non-Salary Benefit Costs
Research Program	9,516	1,824
Veterinary Capacity Program	162	27
Animal Health Laboratory	8,098	2,209
Agriculture and Food Laboratory	8,418	2,471
Property Management Program	7,586	2,108
Exigency Fund (Recognized)	6	0
Total	**33,786**	**8,639**

Table 2.49: Salaries and Wages and Non -Salary Benefit Costs by Object Code
(in thousands of dollars)

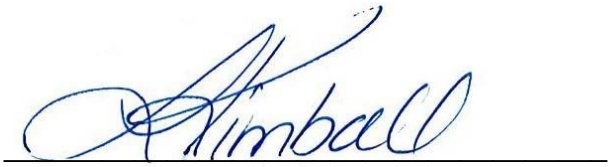
Object Code	Salaries and Wages	Benefit Allocation Rate	Non-Salary Benefit Costs
61103-P&M - RFT	6,330	28.00%	1,772
61108-OVERTIME - RFT	379	6.50%	25
61109-SHIFT PREMIUMS - RFT	77	6.50%	5
61112-FACULTY - VETERINARIANS - RFT	2,101	23.25%	488
61124-COLLEGE PROFESSORS UGFA2 - RFT	-1	29.75%	0
61130-USW - RFT	10,535	33.30%	3,508
61133-EXEMPT- RFT	74	33.80%	25
61134-HONORARIUMS FACULTY (FULL TIME)	96	3.60%	3
61135-OSSTF - RFT	5,989	32.00%	1,917
61203-P&M - TFT	543	17.00%	92
61204-Grant Trust Admin Tech - TFT	594	15.70%	93
61205-Grant Trust Professional - TFT	272	17.00%	46
61207-SUPPORT STAFF - TFT UNREPRESENTED	334	15.70%	52
61221-POST DOCTORAL - TFT	218	17.20%	38
61230-USW-TFT	843	15.70%	132
61234-HONORARIUMS TEMPORARY (PART TIME)	-9	3.60%	0
61235-OSSTF - TFT	361	15.70%	57
61252-VETERINARIAN - TEMPORARY	229	16.05%	37
61253-CONTRACTUALLY LIMITED P&M	170	17.00%	29
61304-Grant Trust Admin Tech - TPT	70	14.70%	10
61305-SUPPORT STAFF - RPT	53	16.70%	9
61307-SUPPORT STAFF - TPT UNREPRESENTED	447	14.70%	66
61335-OSSTF - TPT	119	14.70%	18
61417-STUDENT LABOUR - TPT	1,332	9.00%	120
61419-GRADUATE RESEARCH ASSISTANT	926	0.50%	5
61420-GRADUATE SERVICE ASSISTANT	76	8.25%	6
61431-GRA - DOCTORAL- DOMESTIC	136	0.50%	1
61432-GSA - DOCTORAL- DOMESTIC	2	8.25%	0
61433-Student Labour - Undergrad - Foreign	9	9.00%	1
61435-GRA - MASTERS- DOMESTIC	531	0.50%	3
61436-GSA - MASTERS- DOMESTIC	6	8.25%	1
61438-GRA - DOCTORAL- FOREIGN	238	0.50%	1
61439-GSA - DOCTORAL- FOREIGN	5	8.25%	0
61441-GRA - MASTERS - FOREIGN	61	0.50%	0
61442-GSA - MASTERS - FOREIGN	0	8.25%	0
61443-POST DOCTORAL - DOMESTIC	111	17.20%	19
61444-POST DOCTORAL - FOREIGN	166	17.20%	28
61445-STUDENT - UNDERGRAD - DOMESTIC	329	9.00%	30
61522 -NON-U OF G PERSONNEL COST CHARGE	1	0.00%	0
61552-LUMP SUM PAYMENTS	31	variable	2
Total	**33,786**		**8,639**

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 provide positive social benefits, subsequently maximizing the return on public investment.

3.1 Program Activities and Achievements from 2019/20

Research Leadership

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

- UofG ranks first in Canada and fifth in the world for veterinary science[6].
- UofG ranks first in Canada and seventeenth in the world for agricultural sciences[7].
- UofG ranks first in Canada and thirteenth in the world for food science and technology[8].

The University maintains its commitment to agricultural and associated sciences through its Strategic Research Plan (SRP). 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.

The SRP has been partially operationalized through the recent establishment of three research institutes at the University, each of which will enhance the delivery of new knowledge which addresses the Ministry's research priorities.

1. **Centre for Advancing Responsible and Ethical Artificial Intelligence (CARE-AI)**

   The Centre for Advancing Responsible and Ethical Artificial Intelligence (CARE-AI) fosters 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, it is an excellent example of how UofG looks to *Improve Life*. The Centre involves almost 90 researchers and scholars from across the University. It focuses on applying machine learning and AI to UofG strengths, including human and animal health, environmental sciences, agri-food, and the bioeconomy.

   CARE-AI hosted its inaugural advisory board meeting and a networking event to discuss priorities. CARE-AI's advisory board includes Heather Evans, Director of Frontier Technology Research, Asia Society Northern California; Anthony de Fazekas, Head of Technology and Innovation – Canada, Norton Rose Fullbright; Saadia Muzaffar, CEO/Founder, TechGirls; Lara O'Donnell, Executive Director, W. Garfield Weston Foundation; Ofer Shai, Chief AI Officer, Deloitte; and Steve Woods, Senior Engineering

[6] https://www.topuniversities.com/university-rankings-articles/university-subject-rankings/top-universities-veterinary-science-2020
[7] https://www.usnews.com/education/best-global-universities/canada/agricultural-sciences
[8] http://www.shanghairanking.com/Shanghairanking-Subject-Rankings/food-science-technology.html

Director and Site Lead, Google. The board will counsel on strategy and direction for CARE-AI to ensure alignment with industry needs. CARE-AI also recently launched a seed fund to kickstart new ideas in AI and AI ethics, completed the first semester of its inaugural Collaborative Specialization in Artificial Intelligence master's program, and hired two new faculty to support research and learning in ethical artificial intelligence.

2. One Health Institute (OHI)

The One Health Institute (OHI) advances an interdisciplinary approach to promoting health and curbing infectious diseases. One Health tackles 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.

OHI has been extremely active over the past year, awarding seed funding, launching a speaker series and supporting student research assistantships. In addition, the advent of COVID-19, with a suspected origin at the human–environment–animal interface and its rapid explosion as a result human interconnectivity, mobility, and global trade, has cemented the importance and critical nature of research in One Health.

3. Guelph Institute for Environmental Research (GIER)

The Guelph Institute for Environmental Research (GIER) is expected to stimulate and support interdisciplinary research, foster a sense of community among UofG researchers and raise the profile of environmental research at Guelph. Its launch was held on October 22, 2019. Over 100 environmental researchers from all seven colleges were in attendance.

GIER introduced its first Small Grants Program competition in 2019/20. The response was overwhelmingly positive, with applications from all colleges and several interdisciplinary cross-college collaborations. Eight teams were awarded funding to support key areas of research including many that are critical to agri-food and environmental sustainability.

Third-Party Leverage

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 both continue to contribute to the $53.1M 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 provincial, national, and international agri-food sectors, and rural communities.

The University has also 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 to purchase equipment for the Guelph and Ridgetown Campuses, as well as the ARIO Research Stations. This enhances UofG's research capacity in support of Ministry Priorities. These awards to researchers are adjudicated on the basis 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 funding received from OMAFRA.

Specifically, a submission from the University of Guelph to the 2020 Canada Foundation for Innovation – Infrastructure Fund (CFI-IF) competition asked for a state-of-the art sensor network for livestock and agronomy research at the Elora Research Station, with a project budget of approximately $19M with $7.5M requested from CFI-IF. Agriculture 5.0 (Ag 5.0) is the next revolution in agriculture. Under Ag 5.0, precision agriculture technologies are harnessed to simultaneously boost production and enhance environmental sustainability. As Canada's Food University, the UofG is working with government and industry partners to usher in this next agricultural revolution. Work will couple the promise of technology with the practice of social responsibility, making Canada a global leader in safe, responsible, efficient food systems to feed a growing world.

The vision for the Ag 5.0 Observatory at the Elora Research Station is to create a closed-loop, on-farm laboratory where precision agriculture practices in the barn are connected to impacts on the wider ecosystem. The Observatory will allow researchers to harness unprecedented quantities of data to enhance the sustainability and productivity of the beef and dairy sectors, making Canada and its farmers global leaders in agricultural innovation. The data from these sensors will become part of the Agri-Food Data Canada platform (which is being developed in Food from Thought), allowing unprecedented scales, 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. The outcome of this submission to CFI will be known in November 2020.

In addition, researchers from the University have received numerous research grants and gifts in areas relevant to the Ministry's Priorities, further leveraging their investment.

- $1.65M from the Natural Sciences and Engineering Research Council of Canada (NSERC) CREATE program for "Climate-smart soils". Researchers from across Canada led by Dr. Claudia Wagner-Riddle, School of Environmental Sciences (SES), will study ways to use climate-smart soil (CSS) management to reduce greenhouse gas emissions and sequester carbon.
- $2.95M from the Agricultural Adaptation Council (AAC) and Ontario Genomics through Genome Canada, to finance seven genomics projects led by UofG researchers. The funding will support proof-of-concept stage projects using genomics technology to address specific challenges and opportunities in Ontario agriculture and agri-food, to create jobs and to grow the provincial economy.
- $1.5M gift to promote food literacy and help raise a healthier generation less prone to chronic disease. This funding will support the The Helderleigh Family Food Literacy Research Program within the Guelph Family Health Study (GFHS). The long-term UofG research project currently involves more than 300 local families with preschool-aged children and aims to reduce disease risk.
- $15M in NSERC Discovery Grants. UofG received funding for 60 researchers in five colleges and numerous departments. Most projects will be supported for five years and include funding for graduate scholarships.
- Over $2.5M from the Ontario Research Fund (ORF). Ten UofG research projects will receive support, including a project developing mineral-coated fertilizers to benefit Ontario agriculture environmentally and economically.
- Over $1M from the Canada Foundation for Innovation (CFI) - John R. Evans Leaders Fund. The federal government is investing in seven University of Guelph research projects, ranging from disease resistance to food safety to drug addiction.
- Over $660K from the Weston Seeding Food Innovation Grants program. The funding supports researchers from three UofG colleges for collaborative research intended to increase food production for a growing population in ways that are environmentally, economically and culturally sustainable.

Finally, in 2019/20, a decision note was approved by the Executive Committee describing the process to review and assess leverage opportunities. This agile process will support the University in responding to emerging opportunities while still adhering to appropriate levels of Agreement governance. It will strengthen the University's position when identifying other funding competitions with priorities that complement those of the Ministry that could use Agreement cash and/or in-kind as leverage, increasing their likelihood of success. In addition, the University and its researchers may also leverage existing Agreement funding with other opportunities. This creates additional value from the Agreement. This leverage process has been utilized in several applications to the new NSERC Alliance program. Outcomes are still pending, and, if successful, opportunities for further leverage will be abundant.

COVID-19

Consistent with public health policy, the UofG urged a significant scale back of research activities due to COVID-19, beginning in March 2019. There was a recognition that the pandemic would impact the progress of Alliance-funded projects, as well as all other research projects across the University. To mitigate the impact, the UofG implemented an “exemption” process for faculty members to identify critical and time sensitive research that should proceed. Many of the research projects granted exemptions allowing them to continue were in the agri-food space and included utilization of the Research Stations. Thus, the impact on the Alliance Research Program was less than it might otherwise have been. Throughout the crisis, the University successfully demonstrated that it has the capacity and governance structures in place to nimbly manage issues, at both the operational and at the strategic levels.

The Alliance continued to adjust its operations to support researchers as effectively as possible. Researchers were provided options for support, including:

- Allowance for no-cost project extensions;
- Opportunity to identify concerns about meeting project objectives or deliverables, within the current project design or budget;
- Opportunity to change dates and timelines for new projects;
- Ability to delay report submission by up to three months; and
- Additional support for HQP Scholarship Recipients, including the potential for funding an additional semester for students late in their program if progress was delayed due to COVID-19.

In general, research at the UofG was delayed or took additional time to complete in the last six weeks of 2019/20. However, no COVID-19 related impacts on metrics for 2019/20 were anticipated. During the pandemic, virtual meetings of Research/Property Management Program Management Committee (R/PM PMC) participants occurred to provide regular updates on the UofG’s research management plans, as well as broader UofG COVID-19 planning.

At present, the University continues to be open for essential business only. Researchers can elect to request the resumption of their research, beyond that deemed time sensitive and critical, effective June 29, 2020, if they prepare a Research Management Plan for Research Phase-In. In general, it is expected that research outcomes will continue to be delayed in 2020/21. The impacts on metrics for next year are still to be determined. Impacts will depend on the length of the pandemic, including the potential existence and severity of a second wave. As more information about the course of the pandemic becomes known, it is expected that some researchers will identify the need for additional support to meet the deliverables of their projects. Additional funding is expected to come from unallocated carry forwards and will not affect current or future year allocations in the Research Program.

Finally, in support of COVID-19 research, many faculty members have applied to external funding agencies and been successful with COVID-19 related-research projects. In addition, the

University operated its own COVID-19 Research Development & Catalyst grant program to provide support for small-scale, time-sensitive research projects focused on contributing to the global response to the COVID-19 pandemic. The UofG awarded nearly $700,000 to researchers for 51 projects designed to support the battle against the COVID-19 pandemic and mitigate its impacts. Many of these projects are complementary to OMAFRA's areas of interest.

Alliance Programming

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. In 2019/20, the Tier I Research Program was converted to a single-stage call, which allowed for earlier notification of awards, provided additional planning time for summer field seasons, and supported more effective graduate student recruitment. A single-stage call will also decrease 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. Overall, the single-stage call process was a resounding success, resulting in greater efficiency, both for the researcher and program administration, and time-savings for award notifications of approximately three months. The single-stage call process will continue to be utilized in 2020/21.

Several other initiatives aimed at continuous improvement for efficient and high-quality research program administrative systems and processes were also accomplished in 2019/20, including: improvement of the report review process, development of a completion and compliance check process, enhancements to the Program Guides and initiation of the Issue Resolution process.

The continued development of the Next Generation Research Management System (Next Gen RMS), the database used to administer all OMAFRA/UofG funded Research Projects, was a significant focus for 2019/20. The implementation process provided an excellent opportunity to document processes and procedures, as well as look at ways to improve efficiency. There were also substantial amounts of time invested in system testing and remediation. While considerable work remains to be completed in the implementation of Next Gen RMS, much was accomplished in 2019/20.

In addition, 2019/20 saw the first process and award allocation for the Special Initiatives program. Projects funded under the Special Initiatives program respond to a specific issue or need of the Ontario agri-food sector that has been identified by OMAFRA. These science and research needs are important for the Ministry and agri-food stakeholders but, for various reasons, do not fit well into the annual Tier I call for proposals cycle or under another Alliance program.

Another major initiative proceeding in 2019/20 was the preparation of the first Impact Case Study, which is a reporting requirement under the Agreement. The Impact Case Study is a qualitative assessment and accompanying narrative which illustrates the longer-term cumulative impact of Alliance 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 first case study on Dairy has been submitted, alongside this Annual Report.

Finally, the successes of the Research Program are 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	2019/20 Results	Target	2018/19 Results
Intellectual Capacity			
Research Faculty FTE	75.5	67.8, ↑	77.7, ↓
Number of Faculty Members Involved in Agreement-funded Research	263	-	246, ↑
Research Technician Agreement FTE	96.7	42.4, ↑	87.6, ↑
Number of Research Technicians Involved in Agreement-funded Research	183	-	164, ↑
Research Support Agreement FTE	22.5	22.5, ↑	22.8, ↓
Research Faculty FTE effort engaged in Research Supportive of Ministry Priorities	152.1	97, ↑	153.0, ↓
Number of Faculty Members Involved in Research Supportive of Ministry Priorities	385	-	364, ↑
Highly Qualified Personnel Engaged in Research Projects per $1M Invested	17.0	14, ↑	17.1, ↓
Partnership and Leverage			
Ratio of Third-Party Funding and In-Kind Contributions for Tier I Projects	0.93:1	1:1, ↓	1.00:1, ↓
Value of Third-Party Funding and In-Kind Contributions for Tier I Projects	$6.2M	-	$6.3M, ↓
Ratio of Third-Party Funding of all University Research, Not Funded by this Agreement, but Supportive of Ministry Priorities	1.03:1	0.7:1, ↑	1.05:1, ↓
Value of Third-Party Funding of all University Research, Not Funded by this Agreement, but Supportive of Ministry Priorities	$53.1M	-	$53.4M, ↓
Third-Party Funding Directed at Tier II and III Research Projects	$2.8M	-	$7.6M, ↓
Collaborations per $1M Invested	38.8	35, ↑	41.5, ↓
Number of Third-Party Organizations Supporting Research Projects per $1M Invested	22.3	20, ↑	19.2, ↑
Commercialization			
Intellectual Property - Patents Filed	20	17, ↑	10, ↑
Intellectual Property - Patents Granted	12	5, ↑	4, ↑
Intellectual Property - Licenses	20	19, ↑	22, ↓
Intellectual Property - Revenue	$1.56M	$1.5M, ↑	$1.68M, ↓

3.1.1 Research Faculty

Ontario needs a critical mass of world-class researchers to ensure its agri-food sectors 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 2019/20, the UofG attracted external 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 named positions, made possible through external support
    - Dr. Feliz Arndt - Wood Chair in Entrepreneurship
    - Dr. Thomas Graham - Phyto-Gro Research Chair in Phyto-Medicinal Substances
    - Dr. Kevin Keener - Barrett Family Foundation Chair in Sustainable Food Engineering
- Additional positions, either new capacity or replacement capacity for resignations/retirements
    - Dr. Leanne Chen – Theoretical Chemistry
    - Dr. Clara Cho – Canada Research Chair Tier II in Precision Nutrition
    - Dr. Katie Clow – One Health
    - Prof. Steven Clarke – Regenerative and Sustainable Communities
    - Dr. Giannina Descalzi – Comparative Biomedical Science
    - Dr. Ben DeVries – Geographic Information Science and Remote Sensing
    - Dr. Dalia El Khoury – Functional Foods and Nutritional Science
    - Dr. Sara Epp – Planning and Community Development for Rural and Agricultural Communities
    - Dr. Rui Huang – NMR Spectroscopy Chemistry
    - Dr. Melanie Kalischuk - Specialty Crops Innovation
    - Dr. Saerom Lee – Consumer Behaviour in Marketing
    - Dr. Lei Lei – Machine Learning
    - Dr. Tongzhe Li - Food Industry Economics and Management
    - Dr. Yuanfang Lin – Marketing Strategy and Product Innovation
    - Dr. Jennifer Monk – Molecular Nutrition
    - Dr. Jose Nuno-Ledesma - Food Industry Economics and Management
    - Dr. Derek O'Flaherty – Biological Chemistry
    - Dr. Silvia Sarapura - International Agricultural and Food Planning
    - Dr. Kimberley Schneider - Forage and Service Crops
    - Dr. Joshua August (Gus) Skorburg – Ethics and Philosophy in AI
    - Dr. Travis Steffens – One Health
    - Dr. Jing Wan – Consumer Behaviour

The UofG also named two faculty members as Research Chairs.

- Dr. Amar Mohanty - OAC Distinguished Research Chair in Sustainable Biomaterials
- Dr. Michelle Oblak - Animal Health Partners Research Chair in Veterinary Medical Innovation

In addition, the University announced the hiring of Dr. Lysa Porth as the new Dean for the Lang School of Business and Economics (formerly known as the College of Business and Economics), effective October 1, 2020. She is currently the Associate Dean of Strategic Partnerships and Administration in the Asper School of Business at the University of Manitoba. She also holds the Guy Carpenter Research Chair in Agricultural Risk Management and Insurance. Her research includes a focus on insurance and reinsurance applications for agriculture and weather risks, including product design and pricing, as well as risk modelling and business analytics.

Finally, during 2019/20 work continued collecting information about faculty members' key research areas. The Office of Research, Agri-Food Partnership has strong working relationships with each of the seven Colleges, which are leveraged to support capacity planning. In addition, the Associate Vice-President (Research) works closely with the Deans to continue to advance the University of Guelph's primacy as Canada's Food University through strategic hiring and the pursuit of major gifts/grants in support of the agri-food continuum.

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 2019/20, the University continued to work on identifying the use of research technicians in projects related to the OMAFRA priorities and mapping technical expertise to existing and emerging OMAFRA priorities. The Office of Research, Agri-Food Partnership is also working directly with Departments to identify and address technical or support staff changes that would impact the Agreement. In addition, the methodology for support staff allocations relative to research faculty FTE engaged in Research Projects has been reviewed and updated. It is expected that the revised support staff allocations will be implemented for the 2020/21 year.

The UofG is working on finding efficiencies in order to effectively address the reduction applied in years three, four and five of the Agreement in this Program Activity. All avenues are being explored, with a focus on maintaining capacity in key areas and minimizing the impact to programs. In addition, investing in key areas, such as providing data technicians to support the Elora Research Station (both livestock and crops) is a priority.

The UofG is also continuing to develop the Tiers II, III and IV application and reporting capacity in Next Gen RMS, as well as the processes for project approval and report review. These workflows are critical for ensuring that all Research Support activities are captured appropriately. It is expected that this will be complete in 2020/21. Table 3.2 identifies the projects awarded in Tiers II, III and IV in 2019/20.

Table 3.2: 2019/20 Tier II, III and IV Research Projects

Lead Applicant	Project Title	Type	Research Station Utilized
Luis Arroyo	Does high levels of nutritional iron interfere with equine gut microbiota?	Tier II	Arkell - Equine
Luis Arroyo	Kenetic study of Saccharomyces boulardii as a potential probiotic agent in horses	Tier II	Arkell - Equine
John Barta	A longitudinal observational study of the incidence rate of Eimeria species infecting lambs at the Ponsonby Research Station	Tier II	Ponsonby - Sheep
Dorothee Bienzle	How does asthma (heaves) develop and progress in horses?	Tier II	Arkell - Equine

Lead Applicant	Project Title	Type	Research Station Utilized
Eduardo De Souza Ribeiro	Impact of maternal trace mineral supplementation sources during late gestation on quality of colostrum, and on immunity, health, and performance of dairy calves	Tier II	Elora - Dairy
Trevor DeVries	Individualized feeding strategies for dairy cows milked in robotic systems	Tier II	Elora - Dairy
Abdolvahab Farzan	Optimization of E. coli infection model in pigs to evaluate the interventions for controlling post-weaning diarrhea	Tier II	Guelph – Isolation Unit
Abdolvahab Farzan	Streptococcus suis infection and nursery diet in pigs	Tier II	Guelph – Isolation Unit; Arkell - Swine
Robert Friendship	Characterization of the core gut microbiome associated with pig health and performance: towards fecal diagnostics and microbiome therapy	Tier II	Arkell - Swine
Alexandra Harlander	Wing use and disuse hypothesis: the missing link to understand keel bone damage in adult laying hens	Tier II	Arkell - Poultry
Tom Hsiang	Biology and management of turfgrass diseases	Tier II	Guelph - Turfgrass
Lee-Anne Huber	Means to improve the robustness of newly weaned pigs exposed to mycotoxin-contaminated feeds	Tier II	Arkell - Swine
Elijah Kiarie	Alternatives (prebiotics) to ant-microbial growth promoters in pig feed programs	Tier II	Arkell - Swine
Thomas Gadegaard Koch	In Vivo Tracking of Allogeneic Equine Umbilical Cord Blood Mesenchymal Stem Cells Following Intravenous Injection in Horses	Tier II	Arkell - Equine
Eric Lyons	Improvement of functional horticulture through cultivar evaluation and testing of new products	Tier II	Guelph - Turfgrass
Vern Osborne	Pilot Project: Investigating Technologies that Assess Locomotion and Flooring Interactions in Dairy Cattle in the Context of Preventing Lameness	Tier II	Elora - Dairy
Tina Widowski	Identifying developmental determinants of successful behavioral adaptation and musculoskeletal health of egg-laying hens (Study 1)	Tier II	Arkell - Poultry
Katie Wood	The impact of biochar supplementation on enteric methane emissions and the relationships between methane and feed efficiency in beef cows	Tier II	Elora - Beef
Marcia Chiasson (Station Manager)	Suitability of Lake Whitefish as an Aquaculture Species in Ontario - Hatching and Early Rearing	Tier IV	Alma - Aquaculture

Research Program Directors (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. In 2019/20, there were no changes to the slate of RPDs. However, to accommodate the changes in research priority areas, RPDs were assigned to new areas based on their expertise and disciplinary knowledge. The was necessary to facilitate the Tier I review process. RPDs are expected to continue to provide leadership in the old thematic areas, while projects in those areas are completed. Table 3.3 provides a list of the RPDs with their original thematic appointments, as well as their research priority areas.

Table 3.3: Research Program Directors

Theme	Research Priority Area	Name	Department	Term
Agri-Food and Rural Policy	Productive Land Capacity; Trade, Market, Targeted Sector Growth	Kate Parizeau	Department of Geography, Environment and Geomatics	September 1, 2018 to August 31, 2021
Bioeconomy – Industrial Uses	Innovative Products and Product Improvement; Trade, Market, Targeted Sector Growth	Manjusri Misra	School of Engineering	September 1, 2018 to August 31, 2021
Emergency Management	Animal Health and Welfare; Food Safety	Zvonimir Poljak	Department of Population Medicine	September 1, 2018 to August 31, 2021
Environmental Sustainability	Soil Health; Water Quality and Quantity; Sustainable Production Systems	Laura Van Eerd	School of Environmental Sciences, Ridgetown	July 1, 2018 to June 30, 2021
Food for Health	Knowledge Translation and Transfer Program	Alison Duncan	Department of Human Health and Nutritional Sciences	July 1, 2018 to June 30, 2021
Products and Value Chains	Innovative Products and Product Improvement	Paul Spagnuolo	Department of Food Science	July 1, 2018 to June 30, 2021
Production Systems – Animals	Animal Health and Welfare; Competitive Production Systems	Stephen LeBlanc	Department of Population Medicine	July 1, 2018 to June 30, 2021
Production Systems - Plants	Plant Health and Protection; Competitive Production Systems	Mary Ruth McDonald	Department of Plant Agriculture	July 1, 2018 to June 30, 2021
Data	Data Strategy	Rozita Dara	School of Computer Science	September 1, 2018 to August 31, 2021
HQP Scholarship Program	Highly Qualified Personnel (HQP) Scholarship Program	Keith Warriner	Department of Food Science	July 1, 2018 to June 30, 2021

3.1.2.1 Long-Term Trials

Long-term trials are also a component of the Research Support Program Activity. In 2019/20, a survey of the existing long-term trials was completed. A preliminary meeting was held with UofG researchers to discuss the operation and management of the trials. An Advisory Group meeting, including OMAFRA staff, was planned for April 2020, however, it was put on hold due to COVID-19. Instead, it will be re-convened in August 2020. The Advisory Group will be responsible for overseeing the trials and creating policy documents related to their governance, including specifically addressing questions of trial creation and dissolution.

To support the long-term trials in 2019/20, researchers performing trials were reimbursed for operating costs. Other management strategies, including the hiring of a long-term trial technician at Elora, will be pursued in 2020/21, following the Advisory Group meeting.

Significant work was done by the Alliance's Knowledge Translation and Transfer (KTT) staff, in conjunction with Soils at Guelph and OMAFRA, to create materials that highlight the results of the 25th and 40th anniversaries of the long-term trials at the Ridgetown and Elora Research Stations, respectively. A celebration was planned for Summer 2020, but it has been cancelled due to COVID-19. Infographics highlighting select results from the long-term trials will be promoted instead at Canada's Digital Outdoor Farm Show in September 2020.

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 2019/20, the University launched a call for proposals in September 2018 for projects beginning in May 2019. Eight review committees (including two for Production Systems, namely Animals and Plants) were assembled that were comprised of OMAFRA staff (including the OMAFRA Director Champion or alternate and RIB Research Analyst), academics (including the UofG Research Program Director), and representatives from industry and government.

The response to the call generated 144 Letters of Intent (LOIs), an increase of 12.5% over 2018/19. The LOIs 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-nine 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 76 FPs that were ultimately submitted, 53 projects were recommended for funding by the review committees. The Ministry supported 48 projects, resulting in the total amount awarded of $5,787,950. Table 3.4 provides the breakdown of proposals by status and Ministry Priority. A list of the 48 Research Projects awarded in 2019/20 is included in Table 3.5.

Table 3.4: Number of Proposals by Status and Ministry Priority

Ministry Priority	Number of Letters of Intent	Number Invited to Full Proposal	Number Recommended	Number Awarded	Amount Awarded
Agricultural and Rural Policy	21	10	7	6	$574,231
Bioeconomy	12	8	7	6	$775,738
Emergency Management	10	6	5	4	$240,300
Environmental Sustainability	19	11	8	7	$1,498,132
Food for Health	5	2	1	0	$0
Products and Value Chains	11	5	2	2	$318,204
Production Systems - Animals	42	20	11	11	$889,986
Production Systems - Plants	24	17	12	12	$1,491,360
Total – Tier I Research	**144**	**79**	**53**	**48**	**$5,787,950**

Table 3.5: 2019/20 Tier I Research Projects

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
Wayne Caldwell	OMAFRA's Guidelines on Permitted Uses as a tool to achieve farmland protection, farm diversification and provide economic benefit: Assessing effectiveness and identifying best practices	Agricultural and Rural Policy	$105,500
Erin Nelson	Social Networks for Healthy Soils: Understanding the Role of Peer Learning in Driving Soil BMP Adoption	Agricultural and Rural Policy	$108,860
Simon Somogyi	Value Chain Development in the Ontario Agri-food Sector: Barriers and Keys to Success	Agricultural and Rural Policy	$104,200
Sylvanus Kwaku Afesorgbor	Markets and Products Diversification in the Canadian/Ontarian Agric-Food Sector: The impact of Free Trade Agreements (FTAs) on Disaggregated Exports, Extensive and Intensive Margins of Trade	Agricultural and Rural Policy	$71,320
Richard Vyn	Factors Influencing Farmer Adoption of Soil Health Best Management Practices in Ontario	Agricultural and Rural Policy	$76,000
Getu Hailu	Firm level barriers to entry into export markets in the food processing Industry	Agricultural and Rural Policy	$108,351
Naresh Thevathasan	Impact of land-use change to biomass crops and biofertilizer application on biomass productivity, soil organic carbon, nitrogen, phosphorus and soil health	Bioeconomy - Industrial Uses	$149,000
Amar Mohanty	Complex Shaped Designed Bioplastics and Biocomposites by 3D Printing for Engineering Applications	Bioeconomy - Industrial Uses	$180,000
Brandon Gilroyed	Conversion of poultry mortality hydrolysate to lactic acid, a building block for renewable bioproducts	Bioeconomy - Industrial Uses	$82,000
Manjusri Misra	Biodegradable straws for single-use applications	Bioeconomy - Industrial Uses	$160,000
Jonathan Newman	Biochemical characterization and introduction of crop-beneficial endophytes into biomass grasses	Bioeconomy - Industrial Uses	$117,068
Brandon Gilroyed	Production of syngas and renewable natural gas from greenhouse vegetable waste using steam reforming technology	Bioeconomy - Industrial Uses	$87,670
Jeff Caswell	Investigation of astrovirus as a potential emerging cause of undiagnosed neurologic disease in Ontario cattle	Emergency Management	$76,150
Zvonimir Poljak	Risk-based disease surveillance system in swine populations: machine learning approach	Emergency Management	$68,000

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
Michele Guerin	A temporal study of Salmonella serovars in poultry breeder flocks and hatcheries in Ontario from 2009 to 2018	Emergency Management	$54,000
Tracey Chenier	Seroprevalence of Neospora caninum in Ontario broodmares and its potential role in equine abortions.	Emergency Management	$42,150
Claudia Wagner-Riddle	Tracing nitrogen losses and transfer from cover crops and cover crop mixtures to the subsequent corn crop	Environmental Sustainability	$239,000
Laura Van Eerd	Cover crop research: Scaling up to plant health and scaling out to Ontario.	Environmental Sustainability	$156,140
Adam Gillespie	Developing rapid organic matter assessment tools to monitor soil health BMPs	Environmental Sustainability	$219,900
Adam Gillespie	Updating and calibrating the Century soil organic matter model for Ontario's cropland sector	Environmental Sustainability	$206,080
Susan Glasauer	Transfer of agricultural phosphate from edge-of-field to surface waters via the riparian zone during freeze-thaw cycling	Environmental Sustainability	$233,958
Richard Heck	Quantifying Structural Stability of Agricultural Soils in Ontario	Environmental Sustainability	$207,000
Nigel Raine	Development of best management practices for ecologically sustainable pollination of Ontario fruit and vegetable crops through supporting wild pollinators	Environmental Sustainability	$236,054
Derek Haley	Feed, water, and rest for cattle being transported long-distances, in Canada	Production Systems - Animal	$43,167
Elijah Kiarie	Amino acids nutrition for optimal gut health and productivity in broiler chickens raised without antimicrobial growth promoters	Production Systems - Animal	$88,661
Abdolvahab Farzan	Molecular epidemiology of Streptococcus suis in Ontario nursery pigs	Production Systems - Animal	$120,000
David Renaud	Impact of age at transport and umbilical care on future morbidity, mortality, and growth in male calves destined for the veal industry	Production Systems - Animal	$110,100
Lee-Anne Huber	Pre- and post-weaning nutrition strategies to improve growth performance, gut health, and robustness of pigs after weaning.	Production Systems - Animal	$82,745
David Kelton	Investigating the dynamics of Johne's Disease in Ontario dairy herds (2013-2018)	Production Systems - Animal	$95,000

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
Gregoy Bedecarrats	Determination of the metabolic triggers responsible for sexual maturation in layer chickens and their relation to rearing environment and nutrition.	Production Systems - Animal	$90,000
Stephen LeBlanc	Enhancing natural fertility in dairy cows through health and precision technologies	Production Systems - Animal	$124,534
Trevor DeVries	Enhancing digestion efficiency, weaning success, and welfare of dairy and veal calves through provision of a novel calf starter	Production Systems - Animal	$42,824
Cathy Bauman	Drug Depletion Study of Injectable Trimethoprim Sulfadoxine in Lactating Dairy Does	Production Systems - Animal	$31,955
Zvonimir Poljak	Baseline study of rotavirus frequency and diversity in Ontario swine herds	Production Systems - Animal	$61,000
Cheryl Trueman	Pathogen surveillance for late blight management decisions in field tomatoes	Production Systems - Plant	$116,547
Elizabeth Lee	Application of Genomic Technologies to Improve Fusarium Resistance in Ontario Winter Wheat	Production Systems - Plant	$177,500
Rebecca Hallett	Cyclamen Mite and Strawberries: molecular detection and host plant resistance	Production Systems - Plant	$176,350
Katerina Jordan	Incidence, timing of infection and management of bitter rot in Ontario	Production Systems - Plant	$97,960
Cheryl Trueman	Improving management of cercospora leaf spot in Ontario sugar beets	Production Systems - Plant	$125,525
Rose Buitenhuis	Mistaken identity: the hidden threat of onion thrips to greenhouse floriculture IPM programs	Production Systems - Plant	$140,974
Alan Sullivan	Producing a year round supply of high quality potatoes for Ontario	Production Systems - Plant	$142,250
Ljiljana Tamburic-Ilincic	Development of high yielding, Eastern Canadian hard and soft red winter wheat cultivars and germplasm with increased resistance to Fusarium head blight and leaf diseases	Production Systems - Plant	$129,000
John Cline	Using Novel Grapevine Rootstocks for Stabilizing Yield in Winter Injury Prone Wine Districts in south central Ontario	Production Systems - Plant	$36,974
Mehrzad Eskandari	The Development of SCN-Resistant Edamame soybeans Adapted to Ontario	Production Systems - Plant	$106,000
Jennifer Geddes-McAlister	Defining Mechanisms of Mycotoxin Degradation in Fusarium Head Blight of Wheat	Production Systems - Plant	$131,280

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
Lewis Lukens	Applying quantitative genomics to Ontario barley improvement.	Production Systems - Plant	$111,000
Iris Joye	Innovative strategies to add value to (Ontario grown) bean-derived food ingredients	Products and Value Chains	$224,970
Mike Dixon	Resource Recovery and Inedible Biomass Management in High Intensity Urban Vertical Farming Applications	Products and Value Chains	$93,234
		Total (48 projects)	**$5,787,950**

In addition to administering the awarding of 48 new projects addressing important Ministry research priorities in 2019/20, the University continued to manage the post-award compliance and reporting requirements of 161 continuing Tier I Research Projects.

Continuous improvement in the Tier I program for 2019/20 was predominately focussed on the development of the Next Generation Research Management System (Next Gen RMS), the database used to administer all OMAFRA/UofG funded Research Projects. This included the creation of the application and reporting templates for Tier I, as well as formation of many of the user instructions. In addition, a significant effort in understanding and developing the workflows and process requirements for peer review, industry review (by the Livestock Research Innovation Corporation), and panel review was expended. There was also substantial time invested in system testing and remediation. While considerable work remains to be completed in the implementation of Next Gen RMS, much was accomplished in 2019/20.

Several other initiatives in continuous improvement for efficient and high-quality research program administrative systems and processes were completed in 2019/20, including: improvements in the report review process, development of a completion and compliance check process, enhancements to the Program Guide and initiation of the Issue Resolution process. In addition, timelines for the Tier I call cycle were improved, allowing the researchers to receive award notifications earlier in the year, which supported field season planning and graduate student recruitment.

Hiring of the Manager, Research Program Compliance, had an immediate impact on the receipt of overdue reports, as well as the processing and approval of submitted reports, thus improving compliance with these requirements. More details can be found in Section 3.2.2.

Finally, a number of initiatives were delayed due to the time required to support the implementation of Next Gen RMS and the management of the impacts of COVID-19. These include: determining and implementing Equity, Diversity, Inclusion targets for applications to all programs; and identifying additional third-party incremental leverage opportunities for Research Projects through specific external relationship building.

3.1.4 Special Initiatives (SI)

Projects funded under the Special Initiatives program respond to a specific issue or need of the Ontario Agri-food sector that has been identified by OMAFRA. These science and research needs are important for the Ministry and agri-food stakeholders but, for various reasons, do not fit well into the annual Tier I call for proposals cycle or under another Alliance program. Special Initiatives include breeding research, medium-term trials, synthesis and modelling work.

During 2019/20, the University worked closely with OMAFRA to implement the Special Initiatives program in Next Gen RMS, including developing the application and reporting capacity. In addition, work on determining the appropriate processes for managing the Special Initiatives program was completed.

OMAFRA launched an internal call for SI projects. Eleven projects were defined and provided to the University. Suitable Project Leads were identified and were asked to submit proposal applications through Next Gen RMS. Projects were reviewed by OMAFRA staff (a Research Analyst in RIB and the OMAFRA Lead) and a UofG Research Program Director for alignment with the project description/outcomes and quality of the proposal.

In 2019/20, ten SI projects were awarded funding, as shown in Table 3.6. One project remains unawarded, as there were a number of issues with the Project Leads identified. The University is following up to ensure that an appropriate project proposal is submitted as soon as possible.

Table 3.6: 2019/20 Special Initiatives Projects

Lead Applicant	Project Title	Type	Amount Awarded
Benjamin Bohrer	A global evaluation of modern meat inspection regulation standards	Other	$50,000
Brady Deaton	Farmland Values and Farmland Rents Data for Ontario	Modelling	$175,000
Adam Gillespie	Evaluating and improving agri-environmental indicators for Ontario	Modelling	$140,000
Spencer Henson	Baseline study of the Ontario Cannabis Sector	Synthesis	$52,500
John Lindsay	Creating Modelling Inputs for Soil Map Renewal from LiDAR Data	Synthesis, Modelling	$36,000
Laura Van Eerd	A synthesis of benefits and challenges of adopting cover crops in a temperate humid climate	Synthesis	$55,000
Bill Van Heyst	Odour quantification and mitigation from cannabis production facilities in Ontario	Out of cycle	$124,004
John Zandstra	Advancing Strip Tillage for Vegetable Production	Medium term trial	$147,600
John Zandstra	Improvement of Ontario hazelnut cultivars focusing on winter hardiness and pest tolerance, with an emphasis on management of Eastern Filbert blight	Breeding, Long term trial	$417,660
Richard Zytner	Improved NASM Framework for Food Processing Wash-water and Solid Residuals	Synthesis	$74,100
		Total Awarded (10 projects)	**$1,271,864**
TBC	Microclimatic Conditions for Specialty Crop Production	Synthesis, Modelling	$175,000 (unawarded)
		Total (11 projects)	**$1,446,864**

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, applied research 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. Students are partnered with mentors to complete an agri-food research project that supports producers and rural communities. In 2019/20, the USEL program was expanded to support eight students, instead of the previous five. Due to the timing of the approval of the expansion, the program was limited to the Agriculture Development Branch. It will be extended to other OMAFRA branches, in particular Environmental Management and Food Safety, in 2020/21.

The Office of Research, Agri-Food Partnership provided one-point of contact for all USEL administrative matters in 2019/20, including HR documentation, payroll and processing of expenses. This addressed a number of frustrations around the management of the program experienced by both OMAFRA and the UofG and streamlined operations.

In 2019/20, the University began to look at strategies for involving additional faculty members in the USEL Program and building enhanced working relationships between OMAFRA specialists and UofG faculty. This work will continue in 2020/21.

Due to COVID-19, the USEL survey evaluating employment outcomes was not completed in 2019/20. The survey will be performed in Fall 2020.

Finally, delays in the implementation of the USEL application and reporting templates in Next Gen RMS have limited the University’s ability to ensure all projects are entered appropriately. The University is actively working on implementing the appropriate templates and will ensure that base data is entered for all past USEL projects, to the start of the current Agreement. Assuming that the ongoing issues with Next Gen RMS are resolved, this will be complete in 2020/21.

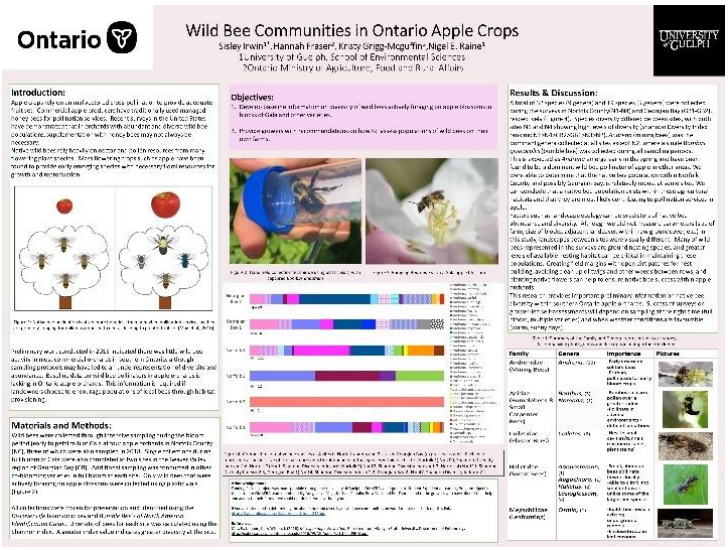
Table 3.7 provides the Summer 2019 project titles, student names and mentors.

Table 3.7: Summer 2019 USEL Student Projects

Student Name	Project Title	UofG Mentor(s)	OMAFRA Mentor(s)
Elizabeth Teel	Goat Kid Management: From Birth to Weaning	Niel Karrow, Department of Animal Biosciences and Cathy Bauman, Department of Population Medicine	Marlene Paibomesai, Dairy Specialist
Emily Conlin	Risk Factors for Ruminal Acidosis and the Role of Effective Fibre in the Feedlot	Katie Wood, Department of Animal Biosciences	Megan Van Schaik, Beef Cattle Specialist
Joshua Mosiondz	Development of a Vegetable Crop Report	Mary Ruth McDonald, Department of Plant Agriculture	Travis Cranmer, Vegetable Crops Specialist and Dennis Van Dyk, Vegetable Crops Specialist
Liam McCarthy	Evaluating Fusarium Head Blight of Winter and Spring Wheat	Nick Wilker, Department of Plant Agriculture and Mitra Serajazari, Department of Plant Agriculture	Joanna Follings, Cereals Specialist
Maja Menegotto	Calibration Curve for a Falling Plate Meter in Ontario Pastures	Ira Mandell, Department of Animal Biosciences	Christine O'Reilly, Forage & Grazier Specialist
Meghan Domony	New Insights on the Effect of Climate Differences in Ontario on Gastrointestinal Parasite Load in Sheep	Angela Canovas, Department of Animal Sciences	Delma Kennedy, Sheep Specialist
Sarah Sims	Incidence and Possible Causes of Early Dying in Ontario Hazelnuts	Katerina Jordan, Department of Plant Agriculture	Melanie Filotas, Horticulture IPM Specialist
Sisley Irwin	Abundance and Diversity Surveys of Wild Pollinator Communities in Ontario Apple and Berry Crops	Nigel Raine, School of Environmental Sciences	Hannah Fraser, Entomologist Horticulture, Kristy Grigg-McGuffin, Horticulture IPM Specialist and Erica Pate, Fruit Crop Specialist

Students led the projects from start to finish and participated in industry events to present project findings (e.g. Southwest Crop Diagnostic Day, FarmSmart, Ruminant Feed Industry Day, etc.). In addition, most students developed several KTT products, such as articles and posters (see two samples below).

Student feedback received on the program included:



"I have benefited from the USEL program immensely by being given opportunities to improve leadership, project management skill, research, and communication skills. Working on other various specialty crops projects at the Simcoe station, I gained knowledge on how research projects are set up and run. I have been taught in lecture about how to properly set them up on paper, but to be assisting with hands-on experience on setting up and running them, as well as maintaining them, is an invaluable skill to have gained. Within the USEL project, I was responsible for project management, and communication skills from my OMAFRA mentor, and the participating growers of the project. Throughout the various tasks given to me this past summer, all have contributed to improving KTT skills, and experience that I can use in my future job search."

"Throughout the duration of the summer, I had the ability to grow my leadership and project management skills extensively. By reviewing existing research, setting up an experimental design, conducting research and analyzing results I was able to grow these skill sets. Communicating my research and results to many different stakeholders throughout the summer allowed me to improve my communication skills by allowing me to understand how to communicate the same information to different levels of understanding."

Virtual Beef

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In This Issue

Preparing for Winter Feeding…While it's a good practice to keep tabs on levels of stored forage on your farm throughout the year, it's especially important to assess your inventory once harvest is complete. This assessment will help inform your winter feeding plan at the onset of the season to minimize costs and disruptions to your feeding program. Read on for an overview of information necessary to take into consideration while assessing feed inventories.

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Estimating Dry Matter Yield on Pasture…Having accurate tools to estimate dry matter yield on pasture is important to developing an effective grazing plan. Over the summer of 2019, Maja Menegotto (OMAFRA USEL student) and Christine O'Reilly (Forage and Grazier Specialist, OMAFRA) set out to assess a tool that has the potential to accomplish just that for Ontario pastures: the falling plate meter. In her article "Know the Amount of Feed in Your Pasture: A Dry matter Yield Estimation Tool", Maja provides an overview of the tool and preliminary results from summer 2019.

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"The USEL program provided me with numerous skills. See below for examples of each.

Leadership - Experience from the USEL program and project allowed me to demonstrate leadership skills especially when working with other summer students. Compiling the crop report weekly gave me a general basis to help point out to the other students which pests to lookout for and which we likely would not see based on thresholds when performing field scouting on various horticultural crops.

Project Management Skills - Creating the weekly crop report allowed me to practice and refine my project management skills when balancing the time required to compile and publish the crop report with other tasks I was responsible for such as trial management, trap monitoring or field scouting.

Research and Communication Skills - These skills were demonstrated with each crop report I published as I had to search for the weather data for each of the ten weather stations I used to create the weekly report, in addition to writing the individual updates. Not to mention the midpoint check-in, final report, and final presentation.

Knowledge Translation and Transfer - This was practiced both within the crop report itself and with conversations I had with growers when performing field visits throughout the summer. For example, passing along crop recommendations from the crop specialists about pest controls methods or cultural controls they could implement in their own growing system; or in conversation with growers when notifying them about the crop report and other information on the ONvegetables blog / updating them on information from the latest crop report."

"I have benefited mainly from the project management side of things. Being in control of the Fusarium Nursery in Elora has given me the opportunity to manage it on my own time, as well

as knowing that my supervisors were counting on me to get results and manage it responsibly. I really liked how independent it was and how much faith my supervisors put in me to get the job done. This allowed me to develop personal time management skills as well as knowing that I was expected to help with other activities other than my own. I was also exposed to various research methods and lab work which helped a lot in deciding on whether a master's degree was in my future. Taking precise notes and doing accurate lab work was valuable to me. Attending various events with Joanna allowed me to be exposed to more than just wheat and diseases as well. This was valuable due to me being able to learn about multiple crops and how they are discussed by industry and OMAFRA employees. It was also good to see how the government/public sector interacted with private industry. I was not aware of the level of communication between the groups and it was very interesting to see how no matter what you are involved with you will be learning constantly about other areas of expertise as well as networking with people from all over the Province."

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 continues to grow, with demand from 94 applicants in 2019/20 and a total ask of $4.5M.

There were 20 HQP Scholarships awarded in 2019/20. Eleven of these scholarships were provided to Masters students (five Entrance and six In-Course) and nine to Doctoral students (five Entrance and four In-Course). Table 3.8 outlines information about the new award winners. These 20 new students add to the 16 continuing Masters and 14 continuing Doctoral students, bringing the total cohort registered in 2019/20 to 50 students.

Over its existence, the HQP Scholarship Program has supported the development of 181 students who are the future researchers, policymakers and innovators in government, academia, the agri-food sector and rural economic development.

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 partnership was developed with the Canada First Research Excellence Fund (CFREF) Food from Thought (FfT) Program. Food from Thought committed the $250K in matching funds for 2019/20, as well as provided an additional $450K in scholarship support. This significantly increased the number of scholarships that were awarded in 2019/20. The matching funds, as well as the additional support, will be available until 2023. This novel partnership provides significant benefits to both parties, including attraction and retention of the best and brightest talent for the agri-food sector and mobilization of knowledge for the benefit of both society and the economy.

Table 3.8: HQP Scholarship Program Award Winners

Student Name	Project Title	Faculty Advisor	Department Name	Degree, Scholarship Type
Connor Fullerton	Achieving Value Chain Status in the Ontario Agri-Food Sector: Barriers to Success	Simon Somogyi	School of Hospitality, Food and Tourism Management	MSc, Entrance
Fernando de Jesus Montaño Lopez	Effect of land conversion on soil carbon and nutrient dynamics in the Great Clay Belt of Northern Ontario: A digital soil mapping approach	Asim Biswas	School of Environmental Sciences	MSc, Entrance
Anna Schwanke	Optimizing Feeding Strategies in Automated Milking Systems using Dairy Cow Behavioral Traits	Trevor DeVries	Department of Animal Biosciences	MSc, Entrance
Emily Sousa	The Rise of Cricket Farms as 'Mini-Livestock' in Ontario	Wayne Caldwell	School of Environmental Design and Rural Development	MSc, Entrance
Jyothi Shiva Swaraj Vutukuru	High Moisture Extrusion for the Development of Plant-based Meat Analogs	Mario Martinez Martinez	School of Engineering	MSc, Entrance
Amanda Hutter	Land steward engagement and drone ecology: exploring the ability to communicate ecosystem health using UAS technology	Helen Hambly	School of Environmental Design and Rural Development	MSc, In-course
Daniel Noble	Groundwater quality linked to ecosystem services on marginal lands of intensively managed farms	Andrew MacDougall	Department of Integrative Biology	MSc, In-course
Maleeka Singh	Food Forensics to Detect Seafood Fraud	Jeffrey Farber	Department of Food Science	MSc, In-course
Kurtis Sobkowich	Spatial surveillance of Varroa destructor emergence in Apis mellifera colonies and identification of high-risk areas in Ontario	Olaf Berke	Department of Population Medicine	MSc, In-course, Transfer to PhD
Anna Welboren	Macronutrient composition of calf milk replacer	Michael Steele	Department of Animal Biosciences	MSc, In-course, Transfer to PhD
Xu (April) Xu	The effect of thermal processing on egg yolk lipid	Michael Rogers	Department of Food Science	MSc, In-course

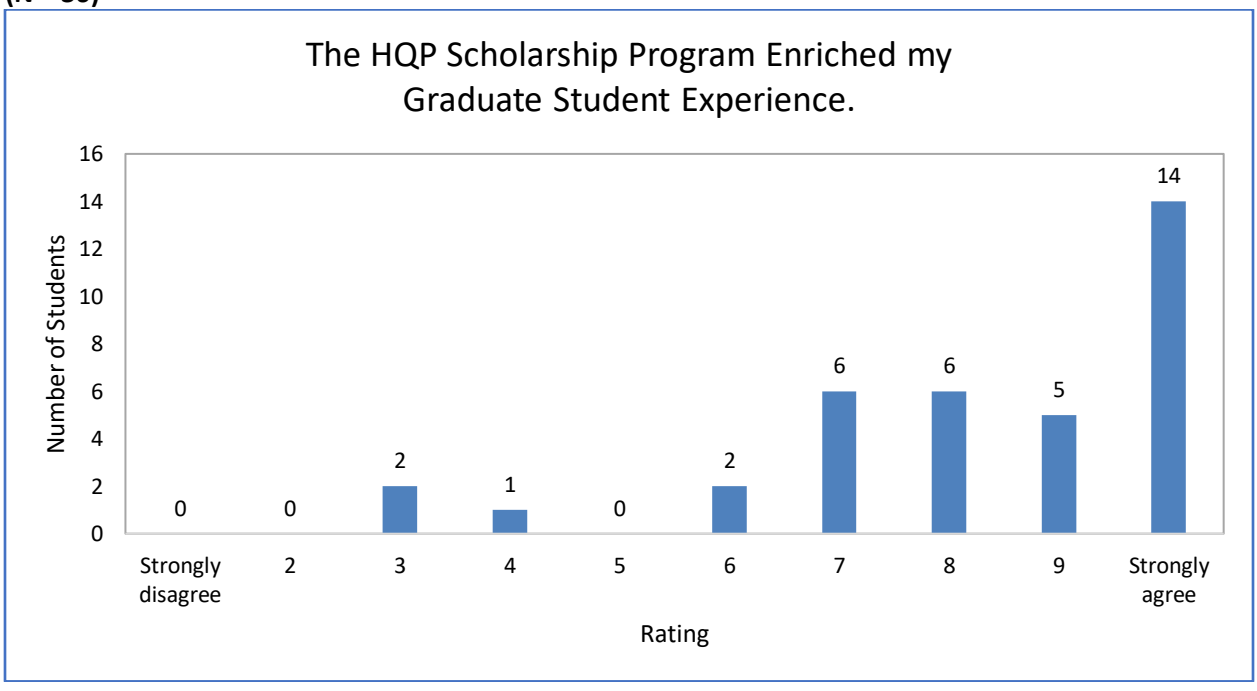
Student Name	Project Title	Faculty Advisor	Department Name	Degree, Scholarship Type
	bioaccessibility assessed using novel digestion model TIM-1			
Joshua Barrett	Municipal Government and Amalgamation: Approaches to Rural Economic Development and Policy-Making	Ryan Gibson	School of Environmental Design and Rural Development	PhD, Entrance
Mylene Corzo-Lopez	Mechanism of resistance to Common Bacterial Blight, Niemann Pick gene like a source of resistance to Xanthomonas sp. in OAC Rex	Peter Pauls	Department of Plant Agriculture	PhD, Entrance
Omid Norouzisafsari	Magnetic hydrochar from agricultural and food wastes (AFWs): A Promising approach of generating renewable catalyst and electrode for energy generation and storage	Animesh Dutta	School of Engineering	PhD, Entrance
Leticia Reis	New strategies for thinning apples without Carbaryl with a focus on Strategies of Early and Late Thinning	John Cline	Department of Plant Agriculture	PhD, Entrance
Nicholas Werry	Identifying Small RNA Biomarkers of Bovine Fertility	Jonathan LaMarre	Department of Biomedical Sciences	PhD, Entrance
Chloe Alexander	Addressing Food Waste in Canada: An Analysis of Food Waste Policies in Ontario and British Columbia	Kate Parizeau	Department of Geography, Environment and Geomatics	PhD, In-course
Emily Duncan	Social dimensions of digital agricultural technologies and the governance of global agri-food data	Evan Fraser	Department of Geography, Environment and Geomatics	PhD, In-course
Andrew Green	Induction and Breaking of the Persister State in Shiga-toxin producing Escherichia coli for the Enhancement of Microbial Safety of Fresh Produce	Keith Warriner	Department of Food Science	PhD, In-course
Sudhanshu Sudan	Antimicrobial peptides as alternative to antibiotics for infection control and improved livestock health	Julang Li	Department of Animal Biosciences	PhD, In-course

2019/20 brought about a number of changes to the HQP Scholarship Program. For the first time, the program offered both entrance and in-course scholarships. This enabled students who did not have a faculty advisor upon admission to participate and allowed program dollars to stretch further, by providing shorter-term, less costly awards for in-course students. By implementing a minimum A- (80%) average transcript requirement, it made the selection process more efficient and ensured only top-performing student participants. A Program Guide was developed that formalized many of the policies currently applied to HQP Scholarship Recipients and was made available on the website. Finally, the transfer of the payments of scholarships to Student Financial Services occurred. This created efficiencies in the distribution of the scholarships, as well as ensured appropriate fiscal management if a student leaves their graduate program.

There were several discussions about instituting an annual recognition event to celebrate HQP Scholarship Recipients' achievements and enable networking. The event was originally planned for Fall 2019. However, due to a number of staffing changes and a lack of capacity, it did not occur. An event will be planned for Fall 2020, likely in a virtual format due to COVID-19.

The HQP Employment survey was completed in 2019/20. The results can be found in Section 3.3.3. In addition to employment status, a number of other questions were asked about the impact of the program. In addition to ratings, respondents were also asked to provide comments. Of those responding, 92% somewhat agreed or strongly agreed that the HQP Scholarship Program enriched their graduate student experience, as shown in Figure 3.1.

Figure 3.1: Influence of the HQP Scholarship Program on Enriching Graduate Student Experience (N = 36)



86% of survey participants agreed that the HQP Scholarship Program was useful in preparing them for the workforce, as demonstrated in Figure 3.2, while 92% would be likely or extremely likely to recommend the HQP Scholarship Program to others, as exhibited in Figure 3.3.

Figure 3.2: Preparation for the Workforce According to HQP Scholarship Program Graduates (*N* = 36)

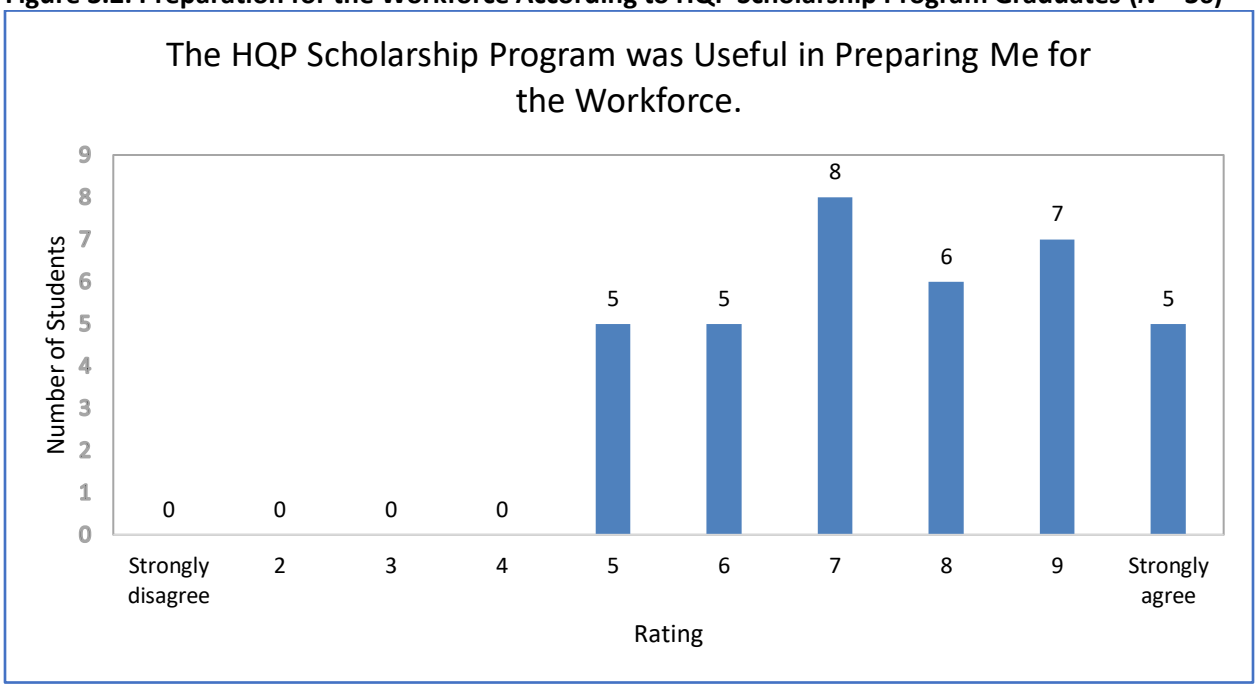
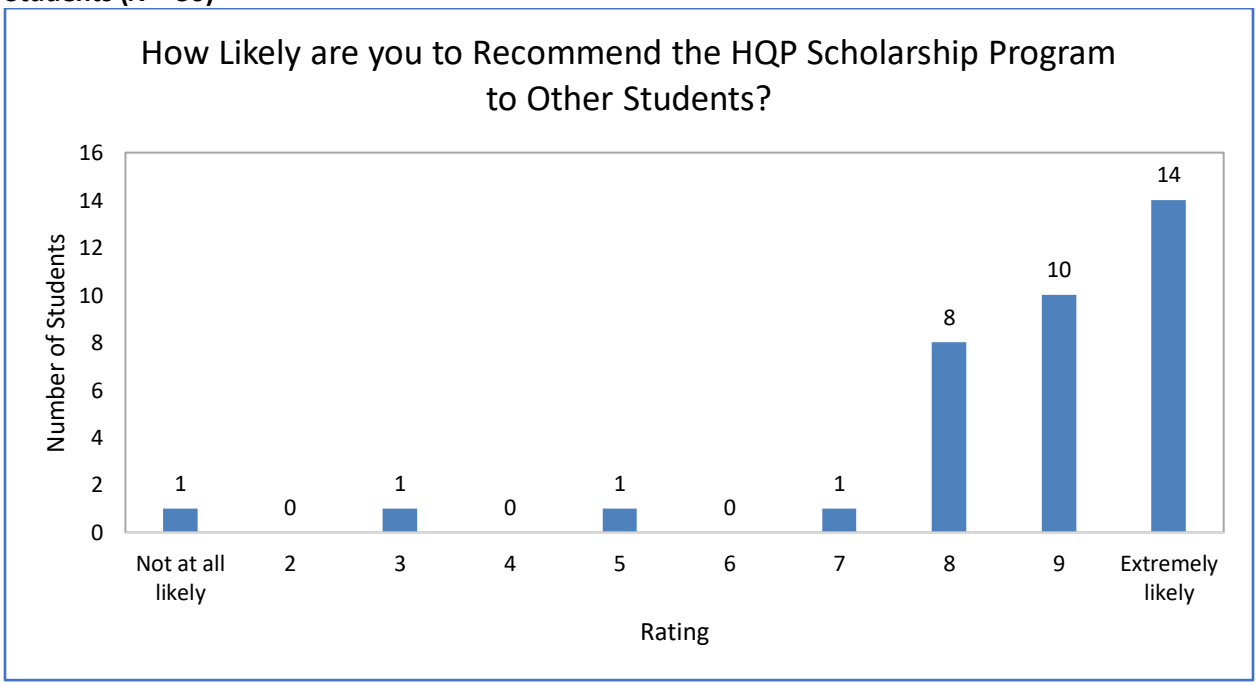


Figure 3.3: Likelihood that HQP Scholarship Graduates Would Recommend the Program to Other Students (*N* = 36)



HQP Scholarship Recipients, in general, were pleased with the program. In response to the question, “What do you wish you had learned during your HQP Scholarship Program that would have better prepared you for the workplace/further education?”, they had some valuable

feedback. In general, students wanted more training on building business relationships and the art/importance of networking. They also wanted more career development workshops. Finally, students mentioned desiring more information about building and managing a budget, as well as fundraising. This feedback has been provided to the HQP Course Instructors, as well the HQP Program Director, for consideration and incorporation into the course.

3.1.7 Research Innovation Office

The Ontario Agri-Food Innovation Alliance supported UofG inventions that had impact across the agri-food sector. The Research Innovation Office (RIO) is responsible for managing and administering research innovation and commercialization programming for the University of Guelph. Despite some challenges, including COVID-19, RIO had a successful year in the development, commercialization and advancement of technologies and projects that will benefit the Ontario agri-food economy.

Products reaching the market have an opportunity to disrupt industries in new ways. For example, plant tissue culture vessels developed with Alliance funding were licensed to start-up company WeVitro, who rapidly gained a foothold in the market. Ford Motor company also announced that it will start incorporating car parts made with biobased resins developed at the UofG starting in 2020.

Increased focus on the germplasm portfolio has led to new opportunities and agreements with companies that have never licensed UofG varieties before. In future years, this will lead to diversification of the royalty base.

New reports of invention represented a wide scope of technology, including novel methods to remove contaminants from wastewater produced in a range of industries; bacterial cultures that will be used to develop new inoculants for plants; and compostable packaging with high oxygen barrier properties.

The Gryphon's LAAIR program, administered by RIO, continued to help faculty work with industry to de-risk commercially viable early stage technologies. A past LAAIR project with Dr. George van der Merwe has led to the creation of Escarpment Laboratories. Escarpment continues to collaborate with Dr. van der Merwe, leading to a successful Genome Canada award, further leveraging the Alliance's investment. Please see the case study *From Start-Up to Scale-Up* in Appendix C.3 for more information.

Thanks to Gryphon's LAAIR funding, RIO also hosted its first pitch competition and innovation showcase highlighting successful LAAIR projects and entrepreneurs. The event attracted hundreds of attendees and distributed $17,500 in prize money to pitch participants.

The Industry Liaison team had a good year with 25 funded projects from 9 different departments receiving nearly $6M in funding despite upheaval in popular funding programs. 2020/21 already shows strong potential with $10M of potential projects in the pipeline. More details can be found in Section 3.4.2.

In 2020/21, RIO looks forward to building on a strong foundation and leveraging support from the Alliance to both increase and communicate research impact.

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

In 2019/20, the Gryphon's LAAIR program funded ten new projects for development totalling $440K. Seven 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 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). The Gryphon's LAAIR projects are shown in Table 3.9.

2019/20 was the second year using two types of awards (Market Validation and Product Development), designed to accurately mirror the crucial steps taken during industrial commercialization. Because markets continually evolve, it is critical that researchers conduct timely market research before moving on to invest multiple years to build a minimum viable product using a Product Development grant. These Market Validation projects continue to provide an important screening step to ensure our new technologies have a suitable product-market fit.

Table 3.9: 2019/20 Gryphon's LAAIR Projects

Lead Applicant	Project Title	Type	Amount Awarded
Manick Annamalai	Market validation for "maple syrup encapsulated protein powder (MSEPP)" in domestic and international sectors	Market Validation	$20,000
Robert Hanner	Point-of-need qPCR assay for pathogens of concern in commercial greenhouse operations	Market Validation	$20,000
Thomas Koch	Market assessment of a stem cell service and therapeutic biobank for the equine industry	Market Validation	$20,000
Julang Li	Market validation via registration of EGF containing yeast fermentation product	Market Validation	$20,000
Praveen Saxena	PTC+: A novel culture vessel for plant propagation	Market Validation	$20,000
Ashutosh Singh	Market validation of protein rich peach crisps and powder	Market Validation	$20,000
Simon Somogyi	An examination of consumers' perceptions and buying behaviour of smart food packaging and smart food cabinets in unmanned food grocery stores	Market Validation	$20,000
		Subtotal (7 projects)	**$140,000**

Lead Applicant	Project Title	Type	Amount Awarded
Art Hill	Development of a Soy-Based Fermented Cheese	Product Development	$100,000
Mario Martinez	Manufacturing of Plant-Based Meat Analogues through High Moisture Twin-Screw Extrusion	Product Development	$100,000
Amar Mohanty	Compostable Thermoformed Vegetable Packaging from Ontario Waste Starch	Product Development	$100,000
		Subtotal (3 projects)	**$300,000**
		Total (10 projects)	**$440,000**

Several past LAAIR projects have seen success for the Ontario agri-food industry. A past project funded by Gryphon's LAAIR to design, build and sell airlift pumps for aquaculture is continuing to show positive results as the industry collaborator, *FloNergia*, has used research results obtained from Gryphon's LAAIR funded market research to optimize their products. As a result, they are now selling pumps in Canada, US, Costa Rica, and Chile; plus, they have obtained a patent in China for one of their pump designs, securing another potential market for the corporation.

In the past two years, two Ontario industry partners have created start-up companies to commercialize products supported by the Gryphon's LAAIR program. *We Vitro*, which is a plant propagation equipment company, and *Neophyto Foods*, which is a food science-based consumer company whose first product is a soy-based cheese. Both companies have penetrated the market and, although sales are small, they are growing. *We Vitro* won the Gryphon's LAAIR pitch competition People's Choice Award in 2019. *Neophyto* is growing faster than expected and they won the 2019 CNE Pitch Competition.

Finally, Dr John Dutcher and his Guelph-based start-up company *Mirexus*, has seen great success after receiving LAAIR funds. *Mirexus* manufactures Phytospherix, a commercial nanoparticle from sweet corn used in cosmetics and other moisturizers. This technology was funded by Gryphon's LAAIR in 2014, and it was crucial to the survival of *Mirexus* which has raised over $20M in investment, built a new manufacturing building in Guelph, employs 34 full time employees, has formed three subsidiary companies and has annual sales revenue over $1M (2019).

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.

In 2019/20, 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 2019/20 program activities and achievements organized by objectives (as detailed in the OMAFRA/UofG Agreement). A full comparison of proposed 2019/20 Business Plan activities relative to delivered programming in 2019/20 is contained in Section 3.4.5 as part of the Agri-Food and Rural Link report requirement.

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 2019/20, the KTT Funding program supported ten new projects, totalling $402K. Four were in the research stream and six were in the mobilization stream. Project titles and award amounts are shown in Table 3.10.

In addition, six projects were funded under the KTT Initiatives program, which provides one-time financial support of up to $5,000 for a product that translates and transfers research that benefits Ontario's agri-food sector or rural communities. KTT Initiatives projects are listed in Table 3.11.

Table 3.10: 2019/20 KTT Funding Program Projects

Lead Applicant	Title	Type	Amount Awarded
Wayne Caldwell	Facilitating Agriculture in Northern Ontario	Mobilization	$30,000
Abigail Carpenter	Adoption of switchgrass use by the dairy sector	Mobilization	$40,000
Kari Dunfield	Soil Health Knowledge Exchange	Mobilization	$40,000
Animesh Dutta	Commercial Applications for Ontario Bio-carbon	Mobilization	$40,000
Ryan Gibson	Immigration: Rural Economic Development Strategies	Mobilization	$39,000
Mary Ruth McDonald	Vegetable IPM	Mobilization	$24,205
		Subtotal (6 projects)	**$213,205**
Ataharul Chowdhury	Improving the Effectiveness of Advisory Services	Research	$68,912
David Kelton	Changing Antibiotic Use Decisions	Research	$36,800
Erin Nelson	Farmer-Led Research as a KTT Best Practice	Research	$31,000
Erin Nelson	KTT and the Adoption of Sustainable Practices	Research	$52,500
		Subtotal (4 projects)	**$189,212**
		Total (10 projects)	**$402,417**

Table 3.11: 2019/20 KTT Initiatives

Lead Applicant	Title	Type	Amount Awarded
Dave Renaud	Improving knowledge in identifying high-risk male calves	Initiatives	$5,000
David Ma	Understanding protein foods: Creation of resources to support the agri-food sector	Initiatives	$5,000
Iris Joye	The Cereal Box: Optimization and Multiplication	Initiatives	$5,000
Michael Steele	Smart Calf Rearing Conference - Producer Day	Initiatives	$5,000
Rich Moccia	Aquaculture Production Statistics Program for Ontario	Initiatives	$1,700
Scott McEwen	Analysis and reporting of antimicrobial use information in the swine industry	Initiatives	$4,970
		Total (6 projects)	**$26,670**

In 2019/20, the University continued to deliver a modernized KTT funding call focused on soliciting and funding high-quality proposals with enhanced efficiency. Alison Duncan was engaged as a Research Program Director to support the review process. An anonymous technical review was added to support adjudication of research stream KTT projects and provide additional feedback to applicants. In addition, the KTT team continued to deliver a modernized communications strategy to promote the funding program, including a combination of social media and web-based communications plan with in-person and online townhall meetings to engage researchers.

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 2019/20 to help stakeholders improve on the skills and networks necessary to enhance research impact.

Knowledge Exchange Events

- **Celebrating Three Years of Research Excellence at the Ontario Dairy Research Centre (May 2019):** 78 individuals, representing 17 different organizations, registered to participate in the invitation-only event celebrating three years of research excellence at the Ontario Dairy Research Centre. This event was designed to engage key partners and donors who supported the design and build of the dairy facility. Dr. Malcolm Campbell (UofG), Dr. Lorne Hepworth (ARIO), and Mr. Henry Wydeven (DFO) delivered opening remarks. Six student researchers were positioned throughout the dairy facility to provide project updates and detail how the facility supported their research. More information is available in Appendix B.
- **2019 Dairy Research and Innovation Day (December 2019)**: Delivered in partnership with Dairy at Guelph, this event was designed to engage key stakeholders in the Ontario dairy sector to support networking and provide an update on current research. 135 individuals attended the event and 36 students presented posters.
    - In a post-event survey, 86% of responding poster presenters (N=15) strongly agreed that events like 2019 Dairy Research and Innovation Day were valuable professional development and networking opportunities.
    - In a separate post-event survey, 17 out of 22 respondents (77%) agreed that 2019 Dairy Research and Innovation Day was an important way to stay up-to-date on dairy research at the University of Guelph; 64% indicated they were able to make or strengthen existing professional relationships or collaborations at this event.

- **Ontario Beef Centre Open House (August 2019)**: More than 800 beef farmers and representatives of the agri-food sector and surrounding community attended the Ontario Beef Centre Open House.
    - Nine graduate students delivered posters and discussed current research.
    - Three University of Guelph faculty presented on their research program.
    - Please see the case study *Research Station Outreach* in Appendix C.2 for more information.

KTT Skills Series

- From October 2019 to April 2020, the Office of Research, Agri-Food Partnership partnered with the Research Innovation Office (RIO), and the Community Engaged Scholarship Institute (CESI) to deliver the Skills for Research Impact workshop series. This series was offered on a monthly basis to faculty, research staff and graduate students to enhance their skills related to designing and delivering KTT plans and ultimately enhancing the impact of their research.
    - Please see the case study *Growing KTT in Ontario* in Appendix C.1 for more information.

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

A two-pronged approach is employed to address this key objective: deploy targeted communications activities to increase awareness of the Alliance and its research among key audiences; and 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 agri-food and rural innovation.

2019/20 Communications Activities

In 2019/20, 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*.

To unify digital channels and increase the Alliance profile across platforms, the Twitter account for Agri-Food and Rural Link was transitioned on August 27, 2019 to the new Ontario Agri-Food Innovation Alliance name and look. The #AllianceInnovations was created to increase name recognition and give readers an easy way to find additional Alliance content.

On Twitter, renaming the account owner and handle (@name) does not disrupt the account or remove existing followers. As a result, program staff created content that built on its existing credibility and history, growing the account following by 4.6%, adding 111 new followers to its

existing 3,504, for a total of 3,665 followers. Table 3.12 provides a number of Twitter metrics for @AgInnovationON. Overall impressions decreased by 27%. However, engagements increased by 1.3% and the overall engagement rate increased from 1.3% to 1.7%, demonstrating that followers who do see Alliance content continue to see value in exploring it further. The drop in impressions was likely due to a new feature that Twitter launched that curated tweets for users rather than displaying all tweets in reverse chronological order. So, tweets were shown to fewer users, but the users who did see them were more likely to be engaged with either the account or related topics/accounts, accounting also for the overall higher engagement rate.

Table 3.12: Twitter metrics for @AgInnovationON

Metric	2018/19	2019/20	Change
Impressions	173,975	126,659	-27.2%
Engagements	2,091	2,119	1.3%
Engagement Rate	1.3%	1.7%	0.4%
Retweets	256	236	-7.8%
Likes	334	429	28.4%
URL Clicks	388	376	-3.1%

During the same period, the @DairyFacility Twitter account (whose handle did not change) attracted 196 new followers (from 1,543 to 1,739), an increase of 12.7%.

The Agri-Food and Rural Link LinkedIn page was a legacy type that needed to be transitioned to the newer Organization page type. Unfortunately, it is not possible to import connections from the old page type to the new; therefore, the number of followers was reset to zero. This transition occurred in February 2020 and work is ongoing to re-build an organic, engaged audience. The new LinkedIn page has 35 followers.

The 2019/20 Agri-Food Yearbook was released in Fall 2019. The 44-page Agri-Food Yearbook profiled outcomes of Alliance-funded research and programming. With the theme *Advancing Research Impact*, this edition contained a feature on the newly opened Ontario Beef Research Centre. 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.

A collaboration among Food from Thought, the Arrell Food Institute and Office of Research, Agri-Food Partnership profiled Alliance-funded research and distributed the Agri-Food Yearbook to participants at an Exhibit at Canada's Outdoor Farm Show in September 2019.

The Alliance was also profiled as part of the joint, 2,700 square foot OMAFRA/University booth at the Royal Agricultural Winter Fair in November 2019. The booth featured Alliance-funded research and the 360-degree video of the Ontario Dairy Research Centre.

In 2019/20, the UofG hosted more than 1,400 people for tours of the Ontario Dairy Research Centre. Hosting tours highlights the facility's role in promoting education and training and helps

strengthen important partnerships with industry and government. Please see the case study *Research Station Outreach* in Appendix C.2 for further information. Tours of the Ontario Beef Research Centre began in January 2020, after cattle were moved in and settled. There was significant interest in tours, with nine tours in early 2020. Tours of all facilities have been paused since March 2020 due to the COVID-19 pandemic.

Evaluate and Promote KTT Best Practices

To help improve the quality of KTT plans submitted at Full Proposal to the Alliance Tier I Research and KTT Funding Programs, three new resources were created by the Office of Research, Agri-Food Partnership KTT unit: a series of example KTT plans; a KTT plan checklist; and an evaluation tips checklist. All of these resources were created with input from OMAFRA IKM KTT analysts. Please see case study *Growing KTT in Ontario* in Appendix C.1 for a full description of these training initiatives.

3.1.10 Data Initiatives

3.1.10.1 Data Management Plans

Data Management Plans (DMPs) are an important tool to help enhance data stewardship, with the goal of improving the sharing and reuse of research data. Under the Agreement, DMPs are required for all Research Projects. The DMPs detail how data acquired during the research project will be stored, shared, and maintained. Consultations to develop this new requirement began in Fall 2018. Phased rollout began in January 2019, requiring DMPs for Tier I, KTT Research and Gryphon's LAAIR projects. In 2019/20, the DMP requirement was expanded to include Tier II projects, per the second phase of the rollout plan.

In 2019/20, the University continued to deliver training and resources to support the phased rollout of the DMP requirement. Details about the DMP process, resources, and structure can be found on the Alliance DMP webpage. The following is a brief summary of activities conducted by the University in 2019/20 to support DMP training and compliance.

- Designed and deployed DMP training and resources in consultation with the University of Guelph Library and Food from Thought. In 2019/20, the following training/resources were completed:
    - Data management plan workshops were presented by a research and scholarship librarian. In the last year, a total of 24 workshops were delivered with 315 attendees. These workshops included specific presentations to Alliance and Food from Thought researchers, as well as workshops and presentations to graduate students. In all cases, these workshops help enhance data management capacity at the University of Guelph.
    - One-on-one consultations with University of Guelph Librarians were available for all researchers at UofG.

    - A DMP Manual, outlining processes for completing and uploading a DMP, was developed and made available to researchers. The manual was downloaded 182 times during 2019/20 and there were 548 page views during the same period.
    - A research and scholarship librarian reviewed more than 100 unique Alliance DMPs using a rubric to provide consistent expert feedback to researchers.
- Carol Perry, Acting Head of Research and Scholarship at the McLaughlin Library, began a research project to assess the data management plan tools and supports delivered by the Library and the Office of Research to build capacity in the UofG research community. Project collaborators include Rebecca Moore, Office of Research, Agri-Food Partnership and Michelle Edwards, Ontario Agricultural College.
    - Research project objectives: Assess the effectiveness of services and supports designed in response to new research data management requirements.
    - Purpose: Gather data to support continuous improvement and resource enhancement.
    - Methods: Survey, focus groups, review and assessment of national and international case studies.
    - In 2019/20, the team completed the study design, received the Research Ethics Board's approval, and a preliminary review of international DMP literature to scope the relevant case studies. A survey was released to the research community in June 2020. Findings will be reported in the 2020/21 Annual Report.

3.1.10.2 Research Station Data Access Portal

In 2019/20, the UofG continued work on enhancing the organization and off-site access to data from the Ontario Dairy Research Centre and the Ontario Beef Research Centre. Dr. Rozita Dara continued to act as the Data Strategy Director for the Alliance. In this capacity, her main focus was on delivering the objectives of the Data Access Portal project.

The objectives of the Data Access Portal are: 1) clean and aggregate data produced/collected at research facilities; and 2) enable remote access to Research Centre data.

This project is part of the UofG's commitment to enhance service delivery to researchers who use the stations. While data aggregation and online access to project-specific data will be leveraged by Agri-Food Data Canada, this project is designed to ease researcher access to data as part of a service commitment. Currently, public access to this portal is outside the scope of this particular project.

Project updates for 2019/20 are as follows:

- Dairy facility pilot project is ongoing and under the direction of Dr. Rozita Dara.
- Data generated at the dairy and beef facilities are stored on an on-site station server and uploaded to secured servers hosted by the University of Guelph's Computing & Communications Services (note: these servers are located at the University of Guelph; at no point are data sent to servers outside of Canada).
- Online interface will allow for access to data stored on UofG servers. The pilot portal is available online at https://eloradairyportal.uoguelph.ca/#/. Data are currently only available to a set of test users (station staff and selected University of Guelph faculty), until the governance processes have been finalized.

3.1.10.3 Metadata Database

The Agreement requires that "[…] research results are made available for public access in accordance with the Data Management Plan, unless otherwise agreed to by the Parties." In 2019/20, the Office of Research, Agri-Food Partnership worked with the University of Guelph Library to explore options for creating a repository that would house: project description; summary of collected data; research results; and a plain language summary. The vision is to create a metadata repository, but researchers will also have the option to append project data, if desired. Work is ongoing. This database will be designed to complement, but not duplicate, the OMAFRA project search database.

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 $11.145M for the research faculty pool which supports a minimum of 67.8 faculty full-time equivalent (faculty FTE) positions, with the expectation that at least that many FTEs will be engaged in Research Projects funded through the Agreement's Research Program, projects which respond directly to OMAFRA Priorities. The University's performance varies from year-to-year depending on the number and type of projects funded.

In 2019/20, the University of Guelph exceeded its target of delivering 67.8 faculty FTEs dedicated to Agreement-funded research by 11%. The 75.5 faculty FTEs is the cumulative effort of 263 faculty in six Colleges leading and collaborating on Agreement-funded projects. This is slightly less than the 78.8 faculty FTEs reported in the 2018/19 Consolidated Annual Report. During the calculation this year, several inconsistencies were discovered in the 2018/19 value. The corrected value for 2018/19 is 77.7 faculty FTEs, still well above the target identified in the Agreement.

Table 3.13 provides the total cumulative engagement of faculty in Research Projects, reported on at the College and Department level.

Table 3.13: 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)	**1.6**
Department of Management	0.1
Department of Marketing and Consumer Studies	1.0
School of Hospitality, Food and Tourism Management	0.6
College of Biological Sciences	**4.6**
Department of Human Health and Nutritional Sciences	0.9
Department of Integrative Biology	1.4
Department of Molecular and Cellular Biology	2.3
College of Engineering and Physical Sciences	**7.0**
Department of Chemistry	0.2
School of Computer Science	0.4
School of Engineering	6.3
College of Social and Applied Human Sciences	**1.7**
Department of Family Relations and Applied Nutrition	0.4
Department of Geography, Environment and Geomatics	0.8
Department of Sociology and Anthropology	0.5
Ontario Agricultural College	**47.6**
Department of Animal Biosciences	11.0
Department of Food Science	3.3
Department of Food, Agricultural and Resource Economics	4.4
Department of Plant Agriculture	9.9
Ridgetown Campus	6.5
School of Environmental Design and Rural Development	2.2
School of Environmental Sciences	10.4
Ontario Veterinary College	**13.0**
Department of Biomedical Sciences	0.6
Department of Clinical Studies	1.1
Department of Pathobiology	5.5
Department of Population Medicine	5.9
2019/20 Total	**75.5**
Target	**67.8, ↑**
2018/19 Total	**77.7, ↓**

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 2019/20, the University of Guelph exceeded its minimum target of 42.4 research technical FTEs by 128%. The total of 96.7 technical FTEs reported on is the cumulative effort of 183 people working on Agreement-funded research. This was a 7.6% increase from 2018/19.

Table 3.14 provides the total cumulative engagement of research technician FTEs, reported on by program.

Table 3.14: Total Engagement of Research Technician FTEs by Program

Program	Research Technician FTEs
Tier I Research	41.6
KTT Program	0.4
Gryphons LAAIR	1.0
Special Initiatives	1.4
Tier II/III Research	18.0
Other Technical Support (not Research Project specific)	34.4
2019/20 Total	**96.7**
Target	**42.4, ↑**
2018/19 Total	**87.6, ↑**

3.2.1.3 Research Support

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

In 2019/20, the University of Guelph met the minimum target of 22.5 research support FTEs. This was slightly less than the 22.8 research support FTEs in 2018/19.

Table 3.15 provides the total cumulative engagement of research support FTEs, reported on by type.

Table 3.15: Total Engagement of Research Support FTEs, by Type

Type	Research Support FTEs
Administrative Support	16.7
Ridgetown Campus Support	5.9
2019/20 Total	**22.5**
Target	**22.5, ↑**
2018/19 Total	**22.8, ↓**

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.

Report Review

With respect to progress reporting, it is very difficult to track how long reports remained at the different review statuses for this past year, as two research management systems were in use for a large portion of 2019/20 and the functionality did not fully exist within the old system. In addition, due to the system migration in Winter 2020, there were many barriers to reporting and report review that impacted both the researchers and the reviewers. While many of these barriers have been addressed, they led to delays and significant frustration. Once the full implementation of Next Gen RMS is complete, the University will be able to provide a fulsome update on progress reporting and the time spent at each stage in the process. Some preliminary information is provided below.

As mentioned in Section 3.1.3, the hiring of Kathy Zurbrigg, Manager, Research Program Compliance, has had an immediate impact on the number of overdue reports and the number of reports in the review process. At the end of 2018/19, 65% of reports were overdue. This dropped to 39% at the end of 2019/20, a 40% improvement. The UofG is continuing to actively work with researchers to encourage timely reporting and following up when that is not the case. At the end of 2018/19, there were 382 reports in the review cycle. That number has fallen to 170 at the end of 2019/20, a reduction of 55%. In 2019/20, the average days from submission to approval was 172 days, with 31% of reports reviewed in 120 days or less. The UofG is working closely with RIB to remove roadblocks in the report review process. In addition, the UofG has created a “Reporting Tips and Guidelines” document that provides best practice information and addresses common feedback from the process. This will assist the researchers in submitting high-quality reports the first time, create efficiencies for the reviewers, limit the number of reports in the a “requires revisions” status and ultimately, reduce the average number of days from report submission to approval.

Data Management Plans (DMP)

The UofG is required to ensure that DMPs are in place for each Research Project and are fully executed. Presently, the compliance rate on DMP submission for Tier I is 84% (43 out of 53 have been submitted for 2018/19 projects and 41 out of 47 for 2019/20 projects). The compliance rate of Gryphon’s LAAIR projects is also 84% (8 out of 9 for 2018/19 projects and 8 out of 10 for 2019/20 projects). Finally, the compliance rate on KTT Research projects is 100% (4 out of 4 for 2019/20 projects). Compliance rates for Special Initiatives and Tier II will be included in the next Annual Report.

The UofG is actively following up with researchers who have not yet submitted their DMPs and expects to be fully compliant by 2020/21.

Post-Project Verification

A risk-based approach has been developed to select and validate completed Research Projects for Post-Project Verification (PPV). The methodology includes 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 and processes are still being incorporated into Next Gen RMS. Once PPV functionality is operational in Next Gen RMS, the University will be able report on this requirement.

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. Delays in the implementation of the required application and reporting templates in Next Gen RMS have impacted the University's ability to meet this requirement. Assuming that the ongoing issues with Next Gen RMS are resolved, the University will be fully compliant in 2020/21. In addition, it is the University's intention to ensure that data is entered for all past USEL/HQP Projects, to the start of the current Agreement.

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 administered 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 for the HQP Scholarship Program

The University confirms that it secured third-party funding of $700,000 in 2019/20 to meet the objectives of the HQP Scholarship Program from 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 award winners are paid out. This significantly exceeds the minimum funding required of $250,000.

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. Delays in the implementation of Next Gen RMS have impacted the University's ability to fully meet this requirement. Assuming that the ongoing issues with Next Gen RMS are resolved, the University will be fully compliant in 2020/21.

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/. The website will be going through a significant refresh in 2020/21 to better serve the needs of the Agreement.

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 manage emerging issues, is congruent with its institutional goal of remaining the top-ranked agriculture and veterinary medicine university in Canada. The Colleges and the academic units therein have strategic plans that identify discipline priorities for faculty hiring, which map onto the demographics 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 2019/20, the University hired additional capacity to assist with the delivery of the Agreement, supported by University funds. A Manager, Research Program Compliance, started in October 2019, to support the day-to-day administration of the contractual obligations of the Research Program, including supporting the review, amendment and reporting processes.

While there were a number of other staffing vacancies in 2019/20, they have all been addressed. The Office is currently at full capacity and has the resources needed to effectively administer the Research Program.

3.2.10 Mitigation of Labour Dispute, Emergency or Force Majeure

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

In 2019/20, the COVID-19 pandemic provided an excellent example of a force majeure. The University was able to successfully mitigate most of the impacts of COVID-19 on the Research Program through the significant work of the Office of Research. The University successfully demonstrated that it has the capacity and governance structures in place to manage issues at both the operational and at the strategic levels. While some specific Research Projects experienced delays due to COVID-19, many projects were considered time sensitive or critical, allowing them to continue with the appropriate precautions in place.

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 2019/20, there were 152.1 faculty FTEs engaged in research supportive of Ministry Priorities. This exceeded the target of 97 research faculty FTEs. It involved 385 individuals (46.4% of all UofG faculty[9]) conducting research supportive of Ministry Priorities. This was a 0.6% decrease from the 153.0 faculty FTEs engaged in research supportive of Ministry Priorities in 2018/19, but a 5.8% increase in the total number of faculty members engaged.

Table 3.16 provides a listing by College of the number and total FTEs of faculty engaged in research supportive of Ministry Priorities.

Table 3.16: 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	0.2
College of Biological Sciences	47	16.3
College of Engineering and Physical Sciences	47	14.9
College of Social and Applied Human Sciences	20	6.2
Lang School of Business and Economics	17	3.2
Ontario Agricultural College	179	83.1
Ontario Veterinary College	73	28.2
Total	**385**	**152.1**
	2019/20 FTEs	**152.1**
	Target	**97, ↑**
	2018/19 FTEs	**153.0, ↓**

[9] 830 Full-Time Faculty at the University of Guelph on October 1, 2019 as per the Office of Institutional Research and Planning (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 3.17 below illustrates the number of Masters students, Doctoral students 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 2019/20, the University exceeded the target by 21% and reached 17.0 HQP per $1M invested for all in scope programs. This was very similar to the metric in 2018/19, where there were 17.1 HQP per $1M invested.

The University has identified, from market analysis, that there are currently four jobs in Ontario for every agri-food graduate[10]. Overall, 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 (SMA) with the Government of Ontario.

Table 3.17: Number of Highly Qualified Personnel (HQP) Engaged in Research Projects by Program and Ministry Priority for 2019/20 Awards

Program and Ministry Priority	Masters Students	Doctoral Students	Post-Doctoral Fellows	Total	Agreement Investment	HQP per $1M invested
Agricultural and Rural Policy	8	4	1	**13**	$574,231	22.6
Bioeconomy	8	2	7	**17**	$775,738	21.9
Emergency Management	2	2		**4**	$240,300	16.6
Environmental Sustainability	6	7	5	**18**	$1,498,132	12.0
Products and Value Chains	2	2	1	**5**	$318,204	15.7
Production Systems - Animals	10	7	2	**19**	$889,986	21.3
Production Systems - Plants	12	7	1	**20**	$1,491,360	13.4
Tier I Research	**48**	**31**	**17**	**96**	**$5,787,950**	**16.6**
KTT	7	2	1	**10**	$402,417	24.8
Gryphon's LAAIR	2	0	5	**7**	$440,000	15.9
Total–In Scope Programs	**57**	**33**	**23**	**113**	**$6,630,367**	**17.0**
Special Initiatives	9	0	2	**11**	$1,271,864	8.6
Tier II/III Research	17	10	4	**31**	-	N/A
Total–Out of Scope Programs	**26**	**10**	**6**	**42**	**$1,271,864**	**N/A**
					2019/20 Ratio	**17.0**
					Target	**14, ↑**
					2018/19 Ratio	**17.1, ↓**

[10] https://www.uoguelph.ca/oac/about/planning-tomorrow-20-report

Table 3.18 provides the number of Undergraduate students engaged in Research Projects by Program and Ministry Priority for the 2019/20 projects.

Table 3.18: Number of Undergraduate Students Engaged in Research Projects

Program and Ministry Priority	Number of Undergraduate Students
Agricultural and Rural Policy	2
Bioeconomy	7
Emergency Management	2
Environmental Sustainability	10
Products and Value Chains	5
Production Systems - Animals	8
Production Systems - Plants	29
Tier I Research	**63**
KTT	-
Gryphon's LAAIR	3
Total–In Scope Programs	**66**
Special Initiatives	14
Tier II/III Research	20
Total–Out of Scope Programs	**34**

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 or 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 of HQP Scholarship Program participants was completed in 2019/20. The results from this survey are reported below. The first survey for USEL Program graduates will be completed in 2020/21, with the results to be reported in the next Annual Report. The target for USEL Program graduates will be established once the baseline data are available from the 2020/21 survey.

The survey included HQP Scholarship Recipients who participated in the program between 2012 and 2020. Fifty of the 100 students who received the survey responded to some or all of the survey questions, representing a 50% response rate. Of the fifty students, 11 were still participating in the HQP Scholarship Program. Data from these individuals were removed from the analyses since the intent of this metric is to focus on graduates of the program. Therefore, data from 39 respondents, in total, were utilized in the analysis. The extent of completion of the survey varied among respondents. In addition, survey response rates and results may have been impacted slightly by the COVID-19 pandemic.

Table 3.19 provides the breakdown of respondents by College and Degree Program. 74% of respondents participated in the HQP Program as Masters students and 26% participated as Doctoral students. 56% of respondents were from the Ontario Agricultural College.

Table 3.19: Number of Respondents in by College and Degree Program

College	Masters Respondents	Doctoral Respondents	Total Respondents
College of Biological Science	4	0	4
College of Engineering and Physical Sciences	2	2	4
College of Social and Applied Human Sciences	1	0	1
Ontario Agricultural College	15	4	19
Ontario Veterinary College	3	3	7
Total	**25**	**9**	**34**

Table 3.20 provides the employment status of the respondents and the sector in which they are currently participating. 76% of respondents are currently employed, 11% are seeking employment and 14% are pursuing further education. Of the 37 respondents to this portion of the survey, 28 are involved with the agri-food or rural sectors, which equates to 76%.

Table 3.20: Employment Status and Sector of Respondents

Employment Status	Agri-Food or Rural Sectors	Other Sectors	Total
Enrolled in Further Education	5	0	5
Employed	21	7	28
Seeking Employment	2	2	4
Total	**28**	**9**	**37**
Percentage of Total	**76%**	**24%**	
		2019/20 Value	**76%**
		Target	**75%, ↑**
		2018/19 Value	**N/A**

The target for this metric was to be established once the baseline data became available from the first survey. After analyzing the data, the target was set at 75%. This is very close to the 2019/20 value of 76% and sets a goal of having at least three quarters of all HQP Scholarship Program graduates employed or seeking employment in the agri-food or rural sectors post-graduation.

The 21 respondents employed in the agri-food or rural sectors work in a variety of aspects. Table 3.21 illustrates which aspect of the agri-food or rural sectors the respondents are currently employed in.

Table 3.21: Aspect of the Agri-Food or Rural Sectors that Respondents are Employed In

Sector	Total
Research or Teaching	6
Government - Federal, Provincial or Municipal	2
Private Sector – Agricultural Production	3
Private Sector – Agricultural Inputs or Equipment	2
Private Sector - Agri-Food Processing, Distribution, or Retailing	2
Private Sector - Agri-Food Advisory Services	2
Private Sector - Agricultural, Food, or Rural Organizations	1
Private Sector – Agri-Food Communications and Marketing	1
Private Sector – Agri-Food Consulting	1
Private Sector – Veterinary Medicine/Science	1
Total	**21**

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. 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 2019/20, OMAFRA's $6.630M of research operating funding leveraged $6.151M of third-party contributions. Table 3.22 below illustrates the amount of cash and in-kind leverage, as well as the ratio, by Program and Ministry Priority. A target ratio of 1:1 has been set. The University was just short of the target in Tier I Research Projects with a ratio of 0.99:1, as well as missing the target overall with a ratio of 0.93:1. Compared to 2018/19 where a ratio of 1.00:1 was achieved, there was an increase in cash leverage of $688K, but a decrease of in-kind leverage of $855K. The most significant drops were experienced in the Bioeconomy and Products and Value Chains themes.

Table 3.22: 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	-	43,120	43,120	$574,231	0.08:1
Bioeconomy	123,130	426,500	549,630	$775,738	0.71:1
Emergency Management	29,250	150,450	179,700	$240,300	0.75:1
Environmental Sustainability	654,977	190,100	845,077	$1,498,132	0.56:1
Products and Value Chains	40,000	38,000	78,000	$318,204	0.25:1
Production Systems - Animals	1,777,154	530,871	2,308,025	$889,986	2.59:1
Production Systems - Plants	1,439,337	290,792	1,730,129	$1,491,360	1.16:1
Tier I Research	**$4,063,848**	**$1,669,833**	**$5,733,681**	**$5,787,950**	**0.99:1**
KTT	73,000	97,370	170,370	$402,417	0.42:1
Gryphon's LAAIR	89,190	157,750	246,940	$440,000	0.56:1
Total–In Scope Programs	**$4,226,038**	**$1,924,953**	**$6,150,991**	**$6,630,367**	**0.93:1**
Special initiatives	-	160,000	160,000	$1,271,864	0.13:1
Total–Out of Scope Programs	**-**	**160,000**	**160,000**	**$1,271,864**	**0.13:1**
				2019/20 Ratio	**0.93:1**
				Target	**1.00:1, ↓**
				2018/19 Ratio	**1.00:1, ↓**

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 2019/20, Agreement investments helped researchers attract another $53.1M in non-Agreement funding for research projects supportive of Ministry priorities. This leveraged value represents funding for 700 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 3.23 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 2019/20, the University exceeded the target by 47% with a ratio of 1.03:1. This is 2% lower than the 2018/19 value of 1.05:1.

Table 3.23: Value of Non-Agreement Investment in Research Supportive of Ministry Priorities by Type
(in thousands of dollars)

College	Academic	Government	Business / Industry / NGOs	Total Investment
College of Arts	-	-	-	-
College of Biological Sciences	85	5,562	1,320	6,967
College of Engineering and Physical Sciences	123	2,078	4,340	6,540
College of Social and Applied Human Sciences	73	1,048	694	1,815
Lang School of Business and Economics	-	17	204	221
Ontario Agricultural College	256	10,424	13,384	24,064
Ontario Veterinary College	274	2,671	2,139	5,083
University	-	8,326	48	8,374
Total Non-Agreement Investment in Research Supportive of Ministry Priorities	**810**	**30,125**	**22,129**	**53,064**
			Agreement Investment in Research	**51,599**
			2019/20 Leverage Ratio	**1.03:1**
			Target	**0.7:1, ↑**
			2018/19 Leverage Ratio	**1.05:1, ↓**

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 3.24 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 2019/20, the University exceeded the target with 22.3 Co-Funders per $1M. This is a 16% increase over the 2018/19 value of 19.2 Co-Funders per $1M. It is notable that most of the financial partners are in the Business / Industry / NGOs type, which clearly indicates that the University is addressing the economic prosperity and needs of the agri-food sector.

Table 3.24: 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			3	**3**	$574,231	5.2
Bioeconomy	4	5	12	**21**	$775,738	27.1
Emergency Management	2	1	1	**4**	$240,300	16.6
Environmental Sustainability	5	7	12	**24**	$1,498,132	16.0
Products and Value Chains			5	**5**	$318,204	15.7
Production Systems - Animals	1	5	21	**27**	$889,986	30.3
Production Systems - Plants	1	6	33	**40**	$1,491,360	26.8
Tier I Research	**13**	**24**	**87**	**124**	**$5,787,950**	**21.4**
KTT	3	3	10	16	$402,417	39.8
Gryphon's LAAIR	4		4	8	$440,000	18.2
Total–In Scope Programs	**20**	**27**	**101**	**148**	**$6,630,367**	**22.3**
Special Initiatives			2	2	$1,271,864	1.6
Total -Out of Scope Programs	**0**	**0**	**2**	**2**	**$1,271,864**	**1.6**
					2019/20 Ratio	**22.3**
					Target	**20.0, ↑**
					2018/19 Ratio	**19.2, ↑**

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 3.25 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 2019/20, the University exceeded the target by 11% with an outcome of 38.8 Collaborators per $1M invested for all in scope programs. This was a slight decrease from the 2018/19 value of 41.5 Collaborators per $1M invested, caused by a decline in the number of academic collaborators compared to the previous year.

Table 3.25: Number and Type of Research Collaborations by Program and Ministry Priority

Program and Ministry Priority	Academic	Govern-ment	Business / Industry / NGOs	Total	Agreement Investment	Collaborators per $1M invested
Agricultural and Rural Policy	4	14	6	**24**	$574,231	41.8
Bioeconomy	13	6	7	**26**	$775,738	33.5
Emergency Management	6	2	2	**10**	$240,300	41.6
Environmental Sustainability	30	21	3	**54**	$1,498,132	36.0
Products and Value Chains	9			**9**	$318,204	28.3
Production Systems - Animals	17	4	6	**27**	$889,986	30.3
Production Systems - Plants	23	26	7	**56**	$1,491,360	37.5
Tier I Research	**102**	**73**	**31**	**206**	**$5,787,950**	**35.6**
KTT	12	14	9	**35**	$402,417	52.2
Gryphon's LAAIR	9	3	6	**16**	$440,000	36.4
Total–In Scope Programs	**123**	**90**	**44**	**257**	**$6,630,367**	**38.8**
Special Initiatives	17	18	1	**36**	$1,271,864	28.3
Tier II/III Research	27	1	1	**29**	-	N/A
Total Out of Scope Programs	**44**	**19**	**2**	**65**	$1,271,864	**N/A**
					2019/20 Ratio	**38.8**
					Target	**35, ↑**
					2018/19 Ratio	**41.5, ↓**

3.3.8 Intellectual Property (IP)

The Research Innovation Office (RIO) supports the Agreement through its management of Intellectual Property (IP) generated from the commercialization of Agreement-funded program activities. The 2019/20 performance measure outcomes for the commercialization of Agreement-funded program activities are illustrated in the tables below.

Table 3.26 illustrates patent filings and allowances, including plant breeders' rights, related to Agreement-funded program activities, broken out by ministry priority. A target of 17 patents filed has been set, which was exceeded in 2019/20. The number of patents issued was 12, which is significantly higher that the target of 5. This included five issued plant breeders' rights certificates and four Canadian utility patents. This metric can be highly variable, as RIO does not have control over the schedule of evaluations/issuances by the Canadian Intellectual Property Office (CIPO) or the United States Patent and Trademark Office (USPTO), or other patent offices around the world.

Table 3.26: Patents Filed and Issued by Ministry Priority

Ministry Priority	Number of Patents Filed	Number of Patents Issued
Bioeconomy	3	2
Products and Value Chains	8	1
Production Systems - Animals	1	4
Production Systems - Plants	8	5
2019/20 Total	**20**	**12**
Target	**17, ↑**	**5, ↑**
2018/19 Total	**10, ↑**	**4, ↑**

Table 3.27 provides the number of OMAFRA-related licenses granted in 2019/20, broken out by Ministry Priority. 19 licenses granted was established as the target. The University exceeded the annual target with 20 licenses granted, 18 of which related to plant varieties, spanning seven different crop species.

Table 3.27: Licenses and Amending Agreements by Ministry Priority

Ministry Priority	Number of Licenses
Products and Value Chains	2
Production Systems - Plants	18
2019/20 Total	**20**
Target	**19, ↑**
2018/19 Total	**22, ↓**

Table 3.28 shows the total dollar value of revenue generated from licenses associated with OMAFRA-supported research. $1.56M was earned, which exceeds the target of $1.5M, though it is a slight decline from last year. Seed licences were down $140K, which is discussed further in Section 3.4.10. Overall, the largest-earning seed variety was Soybean OAC Strive (Secan), while the largest earning technology was Immunity+ High Immune Response technology (Semex).

Table 3.28: Value of License Revenue Generated

Type	License Revenue Generated
Non-seed	$382,368
Seed	$1,180,520
2019/20 Total	**$1,562,888**
Target	**$1,500,000, ↑**
2018/19 Total	**$1,675,704, ↓**

Table 3.29 identifies the number of new inventions reported to RIO in 2019/20 from Agreement-funded research. The inventions are broken out by ministry priority. There is no specific target because the numbers are highly variable from year-to-year, with the majority being new plant varieties.

Table 3.29: Intellectual Property Disclosures by Ministry Priority

Ministry Priority	Number of IP Disclosures
Bioeconomy	1
Products and Value Chains	4
Production Systems - Plants	149
2019/20 Total	**154**
2018/19 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. 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 3.30 provides the Number and Type of KTT Activities in 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 2019/20, 1,083 unique KTT Activities were reported on by faculty members. This is an 18% increase from the 920 KTT Activities reported in 2018/19.

Table 3.30: Number and Type of Knowledge Translation and Transfer Activities by Program and Ministry Priority

Program and Ministry Priority	Peer-Reviewed Publications	Posters, Presentations, Proceedings at Scientific Conferences	Presentations to Stakeholders[11]	Press Articles, Web Articles and Media Citations	Extension Activities[12]	Other[13]	Total
Agricultural and Rural Policy	12	13	26	17	28	4	100
Bioeconomy	21	2	21	2	16	1	63
Emergency Management	15	19	8	17	7	2	68
Environmental Sustainability	10	13	18	18	16	14	89
Food for Health	8	9	13	2	7	6	45
Products and Value Chains	12	7	21	12	12	7	71
Production Systems - Animals	36	49	69	12	18	18	202
Production Systems - Plants	31	16	82	32	70	10	241
Tier I Research	**145**	**128**	**258**	**112**	**174**	**62**	**879**
KTT Program	2	2	0	0	0	3	7
Gryphons LAAIR	1		2	3	0	1	7
Special Initiatives	0		0	0	0	0	0
Tier II/III Research	46	27	63	11	32	11	190
Total – All Programs	**194**	**157**	**323**	**126**	**206**	**77**	**1,083**
						2019/20 Total	**1,083**
						2018/19 Total	**920, ↑**

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

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

[13] 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 RIO had a productive year helping industry partners and University faculty engage in successful projects, despite several external challenges. For example, the Ontario Centres of Excellence (OCE) VIP program ran out of money in August 2018 and did not resume intake of new applications until August 2019. The NSERC CRD and Engage programs were merged in Summer 2019, leading to a lower success rate for CRD due to a surge in applications. The new NSERC Alliance program did not accept any requests greater than $150,000 until December 2019, and response times were slowed significantly due both to program changes and the onset of the COVID-19 pandemic. Despite these factors, nearly $6M in projects were awarded to UofG faculty.

Table 3.31 provides the number of clients helped, number of projects initiated, the number of deals made and the value of the closed projects. Table 3.32 provides the list of closed projects.

Table 3.31: Research Innovation Office – Liaison Activity Details

Activity	Results
Number of Clients Helped (New)	80
Number of Clients Helped (Total)	127
Number of Projects Initiated	37
Number of Closed Projects (Deals Made)	**25**
Value of Closed Projects	**$5,652,738**
2018/19 Number of Closed Projects (Deals Made)	**31, ↓**
2018/19 Value of Closed Projects	**$7,155,690, ↓**

Table 3.32: Project Listing for Closed Projects (Deals Made)

Lead Applicant	Project Title	College	Industry Partner	Program	Total
Max Jones	Methods for Conservation and Improvement of Cannabis Germplasm	OAC	Avicanna Inc	Industry Contract	$57,358
David Ma	To Develop Pet Products combining THC/CBD and other Bioactives such as Omega-3 or Omega-6 Fatty Acids	CBS	CanaQuest Medical Corp	Mitacs Accelerate	$55,000
Michael Steele	How does starch content in starter impact calf gastrointestinal health and development during weaning?	OAC	Cargill Animal Nutrition Canada	Mitacs Accelerate	$15,000
Andrew Gadsden	Computer Vision - Automated Waste Collection	CEPS	Eagle Vision Systems	NSERC Alliance	$67,500
Gregoy Bedecarrats	Metabolic triggers responsible for sexual maturation in layer chickens and their relation to rearing environment	OAC	Egg Farmers of Canada	NSERC CRD	$360,000
Praveen Saxena	An Integrated plant production system for hazelnut in Ontario	OAC	Ferrero Canada Ltd.	NSERC CRD	$334,000
Ibrahim Deiab	Optimizing physical properties of polyhydroxyalkanoate suited for injection molding	CEPS	Genecis	NSERC Alliance	$90,000
Richard Heck	EM technology for assessment of soil hydration and iron content	OAC	Geonics	NSERC Engage	$25,000
Art Schaafsma	Improved sampling and detection for proactive	OAC	Grain Farmers of Ontario	NSERC CRD	$451,500

Lead Applicant	Project Title	College	Industry Partner	Program	Total
	management of mycotoxins in grain				
Manish Raizada	Field testing and directed evolution of crop probiotic(s) that improve nitrogen use efficiency (NUE) of corn and wheat	OAC	ICL Innovation Ltd.	Industry Contract	$443,170
Maria Corradini	Food Integrity: The intersection of identity, quality and safety	OAC	IQfoodchain	Digital Agriculture FfT Fund	$200,000
Ali Dehghantanha	A Cyber Threat Hunting and Intelligence System for Smart Grid	CEPS	IS5 Communications	OCE VIP	$198,400
Marc Habash	Enhancing biocide efficacy against biofilms in metalworking fluids	OAC	KSL Lubricants	OCE VIP	$75,000
Bahram Gharabaghi	Spatial-Temporal Deep Learning for Rapid Time-Series Forecasting and Data Synthesis	CEPS	Lakes Software	NSERC Alliance	$675,000
Kate Shoveller	Camelina oil for canine and equine feed supplements	OAC	Linnaeus Plant Sciences Inc	NSERC Engage	$25,000
Ibrahim Deiab	Development of a Smart Paint Defects Detection System	CEPS	Magna International	NSERC CRD	$270,000
Michael Rogers	Emulsification of cannabinoids and terpenes in aqueous matrix	OAC	Motif Cannabis	NSERC Engage	$21,000
Alejandro Marangoni	Zein Structured Vegan Cheese	OAC	Motif Foodworks	Research Contract	$127,120
Lee-Anne Huber	Protein and Non-Protein Methionine Requirement for Gestating and Lactating Sows	OAC	Ontario Pork	NSERC CRD	$121,000
Larry Goodridge	Stopping Enteric Illnesses Early (Sentinel)	OAC	Public Health Agency of Canada	Genome Canada GAPP	$1,907,690

Lead Applicant	Project Title	College	Industry Partner	Program	Total
Bonnie Mallard	Immunity+ Colostrum: Building a State-of-the-Art Colostrum Product for Better Calf Health	OVC	Research Innovation Office	OMAFRA - Gryphon's LAAIR Product Development	$107,000
Monica Cojocaru	Modelling for prevention of respiratory syncytial virus (RSV) spread at child care service organizations	CEPS	Sanofi	NSERC CRD	$90,000
John Cline	Intelligent Orchards: Redefining the Production and Management of Tree Fruits	OAC	Terranova-UAV	Weston Seeding Food Innovation	$110,000
Mary Ruth McDonald	Evaluating Nematode Pearls for fungus gnat control	OAC	The Environmental Factor Inc	Grant Agreement	$9,000
Cynthia Scott-Dupree	Improving Integrated Pest Management for Cannabis Production Systems in Ontario	OAC	Tilray	Mitacs Accelerate	$45,000
				Total	**$5,879,738**

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 – Technology Development; 4) Applied Research – Technology Assessment; 5) Applied Research – 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 3.33 below provides the Intended Benefit for the 2019/20 Research Projects.

Table 3.33: Intended Benefit by Program and Ministry Priority

Program and Ministry Priority	Discovery Research	Public Policy Research	Applied Research - Technology Development	Applied Research - Technology Assessment	Applied Research - Technology Demonstration	Applied Research - Not Technology	Adoption of New Technologies	Knowledge Translation and Transfer	Total
Agricultural and Rural Policy		6							**6**
Bioeconomy			4	1	1				**6**
Emergency Management	1		1			2			**4**
Environmental Sustainability	2		2			3			**7**
Products and Value Chains	1					1			**2**
Production Systems - Animals	1			1	1	8			**11**
Production Systems - Plants	1		4	1		5	1		**12**
Tier I Research	**6**	**6**	**11**	**3**	**2**	**19**	**1**	**0**	**48**
KTT Program		1				1		8	**10**
Gryphons LAAIR				5	4	1			**10**
Special Initiatives		5	1	1		2		1	**10**
Total – All Programs	**6**	**12**	**12**	**9**	**6**	**23**	**1**	**9**	**78**

3.4.4 Impact Case Study

The Impact Case Study is a qualitative assessment and accompanying narrative that 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 involves assessment across multiple elements and requires 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. Five 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 categories are: advancing knowledge; capacity building; informing decision-making; sector benefits; and broad socio-economic benefits.

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.

The first case study on Dairy has been submitted, alongside this Consolidated Annual Report. The second case study on Breeding will be submitted in December 2020. The third case study, topic to be finalized, will be submitted in May 2021.

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.

Table 3.34 contains a comparative summary of KTT activities noted in the 2019/20 Business Plan, relative to the activities that took place in 2019/20. Further detail on Agri-Food and Rural Link and KTT activities noted below is contained in Section 3.1.9 of this report.

Table 3.34: Comparative Summary of KTT Activities Noted in the 2019/20 Business and Actual Activities

Business Plan Commitment	Status
Administer second KTT Funding Call (KTT Research and KTT Mobilization streams)	Complete
Promote KTT funding using a combination of online and in-person advertisements and information sessions	Complete
Review success of one-stage application process, with goal of continuous improvement	Complete. Adjustments to review process included addition of an external, expert review for KTT research applications and the incorporation of a Research Program Director into the review process in 2019/20.
Administer KTT Initiative Grants	Complete. Six projects were approved in 2019/20 business year.
Support delivery of select discovery and dialogue days	In 2019/20, the updated approach to priority setting and the one-stage funding call necessitated a modification to the Discovery and Dialogue Day format. Office of Research KTT staff supported the promotion and delivery of combined Town Hall Information Session/Discovery and Dialogue Day events. The Research and Innovation Branch's IKM unit played a leadership role in delivering the Discovery and Dialogue portion of the event to communicate changes to the priority-setting process undertaken by the Ministry.
Partner with Food from Thought to deliver two KTT-focused workshops for UofG researchers and graduate students	Complete. In addition to Section 3.1.9, please see the case study *Growing KTT in Ontario* in Appendix C.1 for a description of the eight-part Skills for Research Impact series delivered in collaboration with Food from Thought and the Community Engaged Scholarship Institute, with financial support from the Future Skills Centre through Research Impact Canada.
Review efficacy of KTT questions included in Letter of Intent and Full Proposal stages	Complete. A full review of KTT questions was undertaken as part of the launch of Next Gen RMS. The Research Program administered a one-stage funding cycle in 2019/20 and the application included updated KTT questions.
Deliver two knowledge exchange events that promote KTT methods and increase awareness of ongoing projects	Complete. The Office of Research delivered two knowledge exchange events supportive of Alliance priorities: 2019 Dairy Research and Innovation Day and the open house at the Ontario Beef Research Centre. The KTT-focused knowledge exchange event, to be delivered in collaboration with

Business Plan Commitment	Status
	OMAFRA, was delayed until 2020/21 due to COVID-19 disruptions.
Profile Alliance programs and outputs on Alliance website and social media	Complete. See full social media and communications report in Section 3.1.9.
Explore project to partner with the UofG Library's Atrium to create an OMAFRA-UofG project database complementary to OMAFRA's project summary database	Ongoing. Conversations with the University of Guelph Library are complete, and the Library is supportive of leveraging the Agri-Environmental Data Repository to enhance public access to Alliance project details. Next step involves a proposed project report to be discussed with OMAFRA to ensure the appropriateness of the project before moving forward.
Deliver a new edition of Research Magazine focused on the Ontario Agri-Food Innovation Alliance	Complete. Magazine was released in Fall 2019. It was distributed via Ontario Farmer and promoted at Canada's Outdoor Farm Show. The Alliance edition of the Research Magazine is also available online.

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 academia. Three case studies are included in Appendix C to illustrate the impact of effective knowledge mobilization / innovation / commercialization activities delivered by AFRL and RIO. Taken together, these case studies profile the breadth of activity 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.

1. **Appendix C.1 – Growing KTT in Ontario:** KTT research and training are key to the Alliance's commitment to enhance research impact. This case study profiles tools and training opportunities designed and deployed over 2019/20 to enhance KTT competencies, skills and capacity among University of Guelph researchers with the goal of enhancing the positive impact of Alliance-funded research on Ontario's agri-food and rural sectors. This 'train the researcher' model allows the Office of Research to support individual project teams to deliver impactful research.
2. **Appendix C.2 - Research Station Outreach:** Ontario's Agri-Food Research Stations represent a world-class research platform where scientific innovations are brought to the farm. The Research Station Outreach Coordinator works to enhance the impact of the research that takes place at these stations, all while demonstrating that the sites themselves are key spaces for engagement and networking with agri-food partners from across Ontario and around the world. This case study profiles key activities of the Outreach Coordinator in 2019/20, the first full year of the position.
3. **Appendix C.3 - From Start-Up to Scale-Up:** The Gryphon's LAAIR funding program provides gap funding so that researchers can turn their inventions into innovations that have economic impact. This case study demonstrates how Alliance funding and RIO programming supported the research of Dr. George Van de Merwe and Escarpment Labs, resulting in economic growth for the City of Guelph, new jobs, and unique Ontario beers.

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

Tier II and Tier III Projects have operating funding from non-Agreement programs, for research that supports Ministry Priorities. These projects receive support from the Agreement through subsidized Research Station Access Fees. Table 3.35 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 2019/20, the total third-party leverage funding for Tier II and III projects was $2.79M. This was a significant drop from the $7.62M recorded in 2018/19. While the numbers of projects and co-funders were similar in both years, 2018/19 was dominated by six significant projects, including three projects with leverage in the $500K to $1M range and three projects with leverage of over $1.1M.

Table 3.35: Third-Party Operating Funding Directed at Tier II and III Research Projects

Description	Academic	Government	Business / Industry / NGOs	Total
Operating Funding	$195,825	$402,146	$2,188,309	**$2,786,280**
Number of Co-Funders	8	7	24	**39**
			2018/19 Total Funding	**$7,623,824, ↓**
			2018/19 Number of Co-Funders	**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 2019/20, scholarships were awarded to 11 new Masters and 9 new Doctoral students. In addition, there were 16 continuing Masters students and 14 continuing Doctoral students, for a total complement of 50 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 2019/20, the USEL program supported eight students who completed their projects during Summer 2019.

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

Agri-Food Data Canada (ADC) is envisioned to be an efficient and flexible IT platform capable of complex data integration and analysis. ADC will bring agri-food data together with advanced analytics to create new opportunities for innovative collaborations within the University, and between the University and its strategic partners.

As detailed in the 2018/19 Annual Report, the development of ADC will require an iterative, phased approach that relies on 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.

In 2019/20, Dr. Karen Hand continued to act as Director of Research Data Strategy, Agri-Food Data Canada (ADC) at the University of Guelph. Dr. Hand focused on developing the first case study to support ADC: a detailed needs assessment and user analysis of the Ontario Dairy Research Centre in Elora.

The Ontario Dairy Research Centre was identified as a use case to validate and test the proposed ADC strategy as the Dairy Centre provides a rich environment for scientific experiments and data collection. As a use case, the Dairy Centre has the potential to provide insight regarding a cohesive data strategy for all world-class research stations managed by the University of Guelph through the Ontario Agri-Food Innovation Alliance.

Effort in 2019/20 was focused on completing a full data analysis and user needs assessment for ADC and the first use case (Dairy Centre). The user needs assessment involved consultations with more than 25 individuals from across the agri-food sector, including representatives from the University of Guelph's agri-food research community, OMAFRA, and relevant industry partners (e.g., Lactanet, CG Wellington, Woodrill Farms). Interview responses were used to develop a detailed gap analysis and operational architecture to inform the desired end state or 'ideal state' for the first use case, and to identify and prioritize future use cases.

Dr. Hand also completed an environmental scan of agri-food data initiatives at the University and within the wider agri-food sector to ensure early integration with key data initiatives. The design of ADC will also be integrated with broader University- wide initiatives, such as the Animal Biosciences Animal Database; the Centre for Biodiversity Genomics BOLD System; and the Office of the Chief Information Officer institution-wide data strategy for academic and administrative data.

The existing agri-food data landscape and findings from the user needs assessment informed conversations with representatives from Gartner, a research and advisory company with expertise in information technology, strategy and research and development. Based on conversations with Gartner, the University developed a request for proposal to engage expertise in data architecture, business requirements, data security and governance to advance the

Design Phase of ADC. The COVID-19 pandemic delayed the deployment of this RFP, but the University remains committed to identifying an appropriate solution to continue to advance the Design Phase.

ADC will allow for the seamless sharing of data and information between stakeholders in a complex data environment by addressing issues of data standards, data interoperability, data governance and data security. In doing this, ADC will amplify the value of the University's existing data and information assets, including the work of Dr. Rozita Dara to enhance data capture and off-site data access for researchers conducting projects at the Ontario Dairy Research Centre (see Section 3.1.10.2 for details on this initiative).

3.4.10 Administration of the Germplasm Bank

The total revenue for the Germplasm Bank was $1.18M for 2019/20, a decline of approximately $140K compared to last year. A portion of the decline can be attributed to delays in depositing $75K that would have normally been received in 2019/20. This will be recorded in 2020/21. Table 3.36 provides additional details by crop.

Dry bean revenues continue to grow, up 24% compared to 2018/19, largely on the strength of red kidney variety Dynasty. In 2019/20, a call to license new varieties was successful, with RIO completing licenses with several different companies.

Licensed cereal varieties are approaching the end of their lifespan, so royalties are declining. That said, the cereal pipeline is being refilled, and new varieties are expected to start being released in 2020/21.

For soybean, overall royalties are down slightly, due largely to a decline in sales in Ukraine. Locally, OAC Strive was the top performer, and is gaining a reputation in Canada as a variety that provides dependable yields even with erratic weather conditions.

UofG hemp varieties continue to make sales in Canada, but royalties from Canada are expected to decline. Noteworthy is that RIO completed a license amendment that will enable these varieties to be sold in the USA going forward. The USA is an emerging market for hemp and RIO is hopeful that UofG varieties will find success there.

Finally, the University has seen a continued interest from licensees to seek Plant Breeders' Rights (PBR) protection for new varieties. In 2019/20, eight new PBR applications were filed and five were granted.

Table 3.36: Germplasm Revenue by Crop

Crop	Revenue
Field Crops	
Beans - white and coloured	$170,372
Canola	$845
Cereals - Guelph	$21,306
Cereals - Ridgetown	$35,279
Forages	$4,429
Maize inbreds	-
Soybean - Guelph	$502,849
Soybean - Ridgetown	$239,523
Subtotal – Field Crops	**$974,605**
Horticultural Crops	
Apple rootstocks	$8,585
Asparagus	$125,534
Hemp	$10,262
Mint	-
Strawberries	$838
Tomatoes	$50,281
Tree fruits	$10,416
Subtotal – Horticultural Crops	**$205,915**
Total Revenue 2019/20	**$1,180,520**
Total Revenue 2018/19	**$1,320,716, ↓**

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 2019/20

The VCP is a well-established, stable program, which 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. The VCP funding enables hands-on, experiential learning in an innovative, clinical environment at the Ontario Veterinary College (OVC) Health Sciences Centre and supports 11 faculty FTEs, a subset of the 54 OVC faculty that engage in areas of interest to OMAFRA.

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 at the intersection of animal and human health as part of the University of Guelph's One Health agenda;
- Opportunities to develop practical competency through experiential learning and field experience; and
- 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.

This year, once again, OVC is 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 2020 ranked OVC fifth worldwide (up from seventh place last year), as well as first in Canada and third in North America. OVC has consistently placed in the top ten 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/2020/veterinary-science).

COVID-19

Following the announcement of the COVID-19 pandemic, the University was able to shift to online learning during the Winter 2020 semester. Veterinary students were able to complete their studies, including those in priority species, in the alternative format. Any outstanding learning outcomes in clinical skills were safely met through appropriate remote activities.

For the purposes of this report, it is noted that COVID-19 delayed the spring NAVLE examination period and thus, the results are reported for the fall examination period only.

It is likely that the majority of the COVID-19 influences will be felt in 2020/21 and possibly beyond. At present, however, all activities, including the external Phase 4 rotations, are expected to proceed with modifications. The external Phase 4 rotations have been delayed from May 2020 to August 2020 and are being offered in a shortened format.

Throughout the last few months, VCP PMC Co-Chairs have kept the communication channel open to ensure that any issues, as they arise, could be addressed quickly.

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 2020 meeting, the COE reviewed OVC's 2019 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, OVC has filled the following positions during 2019/20, although all four faculty members are starting their appointments in 2020/21:

- Canada Research Chair (Tier 2) in One Health – Dr. Heather Murphy
- Ruminant Health Management – Dr. David Renaud (previously working in a temporary position, successfully recruited into tenure track position)
- Animal Disease Genomics and Bioinformatics – Dr. Derek Toms
- Large Animal Medicine – Dr. Diego Gomez-Nieto

OVC continues to formalize its leadership in the area of One Health, with the goal of becoming an internationally recognized champion for the veterinary science link in One Health research. This was complemented by the hiring of Dr. Heather Murphy as a Canada Research Chair (Tier 2) in One Health.

In 2019, OVC received its single largest gift, a $11M donation, from long time benefactors Kim and Stu Lang, which President Vaccarino noted will "…*revolutionize animal care and education to shape the future of veterinary care*". The gift will improve the lives of animals through more accessible care, address social inequities and share knowledge using an interdisciplinary One Health approach.

4.2.3 Resources to Administer VCP

OVC confirms that the necessary resources, including faculty and support staff, are available to administer the program. Ilya Bogorad, Executive Director, Strategy and Planning, Ontario Veterinary College, was appointed as the VCP PMC Co-Chair in Fall 2019 and now supports the governance structure at the VCP PMC. Kerry Lissemore, after years of excellent service as a VCP PMC Co-Chair, has returned to fulfilling an academic position as an Associate Professor in OVC.

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 can 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. In 2019/20, the passing percentage was 89% for the fall examination period. OVC's NAVLE pass rate of 93% was 4% higher than the North American cohort.

It is important to note that NAVLE results clearly demonstrate the very tangible value of the VCP: graduates of OVC consistently outperform graduates of other veterinary schools on questions related to OMAFRA's Priority Species.

Table 4.1: NAVLE Results

Graduation Year	OVC Student Exam Score[14]	North American Cohort Exam Score	% Pass Rate for OVC	% Pass Rate for North American Cohort
2020	511	501	93%	89%
2019	525	507	99%	94%
2018	515	509	97%	95%

[14] 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 2019/20. 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

Project Title	Ministry Priority	Student Type	Entry Semester	Status
Detection and surveillance of significant pathogens in Ontario small poultry flocks	Animal Health	DVSc	S16	Graduated
N-acetyl cysteine as a potential treatment for equine persistent breeding-induced endometritis	Animal Health	DVSc	F16	Graduated
Crimean-Congo hemorrhagic fever DNA vaccine trial: pilot safety and toxicity study in cattle and sheep	Animal Health	DVSc	S17	
Effect of prevention of hypocalemia on health and performance in dairy cows	Animal Health	DVSc	F17	
Exercise-induced pulmonary hemorrhage in horses	Animal Health	DVSc	F16	
Investigating kid mortality in Ontario dairy goat farms	Animal Health	DVSc	F16	
Saccharomyces boulardii: a potential biotherapy for horses with acute enterocolitis	Animal Health	DVSc	F18	
Evaluating the impact, management practices and prevalence of coccidiosis caused by Eimeria species in Ontario sheep and goats	Animal Health	DVSc	F16	Graduated
Host factors and co-pathogens as determinants of disease outcomes in M. bovis pneumonia in beef cattle	Animal Health	DVSc	S16	Graduated
Characterisation and investigation of bronchopneumonia with interstitial pneumonia in beef feedlot cattle	Animal Health	DVSc	S19	
Investigation of astrovirus as an emerging cause of previously undiagnosed neurologic disease in Ontario cattle	Animal Health	DVSc	F19	
Electroencephalographic and behavioural evaluation of physical methods for on-farm euthanasia of poultry	Animal Welfare	DVSc	F17	
Bioavailability and efficacy of NSAIDs when compounded (mixed) with iron dextran on pain relief following castration in piglets	Animal Welfare	DVSc	F18	
A prudent approach to antibiotic treatment of high-risk calves	Public Health	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	Public Health	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 six months to one year after graduation, the Employer Survey, which surveys employers of new graduates six months to one year after graduation, and the Alumni Survey, collected five 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 2019 cohort (i.e., students who graduated in June 2019).

Twenty-nine (29) of the 115 graduates responded to some or all of the survey questions, representing a 25% response rate. Responses were received from 40 employers, representing a 35% 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. During 2019/20, OVC continued to implement initiatives to increase survey response rates for both graduates and employers. These initiatives include additional social media outreach, better collection of contact information of graduates, adapting the survey so that is more likely to be completed and developing better employer contact lists.

Due to the COVID-19 pandemic, the initial administration of the surveys was delayed to avoid overwhelming graduates and employers during a stressful time.

Table 4.3: Practice Type (*N* = 27)

Practice Type	Number of Respondents	Percentage of Respondents (%)
Clinical Practice – Equine	0	0%
Clinical Practice - Food Animal	2	7%
Clinical - Rural Community/Mixed	3	11%
Clinical – Small Animal	16	59%
Clinical – Other Private	1	4%
Non-Clinical – Graduate School	3	11%
Non-Clinical – Internship	2	7%
Total	**27**	

Table 4.4: Stream Area and Number of Respondents in Each Stream (*N* =29)

Stream	Number of Respondents	Percentage of Respondents (%)
Equine	2	7%
Food Animal	4	14%
Rural Community Practice	4	14%
Small Animal	19	66%
Total	**29**	

Readiness for Employment Upon Graduation

Graduates (*N* =26) and employers (*N* = 40) 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

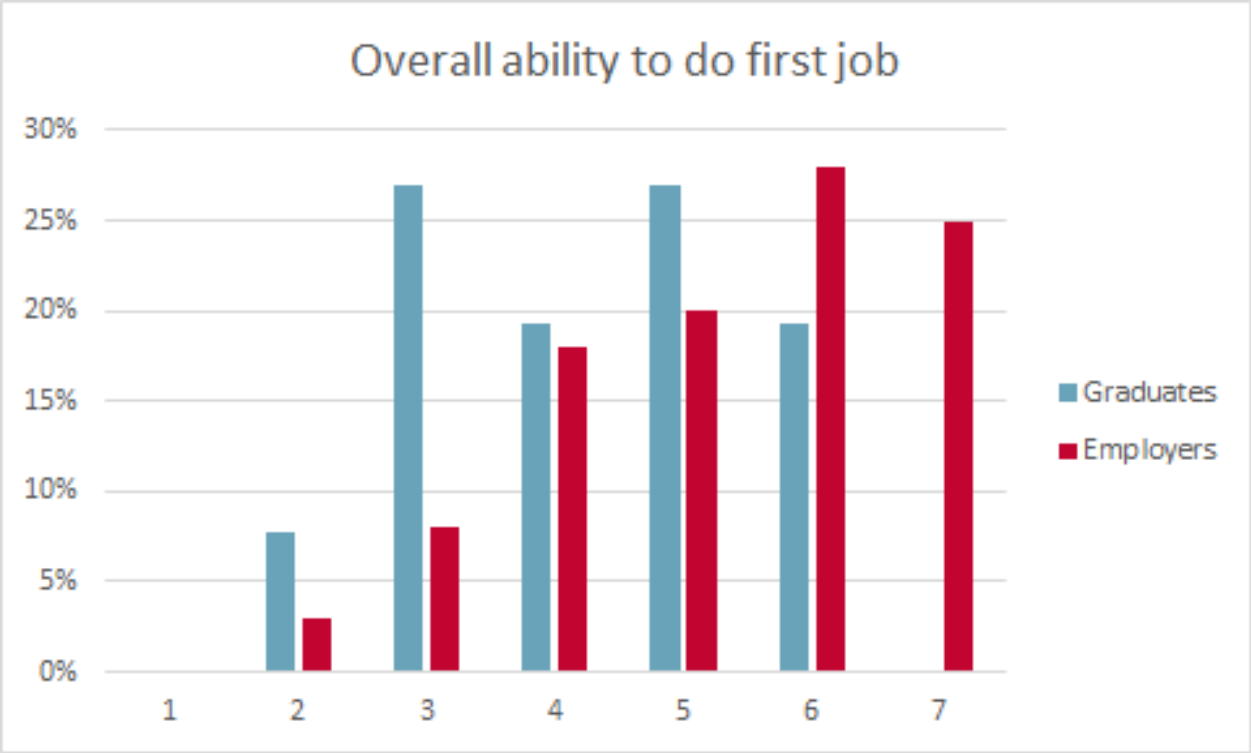


Figure 4.1: Preparation to Perform First Job According to Graduates (*N* = 26) and Employers (*N* =40)

Table 4.5: Location of Employment as a Percentage of Respondents (*N* = 102)[15]

Location	Number of Respondents	Percentage of Respondents (%)
Ontario – Central South	10	10%
Ontario – South West	10	10%
Ontario – Central West	21	21%
Ontario – Central East	8	8%
Ontario – East	15	15%
Ontario – North	3	3%
Ontario - Toronto	10	10%
Subtotal - Ontario	**77**	75%
Canada – Not Ontario	12	12%
Total - Canada	**89**	**87%**
United States	11	11%
Australia and New Zealand	2	2%
Total - Other Countries	**13**	13%
Grand Total	**102**	

Feedback Provided in Comments from Students

Strengths of the Program

Nineteen (19) students provided written feedback about the strengths of the DVM program at the Ontario Veterinary College. Several students listed more than one strength. 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

Ten (10) students commented that the hands-on experience practicing hands-on skills, especially basic 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.

Effective Instruction of Communication Skills

Three (3) students commented that they received helpful training in communications skills at OVC.

“The communication curriculum was very helpful, despite not enjoying it at the time. I have put into practice numerous strategies taught at OVC, with a good deal of success.”

[15] Responses are based on survey data, a search of the CVO “Find a Veterinarian” database, and Google, Facebook, and LinkedIn searches.

Other Strengths of the Program

Other strengths of the program listed by one to three students included the Equine rotations (1), the teaching of nutrition (1), the use of case-based learning (1), and the teaching of factual knowledge (3).

Feedback Provided in Comments from Employers

Strengths of the Program

Twenty-seven (27) employers described strengths of OVC's DVM program. Several employers listed more than one strength. Qualitative responses were coded and the most commonly occurring themes are listed below.

Effective Instruction of Client Communication Skills (13)

Thirteen (13) employers described the teaching of client communication skills as a strength of the OVC program. Several employers specifically described skills taught in the "Art of Veterinary Medicine" courses, including client communication and interpersonal skills.

"We feel our new graduates have been very well prepared for speaking with clients in a manner that allows for understanding of the patients condition and fostering trust in order for treatment plans to be followed."

"Client communication. This grad by far has outshone other grads that we have seen."

"The art of veterinary medicine training has really help better prepare OVC grads for real world practice."

Good Base of Veterinary Knowledge (8)

Eight (8) employers described a strong knowledge base as a core strength of the OVC program.

"The academic training is awesome !! Perhaps the best in the world !!"

"Background knowledge taught well. Clinical thought process from presentation through differential diagnoses and further tests taught well."

Results of Alumni Survey

Table 4.6 displays results from the Alumni Survey of the OVC 2015 cohort (i.e., students who graduated in June 2015).

Forty (40) of the 118 graduates responded to some or all of the survey questions, representing a 34% response rate.

Table 4.6: Type of Practice – First Position After Graduation (*N* = 40)

Practice Type	Number of Respondents	Percentage of Respondents (%)
Clinical Practice – Equine	2	5%
Clinical Practice - Food Animal	2	5%
Clinical - Rural Community/Mixed	5	12.5%
Clinical – Small Animal	26	65%
Clinical – Other Private	0	0%
Non-Clinical – Graduate School	2	5%
Non-Clinical – Internship	2	5%
Non-Clinical - Government	1	2.5%
Total	**40**	

Feedback Provided in Comments from Alumni

Fifteen (15) alumni provided recommendations to improve the DVM program at the Ontario Veterinary College. These suggestions largely echoed the comments from the Graduate Survey.

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 2020 are shown in Table 4.7. 31% of students are involved in the food animal, rural community practice and equine streams. This is a slight decline from 2018/19, where 32% of students were involved in those streams.

Table 4.7: Stream Counts for the Class of 2020

Stream	Number of Students	Percentage of Students
Food Animal	13	11%
Rural Community Practice	14	12%
Equine	10	8%
Small Animal	82	69%
Total	**119**	

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)[16]: 4-8

Total = 38

[16] Commencement of external rotations for DVM 2020 graduates have been delayed from May to August as a result of COVID-19 pandemic.

Rural Community Practice Stream:

Students in the **Rural 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 week)
- Theriogenology (1 week)
- Anesthesia (2 week)
- Radiology (2 week)
- Small-Animal Internal Medicine (2 weeks)
- Large-Animal Medicine (2 weeks)
- Ruminant Health Management I (2 weeks)
- Swine Health Management (1 weeks)
- Approved External Practices, Rural mixed species (4 external weeks)

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

Total = 38

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
Arroyo, Luis	Associate Professor, Clinical Studies	Large Animal Medicine
Barta, John	Professor, Pathobiology	Parasitology
Bauman, Cathy	Assistant Professor, Population Medicine	Epidemiology and Applied Clinical Research
Beeler-Marfisi, Janet	Assistant Professor, Pathobiology	Clinical Pathology
Bienzle, Dorothee	Professor, Pathobiology	Clinical Pathology
Boerlin, Patrick	Associate Professor, Pathobiology	Bacteriology
Bridle, Byram Wayne	Associate Professor, Pathobiology	Anatomic Pathology
Caswell, Jeffrey	Professor, Pathobiology	Anatomic Pathology
Chenier, Tracey Sue	Associate Professor, Population Medicine	Theriogenology
Clow, Katie	Assistant Professor, Population Medicine	One Health
Cote, Nathalie	Assistant Professor, Clinical Studies	Large Animal Surgery
Deckert, Anne	Veterinarian, Health Sciences Centre	Veterinarian. DOE does not apply.
Dewey, Cate	Professor, Population Medicine	Swine Health Management
Dubois, Marie-Soleil	Assistant Professor, Clinical Studies	Large Animal Surgery
Duffield, Todd	Professor, Population Medicine	Ruminant Health Management
Foster, Robert	Professor, Pathobiology	Anatomic Pathology
Friendship, Robert	Professor, Population Medicine	Swine Health Management
Gomez-Nieto, Diego	Assistant Professor, Clinical Studies	Large Animal Medicine
Gordon, Jessica L	Assistant Professor, Population Medicine	Ruminant Health Management
Guerin, Michele T.	Associate Professor, Population Medicine	Epidemiology
Haley, Derek	Associate Professor, Population Medicine	Animal Welfare
Hewson, Joanne	Associate Professor, Clinical Studies	Large Animal Medicine
Jardine, Claire	Associate Professor, Pathobiology	Comparative Pathology
Johnson, Ronald	Associate Professor, Biomedical Sciences	Pharmacology/Toxicology
Kelton, David	Professor, Population Medicine	Epidemiology
Kenney, Daniel	Veterinarian, Health Sciences Centre	Veterinarian
Koch, Thomas G.	Associate Professor, Biomedical Sciences	Cellular/Molecular Biology
Koenig, Judith	Associate Professor, Clinical Studies	Large Animal Surgery
LeBlanc, Stephen	Professor, Population Medicine	Ruminant Health Management
Lillie, Brandon	Associate Professor, Pathobiology	Anatomic Pathology

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

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

- 13 FTE in Large Animal Veterinary Technicians;
- 1 FTE in a Sterile Processing Technician;
- 1 FTE in a Pharmacy Technician;
- 8 FTE in Large Animal Agricultural Assistants; and
- 2.7 FTE in Administrative Support Staff who support the Large Animal Hospital.

These represent a total of 25.7 FTE, which is approximately 17% of all Health Science Centre Staff.

5 Animal Health Laboratory (AHL)

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

AHL is a long-standing program under the Agreement that continues to evolve, providing high-value analytical and diagnostic services and animal health expertise to local communities, industry, Canadian universities, and provincial and federal government bodies. Further to the transformation of the Veterinary Laboratory Services Branch of OMAFRA into the Animal Health Laboratory within the Laboratory Services Division (LSD), Office of Research, AHL continues to serve Ontario as the provincial veterinary reference laboratory and to act as a central source for provincial animal disease trend information and timely dissemination of knowledge to veterinarians, producers and industry groups.

5.1 Program Activities and Achievements from 2019/20

The AHL diagnostic system provides valuable and timely information that enables Ontario to remain competitive in national and international trade. Through accessions from veterinarians, 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 at AHL in Guelph and Kemptville. Because of the laboratory infrastructure and expertise needed to detect disease hazards, AHL provides an efficient and effective early warning system for a wide variety of diseases.

- AHL sent 115 samples to the Canadian Food Inspection Agency (CFIA) for confirmatory testing in suspect cases of reportable disease (African Swine Fever (ASF), influenza, bovine tuberculosis, Classical Swine Fever, Newcastle Disease Virus, pseudorabies, rabies).
- AHL plays an important role in public health by identifying pathogens common to animals and people. Over 1,400 cases that identified zoonotic pathogens were diagnosed by AHL in 2019/20.
- AHL received approximately 50 medicolegal cases, including several from the Ontario Ministry of the Solicitor General under the new 2019 Provincial Animal Welfare Services (PAWS) Act, as part of investigations into animal neglect and abuse. AHL also performed 47 equine postmortems submitted by the Alcohol and Gaming Commission of Ontario (formerly the Ontario Racing Commission). Through testing at AHL, AGCO can assure Ontarians participating in the horse racing industry that it is closely scrutinized, and that animal welfare is a priority.

AHL monitors trends in existing diseases and sends electronic real-time alerts to OMAFRA, enabling the Ministry 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.

The Animal Health Laboratory has focused on several important program activities during 2019/20. These included: upgrading the Laboratory Information Management System (LIMS) (September 2019), preparing for and responding to outcomes of three major external quality system audits (May to November 2019); and expanding Ontario Animal Health Network (OAHN) surveillance projects. A significant change was the retirement of long-serving AHL Director Dr. Grant Maxie and the recruitment of his successor, Dr. Maria Spinato (September 2019).

The successful upgrade of the LIMS to LabVantage Version 8.3.4 has improved the utility and responsiveness of the system to users, both internal and external, and will enable AHL to improve mobile functionality, a desirable business outcome identified by clients polled at the annual AHL Client Feedback Group meeting.

In May 2019, AHL underwent a four-day peer review audit conducted by four technical experts from the American Association of Veterinary Laboratory Diagnosticians (AAVLD). It was a successful audit and AHL met the AAVLD standard to maintain “Full Accreditation/All Species” for five years, which is the maximum accreditation awarded. In October and November 2019, AHL underwent its biennial Standards Council of Canada (SCC) and Canadian Association for Laboratory Accreditation Inc. (CALA) audits. Every two years, AHL is audited by SCC and CALA in order to maintain its accreditation to the International OIE Standard ISO/IEC 17025:2017 “General requirements for the competence of testing and calibration laboratories”, as shown on the scopes of accreditation (refer to the AHL website for more information). The strength of AHL’s mature quality system and knowledgeable staff was evidenced during all these external audits by the many commendations from the AAVLD, CALA, and SCC audit teams. Although it is a significant investment for AHL to maintain its accreditations, these external audits ensure the highest degree of technical competence and continuous improvement of client service.

A successful OAHN Annual Workshop was held on November 28, 2019. Members of the species-specific expert networks participating in this workshop generated many surveillance proposals that were subsequently submitted and funded under the OAHN Projects program. A total of 14 projects were approved, valued at $245K, for the 2019/20 fiscal year. More details about the OAHN Projects program are in Section 5.4.5.

AHL specialists continue to advance their expertise in novel technologies in order to ensure that AHL remains at the forefront of animal disease testing. The next generation of Whole Genome Sequencing (WGS) utilizing the Illumina MiSeq is one of these revolutionary technologies, and all three AHL microbiologists (Ojkic, Slavic, Cai) have projects underway that provide training opportunities for technical staff and interactions with international colleagues that should position AHL to translate this platform, as it matures, into the diagnostic testing program. These projects include: i) identification of new antimicrobial resistance mechanisms through WGS of AHL clinical strains of *Mycoplasma bovis* isolates; ii) identification of *Anaplasma* spp. infection by WGS; iii) routine WGS of *E. coli*, *Staphylococcus pseudintermedius* and *Salmonella* spp.

isolates for the Veterinary Laboratory Investigation and Response Network (Vet-LIRN); iv) WGS of *Erysipelothrix rhusiopathiae* isolates for an OAHN project where seven novel MLST types and antimicrobial resistance genes for this pathogen were detected; v) MLST typing of *Salmonella* spp. isolates for a major AHL poultry industry client. These activities will position AHL at the leading edge of revolutionary diagnostic test platforms in the future.

In the AHL Virology laboratory, two Roche FLOW lines have been installed to fully automate PCR and create workflow standardization. A driver has been developed to link and upload data generated by the FLOW software into the upgraded LIMS. The functionality has been tested on various methods and sample types, and the process has been validated and approved. Analytical performance of the system has been found to meet or exceed the intended purposes.

Client feedback has identified areas for continuous improvement, in relation to the LIMS functionality and tools, such as smartphone accessibility and formatting reports. Large volume clients, such as the amalgamated swine veterinary clinics, have requested a greater ability to access their clients' data, as data mining and trending have become important tools for this population-based livestock sector. Therefore, optimization of LIMS mobile functionality, a large-scale LIMS data management project (funded by Food from Thought Digital Agriculture grant) and a smartphone application are both development projects that will be priorities for AHL in 2020/21.

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

COVID-19

Due to the COVID-19 pandemic, case submissions were reduced in March (down 10.7%) and April (down 32.3%) compared to the same months in 2018/19. There was a reduction of laboratory staffing (by alternating and splitting shifts), mandated by physical distancing, which required prioritization of essential tests, batching and elimination of other testing, and closure of the Specimen Reception on Sundays. Supervisors worked hard to manage human resource issues, alter scheduling and implement enhanced safety procedures.

AHL had an estimated revenue loss of $150K for the last six weeks of 2019/20, $105K external and $45K internal. Due to strong testing activity pre-COVID, AHL still achieved its mandatory revenue growth target. However, AHL was unable to meet the target of 95% of routine AHL tests meeting the published service level standards. Laboratory staffing changes led to reductions in the turnaround times (TAT). In addition, emergency exercises, scheduled for March/April 2020 were postponed, with approval from the AHL PMC.

It is expected that submissions will continue to be variably decreased due to unanticipated effects of COVID-19 on clients' businesses in 2020/21. This makes it unlikely that AHL will

achieve the mandatory compliance requirement of 3.0% revenue growth next year due to the significant negative impact of COVID-19 on economic activities, including agriculture, and the anticipated recession. Other metrics, including turnaround time and emergency exercises, should be achievable provided business operations continue to open and staffing returns to normal levels. However, there is always an ongoing risk of a staff member testing positive for the virus, leading to the isolation of a group of staff members and impacting laboratory operations.

Provide Animal Health Expertise

AHL veterinarians/supervisors participated in a host of regional, provincial, and national veterinary organizations to provide animal health expertise. In addition, AHL veterinarians/supervisors also produce a significant number of KTT publications, outlined in Section 5.4.7.

This expertise and knowledgebase are used to alert OMAFRA about any potential health threats. Any occurrence of one of the 81 immediately notifiable diseases named in the provincial Animal Health Act, 2009, is reported to the Office of the Chief Veterinarian for Ontario (OCVO) electronically at 0900 and 1500 hours daily. Table 5.1 below illustrates the notifiable and alertable tests for 2019/20. New and emerging hazards are tabulated annually in an Impact Table, as provided in Table 5.2, and are reported in the quarterly AHL Newsletter. Disease trends are also discussed in detail in each of the OAHN expert network quarterly calls.

Table 5.1: Immediately Notifiable Hazards – May 1, 2019 - April 30, 2020

Reportable Disease Tests	**Number**
African swine fever – PCR	9
African swine fever – CFIA	9
Avian influenza – CFIA	17
Avian paramyxovirus-1, fusion rt-RT-PCR	8
Bovine tuberculosis – CFIA	3
Brucellosis – CFIA	1
Classical swine fever – CFIA	9
Classical swine fever virus - real-time RT-PCR	9
Foot and mouth disease virus 3ABC antibody ELISA	1
Influenza – CFIA	2
Influenza A, H5 PCR	10
Influenza A, H7 PCR	10
Koi herpesvirus real-time qPCR	1
Newcastle disease – CFIA	3
Pseudorabies – CFIA	1
Small Hive Beetle PCR	11
Notifiable Tests Completed	**Number**
African swine fever – PCR	9

Reportable Disease Tests	Number
African swine fever – CFIA	9
Avian influenza – CFIA	16
Avian paramyxovirus-1, fusion rt-RT-PCR	8
Bovine tuberculosis – CFIA	3
Classical swine fever – CFIA	9
Classical swine fever virus - real-time RT-PCR	9
Foot and mouth disease virus 3ABC antibody ELISA	1
Influenza – CFIA	2
Influenza A, H5 PCR	10
Influenza A, H7 PCR	10
Koi herpesvirus real-time qPCR	2
Newcastle disease – CFIA	3
Pseudorabies – CFIA	1
Rabies, CFIA – FA	45
Small Hive Beetle PCR	11
Notifiable E-Code Cases	**Number**
Cache Valley Virus	1
Clostridium botulinum	2
Coxiella burnetii	14
Listeria monocytogenes	30
Avian herpesvirus type 1 (AHV-1)/ ILT	5
Notifiable Alerts	**Number**
APMV-1m rt-RT-PCR	6
Botulism MIT (Serum)	1
Bovine *Anaplasma* PCR	1
Brucella canis RSAT	15
Coxiella burnetii ELISA	5
Coxiella burnetii PCR v2	47
Chlamydia psittaci RT PCR	1
Culture Bact	308
EEEV IgM ELISA	5
EEEV rRt-PCR	2
EHV-1 A Non PCR	15
Echinococcus Taenia PCR	1
HSFP environmental culture	32
Heavy metals Scr ICP	4
IHC WNV	1
IHC *Listeria* food animals	7
ILV rt-RT-PCR	9
Notifiable Alerts	**Number**

Reportable Disease Tests	Number
Influenza A vir MultiS-sc	13
Influenza A H1 PCR	98
Influenza A H3 PCR	56
Influenza A N1 PCR	63
Influenza A N2 PCR	79
Influenza A matrix PCR	176
Listeria monocytogenes Isolation	9
Lead – blood	3
Porcine coronavirus PEDV	61
Porcine coronavirus PDCoV	15
Public health mycobacteria	1
Rabies FA	9
Ranavirus rt-RT-PCR	2
Salmonella enteritidis PCR	4
Salmonella Pullorum-Typhoid plate	6
Salmonella Pullorum-Typhoid tube	1
SVV rt-RT-PCR	85
Salmonella Dublin Ab ELISA	26
Salmonella serotyping	827
Salmonella Dublin ELISA	4
Small Hive Beetle PCR	11
Sucrose Wet Mount	4
VTEC PCR Geno	9
WNV IGM ELISA-IOWA	1
WNV rRT-PCR	23

Table 5.2: Impact Table - 2019/20

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.
2020, April	Ovine	*Copper toxicosis*	200 5mo ewe lambs shipped from western Canada to ON; 25 dead over 3 day period	**20-030080:** Outbreak of Cu toxicosis in lambs imported from Manitoba
2020, March - April	Avian, small flock chicken	*Infectious Laryngotracheitis virus (ILT)*	Small flock of 20 birds, 5 sick/dead. Respiratory signs (20-021171). Small flock of 15 birds, 4 dead. Owner brought in 5 new birds about two weeks ago - 15 birds in total. Seven days later a few chickens developed respiratory signs (20-028992). Small flock (unknown number of birds). Birds are gasping, closing eyes, blood in trachea (20-031345).	**20-021171 (PCR), 20-028992 (PCR + histo), 20-031345 (PCR + histo):** ILT diagnoses in small farm flocks trigger an OMAFRA alert and a Feather Board Command Centre **ILT Biosecurity Advisory** which initiates enhanced biosecurity on commercial poultry premises to prevent spread of this common pathogen. One ILTV isolate was sequenced and determined to be indistinguishable from vaccine strain (20-031345).
2020, March	Rainbow Trout	*Bacterial Kidney Disease (Renibacterium salmoninarum)*	Pre-shipment screening of aquaculture rainbow trout (20-030796). 60,000 aquaculture hatchery: 0.02% mortality, increasing over last 2 months (20-024649).	**20-030796:** Novel disease in ON, confirmed by send-out PCR test; prevented translocation of disease into environmental water habitat. **20-024649:** Novel disease in ON, confirmed by send-out PCR test; AHL now developing in-house test to monitor**.**

Year identified; Outbreak	Species or Commodity	Disease, Hazard, or Pathogen	AHL Finding	Impact on Animal Health, Public Health, and/or Trade
2020, March	Bovine, Simmental	*Urea toxicosis*	Herd of 18 cattle; 3 sick and 2 dead following feed change and ivermectin treatment.	**20-017191:** Anthrax ruled out by rapid screen test; toxicologic analyses consistent with urea toxicosis (ocular fluid).
2020, March	Avian, Turaco	*Avian tuberculosis (Mycobacterium)*	Public aviary with possible exposure to this zoonotic pathogen.	**20-020093:** *M. avium* subsp. avium infection previously diagnosed by OVC clinician; confirmed by histopathology and special staining.
2020, February	Chicken, boiler	*Salt toxicosis*	High mortality event: 9,000 dead over 3 days in a flock of 24,000 broilers. Birds are flushing, wet litter, swollen kidneys.	**20-011414:** PCR tests for FAD (AI, NDV) performed on Sun. Feb. 9/20 due to high mortality; all tests, including IBV PCR negative **20-011430, 20-011443, 20-011535, 20-011430:** Postmortems, toxicology and PCR tests performed**;** PCR positive for CAV, IBDV, CAstV, Reovirus; high brain Na confirms salt toxicosis.
2020, February	Bovine, Holstein	*Mannheimia haemolytica type 2*	200 cow dairy herd, 3 sudden deaths in 24 hours.	**20-010432:** Primary *Mannheimia* fibrinous pneumonia causing sudden death in dairy herd; all tests for viruses negative.
2020, January	Fish, Hatchery Lake Trout	*Epizootic epitheliotropic disease*	Daily mortality: usually 2-4 daily. Increased when handled.	**20-003659:** Lake trout hatchery case with gill hyperplasia and suspect herpesviral inclusion bodies with extensive collaboration with CFIA-NCFAD, DFO-NAAHP, BC-AHC, and WCVM imaging centre – all investigative tests negative. Koi herpesvirus (CFIA reportable disease) ruled out.
2019, December	Porcine, domestic	*Viral encephalitis - Porcine sapelovirus, Porcine teschovirus*	Pigs between 4-6 weeks of age. Averaging 5 out of every 1,000 (per day) - showing neurological signs, unresponsive to antibiotics. Death occurring within 24 hours of first signs.	**19-095232:** First identification of porcine sapelovirus in Ontario; low pathogenic porcine teschovirus also isolated as contributing cause of neurologic signs.

Year identified; Outbreak	Species or Commodity	Disease, Hazard, or Pathogen	AHL Finding	Impact on Animal Health, Public Health, and/or Trade
2019, October	Bovine, Angus	*Lead toxicosis*	Beef herd under quarantine due to lead toxicosis; ongoing monitoring.	**19-081395:** 3 animals still have elevated blood lead levels.
2019, October	Chicken, layer	*Fowl cholera (Pasteurella multocida)*	Flock of 500 layer chickens, unvaccinated. Low rate of ongoing sudden deaths.	**19-078830:** Positive for Fowl Cholera (*Pasteurella multocida*).
2019, September	Parrot, Amazon	*Avian tuberculosis (Mycobacterium)*	Multiple birds in house. 2 died recently, no PM. Previous bird had Chlamydophila.	**19-071272:** Amazon parrot from a household with multiple other birds. *Mycobacterium* spp. positive (special stain). Potential zoonotic infection.
2019, August	Equine	*EEE virus*	Neurologic signs.	**19-068397:** EEEV & WNV testing requested by OMAFRA - EEEV positive PCR on brain.

Conduct Testing and Analysis

The Animal Health Laboratory accessioned 72,111 cases and performed 798,358 procedures in 2019/20 in support of disease surveillance. Compliance with published turnaround times from the AHL Laboratory Information Management Systems was 93.48%. Standards Council of Canada scope of accreditation was unchanged in 2019/20. Testing equipment in AHL's inventory was replaced in 2019/20 to improve efficiency and surge capacity of the lab. In addition, AHL developed or improved 34 tests in 2019/20.

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 in italics.

Case 1: Porcine sapelovirus encephalomyelitis in nursery pigs – Dr. Josepha DeLay and Dr. Rebecca Egan

G19-095232, G19-095940

Ataxia in incoming nursery pigs was identified in a 4,200-head herd. All affected pigs died within 24 hours of onset of clinical signs. Between 0.5% and 12% of pigs were affected at any one time, and clinical disease had been noted for two weeks prior to the submission for diagnostic investigation. Samples from a field postmortem were submitted to AHL for evaluation on December 4, 2019, and three live pigs were submitted to AHL for postmortem on December 5, 2019.

Central nervous system (CNS) samples from the field postmortem included brain only (spinal cord not included). Histopathology identified non-suppurative encephalitis, and results were released on December 5, 2019.

Comment from the pathologist to the referring veterinarian: "Lesions in brain are compatible with a viral etiology. Porcine enteroviruses (including porcine sapelovirus) and possibly porcine hemagglutinating encephalomyelitis virus (PHEV) are most likely, based on the anatomic distribution of lesions, with targeting of brainstem. Rabies is a differential diagnosis, although this seems less likely given the epidemiology of the disease situation in the herd. I have contacted OMAFRA regarding rabies testing. Testing for enteroviruses and porcine hemagglutinating encephalomyelitis virus (PHEV) will be done pending rabies test results."

Similar lesions of non-suppurative encephalomyelitis were present histologically in brain and spinal cord from the pigs submitted for postmortem at AHL (gross postmortem results released December 5, 2019; histopathology results released December 18, 2019). Appropriate fresh tissues for rabies testing were available and collected from brain of these pigs. Following

discussion with Dr. Maureen Anderson, OMAFRA - Animal Health and Welfare Veterinary Science Unit, the samples were submitted to CFIA for rabies fluorescent antibody (FA) testing. Rabies results were received through Dr. Anderson on December 10, 2019 and negative rabies status was confirmed; as a result, additional diagnostic testing could proceed.

Negative PHEV PCR results for samples from the two cases were released on December 11 and 12, 2019. External laboratory PCR test results for porcine sapelovirus, porcine teschovirus, and porcine astrovirus PCRs were received on December 18, 2019. Porcine sapelovirus nucleic acid was detected in brain from pigs in both cases, and porcine teschovirus nucleic acid was detected in brain from pigs from case 19-095232. Porcine astrovirus type 3 was not detected in either group. Porcine sapelovirus was considered the most clinically significant pathogen in this case.

Dr. Christa Arsenault, OMAFRA - Animal Health and Welfare and Ontario Animal Health Network (OAHN) swine network co-lead, was notified by Dr. DeLay on December 19, 2010 of the positive porcine sapelovirus and porcine teschovirus results. This was the first case of porcine sapelovirus encephalomyelitis identified in Ontario, and references were provided for additional information on the agent and associated disease. Dr. Arsenault and Dr. Tim Pasma, OMAFRA, notified Ontario swine veterinarians of the detection of a porcine sapelovirus-positive clinical case in the Province, through the Ontario Association of Swine Veterinarians list-serve.

CFIA was notified by Dr. DeLay on December 19, 2020 of the positive teschovirus PCR result. Although clinical disease in the herd did not fit epidemiologically with reportable ‘Teschen disease’, CFIA was consulted regarding the need for further testing. CFIA retrieved samples from AHL on December 19, 2019 and released results on January 10, 2020, confirming and further characterizing the porcine sapelovirus and teschovirus isolates.

Notification of the sapelovirus case and on appropriate sampling / testing has been disseminated to Ontario veterinarians and swine producers through the OAHN veterinary and producer reports, the AHL newsletter, and by individual veterinarians at producer update meetings.

This case demonstrates an organized, thorough sequence of appropriate diagnostic testing; timely reporting of results to the referring veterinarian; efficient coordination of testing priorities between AHL, OMAFRA, CFIA, and external laboratories; and responsive communication of an outbreak of a disease new to Ontario to veterinarians involved in the swine industry.

“*The report by Drs. DeLay and Egan summarizes a case of unusual neurologic disease affecting an atypically large proportion of nursery pigs of unconfirmed age during December 2019. Apparently formalized brain tissue was submitted to AHL on December 4th and histologic results from the examination of these tissues (non-suppurative encephalitis) were reported extremely rapidly on the following day. The herd veterinarian and pathologists coordinated the submission of 3 live pigs on December 5th to provide samples for a more extensive work-up of the syndrome. They should be lauded for this extra effort to ensure a complete and accurate diagnostic investigation could be undertaken. The pathologists ensured the timely reporting of the laboratory testing for all suspected etiologies (rabies, porcine hemagglutinating*

encephalomyelitis virus, porcine sapelovirus, porcine teschovirus and porcine astrovirus). The pathologists ensured throughout the investigation that all appropriate authorities were notified of laboratory findings including the herd veterinarian, OMAFRA, and CFIA. The CFIA was notified regarding the identification of teschovirus from the samples associated with these submissions. CFIA concluded that samples should be collected and apparently sent to Winnipeg (or perhaps an external laboratory, Iowa?) for further characterization. It was not apparent from the report what CFIA's specific concerns were regarding the teschovirus identified nor what conclusions were drawn from the further characterization of both the sapelovirus and teschovirus. Expanding on this aspect of the investigation would have been beneficial.

In summary, I concur with the pathologists' assessment that, "This case demonstrates an organized, thorough sequence of appropriate diagnostic testing; timely reporting of results to the referring veterinarian; efficient coordination of testing priorities between AHL, OMAFRA, CFIA, and external laboratories; and responsive communication of an outbreak of a disease new to Ontario to veterinarians involved in the swine industry."

Case 2: Salt toxicosis in broiler chickens – Dr. Emily Martin

G20-011414, G20-011430, G20-011443 and G20-011535

These four case numbers related to one single story barn of 27-day-old broilers housing 24,000 birds. Mortality started on February 5, 2020, slowly increased during the week, and by February 10, reached approximately 50%. The birds were flushing (diarrhea), huddling and depressed; the litter was extremely wet. The CFO (Chicken Farmers of Ontario) was called on February 9 by the farmer for help. FBCC (Feather Board Command Centre) was also involved and OMAFRA veterinarians were notified on the same date regarding this high mortality event.

G20-011414: On Sunday, February 9, the rDVM phoned Dr. Jim Fairles to arrange sample submission and rush virology testing - PCRs for Influenza A, APMV-1, IBV. Dr. Fairles contacted Dr. Davor Ojkic and he arranged for Joanna Sawicki (Virology Technical Supervisor) to run the PCR tests on Sunday. Influenza A and APMV-1 PCRs were negative. The IBV PCR was weakly positive and histopathologic lesions suspicious for IBV were noted in samples obtained by the rDVM.

G20-011430: Birds were dropped off early Monday, February 10 and the postmortems were performed immediately. Preliminary postmortem results were phoned to the rDVM late morning and permission was obtained to discuss the case with OMAFRA, FBCC and CFO. Numerous tests were ordered in consultation with the rDVM (histology, bacteriology, Brachyspira PCRs, sucrose wet mount, avian astrovirus PCR, avian reovirus PCR, chicken anemia virus PCR, IBV PCR, IBD PCR, and salt screen on brain - reported by Friday, February 14). These test results were combined with the results from the other three cases for a final diagnosis of salt toxicosis – refer to case summary.

G20-011443: Feed sample: Testing included a Feed Additive Screen, Aflatoxin, Ochratoxin, Vomitoxin and Salt Screen (reported Friday, February 14).

G20-011535: Water sample – No coliforms or E. coli identified.

On postmortem examination the birds were in excellent body condition, dehydrated, and extremely dirty (covered in fecal material). The kidneys appeared slightly swollen and pale, the thymus and bursas appeared small, and the cloacas were distended with mucoid fluid and chalk white urate material. On histopathology, there was mild perivascular edema in the brain suggestive of salt toxicity. Brains were submitted for sodium analysis; levels were in the toxic range (brain had 2,100 ppm Na or ug/g). Feed analysis also revealed a high sodium level (5,700 ug/g). Additional virology testing showed positive PCR tests for: CAV (Ct 32.5), IBD (Ct 25.64), CAstV (Ct 31.11) and Reovirus (Ct 31.96). The IBV PCR was only positive on the original case and could not be typed. While the presence of these viruses can impact the health of any flock, the primary cause of the clinical signs is attributed to salt toxicity.

This case shows how collaborative work between the rDVM, AHL, OMAFRA, CFO and FBCC can provide timely information and testing results to obtain answers for critical high mortality events that could presage a foreign animal disease outbreak.

"There was good collaboration with AHL, OMAFRA, FBCC and CFO on these cases. OMAFRA was promptly notified of this case and communication with AHL was excellent. AHL pathologists assigned to these cases communicated in a timely manner with OMAFRA staff. Work on the case was timely including submission and set up of testing on Sunday and early Monday morning – this is critical to have especially for potential foreign animal diseases. The case was thoroughly investigated and followed good diagnostic process, starting with testing for foreign animal diseases and major poultry diseases, followed by testing for less common conditions including feed toxins and toxicoses. Pathologists contacted OMAFRA staff with questions related to testing and inquiries on applying for funding via the OMAFRA-University of Guelph Agreement. It is my understanding that AHL no longer conducts virus isolation – is this something AHL should consider and would this have been beneficial in this case? I noted that we do not have final reports of these cases – this is an example of a case that is reportable and not immediately notifiable and therefore not conducive to auto-alerts or access in LabVantage. For cases that are considered reportable or where OMAFRA is extensively involved, I recommend adding OMAFRA to the reporting list."

Case 3: Urea toxicosis in a herd of Simmental beef cattle - Dr. Janet Shapiro

K19-017191

This diagnostic investigation involved a herd of 18 Simmental beef cattle in which three sick and two dead cows were found following a change in feed and ivermectin therapy on March 1, 2020. The referring veterinarian was concerned regarding the possibility of ivermectin toxicosis.

The postmortem of one cow was conducted at AHL Kemptville on March 2. Due to the history of multiple sudden deaths and the presence of bloody discharge from the oral cavity and rectum, anthrax was ruled out by rapid screen test. No specific abnormalities were identified at PM examination. Ancillary testing included histopathology, feed assay for urea and nitrate, intraocular fluid assay for urea, heavy metal screen of liver. An elevated ocular fluid ammonia (metabolite of urea) level of 34 mg/L was confirmed by the Toxicology laboratory on March 4, consistent with a diagnosis of urea toxicosis. Histopathology performed on March 6 noted an absence of lesions, ruling out infectious disease and ionophore toxicosis. Toxicologic analyses performed and communicated on March 4 ruled out heavy metal and nitrate toxicosis. It identified a level of 62 mg/g (6.2%) urea in the feed (no specific amount of NPN indicated in feed label).

This case demonstrates the value of an experienced veterinary pathologist with a comprehensive knowledge of ruminant diseases and management. Because of her expertise, testing was prioritized to rapidly rule out the threat of a notifiable disease (anthrax) and to confirm a suspected feed toxicosis, thus preventing additional losses. In addition, a complaint related to veterinary drug use was avoided. The owner is pursuing potential legal action against the feed company to recoup his losses, based upon the findings in this postmortem case.

“Dr. Shapiro followed the required diagnostic steps, and tests were ordered and prioritized to efficiently pursue a diagnosis. The investigation ruled out other causes of sudden death in cattle, including anthrax and heavy metal toxicosis, and ruled in urea toxicosis, confirming by tissue toxicology, and established the source of toxin by feed testing. The reporting of results was timely to the submitting veterinarian in order to manage the health of the herd. A thorough investigation and diagnosis allowed the producer to pursue compensation for cattle losses. The investigation highlights the importance of complete diagnostic procedure and how swift submission of animals for postmortem can quickly identify and eliminate a source of toxin to preserve the health of other animals in the herd.”

Disease Surveillance and Ontario Animal Health Network

The Ontario Animal Health Network has continued to share and receive information from other surveillance networks across the country through the Canadian Animal Health Surveillance System (CAHSS). The Equine, Swine, and Poultry networks have continued nationally, and additional networks such as Bovine and Small Ruminants are developing a critical mass. A notable development has been the translation of OAHN reports and products to French, and reciprocal translation from Quebec's RAIZO networks, allowing for much improved information sharing with a neighbouring province. Additionally, the translation of materials from OAHN, such as infographics, shows a growing national appreciation for the valuable work being produced by the OAHN network co-leads and members.

5.2 Mandatory Compliance Requirements

5.2.1 Increase in Revenues

In 2019/20, AHL met the mandatory compliance requirement for a 3.0% annual increase in revenues by achieving revenue of $7.762M, which exceeded the 2018/19 AHL revenue of $6.999M by 10.9%.

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. The Plan outlines business continuity procedures in the event of critical infrastructure outages, staff unavailability, pandemic, facility inaccessibility/evacuation or a surge in service requirement. It was heavily utilized in response to the COVID-19 pandemic.

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 or labour disruption.

Surge capacity is maintained year-round and has benefited from the acquisition of high-volume, leading-edge equipment funded by OMAFRA. AHL performed 368,189 ELISAs and 120,970 PCR reactions in 2019/20, in addition to ongoing development of new and improved tests. Given the current level of automation, AHL can easily accommodate additional testing in an emergency or surge capacity event.

5.2.3 Emergency Simulation Exercises

The University confirms that Emergency Simulation Exercises and Emergency Response Evaluations are typically planned for and performed annually in accordance with the Emergency Response Plan. However, in 2019/20, these were postponed due to the COVID-19 pandemic. More details are provided in Section 5.3.5.

5.2.4 Capacity Strategy Plan

Capacity planning is managed Division-wide 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) is embedded in the operations of Laboratory Services Division. 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 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. Nine of the ten Ontario Animal Health Network (OAHN) expert networks were functional in 2019/20. The networks have continued regularly 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 complete projects aimed at filling a gap in disease surveillance in their commodity.

Work continued in 2019/20 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 additional information on OAHN communications.

5.2.8 AHL Accreditation

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

American Association of Veterinary Laboratory Diagnosticians (AAVLD) Accreditation

AHL is audited every five years to maintain full AAVLD accreditation. The AAVLD audit was held May 6-9, 2019 and the outcome was successful, with AHL retaining full accreditation, all species for the five-year maximum. AHL's new AAVLD certificate expires December 31, 2024.

Canadian Food Inspection Agency (CFIA) Accreditation

AHL is a Canadian Food Inspection Agency approved laboratory for equine infectious anemia (EIA) testing. SCC now audits on behalf of CFIA and the most recent SCC audit was held in November 2019.

As part of disease preparedness, and through membership in the CAHSN, 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/IEC 17025 Accreditation

Laboratory Services Division (LSD), including AHL, 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 the scopes of accreditation. LSD is audited biennially by SCC and CALA in order to maintain this accredited status. LSD demonstrated compliance to ISO/IEC 17025:2017 during the October and November 2019 CALA and SCC audits. Both CALA and SCC scopes show LSD complies with ISO/IEC 17025:2017. LSD expects CALA and SCC to conduct the next biennial audit in Fall 2021.

LSD is accredited by SCC in these Program Specialty Areas (PSAs): Agriculture Inputs, Food, Animal Health and Plant Protection (AFAP), and Test Method Development, Evaluation and Non-Routing Testing (TMD/NRT). Based on the current (February 21, 2020) SCC scope, LSD has 93 accredited tests listed on its SCC scope: 31 AHL tests and 62 AFL tests. 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 to SCC for inspection.

Since there are lags in applying for and adding a test to the SCC "fixed" scope, AHL uses the flexible scope to accredit tests more rapidly. AHL is accredited for five veterinary laboratory

techniques: culture detection of microorganisms, inorganic analysis by inductively coupled plasma spectroscopy (ICP), enzyme linked immunosorbent assay (ELISA), agglutination, and PCR.

AHL updated the flexible scope on April 7, 2020 to remove the following 14 hazards since they had been added to AHL's SCC fixed scope on February 21, 2020:

1. BAC-018 PCR of fecal and tissue samples for Mycobacterium paratuberculosis (MAP)
2. BAC-037 Culture detection of Paenibacillus larvae, causative agent of American foulbrood (AFB)
3. V-002 Detection of antibodies using enzyme-linked immunosorbent assay (ELISA) – 7 hazards
    a. Anaplasma
    b. Bluetongue virus
    c. Equine infectious anemia virus (EIAV)
    d. Foot and mouth disease virus (FMDV)
    e. Influenza A
    f. Infectious bovine rhinotracheitis virus (IBRV)
    g. Porcine reproductive and respiratory syndrome virus (PRSSV)
4. V-006 Detection by TeSeE ELISA
    a. Bovine spongiform encephalopathy (BSE),
    b. Chronic wasting disease (CWD),
    c. Scrapie
5. V-005 Polymerase chain reaction (PCR) techniques
    a. Porcine coronavirus
    b. Porcine reproductive and respiratory syndrome virus (PRSSV)

ISO/IEC 17025 Accredited Techniques (flexible scope)

AHL is accredited for veterinary laboratory testing techniques (flexible scope) as listed on LSD's SCC scope of accreditation https://www.scc.ca/en/search/laboratories/ahl.

The test methods listed below are under AHL's flexible scope.

Medical - Veterinary (flexible scope)

AHL 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 AHL is accredited are listed in Tables 5.3 to 5.7 below.

Table 5.3: Culture Detection of Microorganisms

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

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	• *Coxiella burnetii* (Q fever) • 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
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*

Method Code	Method Name	Agent
MOL-267	*Myxobolus cerebralis* (whirling disease pathogen) PCR	• *Myxobolus cerebralis*
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 parvovirus (PPV) • Porcine respiratory coronavirus (PRCV)

Based on AHL's current January 27, 2020 scope, LSD is also accredited by CALA for eight environmental tests (11 CALA appendices): one in AHL and seven in AFL.

2019/20 AHL Proficiency Testing Results Summary

Proficiency Testing (PT) programs

AHL received reports for participation in 75 different proficiency test programs in 2019/20. PT programs are divided into two 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 and unsatisfactory.

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

Chemical PT programs

In 2019/20, the chemical sections of AHL, Clinical Pathology and Toxicology, participated in 25 different PT programs. Note that multiple sets of samples were tested within each PT program.

In 2019/20, AHL reported over 3,000 chemical PT results. Either the OMAFRA soil PT program results or NAPT proficiency sample results are included in these totals, as applicable. A summary of chemical PT results is available for onsite review.

Overall, the chemistry results are as follows:

1. Satisfactory: 98.2% (96.8% acceptable and 1.5% questionable)
2. Unsatisfactory: 1.8%

Biological PT programs

In 2019/20, AHL reported 608 biological results or panels in 53 programs. The programs are listed in Table 5.8 below. The number of proficiency samples was more than double of last year.

Overall, the biology results are as follows:

1. Pass: 99.5%
2. Fail: 0.5%

Table 5.8: 2019/20 AHL Biological Proficiency Results

Lab Section	Proficiency Program	Parameter	Scoring Criteria	Results Reported	Pass
Bacteriology (Bacti)	NVSL – Johne's direct PCR and pooled direct PCR	Mycobacterium avium paratuberculosis (Johne's disease)	Agreed with expected results	5	5
Bacti	VETQAS PT0088	Salmonella in poultry	Agreed with expected results	20	20
Bacti	AAVLD IBQAS	Bacterial ID	Agreed with expected results	4	4
Bacti	AINSES PLMICRO19	Detection P. larvae	Agreed with expected results	12	12
Bacti	VET-LIRN Listeria spp. Detection, dog food	Listeria spp detection	Agreed with expected results	22	22
Bacti	VLA-QAP BACT1	Bacterial ID	Agreed with expected results	4	4
Bacti	USDA APHIS NVSL AAVLD Internal Bacteriology QA Survey (IBQAS)	Bacterial ID	Agreed with expected results	5	5
Bacti	USDA NVSL NAHLN APHIS Antimicrobial susceptibility test (AST)	Isolate ID and MIC	Panel passed by participant	1	1
Bacti	NMG-NML External Challenge Test from PHAC (Share with Molecular)	Bacterial ID	Agreed with expected results	2	2
Myco-plasmology	CFIA – OLF Goat genotyping blind coded samples	Goat Genotype sequencing	Agreed with expected results	120	117
Molecular Biology (Mol Bio)	VETQAS PT0136	KHV	Agreed with expected results	2	2

Lab Section	Proficiency Program	Parameter	Scoring Criteria	Results Reported	Pass
Bacteriology (Bacti)	NVSL – Johne's direct PCR and pooled direct PCR	Mycobacterium avium paratuberculosis (Johne's disease)	Agreed with expected results	5	5
Mol Bio	VETQAS PT0121	Mycoplasma gallisepticum and meleagridis culture	Agreed with expected results	12	12
Mol Bio	ILC with Prarie Diagnostic Services	Chlamydia abortus PCR	External lab results matched LSD results	10	10
Mol Bio	ILC with USGS National Wildlife Health Center	Pseudogymnoascus destructans	External lab results matched LSD results	9	9
Mol Bio	VETQAS	Mycoplasma hypopneumoniae	Agreed with expected results	5	5
Mol Bio	NMG-NML External Challenge Test from PHAC	Bacterial ID	Agreed with expected results	36	36
Mol Bio	ILC with Prairie Diagnostic Services	Coxiella burnetti PCR	External lab results matched LSD results	5	5
Parasitology	VLA-QAP Parasite Identification	Parasite ID	Agreed with benchmark result	7	7
Pathology	VLA-QAP Mammalian Histopathology	Disease diagnosis	Agreed with benchmark result	3	3
Virology	USDA NVSL 2018 Anaplasmosis PT (ANP-CHK)	Anaplasma	Analyst passed panel	1	1
Virology	CFIA CAHSN panel, BTV ELISA (IDEXX)	BTV antibody detection	Analyst passed panel	1	1
Virology	CFIA EIA antibody ELISA panel	EIA Ab	Analyst passed panel	8	8
Virology	GD Animal Health VLDIA286	BVDV	Agreed with consensus	10	10
Virology	CFIA CAHSN FMD cELISA	FMD	Analyst passed panel	3	3
Virology	CFIA CAHSN AIV ELISA	AIV	Analyst passed panel	1	1
Virology	GD Animal Health VLDIA333	IBR	Agreed with consensus	8	8
Virology	USDA NVSL 2019 PRRS Check Test (ELISA)	PRRSV	Agreed with expected result	20	20
Virology	CFIA CAHSN CSFV RRT-PCR	CSFV	Analyst passed panel	1	1

Lab Section	Proficiency Program	Parameter	Scoring Criteria	Results Reported	Pass
Bacteriology (Bacti)	NVSL – Johne's direct PCR and pooled direct PCR	Mycobacterium avium paratuberculosis (Johne's disease)	Agreed with expected results	5	5
Virology	CFIA (CAHSN) FMDV panel	FMDV	Analyst passed certification	1	1
Virology	ILC with ISU TGEV PCR	TGEV	Two labs achieved the same result	13	13
Virology	GD Animal Health VLDIA290	PRRSV	Agreed with consensus	16	16
Virology	CFIA 2020 Rapid Test Proficiency Panel (BioRad TeSeB SAP ELISA)	BSE	Samples correctly interrupted and ran within 2SD	4	4
Virology	CFIA-OLF 2019 ELISA OIE and National Reference Laboratory for Scrapie and CWD	PrP Scr/CWD	Analyst passed certification	5	5
Virology	USDA NVSL PRRS IFA PT	PRRSV	Agreed with expected result	40	40
Virology	ILC samples sent to Prairie Diagnostic Services Inc	Coxiella burnetti (Q fever)	Two labs achieved the same result	5	5
Virology	ILC with Iowa State University	TGE	Two labs achieved the same result	13	13
Virology	USDA APHIS 2019 Leptospira Microscopic Agglutination Proficiency Panel	Leptospira	Analyst passed certification	4	4
Virology	ILC with USDA NVSL	Infectious laryngotracheitis virus (ILTV)	Two labs achieved the same result	6	6
Virology	GD Animal Health VLDIA286	BVDV (RNA detection)	Agreed with consensus	8	8
Virology	ILC with ISU	TGEV PRCV	Two labs achieved the same result	13	13
Virology	CFIA (CAHSN) ASFV panel	ASFV	Analyst passed certification	1	1

Lab Section	Proficiency Program	Parameter	Scoring Criteria	Results Reported	Pass
Bacteriology (Bacti)	NVSL – Johne's direct PCR and pooled direct PCR	Mycobacterium avium paratuberculosis (Johne's disease)	Agreed with expected results	5	5
Virology	2019 NVSL (USDA) Johne's disease serologic ELISA	Mycobacterium avian paratuberculosis (MAP, Johne's disease).	Successful quantitative and qualitative diagnosis	30	30
Virology	GD Animal Health VLDIA226	Mycoplasma gallisepticum and Mycoplasma synoviae	Agreed with expected results	8	8
Virology	GD Animal Health VLDIA235	Small Ruminant Lentiviruses (MVV/CAEV)	Agreed with consensus	12	12
Virology	GD Animal Health VLDIA286	BVDV (antigen detection)	Agreed with other labs reporting with the same kit	6	6
Virology	GD Animal Health VLDIA255	AMPV (antibody detection)	Agreed with other labs reporting with the same kit	8	8
Virology	VetQAS PT0074	toxA, gene encoding the PMT (Pasteurella multocida toxin)	Agreed with expected results	4	4
Virology	GD Animal Health VLDIA233	Antibodies against Salmonella	Agreed with consensus	8	8

5.2.9 AHL Testing Data

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

5.2.10 Resources to Administer AHL

The University confirms that it has the necessary resources, including technical and support staff, to administer AHL. Dr. Maria Spinato was appointed in Fall 2019 as the AHL Director and Co-Executive Director of Laboratory Services Division, as well as the AHL PMC Co-Chair. She is highly qualified to support the governance structure of the AHL PMC.

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 2019 and is due again in Fall 2021.

Dr. Jim Fairles (AHL Client Services Veterinarian) presented an update at the Feedback Group meeting (November 12, 2019) on the 2019 survey that was sent to 782 major clients with 79 responses for a 10% response rate (considered a good response rate for an email survey).

Overall level of satisfaction with AHL service was 94.8%.

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 AHL provided excellent service. Figures 5.1 and 5.2 provide examples illustrating the results from the 2019 Biennial Client Satisfaction survey.

The Biennial Client Satisfaction Survey overview of feedback and action taken were also addressed at the annual AHL Feedback Group meeting in November 2019 (AHL Feedback meeting documentation provided below).

Figure 5.1: Survey Results, 2008-2019, Average Overall Level of Satisfaction with AHL Service

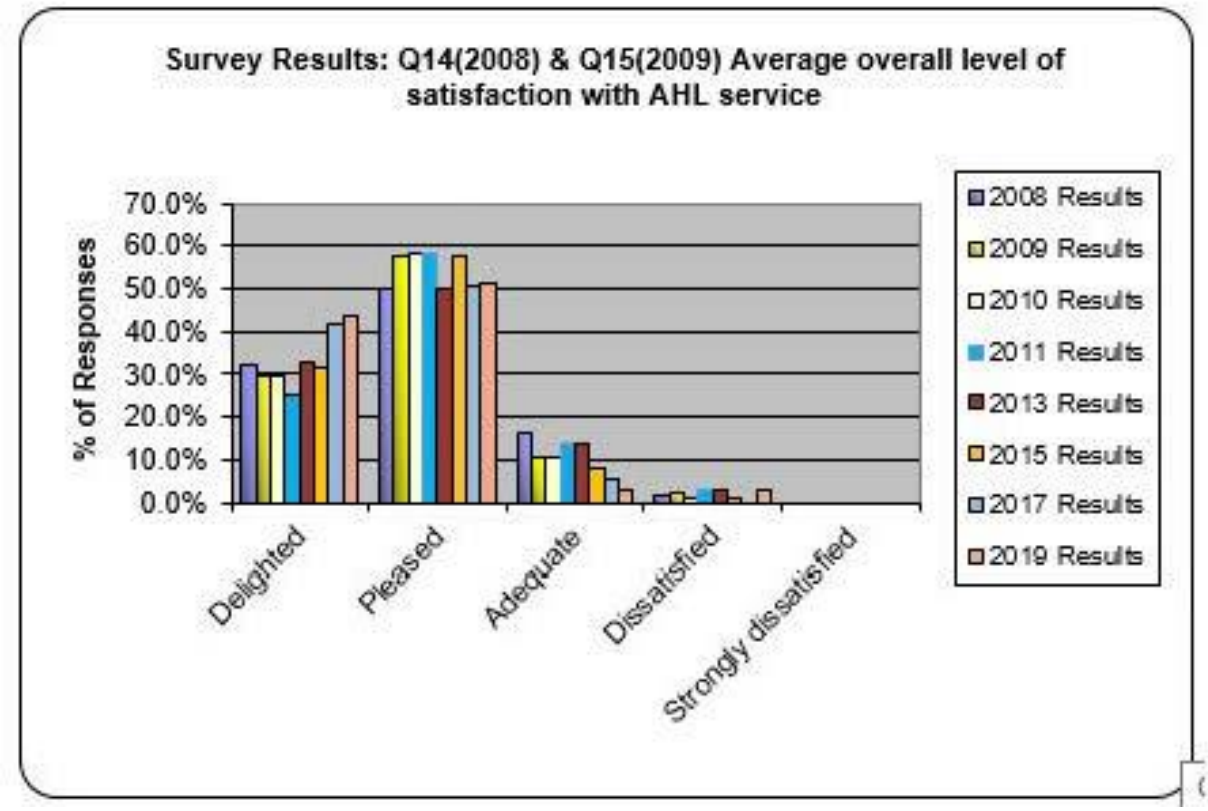
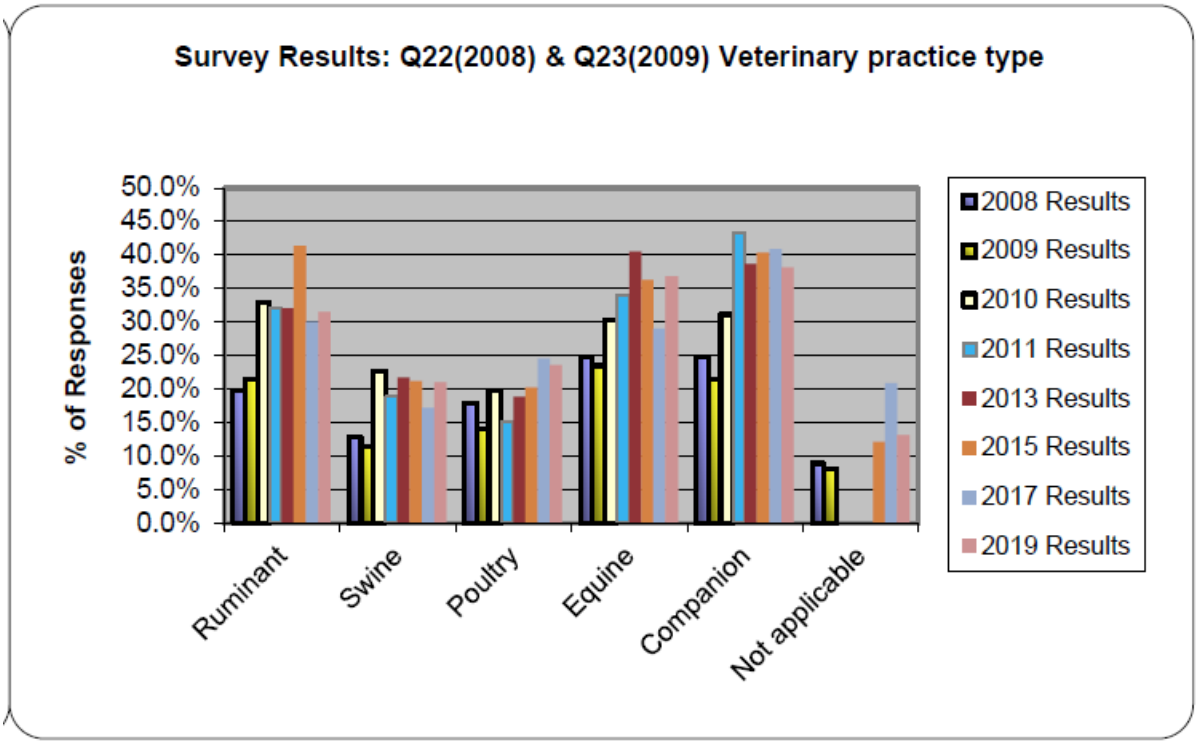


Table 5.2: Survey Results, 2008-2019, by Veterinary Practice Type



The 2017 and 2019 Biennial Client Satisfaction Survey Assessment and the 2018/19 Feedback Group meeting identified the following action items and the continuous improvement outcomes, as outlined in Tables 5.9, 5.10 and 5.11.

Table 5.9: 2017 and 2019 Biennial Client Satisfaction Survey Assessment Action Items and Outcomes

2017 (renewed and ongoing) and 2019 Action Items	AHL Improvement Outcome Response
1. Work on diagnostic plans, and vet education regarding test requests and other related client outreach (videos / webinars); training in lab techniques	Ongoing
2. LabNote on antimicrobial susceptibility testing in mastitis	In progress
3. Promote milk QA program, more clinics should be participating	Ongoing (low interest since user pay / voluntary) Continuing to provide info in newsletter and OABP
4. Offer trending abilities	Addressed with client portal for some clients
5. Transcription errors in data entry – readability – reduce use of paper	Passed to Spec room – ongoing sign-up of clinics for online submissions (portal/e-form) and online access to results and invoices
6. Investigate Parasitology Egg per Gram testing quality assurance	Ongoing
7. Toxicology – QA Mercury analysis	Ongoing
8. PDF of fee schedules on the website	Completed – behind username and password
9. Improve client portal interface	Ongoing
10. Provide online statements and payment online, update LIMS data entry online access	Online payment available – researching online statements. Mobile LIMS functionality being investigated
11. Ability to accept new world primate samples	AHL policy is currently does not allow processing new world monkey samples - Completed
12. Have an equivalent to SDMA	Not available - Completed
13. Expand courier options locally	Ongoing

Table 5.10: 2018 Feedback Group Meeting Action Items and Outcomes

2018 Action Items (ongoing)	AHL Improvement Outcome Response
1. Milk culture results entered into DairyComp, any chance for blood, Johne's, BLV to be auto-added? How difficult to program?	Ongoing – discussion with CanWest DHI
2. Investigate expanding in-house culturing QA to urine	Ongoing - along with parasitology
3. Attempt to frame/work with beef industry to promote PIDs, make it a QA factor	Ongoing - starting with swine and dairy as easier sectors to sign-up
4. Investigate *Salmonella* sequencing and ways to find efficiencies in getting results back sooner	WGS validation in progress – this will be a future consideration
5. Trending solution needed in view of Hendrix LIMS delay	Ongoing – currently use eform – reassess after LIMS upgrade
6. 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)	App development initiated in June 2020

Table 5.11: 2019 Feedback Group Meeting Action Items and Outcomes

2019 Action Items	AHL Improvement Outcome Response
1. Check with IT re LabVantage compatibility with browsers other than Chrome	Works best on Chrome - investigating mobile functionality online access and app. June 2020
2. Work on improving functionality of LabVantage, investigate app, and allow more involved searches	Committee looking at mobile functionality / app. / enhanced data management protocols
3. LabVantage - look at concern with more clicking needed to look up results (external OVC)	Committee looking at mobile functionality / app
4. Check with IT re report formatting on mobile devices, app mobile functionality	Committee looking at mobile functionality / app
5. Check with mycology re: feasibility of adding fungal sensitivity.	Completed – unable to comply
6. Whenever possible, include normal values (ref. ranges) for send out tests.	Normal ranges are entered if provided (in notes on the case)
7. Improve descriptions of test in StringSoft for data entry	AHL will need the list of tests of concern – ongoing
8. Check with IT re capability of adding something to identify report is available when on submission page in LIMS (to avoid opening blank report)	Ongoing
9. Client portal date mix-ups	Checking with SR - have them contact Client Service when this occurs to track
10. Milk Bacteriology Report formatting	In progress, nearing completion
11. Check with Virology/SR to ensure process is in place, and all on board for testing ASAP	Procedure in place – completed
12. Goat Johne's Elisa (Prionics) - currently send out	Added to AHL new testing priority list

2019 Action Items	AHL Improvement Outcome Response
13. Re-assess Saturday waybill delivery i.e. ½ charge for samples not tested on Saturday but client has requested a waybill ($15??) e.g. arrive Saturday for testing Monday.	Ongoing - still free for regular clients
14. BACT: disinfectant sensitivities?	Unavailable
15. BACT: working on Salmonella serotyping in-house	Ongoing - WGS
16. Would like virus isolation available again	Business case needed; still available for emergencies/new virus suspected
17. VIRO: titre mapping	Ongoing
18. Improvement on data mining services	Other action items involved - project starting re data functionality and surveillance at AHL
19. VIRO: Suggest offering ELISA testing for hemorrhagic enteritis virus for turkeys - this may provide a more useful assessment of vaccine response by providing a GMT and CV versus only a positive/negative result provided by the current AGID	Discussion re priority list – requires business case
20. Suggest offering Bordetella avium PCR and Ornithobacterium rhinotracheale PCR; most useful for turkeys, and possibly useful for chickens.	Discussion re priority list - requires business case
21. Suggest offering Pasteurella multocida AGID or other form of serotyping, which is considered a standard follow-up to a culture positive by poultry veterinarians in other locations. Presently we must send samples to an American lab to have this testing performed.	Discussion re priority list – requires business case
22. Suggest that AI and NDV suspect negative PCR testing be subsidized by the Province to encourage veterinarians to submit more samples for surveillance. This is offered by some other provinces and has been successful in detecting LPAI in turkeys.	Discussion with OAHN Poultry / OMAFRA
23. Suggest creating a VN test or other serologic screening test for chicken astrovirus to screen broiler breeders. This would likely have very high usage if it was developed.	Discussion re priority list – requires business case
24. Suggest that further evaluation of viral sequencing would be useful in some cases, to supplement the use of Genbank reference virus evaluation	Ongoing
25. Data mining requests - develop a “permission form”, make it easier to obtain?	Completed
26. Investigate whether Seneca VV ELISA is doable?	Discussion re priority list - currently no business case - available as send out
27. Expand antibiotic panel for swine	CSLI guidelines need to be followed, MIC available

2019 Action Items	AHL Improvement Outcome Response
28. Characterize influenza strains	Ongoing
29. Look into IHC PCV3	Currently send out PCV3 ISU at Iowa
30. Site remember password/username: likely a Google Chrome permission	Resolved
31. Consult with Davor/Joanna re cut-off/reporting times options - earlier	Samples must be received in lab by 11:00 for same day testing; results may not be sent out until evening (split work teams due to COVID)
32. Ability to alter eforms and online submissions after sending to the lab	Not feasible currently

AHL Feedback Meeting, November 12, 2019

List of Participants:

OMAFRA
- Dr. Cathy Furness
- Dr. Tim Pasma

Species group presidents
- Dr. Dan Shock – Vice President OABP
- Dr. Chris Bushbeck - Past President SRVO
- Dr. Ryan Tenbergen – President OASV
- Dr. Fernano Salgado-Bierman – President OAPV
- Dr. Amy Bennett – OAEP – absent

Large volume clients
- Mr. Peter Pozder – Hendrix
- Dr. Paisley Canning – SWOVS

Private practice
- Dr. Rex Crawford – Dufferin Vet Services
- Dr. Bianca Ferenczy – Park Avenue
- Ms. Brittany Tartaglia – Park Avenue
- Dr. Alex Weisz –Poultry – absent
- Dr. Keith Colquhoun – Equine – absent
- Dr. Rob Swackhammer – Bovine – absent

Ontario Veterinary College
- Dr. Chantelle Piro – HSC OVC
- Dr. Maureen Bary – HSC OVC
- Dr. Brandon Lillie – HSC OVC Pathobiology Chair
- Dr. Stephen LeBlanc – HSC OVC Population Medicine

- Dr. Daniel Henny – HSC OVC LA Internal Medicine

AHL

- Dr. Kate Todd - OAHN Coordinator
- Ms. Josie Given - Client Outreach tech
- Ms. Rina Pigozzo - Client Services tech
- Dr. Jim Fairlies - Client Services Veterinarian
- Dr. Maria Spinato - Director

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.

5.3.2 Relevant Test Results and Reporting Times

In 2019/20, 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, specifically turnaround time (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. AHL proactively measures and analyzes 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. A detailed explanation of the 2019/20 TAT statistics report is available upon request.

The target of 95% of routine AHL tests meeting the published Service Level Standards was set in 2018/19. The AHL Service Level Standards reporting includes service levels from external testing facilities in the target reporting, which are non-controllable. In 2019/20, AHL did not meet the target, as only 93.48% of tests met the expected Service Level Standards, based on calculation from LIMS. Due to the COVID-19 pandemic, the reduction of laboratory staffing mandated by physical distancing necessitated prioritization of essential tests, batching and elimination of some testing. This response, implemented for the last six weeks of the 2019/20 reporting period, was the probable direct cause for the reduction in the calculated turnaround time. The AHL PMC was formally notified of the AHL operational changes in response to the COVID-19 pandemic, and the negative impact on the reporting times performance measure for 2019/20. In the future, AHL would also like to remove the legal cases from the calculation of TAT, as they are done when capacity is available and are not prioritized over food animal cases.

Tables 5.12 to 5.14 and Figures 5.3 to 5.4 below 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 5.12: Overall AHL Caseload Distribution, May 1, 2019 – April 30, 2020

Number of Cases	72,111
Number of Procedures	798,358
Number of Tests	~1,000,000

Table 5.13: AHL Caseload Distribution, by Cases and Lab Section, May 1, 2019 – April 30, 2020

AHL Function	Number of Cases
Clinical Pathology	21,601
Virology	17,582
Bacteriology	13,602
Histotechnology	5,446
Parasitology	3,327
Toxicology	3,309
Mycoplasmology	2,562
External	2,381
Anatomic Pathology	2,301
Total Cases	**72,111**

Table 5.14: AHL Caseload Distribution, by Procedures and Lab Section, May 1, 2019 – April 30, 2020

AHL Function	Number of Procedures[17]
Virology	627,048
Bacteriology	66,114
Clinical Pathology	63,027
Mycoplasmology	13,890
Toxicology	7,461
Parasitology	6,834
Histotechnology	6,549
External	5,109
Anatomic Pathology	2,326
Total Procedures	**798,358**

[17] Procedures such as profiles include multiple tests.

Figure 5.3: AHL Caseload Distribution, by Cases and Species, 2019/20

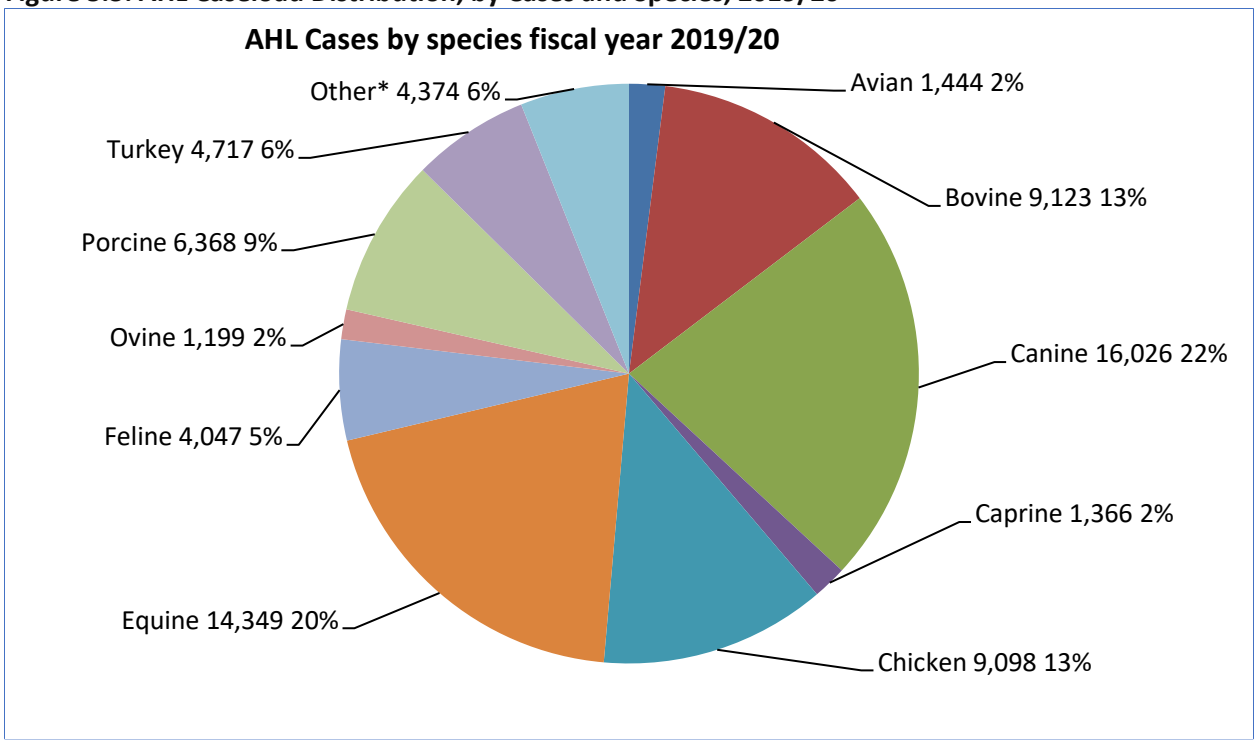
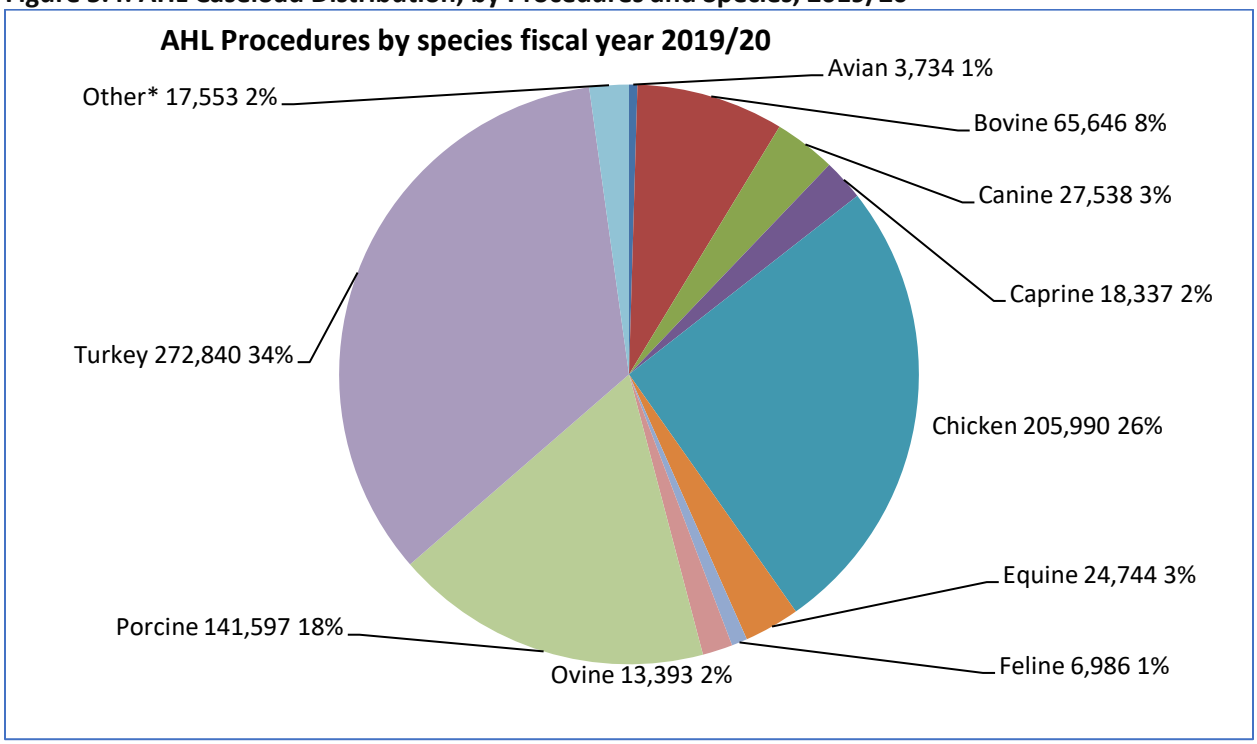


Figure 5.4: AHL Caseload Distribution, by Procedures and Species, 2019/20



*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. 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 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 2019/20.

The following requests were made to IT regarding the LabVantage system:

- 2019-07-11 – Requested reporting of negative results for SVA PCR – Completed
- 2019-07-19 – Set up a LabVantage account for Tim Blackwell – Completed
- 2019-08-07 – Requested access in LabVantage and check of an auto-alert for a case of Chlamydophila psittaci – Completed
- 2019-09-11 – Checked regarding an auto-alert for an influenza test – Completed
- 2019-10-29 – Requested a LabVantage password reset for Cathy Furness – Completed
- 2020-01-06 – Requested unlocking of a LabVantage account for Alison Moore – Completed
- 2020-02-04 – Requested access in LabVantage for an external send out for Brucella canis – Completed
- 2020-03-10 – Requested access in LabVantage to a case of Brucella canis – Completed
- 2020-03-20 – Requested access in LabVantage to a case of Brucella ovis – Completed
- 2020-03-27 – Requested a list of OMAFRA accounts in LabVantage and WebI, disabled accounts for Csaba Varga – Completed
- 2020-04-14 – Requested a LabVantage account for Jocelyn Jansen – Completed

5.3.4 Premises Identification (PID)

The performance indicator 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 targets were established as the 2018/19 Percentage of PIDs Available by Commodity. Table 5.15 below shows the 2019/20 results and the targets. AHL successfully achieved the target in two of the six commodities, seeing significant growth in swine and avian. Cattle held largely constant, with small decreases in small ruminants and camelids cervids rabbits.

Table 5.15: Premises Identification, Percentage of PIDs Available by Commodity, 2019/20

Commodity	Percentage of PIDs Available (%)	Target (%)
Swine	73.6	53.7, ↑
Cattle	11.0	11.2, ↓
Small Ruminant	1.9	4.4, ↓
Camelids Cervids Rabbits	0.0	0.4, ↓
Avian (Chicken, Turkey, Other)	0.9	0.0, ↑
Fish / Bees	0.0	0.0, ↔

PID numbers fluctuate as new clients are added to the AHL database. While AHL Client Services staff encourage all clients to enroll and obtain a PID, compliance is voluntary, thus this performance metric is largely outside of AHL's control. The AHL PMC was formally apprised of the potential impact of voluntary compliance with PID on AHL's ability to meet performance measures for premises identification. OMAFRA is investigating other potential avenues to increase PID use and support fulfillment of this important performance indicator.

5.3.5 Emergency Simulation, Exercise and Response

This performance indicator describes AHL's ability to effectively carry out its responsibilities for emergency simulation, exercises and response, to effectively support the Ministry. It also looks at AHL's ability to develop and respond to continuous improvement action requests through the 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 for this performance metric is implementation of 100% of action requests by the University within one year.

With approval from the AHL PMC, the 2019/20 emergency exercises (including the responses from the 2018/19 exercises), initially scheduled for March/April 2020, were postponed due to the COVID-19 pandemic, and will remain postponed until there is sufficient reopening of businesses to permit physical participation by external reviewers (OMAFRA and CFIA). The postponed exercises will involve a suspected case of African Swine Fever and are tentatively scheduled for Fall 2020. An update for this KPI will be submitted when the exercises are concluded, and reports have been completed.

AHL intends to perform the annual 2020/21 emergency exercises in March/April 2021. These are tentatively planned for an outbreak of Avian Influenza.

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 responses 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 2019/20, there were no major emergency incidents requiring an AHL response. 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 response to a major incident.

5.4 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 ten OAHN expert networks can apply for approximately $25,000 annually to conduct a project on an identified gap in surveillance in their commodity. Table 5.16 lists the OAHN Projects funded in 2019/20. Results of some of these projects were presented at various industry meetings, published in journals, and posted on the OAHN website.

Table 5.16: 2019/20 OAHN Projects

OAHN Expert Network	Project Description	Project Leader	Amount
Fish	Feed-based probiotic to reduce natural coldwater disease	Alex Reid	$26,126
Companion Animal	Brucella canis in commercial dog breeding operations in Ontario	Scott Weese	$24,600
Poultry	Small flock poultry disease lecture series for veterinarians	Csaba Varga	$4,620
Bovine	Parasitism in Grazing Cattle in Ontario	Jessica Gordon	$21,789
Bovine	Atwood Resources	Cynthia Miltenburg	$5,750
Poultry	Identification of Transmissible Viral Proventriculitis (TVP)	Marina Brash	$1,800
Swine	Modelling potential hotspots of African Swine Fever in Ontario's wild pig population	Erin Koen	$25,000
Swine	Ongoing investigation of an outbreak of Senecavirus A	Ryan Tenbergen	$20,617
Equine	Investigation into the seasonal variations in ACTH levels in Ontario's senior horses (aged 15 yrs+)	Kris Ruotsalo	$22,980
Small Ruminant	Investigating Milk Quality and Udder Health in the Ontario Dairy Goat Industry	Jocelyn Jansen/Cathy Bauman	$34,500
Bees	Density mapping of Managed Honey Bee Colonies in Ontario Density mapping of Managed Honey Bee Colonies in Ontario	Olaf Berke	$1,080
Bees	Mid-season treatments for Varroa mites, Residue testing in honey	Paul Kozak	$14,805
Swine	OAHN Swine Smallholder Postmortem Project	Christa Arsenault / Josepha DeLay	$25,000
Equine	Potomac Horse fever in Ontario: Environmental molecular surveillance of the intermediate host	Luis Arroyo	$16,222
		Total	**$244,889**

5.4.6 OAHN Communications

During 2019/20, AHL continued to facilitate an integrated and collaborative disease surveillance system in Ontario, through OAHN.

Objectives of the Ontario Animal Health Network 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; and
3. Contribute expertise to prevention, detection, and response activities.

Most networks consist of an expert from each of OMAFRA, AHL, OVC, and between one and 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 2019/20, all networks, except the alternative species network, were active. Networks include:

- 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 2019/20 for their regularly scheduled communications and information sharing. The exceptions included 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.

Kate Todd also provided quarterly updates on OAHN communications and collaborative activities, as well as key performance indicator updates, to the AHL PMC.

The OAHN website 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 registered veterinary technicians (RVTs) to access. Page views on oahn.ca totaled 53,025, with 153 new registered users this year. OAHN newsletter subscribers include 1,010 veterinarians, with 1,843 subscribers in total. There were 856,545 social media post impressions (501,682 - Facebook, 354,863 - Twitter), three new podcasts, and 3,700 podcast listens this year. Resources created by the networks were viewed 22,664 times on the website. Veterinary medical listservs (bee, fish, and small flock poultry) had 137 new veterinarian members this year, and a total of 281 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/Maria Spinato (AHL) and Tim Pasma (OMAFRA) were members of the Directors Group and the Core Team;
- Several staff from AHL (Grant Maxie/Maria Spinato, Kate Todd, Jim Fairles) rated pings for CEZD (Community for Emerging and Zoonotic Disease), which is now included under the CAHSS umbrella;
- Both OMAFRA and AHL participated 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 participated in monthly disease surveillance calls with Equestrian Canada industry group to share OAHN information and support the initiative;
- AHL participated in national level laboratorian conferences to facilitate information and expertise exchange and laboratory enhancements (CAHLN 2019);
- Network coordinator communicated with other provincial surveillance networks every two months throughout the year; and
- Network projects were reviewed at CPHAZ conference and network members and co-leads attended 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 contributes to increased knowledge and expertise and a One Health approach to animal health.

The KTT and Learning Opportunities information illustrates the knowledge and expertise gained by AHL staff throughout the 2019/20 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 record of staff participation in national and provincial committees and scientific meetings. It includes information regarding officer roles in these organizations held by staff. 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 regular 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 21 AHL veterinarians/supervisors participated in 135 meetings of 44 international and 91 national organizations (total 962 hours) and participated in 157 meetings of 25 provincial organizations (total 462 hours).
- All 21 AHL veterinarians/supervisors participated on federal and/or provincial animal health strategy committees and 17 attended meetings or conferences for these committees in 2019/20.
- Average of 77.1 meeting hours per year spent on relevant committees per staff member, equivalent to 4.4% of available personnel time (5.1% in the previous year; some reduction due to cancelled meetings related to COVID-19 pandemic).
- Veterinarians/supervisors attended two court appearances, had 32 publications, 35 peer-reviewed articles, 60 scientific newsletter articles, three podcasts, 34 oral presentations, three poster presentations, and provided 22 tours of AHL.
- Quarterly AHL Newsletter published nine Ruminant, seven Swine, ten Avian/Fur/Exotic & Fish species, five Equine, seven Companion Animal articles, as well as twenty general/updates /announcements/OAHN items in 2019/20.

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 requirement of the OMAFRA/UofG Agreement. 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. It was held in St. Hyacinthe, Quebec, May 26-29, 2019. This meeting included participants from national (CFIA), provincial and university-based laboratories, in addition to industry representatives serving these organizations. 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.

AHL staff members are also regular participants at numerous conferences, e.g. the OVMA and OAVT annual conferences, both as exhibitors and as guest speakers or expert panel members. Dr. Fairles (supported by Ms. Josie Given and Ms. Rina Pigozzo) actively markets the services of 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, as approved by the AHL PMC. Table 5.17 provides, for 2019/20, a list of the new tests developed, the adoption of tests developed by other laboratories and any AHL PMC approved in-year modifications to tests and methods.

Table 5.17: New or Improved Tests in 2019/20

Test Name - Method	Code	Species
Aeromonas salmonicida – PCR	asalpcr	Oth
Astrovirus type 3, porcine (PoAstV3) - PCR	xastro	Porc
Aves polyomavirus (AvPyV)-PCR; Beak and feather disease virus (BFDV)-PCR; Psittacid herpesvirus (PsHV)-PCR	psitpcr	Av
Bacterial culture, fecal, Clostridium perfringens, add-on test	clopadd	Av, Bov, Can, Cap, Eq, Fel, Oth, Ov, Porc
Bacterial identification – API	idbaapi	Av, Ch, Tur
Biochemistry profile, avian/reptilian (OVC) - photometric	ovcaprf	Av, Oth
Botulism, serum - mouse inoculation test	xmits	Av, Bov, Can, Cap, Ch, Eq, Fel, Ov, Porc, Tur, Oth
Botulism, tissue/feed - mouse inoculation test	xmittf	Av, Bov, Can, Cap, Ch, Eq, Fel, Ov, Porc, Tur, Oth
Chlamydia suis - real-time PCR	csuipcr	Porc

Test Name - Method	Code	Species
Coagulase tube	ctube	Bov, Porc
Dourine – CF	xdour	Eq
EPM, S. neurona Western blot and SAG 2/4/3 ELISA panel	xepmfe	Eq
Feline Leukemia Virus (FeLV) - Real PCR	xfelv	Fel
Fish processing charge, non-food (up to 4 fish)	kfpmmf	Oth
Fish viral hemorrhagic septicemia virus (VHSV) - PCR – not positive certification for fish movement	vhsvc	Oth
Flavobacterium psychrophilum - real-time PCR (Bacterial coldwater disease)	fpsypcr	Oth
Glanders - CF	xgland	Eq
Granulosa cell tumor panel II, equine	xegctp2	Eq
Mycoplasma synoviae - vlhA gene sequencing typing	mstype	Av, Ch, Tur
Nucleic acid (RNA/DNA) extraction from paraffin embedded tissues	parafex	Av, Bov, Can, Cap, Eq, Fel, Ov, Porc, Oth
Ornithobacterium rhinotracheale (ORT) - ELISA	orte	Av, Tur
Pasteurella multocida – antibody ELISA - Turkey	pmturke	Av, Tur
Postmortem radiology CT	nradct	Oth
Postmortem, cremation private return, Kv	kpmcr	Can, Fel, Oth
Postmortem, research animal, Pathobiology	parespm	Oth
Public Health Report - Fungus	phrf	Av, Bov, Can, Cap, Eq, Fel, Ov, Porc, Oth
Rabies virus - titer, RFFIT ENDPT, equine	xrtfke	Eq
Rivaroxaban	xriva	Can, Eq, Fel, Oth
Salmonella Pullorum-typhoid - microplate agglutination test	salmp	Av, Ch, Tur
Salmonella Typhimurium Vaccine, food animal - PCR	stvpcr	Av, Ch, Tur
Sapelovirus, porcine (PTV) - PCR	xsapelo	Porc
Scrapie resistance PrP genotyping in goats (codons 146, 211, and 222) - sequencing	prpgoat	Cap
Teschovirus, porcine (PTV) - PCR	xtescho	Porc
Toxoplasma gondii - PCR	toxopcr	Bov, Cap, Fel, Ov

6 Agriculture and Food Laboratory (AFL)

The Agriculture and Food Laboratory's (AFL) vision is to be a laboratory partner of choice for governments and universities in Canada, for agriculture, food safety, and animal health testing. In addition, AFL is a leader in providing high-value laboratory services to the academic and private sectors in selected niche markets.

AFL's mission is "Working together toward a healthier future … providing high-value analytical and diagnostic services for the agricultural, food and veterinary sectors."

As part of the Laboratory Services Division (LSD), along with the Animal Health Laboratory (AHL), AFL continues to optimize the leveraging of services offered within the OMAFRA/UofG Agreement to other government, commercial and academic clients, while maintaining its status as a self-sustaining division of the UofG.

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

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

Introducing Efficiencies in Economies of Scale

Scope expansion for residue detection methods in both veterinary drug and pesticide residues allows OMAFRA to retain its sampling intensity, while improving detection limits and increasing the number of analytes provided in the data. This supports the Food of Plant Origin monitoring program (OH0001). In addition, expanding AFL's current expertise through projects with third-party clients allows for this new expertise and/or technology, e.g. whole genome sequencing, to be readily applied to OMAFRA programs.

Timely Delivery of Laboratory Test Results to Allow for Optimal Regulatory Response

AFL has extensive experience meeting performance indicator targets for over 20 years. Several new updates to the results reporting process ensures that a key OMAFRA staff member receives notification of any alertable results obtained by the laboratory, even outside of normal working hours.

As AFL enters the third year of the current Agreement, insights gained by accomplishments and challenges from the past year will contribute to future directions. Facing the need to replace some significant contract work in the past year, AFL was able to generate new revenue, while maintaining excellent client retention and a high level of service delivery to all clients. Over the next year, AFL will continue to focus on client service excellence as a means to securing its current market share and reputation. AFL will also pursue targeted marketing activities to build

revenue in identified niche areas, with the goal of continuing to build external revenues for reinvestment and sustainability. Finally, AFL will continue to develop and maintain partnerships with 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 2019/20

AFL is an active, contributing partner to OMAFRA in helping them achieve 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, AFL aims to support OMAFRA in securing public confidence in the quality and safety of the agriculture, environment and food sectors in Ontario.

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. In 2019/20, AFL exceeded 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. Over the last year, 99.90% of all tests were reported accurately (54,309 out of 54,366). AFL also exceeded the 98% performance target in effectively communicating actionable test results to OMAFRA.

In October and November 2019, AFL, as part of LSD, underwent its biennial Standards Council of Canada (SCC) and Canadian Association for Laboratory Accreditation Inc. (CALA) audits. Every two years, AFL is audited by SCC and CALA in order to maintain its accreditation to the International OIE Standard ISO/IEC 17025:2017.

AFL’s method development activities are designed to meet the changing regulatory standards and requirements that OMAFRA faces in each of its program areas. The customized Multiple Target Analyte (MTA) method fully replaced the 2007 Multi-Residue Detection method (35 compounds). As of 2019/20, this method is now applied to all target species and provides detection of up to 67 drug residues across multiple species for OMAFRA’s Meat Inspection Program. In 2019/20 OMAFRA did not issue new targets for method development. A new priority list is expected in 2020/21.

With the agreement of OMAFRA, AFL verified a new detection method for the mycotoxin Patulin, potentially present in apple products. This new approach applies LC-MS/MS instrumentation and eliminates naturally occurring interferences previously seen with other modes of detection as well as providing a lower detection limit. This method is now available for any future Patulin work that may be requested by OMAFRA.

AFL also added capability and capacity in the area of plant disease testing. For example, the Plant Disease Centre developed a Rubus viruses screen using RT-PCR. In addition, AFL also completed installation of methods for detection of an expanded number of drug residues (up to 70) in animal tissues from seven species (MTA and aminoglycosides methods).

AFL also installed and verified a new ICP-MS instrument providing a lower detection limit for lead in maple syrup (OH0005) and honey (OH0004).

An opportunity for new third-party revenue was identified in the emerging cannabis testing market. In 2019/20, AFL successfully became an Analytical Testing licence holder under the Cannabis Act. With completion of the Priority Method Development Memo list from OMAFRA, the Chemistry Research and Development (CRD) team was deployed to assist in identifying viable methods for performing potency testing. Many of the required regulatory test methods already exist among the testing services offered by AFL. However, the testing of cannabinoids is a new area. AFL will launch its Cannabis Testing Services in 2020/21.

AFL completed an OMAFRA Dairy Food Safety Program baseline study that incorporated the installation and verification of a multiple residue method to detect mycotoxin compounds in dairy products. This new methodology is available for use by OMAFRA and AFL's other dairy clients.

All laboratory sections continue to identify and implement advances in testing and technology. OMAFRA can then design their lab programs to incorporate the advances that most benefit their surveillance and monitoring programs and annual baseline studies.

Collaborative research and other projects also expanded services available to OMAFRA. Analysis for the development and the expansion of the composition test panel delivered to the Dairy Farmers of Ontario (DFO) demonstrates AFL's commitment to OMAFRA to support any program issues that may arise periodically in this industry. AFL is pleased to be entering its fifth year of a contract extension with Dairy Farmers of Ontario and the Ontario Dairy Council (ODC), processing more than 800,000 samples annually.

AFL identified a technical failure in a manufactured test kit that impacted lab test results for OMAFRA in the monitoring of drug residues in milk. AFL responded with alternative methods in order to continue testing compounds of concern to OMAFRA. The subsequent investigation and work-up by the laboratory resulted in the manufacturer correcting the issue, thus allowing OMAFRA to return to use of this economical test kit. Safeguards are in place in the testing process to ensure ongoing successful use of this test kit to deliver accurate results to OMAFRA.

In further support of the Ontario and national dairy industries, AFL is now licensed for Laboratory Analysis with the National Conference on Interstate Milk Shipments (NCIMS) / US-FDA Grade A Milk Program. This program allows Ontario dairies to export milk and milk products to the USA.

AFL staff provide high value, impactful scientific support to OMAFRA. They are actively involved in Knowledge Translation and Transfer (KTT) activities, completing research projects and publishing in peer-reviewed journals. This instils public confidence in AFL and ensures it remains on the cutting edge of new developments in laboratory research and testing. A full list of KTT activities is provided in Appendix D. A few key examples are included below:

- Huimin Xu, Desmond L. Hammill, Shannon Shan, Tongyang Tian. First report of Tomato brown rugose fruit virus on tomato in Canada. Canadian Phytopathological Society Atlantic Region Meeting 2019 (Presentation);
- Shehata HR, Bourque D, Steinke D, Chen S, Hanner R. Survey of mislabelling across finfish supply chain reveals mislabelling both outside and within Canada. Food Research International. July 2019, 121:723-729 (Publication); and
- Robert L. Conner, Greg J. Boland, Chris L. Gillard, Yongyan Chen, Xuechan Shan, Debra L. McLaren, Anfu Hou, Waldo C. Penner, Melody S. Melzer, Parthiba Balasubramanian, Sheau-Fang Hwang, and Kenneth B. McRae. Identification of anthracnose races in Manitoba and Ontario from 2005 to 2015 and their reactions on Ontario dry bean cultivars. Canadian Journal of Plant Science, 2020. 100(1): 40-55, https://doi.org/10.1139/cjps-2019-0003 (Publication).

AFL continues to work with stakeholders and external groups, such as DFO, to protect the industry competitiveness in Ontario. AFL is providing analysis for various studies that DFO is conducting or collaborating on. Examples of DFO studies include current interest in an extended fatty acid profile to assist with herd management and cheese making, as well as silos as an alternative to on-farm bulk tanks.

AFL prioritizes maintaining an advanced level of technology in instruments, capacity and expertise, thus is well positioned to respond to all of OMAFRA's needs. These include: urgent or emergency situations such as the COVID-19 pandemic; food-borne pathogen outbreaks and investigations (STEC testing protocol, replacement of PFGE with WGS); 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, AFL has consistently met testing and service performance measures including those laid out in the Agreement.

Finally, AFL provided comprehensive and successful management of activities occurring during the global COVID-19 pandemic while maintaining services essential to the release and sale of safe food and beverages in Ontario. This is discussed further below.

COVID-19

In the fourth quarter of 2019/20, the global COVID-19 pandemic resulted in emergency measures being implemented across the Laboratory Services Division starting March 17, 2020. AFL implemented operational changes to meet recommendations from Public Health Ontario. Incident Management System (IMS) communications occurred with OMAFRA and other clients as required. Significant planning for business continuity and the prioritization of food safety testing also occurred.

During the pandemic, communications with AFL PMC members occurred electronically to identify any operational changes required at AFL and OMAFRA. All actions taken by AFL were sanctioned by the AFL PMC.

In keeping with national and provincial emergency measures, AFL reduced the number of laboratory staff at 95 Stone Road by approximately 50% and began working various rotating schedules in the labs to facilitate physical distancing. Nearly all OMAFRA staff at 1 Stone Road moved to “work from home”. Also, in many cases, OMAFRA field staff were unable to collect the samples per Schedule D described allotments.

Reduction of staffing at AFL required the prioritization of testing and extension of some turnaround times (TAT). In a series of electronic meetings, emails and telephone discussions, OMAFRA identified their top priority projects; mainly surveillance projects aimed at detecting veterinary drug residues in raw meat, raw milk testing, water testing and any food safety issues identified across Ontario. Routine monitoring projects for meat, dairy, foods of plant origin, and agricultural development programs were maintained to the extent that AFL’s reduced capacity allowed. Raw milk testing for cow and goat milk is a service essential to the continued sale of milk in Ontario. AFL was able to continue full testing capacity for milk producers, while supporting this regulatory requirement and maintaining on-call and after-hour confirmation of positive milk loads identified in field testing. Regular status updates on lab capacity and protocols were provided to AFL PMC and DFO. This provided the opportunity to address concerns with delivery of services, or receipt of samples in real time.

Despite the on-going reduction of staff, and in tandem with changes in OMAFRA and other clients’ workflows, AFL met the prioritized testing needs of OMAFRA, as well as dairy testing for the Dairy Farmers of Ontario, and other food safety related testing identified as essential to the continued flow of food throughout the Province. AFL is proud of its staff who worked throughout the emergency to provide essential testing, in order to support the continued supply and sale of food and beverage products in Ontario.

AFL saw both surges and declines in the flow of samples across all lab sections during the fourth quarter in 2019/20. Overall, sample submissions were down by 20-25%. There was an estimated loss of revenue of $120K in 2019/20 due to COVID-19, $105K from external parties and $15K from internal users, causing AFL to miss its mandatory revenue growth target. While

financial impact is recognized and expected in times of emergency, the total impact of the pandemic on AFL is still unknown.

In 2020/21, it is anticipated that there will be continued uncertainties in the number of samples submitted to AFL, due to various impacts of the pandemic at the farm level. Reduced meat inspection samples and extensions to TATs are expected to be the case for some time yet. Staffing will slowly be brought back to full capacity as directed by the Ontario Government and the University of Guelph. However, there is always an ongoing risk of a staff member testing positive for the virus, leading to the isolation of a group of staff and impacting laboratory operations.

It is unlikely that AFL will achieve the mandatory compliance requirement of 2.5% revenue growth in 2020/21 due to the ongoing reductions in sample numbers. Lower sample numbers translate into less efficient batch sizes, which means that the same number of staff are still required to run the tests, limiting the potential for cost savings. The financial bottom line is likely to suffer in 2020/21, from the combination of lower revenue and relatively fixed costs.

6.2 Mandatory Compliance Requirements

6.2.1 Increase in Revenues

AFL achieved third-party revenue of $8.715M in 2019/20, a growth of 1.8% over the 2018/19 third-party revenue of $8.557M. This was marginally lower than the Agreement's mandatory compliance requirement for a 2.5% annual increase in revenues. This small shortfall can be related to the COVID-19 pandemic, where there was an estimated $105K of lost external revenue. If this had been realized, AFL would have achieved a revenue growth of 3.1%.

In the coming year, AFL is looking to continue to leverage its opportunities for growth in pesticide GLP testing, microbiology and 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. AFL will continue to increase and diversify revenues from third-party organizations.

6.2.2 Emergency Response Plan and Surge Capacity Plan

AFL has an Emergency Response Plan and a Surge Capacity Plan in place, which are comprehensive and ensure that AFL can fulfill the objectives of the Program Schedule. The Plan outlines business continuity procedures in the event of critical infrastructure outages, staff unavailability, pandemic, facility inaccessibility/evacuation or a surge in service requirement. The Emergency Response Plan was used to respond to the emergency measures, implemented in Ontario in March 2020, in response to the COVID-19 pandemic. AFL rapidly mobilized a comprehensive and successful Incident Management Plan (IMP), maintaining services to clients essential to their businesses and to the release of safe food and beverages in Ontario. The majority of services continued to be provided at AFL, while managing 100% of dairy samples. This was achieved through strategic rotation of staff through shifts on-site.

6.2.3 Emergency Simulation Exercises

Emergency Response procedures at AFL have been developed to mirror the OMAFRA Emergency Response program. This Incident Management Plan (IMP) is aligned with OMAFRA to further protect OMAFRA's need for continuity in Laboratory Services in difficult times. AFL will ensure ongoing development in the areas of staff training, continuous updating and improving the program, and documentation.

Although no formal exercises were performed in 2019/20, testing interruptions from building closures due to maintenance issues with CBRE, as well as 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 requirements for expertise in existing and emerging areas, AFL maintains a staff complement with advanced scientific training, 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, 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 the Laboratory Services Division. Equipment and instruments are closely monitored, identifying requirements for repair or replacement. Also, the need for additional equipment for testing to support new methods is considered. The Division follows a scheduled plan to replace computer hardware and software as the organization faces growing volumes of data. This equipment is necessary for the ongoing operation of AFL.

In 2019/20, the AFL effectively met the annual challenge of maintaining capital intensive technology and infrastructure. AFL continues to reinvest in those capital items, strategically identified by its management team, in keeping with the available financial resources. Ongoing support from OMAFRA's Capital Expenditure Fund, to provide direction and funds annually, for equipment purchases is a critical part of this process, given the challenges in securing external funds for reinvestment. In 2019/20, OMAFRA's capital investment of $500,000 was used to replace a BactoScan instrument used in support of the DFO/ODC/OMAFRA contract.

Other equipment purchases required for the ongoing support of OMAFRA programs and third-party client needs are funded from operating income in excess of budget and from program carry forwards. In 2019/20, the original Scanning Electron Microscope (SEM) was also replaced after 26 years of operation. This heavily used instrument is key to the support of the AFL's Foreign Material ID services and Canadian Veterinary Urolith ID service.

6.2.6 Resources and Capacity to Administer AFL

The University confirms that it has the necessary resources, including technical and support staff to administer AFL. John Melichercik[18], Co-Executive Director of Laboratory Services Division and Director of AFL continued to provide outstanding leadership and support of the governance structure as an 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 Director of Finance John Mah, the AFL Program is supported by employing four operation managers: Shu Chen, Linda Lissemore, Perry Martos and Andrew Moore. In addition, Karen Peer, Executive Assistant, Liz King, Quality Assurance Manager, Lynne Fruhner, OMAFRA Agreement Manager, Pauline Nelson-Smikle, Information Technology Manager and Joel Jobin, Facility Manager, also play critical roles in supporting the program. Together, they lead AFL's complement of 137 supervisory, support, and technical staff.

AFL cross-trains within a discipline, 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 6.1 provides the highest degree earned for AFL's staff complement.

Table 6.1: 2019/20 AFL Staff Complement by Highest Degree Earned

Doctoral (e.g. PhD)	Advanced (e.g. MSc)	Undergraduate	Other	Total
10	25	57	45	**137**

The flexibility afforded in using cross-trained technicians and/or adding temporary positions, in cases of sudden or short-term capacity demands, allows 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.

[18] John Melichercik retired on June 30, 2020. Dr. Linda Lissemore, was appointed as Interim Co-Executive Director of Laboratory Services Division and Director of AFL until August 2021.

6.2.7 Annual Summary of the ISO 17025 Accreditation Report

LSD, including 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 the scopes of accreditation.

LSD is accredited by SCC in three program specialty areas:

- Agriculture Inputs, Food, Animal Health and Plant Protection (AFAP);
- Test Method Development and Evaluation and Non-Routine Testing (TMD/NRT); and
- Good Laboratory Practice (GLP) compliant with requirements of OECD Principles of GLP; Test Facility, Test Site.

Currently, LSD has 93 accredited tests listed on their SCC scope (February 2020), comprised of 62 AFL tests and 31 AHL tests. LSD completed the biennial SCC audit in October and November 2019. SCC will conduct their next biennial audit of LSD in Fall 2021. LSD received accreditation to the most recent standard, ISO/IEC 17025:2017. For a method to be accredited, competence must be demonstrated by submitting the method, forms, training records, validation/verification records, blind proficiency testing results and internal audit report to SCC for inspection. In June 2019, AFL streamlined its scope by withdrawing six methods rarely used.

Currently, LSD is accredited by CALA for eight environmental tests (11 CALA appendices) of which seven are AFL tests, including three microbiology tests licensed under the Ontario Safe Drinking Water Act (OSDWA).

Table 6.2 shows the numbers of tests and accredited methods used in OMAFRA Programs. Some tests are common to more than one program and are included for each program they are used in.

Table 6.2: 2019/20 – Numbers of Used in OMAFRA Programs

Branch	Number of Tests	SCC Accredited	CALA Accredited
Meat Inspection Program	34	22	2
Dairy Food Safety Program	51	38	2
Food of Plant Origin Program	38	24	1
Total – Food Safety Program	**123**	**84**	**5**

In addition, AFL performs 50 tests for the OMAFRA Horticulture and Agriculture Land Use program and the Environmental Management program, 15 of the tests are accredited by SCC, CALA or the OMAFRA soil fertility program.

New Certifications/Licenses

AFL is now an approved provider of Laboratory Analysis with the National Conference on Interstate Milk Shipments (NCIMS / US-FDA Grade A Milk Program). This supports export of milk and milk products from Ontario into the USA.

In 2019/20, AFL successfully became an Analytical Testing licence holder under the Cannabis Act. This allows AFL to test cannabis and related products for composition and compliance indicators using existing methods, as well as some new methods to be developed.

6.2.8 AFL Program Sample Testing Data

Quarterly reports are provided from AFL to OMAFRA demonstrating compliance with the performance indicators assigned to sample testing data. AFL and OMAFRA have integrated their information management systems to allow for seamless transfer of data between organizations. Please see Section 6.3.3 High Quality Reliable Laboratory Results for the annual summary of the performance data.

6.2.9 Changes to Methods or Testing Protocols Used in Ministry Samples

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
- Decisions documented in meeting minutes.

AFL remained in compliance throughout 2019/20.

Based on AFL's investigation into the performance of the CHARM Quad3, and subsequent manufacturer modification to remediate the kit, OMAFRA issued an authorized memo from the Director of the Food Safety Systems Development Branch to allow AFL to reinstate use of Quad3 testing again. As an extra measure of performance, AFL will use LC-MS/MS confirmation testing when required.

6.2.10 Notifications to the Ministry

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

AFL 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 provided each fiscal quarter, AFL also tracks the number of samples received that are suitable for testing, unsuitable for testing or that have insufficient volume for testing. AFL notifies the Ministry for further direction in the case of unsuitable or insufficient samples.

AFL and the Ministry collaborate to ensure that only high integrity samples are used for Ontario’s regulatory testing program. In 2019/20, the impacts of the pandemic added another level of complexity to OMAFRA’s sample delivery system. Due to COVID-19, couriers faced reduced staffing and significant increases in the demand for package delivery. Courier companies were no longer meeting their agreed upon expedited shipping times and sample quality started to degrade in transit. This resulted in a number of OMAFRA samples arriving at AFL that were unsuitable for testing. The need for OMAFRA to provide substitute samples increased costs for sample collection. This problem may continue to escalate if couriers cannot re-establish service times. In addition, the warm summer months cause a higher risk of sample deterioration since samples sit even longer in unrefrigerated warehouses and courier trucks.

The implementation of automated “time in transit” recording in the AFL LIMS, in 2018/19, provides additional data to consider when assessing the quality of the test sample that is reported by 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. It has proven to be a highly useful tool during the pandemic in assessing sample integrity when courier services are suboptimal.

6.3 Key Performance Indicators

6.3.1 Emergency Preparedness

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

The COVID-19 pandemic provided real-time application of the AFL's Emergency Preparedness protocols. AFL met the target for 100% of action requests to meet implementation targets set by the AFL Program Management Committee.

AFL continues to meet the Ministry's requirements during the pandemic for prioritizing samples and providing ongoing services within a modified workplace.

6.3.2 Emergency Situations

AFL continues to successfully support the Ministry in response to, and management of, significant, unanticipated, or urgent incidence 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 2019/20, AFL was required to install an LC-MS/MS method for confirmation of drug residues in raw milk to secure confidence in the use of the Quad3 rapid test. This involved acquisition of reference materials, installing and verifying the method for the target residue compounds and retesting several samples which had been identified as having questionable results.

The "white residue" issue at 95 Stone Road, identified in 2018/19, continues to be monitored to ensure no recurrence. To date, there has been no reoccurrence. AFL continues to accommodate CBRE's ongoing maintenance/restoration activities within the work schedule.

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

6.3.3 High Quality Reliable Laboratory Results

Tables 6.3 to 6.5 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 AFL PMC meetings.

The performance measurements are the percentages 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 that Turnaround Times exceed 98%; Corrected Reports are less than 2%; and Unsuitable for Testing are less than 2%.

The Food Safety Program (Total) and 2019/20 Summary are expressed as weighted averages. For 2019/20, there was 99.90% overall compliance for the Food Safety Program with respect to Turnaround Times, exceeding the service standard of 98%.

Table 6.3: 2019/20 Food Safety Program Compliance with Turnaround Times

Program	Q1	Q2	Q3	Q4	2019/20
Meat Inspection Program	100.00%	99.99%	100.00%	99.95%	**99.98%**
Foods of Plant Origin	99.57%	99.45%	99.74%	100.00%	**99.57%**
Dairy Food Safety Program	100.00%	99.81%	99.97%	100.00%	**99.95%**
Food Safety Program (Total)	99.91%	99.80%	99.97%	99.97%	**99.90%**
Agriculture Development Branch	99.18%	100.00%	100.00%	100.00%	**99.50%**
2019/20 Value					**99.90%**
Target					**98%, ↑**
2018/19 Value					**99.55%, ↑**

In 2019/20, there was 0.22% rate of Corrected Reports for the Food Safety Program. This exceeded the service standard of a maximum of 2%.

Table 6.4: 2019/20 Food Safety Program Compliance for Corrected Reports

Program	Q1	Q2	Q3	Q4	2019/20
Meat Inspection Program	0.28%	0.04%	0.11%	0.12%	**0.14%**
Foods of Plant Origin	0.06%	1.46%	0.17%	0.00%	**0.65%**
Dairy Food Safety Program	0.06%	0.28%	0.23%	0.00%	**0.14%**
Food Safety Program (Total)	0.14%	0.46%	0.16%	0.08%	**0.22%**
Agriculture Development Branch	1.48%	0.00%	0.00%	0.00%	**0.89%**
2019/20 Value					**0.22%**
Target					**2%, ↑**
2018/19 Value					**0.52%, ↑**

In 2019/20, there was 0.22% rate of Samples that were Unsuitable for Testing in the Food Safety Program. This exceeded the service standard of a maximum of 2%.

Table 6.5: 2019/20 Food Safety Program Compliance for Samples Unsuitable for Testing

Program	Q1	Q2	Q3	Q4	2019/20
Meat Inspection Program	0.30%	0.55%	0.00%	0.14%	**0.25%**
Foods of Plant Origin	0.06%	0.00%	0.00%	0.00%	**0.02%**
Dairy Food Safety Program	0.12%	0.19%	0.31%	0.69%	**0.28%**
Food Safety Program (Total)	**0.17%**	**0.31%**	**0.10%**	**0.30%**	**0.22%**
Agriculture Development Branch	0.00%	0.00%	0.00%	0.00%	**0.00%**
2019/20 Value					**0.22%**
Target					**2%, ↑**
2018/19 Value					**0.08%, ↓**

6.3.4 Effective and Timely Communication of Violative or Actionable Test Results

Table 6.6 presents the performance measure of the consistency with which AFL provides timely test results required for actionable response to stakeholders.

All incidents of inconsistency in providing, or that have a risk of not providing, timely test results require an actionable response. The measurement of the performance metric is, in practice, how 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 AFL's Corrective Action Preventive Action (CAPA) database. The performance target is set as continuous improvement and resolution of initiatives based on review of incident reports.

Table 6.6: 2019/20 Trend Summary - Frequency

CAPA Classification	Q1	Q2	Q3	Q4	2019/20
Administrative	2	6	3	1	12
Technical	5	2	1	3	11
Force Majeure	2	2	1	0	5
Schedule D (Total)	**9**	**10**	**5**	**4**	**28**

In the 2019/20 Sampling Plan Year, 99.90% of all tests were reported accurately (54,309 out of 54,366).

There was one continuous improvement with significant relevance for OMAFRA reported in 2019/20. AFL installed and verified a new ICP-MS instrument providing a lower detection limit (MDL) for lead in maple syrup (OH0005) and honey (OH0004). The new MDL for the method TOXI-064 is now 0.002 ppm, previously 0.01 ppm. This improvement will provide enhanced surveillance capacity to OMAFRA, helping to assure food safety for the public.

The majority of CAPAs from the 2019/20 Sampling Plan year were low risk. Many incidents were administrative in nature, due to data-entry. These types of incidents are flagged by the quality checks within the OMAFRA and AFL information systems and do not impact human health, a key criterion considered when assigning risk or organizational reputation.

There were two instances of high risk CAPAs, rated such as they had the potential to impact the reputation of OMAFRA and the Agriculture and Food Laboratory. One incident was due to the faulty manufacture of a rapid test kit, leading to false positive results (Quad3 test). The other incident occurred due to an error made during analysis causing delayed results. AFL has ensured appropriate staff training has occurred to address this high risk event.

This parameter is reported on quarterly at the AFL PMC meetings. The University was able to meet the target of ensuring continuous improvement and resolving initiatives based on review of the incident reports.

6.3.5 Effective Response to Incidents

In 2019/20, AFL delivered excellence in regard to compliance with communication protocols, providing effective response to food contamination and other serious plant and environmental hazards with potentially grave human health or economic consequences.

The performance measurement is the percentage of tests requiring an actionable report from AFL that met communication criteria, Sampling and Testing Plan, or Standard Operating Procedure for Adverse Results Notification. The performance target is set at 98%.

AFL met the performance target 100% of the time. All actionable results were reported to OMAFRA per 95S-028. Overall, for 2019/20, AFL LIMS adverse result alert program generated 366 alert emails, reporting 1,013 alertable, adverse or presumptive positive test results for 682 samples.

The proportion of test results that are alertable, adverse or presumptive positive versus the total number of tests reported was 1.25% this year, an increase from 1% in 2018/19.

This parameter is reported quarterly at the AFL PMC meetings.

6.3.6 Development of New/Improved Detection Methods

The performance metric for the development of new and improved detection methods is an 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, typically based on historical data.

OMAFRA did not activate their Method Development Priority List in 2019/20. Thus, there is no activity to report. A new OMAFRA priority list for development is expected in early 2020/21. Progress with method development timelines are reported quarterly at the AFL PMC meetings.

6.4 Reporting Requirements

6.4.1 Summary of the ISO 17025 Report

See Section 6.2.7 for the summary of the ISO 17025 Report.

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 goals of continuous improvement and 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 2019/20

The Agreement supports 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. Together with the University's state-of-the-art research infrastructure, ranging from controlled environment facilities to leading edge laboratories, these places create a provincial platform for excellence in agri-food research and innovation.

Ontario's agri-food research stations enable research that is farm and field-tested. The stations are also key outreach spaces where researchers and staff welcome producers, policy makers, international visitors, students and industry partners.

In 2019/20, there were significant infrastructure development activities under ARIO's Infrastructure Strategy. These developments are detailed in Section 7.1.1.

Significant progress was made in preparing surplus properties at the Kemptville and Alfred Campuses for final disposition by the Province. At Kemptville, a major water main project to separate the water service from the main campus property previously sold to the Municipality, and the removal of a pesticide storage tank and related contaminated soil were all substantially completed by year end. All tenants have now left the Kemptville farm property, and final clean-up was largely completed. The University continues to support ARIO's disposition-related due diligence activities for these properties and looks forward to the winding up of Agreement-related involvement at these locations.

COVID-19

The COVID-19 pandemic impacted the Property Management program in two distinct ways, construction limitations and operational changes. Restrictions were put in place by the Province, resulting in suspension of some construction-related activities, leading to a number of delays. However, by the end of 2019/20, most construction activities had resumed with appropriate mitigation and safety measures in place.

As mentioned in Section 3, consistent with public health policy, the UofG urged a significant scale back of research activities due to COVID-19. However, with an exemption process for time sensitive and critical research and the need for animal care, all Research Stations remained continuously operational throughout the pandemic. With guidance and support from University services, physical distancing and enhanced hygiene practices were incorporated into Research Station activities. In addition, researchers were asked to reduce their team size to the greatest extent possible, in order to minimize the number of additional staff that needed to be present at the Research Stations. Overall, some reductions in research activity occurred at the Livestock Research Stations. Reductions occurred to a lesser extent at the Crop Research Stations, as most projects were scheduled to start several months following the declaration of the provincial emergency.

Virtual meetings of R/PM PMC participants occurred regularly to provide updates on the status of operations, construction and plans for managing research projects.

Research resumption will continue throughout the summer months, and it is expected that research activities will return to closer to normal levels. Pent up demand could create additional pressure at the livestock stations. There continues to be an ongoing risk of staff testing positive for the virus, leading to the isolation of all staff at a station, which would have a significant impact on operations. The University is taking measures to mitigate the risk. The UofG is also using the learnings from the COVID-19 pandemic to update and reorganize its business continuity plans. These will be discussed with R/PM PMC in the Fall.

7.1.1 ARIO Properties Infrastructure Update

The UofG is working closely with its partners to execute ARIO's Infrastructure Strategy, as major construction projects are underway across the Province according to the long-term research objectives of the strategy. Although funded outside of the Agreement, the implementation of the Infrastructure Strategy requires considerable allocation of UofG staff resources and impacts research capacity in the short term through construction and transition. In the final quarter of the year, all projects were required to implement pandemic response measures, and many had a period of suspended activity.

7.1.1.1 Major Capital

In 2019/20, work continued or was initiated on several major capital projects across the research station portfolio. Major capital projects are funded and managed through project-

specific Transfer Payment Agreements (TPAs) between ARIO and the University which provide funding outside of the Agreement and have separate reporting requirements. Project summaries are included below.

Ontario Beef Research Centre (Elora Research Station)

The Ontario Beef Research Centre (OBRC) at the Elora Research Station is currently under construction through separate agreements with ARIO and funded in part by Beef Farmers of Ontario. The $15.5M initial phase of the project, which included the construction of a new cow-calf housing and handling facility, plus new office and research spaces, was completed in September 2019. Its unveiling was celebrated with an Open House attended by the Minister of Agriculture Food and Rural Affairs in August 2019.

The expansion and redevelopment of the pasture facilities associated with the OBRC were also ongoing through the year, funded through the minor capital program. The expansion portion of the pasture project provides approximately 50 hectares of new managed pasture with a central handling facility and is expected to be completed in time for use in Summer 2020. The redevelopment aspect of the project will improve approximately 60 hectares of existing pasture with updated handling facilities, fencing and utilities. Construction of this portion is expected to commence in 2020/21. Demolition of the original Elora Beef Research Station was completed in 2019/20, funded through the initial phase. The final phase of the OBRC development will be the construction of a new Beef Feedlot Facility, expected to commence in 2020/21.

Precision Feed Preparation and Storage Facility (Elora Research Station)

The existing feed storage facility at the Elora Research Station for the Ontario Dairy Research Centre and the Ontario Beef Research Centre is being replaced with a new Precision Feed Preparation and Storage Facility. This $9.45M facility will provide new capacity for the preparation of precise and consistent research rations for the dairy and beef herds, as well as expanded feed storage capacity in anticipation of an expansion of the beef research herd due to the transfer of cattle from the New Liskeard Agricultural Research Station. The Precision Feed Preparation and Storage Facility is expected to be completed in 2020/21.

Ontario Swine Research Centre (Elora Research Station)

ARIO and the University executed a $15M TPA in December 2018 for the construction of a new swine research facility at the Elora Research Station. This facility will replace the existing, aged facility at the Arkell Research Station. A design and construction committee, including UofG faculty and staff, industry (Ontario Pork) representatives and OMAFRA staff, have met regularly through 2019/20 with the design consultants to determine the scope of the project given the budget available. A schematic design package summarizing the scope and preliminary plans is expected early in 2020/21. The tender for construction is anticipated in the third quarter of 2020/21, with completion of the project expected in the second quarter of 2022/23.

Guelph Turfgrass Institute

Construction of the Guelph Turfgrass Institute administration building, which will replace the existing building at the Guelph Research Station, was ongoing through 2019/20. This $15M project will allow the University to vacate the current Guelph Research Station, as directed by Infrastructure Ontario to OMAFRA / ARIO, and relocate to a new site on the University of Guelph main campus. Project activity was suspended in March under the Province's pandemic response regulations for approximately one month. The suspension of activity, in addition to setbacks in the provision of utilities to the site, have caused a delay, with completion now expected in January 2021. The construction of turf research plots at the new site was completed in 2018/19 and they are now in use. Research activity at the existing ARIO owned site is winding down and 2020/21 is expected to be the final year for field research at that site.

Winchester Agronomy Service Building

The new Winchester Agronomy Research Service Building was completed in 2019/20 and celebrated with a visit from the Minister of Agriculture Food and Rural Affairs in June 2019. The new $3.5M facility provides administrative and staff spaces, seed and sample preparation and storage, workshop, and equipment storage spaces. This new facility, combined with the existing machinery storage and pesticide storage buildings, allows Winchester to operate as a stand-alone research station.

New Liskeard Agronomy Service Building

New facilities, similar in design to the ones completed at Winchester, were proposed for the eastern portion of the New Liskeard Agricultural Research Station where most of the crop research plots are located. Given the unstable clay soils at the station, identified in detailed geotechnical analysis and testing, 'pre-loading' of the site was required. This involved loading the development area with granular materials in sufficient quantity to induce settlement in the clay, preventing settlement after construction. The preloading of the site was completed in August 2019, with approximately 1.5 metres of material, on top of 1.5 metres of permanent grade raise required for drainage of the site (e.g. 3.0 metres of material applied to the site, with 1.5 metres to be removed following settlement). Tender for the construction of the new service building, equipment storage and chemical storage structures was deferred due to the uncertainly in construction associated with the ongoing pandemic. The original budget for the facility according to the TPA between ARIO and the University was $4.0M, however cost increases are expected due to the pre-load requirement and the extended schedule for completion. An updated budget forecast will be submitted following construction tender in the first quarter of 2020/21.

Ridgetown Campus Field Crop Service Building

Design and planning work continued through 2019/20 for the proposed Field Crop Service Building at the Ridgetown Campus. This proposed building consolidates support facilities for crop research into one central and modern facility, replacing a number of outdated and inefficient spaces across the Campus. Tender documents for the proposed $6.5M facility were completed in 2019/20, however, tender was deferred due to uncertainties associated with the COVID-19 pandemic. Tender is expected to occur in the first quarter of 2020/21, along with the signing of a TPA between the University and ARIO.

7.1.1.2 Minor Capital

Under the minor capital program, $4.5M was recovered from ARIO, outside of the Agreement, for 41 projects supporting state of good repair and program capacity improvements. In addition, $1.3M was recovered for projects associated with the Kemptville Campus in preparation for disposal of the property. An updated five-year minor capital program priority list was submitted to OMAFRA in February 2020 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).

The Minor Capital Program is an essential source of funds to maintain the state of good repair and research capacity (equipment and built infrastructure) at the ARIO properties. Significant projects funded in 2019/20 include:

- Plot combines for field research purchased for each of Huron, Elora, Winchester and New Liskeard Research Stations;
- Laboratory and storage cooler upgrades at the Simcoe Research Station;
- Irrigation upgrades at the Simcoe Research Station;
- Beef pasture expansion and redevelopment at the Ontario Beef Research Station at Elora; and
- Quarantine and isolation facility upgrades at the Alma Research Station.

An updated five-year priority list (covering the fiscal years 2021/22 to 2026/27) will be submitted in December 2020.

7.2 Mandatory Compliance Requirements

None

7.3 Key Performance Indicators

7.3.1 Station Revenue

Table 7.1 provides a summary of all revenues resulting from the activities within the Property Management program, including the sales of farm products, rental revenues and recoveries for station/facility usage and animal purchases. Property specific information can be found in Section 2.3.5.2. In 2019/20, the five year rolling average for all revenues and recoveries related to the Research Stations was $6,444K. This exceeded the target in the Agreement of $4,871K by 32%. This was a 1% decline from the 2018/19 five year rolling average of $6,518K.

Table 7.1: Station Revenues and Recoveries by Year
(in thousands of dollars)

Revenues and Recoveries	2015/16	2016/17	2017/18	2018/19	2019/20
Revenues (External)					
Sales-Farm Products, Services	4,461	3,634	4,777	4,600	4,266
Other	63	70	102	183	215
Facility Rentals	1,013	1,084	1,319	1,182	985
Total Revenues (External)	**5,537**	**4,787**	**6,199**	**5,965**	**5,465**
Recoveries (Internal)	**815**	**808**	**786**	**893**	**963**
Sales (net)-Animals, Farm Products	240	239	40	151	202
Research Station Fees	316	289	549	417	426
Facility Usage (net)	259	280	197	325	334
Total Recoveries (Internal)	**815**	**808**	**786**	**893**	**963**
Grand Total	**6,352**	**5,596**	**6,985**	**6,858**	**6,428**
Five Year Average – 2019/20					**6,444**
Target					**4,871, ↑**
Five Year Average – 2018/19					**6,518, ↓**

Although station revenues and recoveries remain well above the target established, there has been a general decline in total revenue since the peak in 2017/18. The is mainly attributed to two factors: reductions in cropping revenue at the Elora Research Station and reductions in facility revenues due to the loss of the ARIO tenant share of operations and maintenance (O & M) costs. Elora cropping revenue peaked in 2017/18 when UofG was given full access to newly acquired lands purchased by ARIO. Since that year, lands have been allocated for pasture expansion and new construction, as planned, reducing the acreage available for cash cropping.

The areas for cash cropping and the associated revenue are expected to stabilize in the medium term, until other ARIO real estate initiatives are implemented that further reduce lands available. The budget impact of reduced cash cropping is mitigated in part by a reduction in input and harvest costs. Tenant facility revenues from ARIO for O & M costs are directly related to the number of ARIO tenants and the amount of space they occupy. As ARIO sells tenant occupied properties, like the Kemptville and Alfred Campuses, corresponding tenant facility revenues are also reduced. This decline in revenue is expected to continue in the future as other properties are partially or fully sold, such as is underway for the New Liskeard Agricultural Research Station. In general, however, there is no net budget impact associated with reductions in ARIO tenants, as there is also an equal reduction in O & M cost.

7.3.2 Research Station Capacity and Utilization

ARIO Property Use and Capacity is measured through the calculation of a utilization rate for each Research Station, with the 2018/19 utilization rates used as targets. For Livestock Research Stations, the unit of tracking is an Animal Research Day (ARD). Animal use is strictly controlled by Animal Use Protocols (AUPs) required under the Animals for Research Act and Canadian Council on Animal Care. Station managers report 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 (ha)). Area is allocated on a seasonal basis, and there is generally no overlap of trials.

The utilization rate 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 accounts for the need for crop rotation, replacement animals or cycle time in space-based animal facilities.

In general, the utilization rates for Crop Research Stations are higher than those of the Livestock Research Stations. Crop trials, to some extent, can expand to better utilize available research plot area by increasing replications or increasing 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 usage. For example, in the Beef Cow-Calf facilities at the Ontario Beef Research Centres 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 though space may be available to conduct this type of work.

The Research Station capacity and utilization rates for 2019/20 are shown in Tables 7.2 and 7.3. Livestock Research Stations had an average utilization rate of 50.5% in 2019/20, exceeding the target of 49%. This was a small increase over the utilization rate for Livestock Research Stations in 2018/19. Utilization at the beef stations (Elora and New Liskeard) were lower than last year due to the transition to the new facility at Elora part way through the year. As

experienced with the Ontario Dairy Research Centre, research projects tend to wind down leading up to a move to a new facility and can take several years to fully recover. This reduction in utilization was offset by increases at several other stations.

Table 7.2: Livestock Research Station Capacity and Utilization

Livestock Research Station	Capacity (ARD)	Research Utilization (ARD)	Research Preparation (ARD)	Utilization Rate (%)
Alma - Aquaculture	111,690	8,961	28,105	33.2%
Arkell - Equine	11,680	11,113	365[19]	98.3%
Arkell - Poultry	3,923,750	1,903,755	335,800	57.1%
Arkell - Swine	156,950	115,587	14,600	82.9%
Elora - Beef	206,995	14,595	38,895	25.8%
Elora - Dairy	173,010	54,723	83,950	80.2%
New Liskeard - Beef	164,250	140	27,375	16.8%
Ponsonby – General Animal Facility	100,375	25,656	21,900	47.4%
Ponsonby - Sheep	102,200	2641	10,950	13.3%
Total - Livestock Stations	**4,950,900**	**2,137,171**	**561,940**	**50.5%[20]**
2019/20 Value				**50.5%**
Target				**49%, ↑**
2018/19 Value				**48.9%, ↑**

Crop Research Stations had an average utilization rate of 80.7% in 2019/20, exceeding the target of 78%. Elora and Ridgetown continue to post high utilization rates, while Emo and New Liskeard have space available for additional research projects. With the hiring of the MacSon Professorship in Agronomy for Eastern and Northern Ontario, Dr. Joshua Nasielski, the utilization rates are expected to increase at those stations in the future.

There were several minor capacity modifications that occurred in the Crop Research Stations data in 2019/20. Capacity at Emo was reduced from 21.25 ha to 17.85 ha based on remeasurement of non-cropped areas. Similarly, Simcoe capacity was reduced from 69.40 ha to 46.78 ha based on remeasurement of building, parking and lawn areas and reclassification of some areas as not suitable for research. Winchester capacity increased from 36.42 ha to 40.51 ha based on remeasurement of building and yard areas following construction of the new buildings. Finally, Woodstock capacity was reduced from 60.70 ha to 58.88 ha, as more area was leased by the Canadian Outdoor Farm Show for demonstration purposes in 2019/20. The net result was that capacity available for research plots was reduced from 618.81 ha in 2018/19 to 595.13 ha in 2019/20. Research preparation area, which is the area used from crop rotation

[19] Research Preparation at Arkell – Equine dropped from 1,095 in 2018/19 to 365 days in 2019/20, as only one horse was replaced versus three in the previous year.

[20] This is an average of the utilizations rates for each station.

increased from 236.17 ha in 2018/19 to 249.81 ha in 2019/20. Rotation varies based on agronomic practice and the specific requirements of the research projects. Overall, research utilization increased from 251.07 ha to 253.13 ha in 2019/20.

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))	Utilization Rate (%)
Cedar Springs	7.28	6.47	0.00	88.9%
Elora	154.35	54.31	95.51	97.1%
Emo	17.85	6.64	1.05	43.1%
Guelph	76.89	55.68	0.00	72.4%
Huron	42.90	21.85	18.62	94.3%
Muck	2.06	1.86	0.00	90.2%
New Liskeard	51.31	7.73	18.09	50.3%
Ridgetown	96.32	39.66	52.61	95.8%
Simcoe	46.78	25.50	17.40	91.7%
Winchester	40.51	17.04	19.42	90.0%
Woodstock	58.88	16.39	27.11	73.9%
Total - Crop Stations	**595.13**	**253.13**	**249.81**	**80.7%**[20]
2019/20 Value				**80.7%**
Target				**78%, ↑**
2018/19 Value				**78.1%, ↑**

The University is pursuing opportunities to improve utilization rates through efficiency (e.g. allowing more trials to occur concurrently), infrastructure improvements (e.g. improved tile drainage allowing a greater number of trials to take place at stations), encouraging additional research projects at underutilized stations and other actions to streamline research program administration. Considering these efforts are in the early stages, modest improvements in utilization should be expected in the future.

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): Vacant (renovations underway);
- 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): Vacant;
- 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): Christina Lockerbe; and
- Simcoe Research Station (Station Residence): Amanda Green.

7.4.2 Repair Priority List

The University develops and submits, typically 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 February 2020. The next list will be submitted in December 2020.

Appendix A Audited Financial Statements

University of Guelph

OMAFRA Agreement

Financial information

Year ended April 30, 2020

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, 2020 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, 2020.

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, 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.

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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 27, 2020

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 (Recognized) $	Minor Capital Repairs $	Total OMAFRA 2020	Total OMAFRA 2019
Revenue									
Provincial	37,043	5,292	6,771	6,913	13,399	0	9,857	79,275	75,526
Sales of Goods and Services	99	0	7,762	8,715	4,248	0	0	20,824	20,296
Investment Income	0	0	0	0	0	6	0	6	629
Other	49	0	3	6	1,218	0	0	1,276	1,492
Total Revenue	**37,191**	**5,292**	**14,536**	**15,634**	**18,865**	**6**	**9,857**	**101,381**	**97,943**
Expenses									
Salaries	9,516	162	8,098	8,418	7,586	6	0	33,786	33,405
Non Salary Benefits	1,824	27	2,209	2,471	2,108	0	0	8,639	8,487
Support for Faculty Costs	11,145	1,900	0	0	0	0	0	13,045	13,045
Travel	396	203	75	48	33	0	0	755	795
Operating	15,379	3,000	6,354	5,289	10,594	0	9,857	50,473	47,059
Internal Recoveries	(1,069)	0	(2,200)	(592)	(1,456)	0	0	(5,317)	(4,848)
Total Contract Expenses	**37,191**	**5,292**	**14,536**	**15,634**	**18,865**	**6**	**9,857**	**101,381**	**97,943**
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, 2020

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 2018, a five-year agreement [the "Agreement"] was signed between the University and OMAFRA [Ontario Ministry of Agriculture, Food and Rural Affairs], replacing the agreement signed between the University and OMAFRA in 2008. This financial statement has been prepared under the terms of the Agreement, 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.

	2020	2019
Opening Balance	37,756	35,242
Funds Received	66,628	71,300
Expenditure	(68,923)	(68,786)
Ending Balance	35,461	37,756

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, 2020

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.

Appendix B Student Research Spotlight – Ontario Dairy Research Centre

Student Research Spotlight

Amanda Armstrong

Project title: Understanding the relationship between injuries and lameness in dairy cattle

Lameness is one of the top welfare concerns that the dairy industry faces. Injuries to hocks and knees of dairy cows are also a growing concern in the industry due to their high prevalence. There is very little research addressing the potential link between injuries and lameness, and whether one causes the other. Traditional lameness research has focused on hoof lesions (e.g. sole ulcers, strawberry foot rot, etc.) and their relationship with lameness, while few studies have examined the proportion of lameness that can be attributed to other issues, such as injuries. There were two main objectives for our research: 1) to determine if there is an association between hock and knee injuries AND lameness; and 2) if there is an association, do injuries cause an abnormal gait score OR does lameness lead to more injuries? This research is important to the dairy industry as it will provide more evidence on the potential risk factors for lameness, and hopefully determine if there is a causal relationship between injuries and lameness. If the above can be achieved, appropriate measures can be taken to decrease the prevalence of both injuries and lameness on dairy farms across Canada.

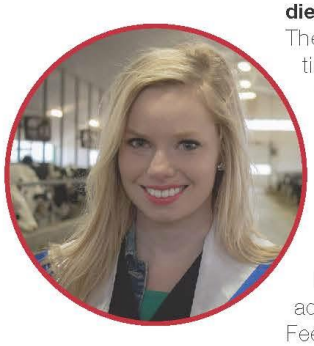
Shannon Cartwright

Project title: Can we identify dairy cattle that withstand climate change?

There is no question our climate is constantly changing. Globally greenhouse gas emissions continue to rise resulting in a warmer climate overall and a lot more extremes in temperature swings and weather events in general. This can make it challenging for livestock to adapt to a constantly shifting climate. Extreme heat, and in some cases extreme cold, have been shown to be detrimental to livestock causing reduced production, reproduction and an increase in disease and mortality. What is not known is whether some individuals are better at adapting to the changing climate than others. Previous work done at the University of Guelph in our lab has shown dairy cattle identified as having enhanced immune responses have overall lower disease incidence compared to their herd mates. Therefore, the overall purpose of this research project is to determine if dairy cattle with enhanced immune response are better able to adapt to climate changes compared to their herd mates. If we can identify cattle that can withstand extreme changes in temperature while also maintaining health and productivity, this will provide continued growth and sustainability to the Canadian dairy industry.

Casey Havekes

Project title: Make it short and sweet! Manipulating characteristics of high straw dry cow diets



The transition period (3 weeks pre-calving to 3 weeks post-calving) is a challenging time for dairy cows as they adapt to changes in energy supply and demand. Greater feed intake in the dry period (45 to 60 days prior to calving) and in the week prior to calving can reduce the risk of metabolic disease after calving. One strategy is to feed high-straw diets, which are designed to promote feed intake while controlling energy consumption. From a behavioural standpoint, one major issue with these diets is that straw is not palatable. The objective of this research was to manipulate characteristics of high-straw dry cow diets to improve feed intake and promote overall health across the transition period. In a series of three trials, we manipulated the chop length (2.54cm vs 10.16cm) of straw, reduced the dry matter content by ~10% by adding water, and supplemented molasses-based liquid feed in high-straw dry cow diets. Feed intake during the dry period, and more specifically in the week leading up to calving, was greater, and overall metabolic health was improved when cows were fed the 2.54cm straw and when water and molasses were added to the diet.

Kerry Houlahan

Project title: Cows for the future: Breeding for efficiency

In recent years, the efficiency and sustainability of the dairy industry has been in the public eye. As our global population grows, the land available for growing food is shrinking and our impact on the environment is increasing. Agriculture is responsible for 10% of the total greenhouse gas emissions in Canada, with methane from livestock accounting for 3.5% of total emissions. Finding ways to reduce inefficiencies and the environmental footprint of farms can improve the sustainability of farms for the future. Improved feed efficiency not only provides environmental benefits, but also economic ones. Feed costs can account for up to 60% of the total costs for a Canadian dairy farm, and feed prices are expected to continue to rise. By selecting animals that have increased feed efficiency and lower methane emission, there is potential to simultaneously improve feed efficiency and reduce the environmental footprint of the dairy sector. This will help Canadians feel confident that their dairy foods are produced in an economically and environmentally sustainable manner.

Sarah Parsons

Project title: Does slow and steady weaning win the race?

The care and nutrition dairy producers provide to their calves is essential to optimize their performance and welfare. Around 6-8 weeks of age, producers commonly wean their calves, meaning their diet will change from milk to solid feed. Weaning is very stressful and if not done properly, can result in poor welfare and growth. Therefore, it is essential that research is conducted to gain information on how we can improve the weaning process. The research conducted at the Elora Research Station-Dairy Facility allowed us to take individual, controlled measurements of 60 calves. This research investigated weaning methods and location of solid feed within the pen. Calves were weaned over 14 days (d 43-56) based on a continuous gradual weaning program (small, equal reductions in milk), or by a multi-step gradual weaning program (larger, more noticeable reductions in milk). Calves were also offered their solid feed either next to their milk source, or opposite of their milk source within their pen. Researchers measured feed, water and milk consumption, growth and behaviour. Overall, it was found that either gradual weaning program resulted in good performance, while placing the solid feed next to the milk source increased feed consumption and growth for dairy calves prior to weaning.

Cassie Reedman

Project title: Disbudding: To sedate or not to sedate

Disbudding is widely practiced in the dairy industry and is known to cause pain when no pain mitigation is used. The Code of Practice recommends the combination of local anesthesia, sedation, and a nonsteroidal anti-inflammatory drug (NSAID) to control the pain associated with this procedure. While studies have found that local anesthesia and NSAIDs decrease pain-related outcomes and increase self-rewarding behaviour such as play, the effects of sedation have not been studied in controlled trials. Therefore, the objective of this study is to evaluate the effect of xylazine sedation on outcomes associated with disbudding pain, feeding and play behaviours, inflammation, and stress response in dairy calves 2-6 weeks of age. Outcome measures are feeding behaviour, milk consumption, pressure sensitivity, play behaviour, standing and laying behaviour, serum haptoglobin (indicator of inflammation), time to administer nerve block, and time to perform the disbudding procedure. Data is collected at -1, 0 and +1 days relative to the disbudding procedure. Each day that trial is conducted, a full room of calves (~15) participate, with calves randomly assigned to one of two treatment groups; xylazine or placebo. All calves also receive local anesthesia (lidocaine cornual nerve block) and an NSAID (meloxicam).

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Appendix C Agri-Food and Rural Link and Research Innovation Office Outcomes – Case Studies

C.1 Growing KTT in Ontario

C.2 Research Station Outreach

C.3 From Start-Up to Scale-Up

Appendix D AFL KTT and HQP Contributions

The list of AFL's publications, presentations, research projects and training of HQP in 2019/20 is provided below. It provides evidence of AFL's competence and willingness to further develop its technical capacity, adding to the public confidence in AFL.

D.1 KTT Contributions

D.1.1 Journal Publications

Julien DA, Sargeant JM, Guy RA, Shapiro K, Imai RK, Bunce A, Sudlovenick E, Chen S, Li J, Harper SL. Prevalence and genetic characterization of Giardia spp. and Cryptosporidium spp. in dogs in Iqaluit, Nunavut, Canada. Zoonoses Public Health. 2019 Jul 15. doi: 10.1111/zph.12628.

León-Velarde CG, Jun JW, Skurnik M. Yersinia phages and Food Safety. Viruses. 2019. 11(12): 1105.

Shehata HR, Bourque D, Steinke D, Chen S, Hanner R. Survey of mislabelling across finfish supply chain reveals mislabelling both outside and within Canada. Food Research International. July 2019, 121:723-729.

Shehata HR, A. M. Naauma, S. Chen, T. Murphy, J. Li, K. Shannon, D. Awmack, A. Locas, and R. Hanner. Re-visiting the occurrence of undeclared species in sausage products sold in Canada. Food Research International. August 2019, 122:593-598.

Gao. A., J. Fischer-Jenssen, C. Wroblewski, and P. Martos. Interpretation and Implications of Lognormal Linear Regression Used for Bacterial Enumeration. Journal of AOAC International (https://doi.org/10.1093/jaoacint/qsaa005), April 2020.

M. Melzer & X. Shan. Diseases diagnosed on plant samples submitted to the Plant Disease Clinic, University of Guelph, in 2018. Canadian Plant Disease Survey, 2019. 33.

Robert L. Conner, Greg J. Boland, Chris L. Gillard, Yongyan Chen, Xuechan Shan, Debra L. McLaren, Anfu Hou, Waldo C. Penner, Melody S. Melzer, Parthiba Balasubramanian, Sheau-Fang Hwang, and Kenneth B. McRae. Identification of anthracnose races in Manitoba and Ontario from 2005 to 2015 and their reactions on Ontario dry bean cultivars. Canadian Journal of Plant Science, 2020. 100(1): 40-55, https://doi.org/10.1139/cjps-2019-0003.

D.1.2 Oral Presentations

Nicola F. Linton. Microbial Communities in Agricultural Soil – Diversity, Abundance and Activity Impacted by Fertilization, Cropping and Tillage Practices. Ph.D. Thesis. School of Environmental Sciences, University of Guelph. January 27, 2020.

Linda Lissemore. Pesticides: Analysis and Monitoring. University of Guelph, School of Environmental Sciences students. February 5, 2020.

D.1.3 Poster Presentations

Carolina Varilla, Reena G. Pinhero, Rickey Y. Yada and Massimo F. Marcone. Quality aspects of cooked early potatoes in relation to polyphenols/antioxidant content using a new LC-MS/MS technique (Method Development and Application); University of Guelph, Food Science Building, September 2019.

D.1.4 Research Projects (Grants)

Shu Chen (PI), Carlos Leon Velarde (Co-PI). Team members: Jeanine Boulter-Bitzer, Susan Lee, Nicola Linton, Kelly Shannon, Jiping Li, Saleema Saleh-Lakha. 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. Niagara Peninsula Fruit & Vegetable Growers' Association (NPFVGA). April 1, 2018 – present.

Shu Chen (PI), Team members: Susan Lee, Saleema Saleh-Lakha, Carlos Leon-Velarde, Mythri Viswanathan, Nicola Linton. Comprehensive evaluation of a high throughput culture-independent diagnostic test (CIDT) against standard methods for simultaneous detection of common food-borne pathogens in foods. Proposal submitted to Ontario Agri-Food Research Initiative Program (OMAFRA). January 2020.

Shu Chen (PI), Carlos Leon Velarde (Co-PI) and Nicola Linton (Team member). Evaluation of a High Throughput CRISPR Sequence-Based Method for Identification of Multiple Salmonella Serovars in a Sample from Poultry Production Environments. Proposal submitted to Ontario Agri-Food Research Initiative Program (OMAFRA). January 2020.

D.1.5 Laboratory Tours

June 19, 2019, Tour for Jennifer Birchmore and Ross Kelly, OMAFRA.

October 25, 2019, New Zealand Beekeepers requested by Paul Kozak, OMAFRA.

November 21, 2019, Welcome Tour for new DFO CEO Cheryl Smith and her staff.

February 12, 2020, Welcome Tour for new FSR Genna Wright, OMAFRA.

D.2 Highly Qualified Personnel (HQP) Training

AFL contributed to the training of six HQP in 2019/20.

Shu Chen served on graduate committees for PhD candidates, Atinuke Olajide (Department of Food Science), and Nicola Linton (School of Environmental Sciences), and MSc (FSQA) candidate Iyabo Ojebiyi (Department of Food Science), University of Guelph.

Carlos Leon-Velarde served on graduate committee for MSc (FSQA) candidate Mohamed Mohamed (Department of Food Science), University of Guelph.

Linda Lissemore served on graduate committee for MSc candidate, Maria Sanford (School of Environmental Sciences), University of Guelph.

Shu Chen provided orientation/training to MSc candidate Maleeka Singh from the Biodiversity Institute for fish species analysis of sushi samples by next generation sequencing, University of Guelph.