



2018/19 Results Report

Submitted to the Canadian Beef Cattle Research, Market
Development and Promotion Agency

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I. Executive summary

The Beef Cattle Research Council (BCRC) plays a leadership role in identifying research priorities and maximizing the value of research to improve the competitiveness of the Canadian beef industry. A national industry-led funding agency, the BCRC works closely with other industry and government funding agencies to increase coordination, reduce duplication and ensure priority research outcomes are addressed for the benefit of Canadian beef and cattle producers.

A division of the Canadian Cattlemen's Association (CCA), the BCRC is directed by a committee of 12 beef producers from across the country. The BCRC is funded in part through a portion of a producer-paid national levy, the Canadian Beef Cattle Check-Off. In 2018/19, the BCRC received on average 79 cents of every \$2.50 Canadian Beef Cattle Check-Off collected. Additional 2018/19 funding was provided through the Agriculture and Agri-Food Canada (AAFC) third Beef Science Cluster under the Canadian Agricultural Partnership (CAP). The Canadian Beef Cattle Check-Off revenue and additional industry stakeholder funding leveraged the CAP and other provincial and federal government funding.

This report covers the period April 1, 2018 to March 31, 2019. Research programming during this period was centered around the following areas:

- Maintaining or improving competitiveness in the production of beef cattle – animal health, feed efficiency and feed production
- Supporting science-based policy, regulation and trade
- Supporting science-based public education and advocacy
- Supporting the Canadian Beef Advantage through continual advancements in beef quality and food safety, and
- Accelerating the adoption of new innovations in the Canadian Beef Industry.

Section A of this report covers the projects funded under the third five-year Beef Science Cluster. It is a \$21.7 million program, with AAFC contributing \$14.1 million and industry contributing \$7.6 million over the five years. There are 25 approved projects managed by the BCRC under the third Science Cluster. Given that 2018/19 was the first year of a new Science Cluster, the projects were started well into the 2018/19 fiscal year and therefore the reportable results are very limited. All projects cover areas relating to one of the following priority areas: Beef Quality and Food Safety; Animal Health, Welfare and Antimicrobial Resistance; Feed Production and Feed Efficiency; Forage Productivity and Environmental Sustainability; or Knowledge and Technology Transfer. The project status as well as a link to a factsheet, highlighting background, objectives and what the researcher will do under each project, is included in Section A.

Under the Knowledge and Technology Transfer science cluster project, several resources including factsheets, interactive decision making tools, videos, articles, webinars, blog posts and infographics were developed and distributed to industry. Analytics indicate that website traffic and redistribution levels of articles and fact sheets has increased, the audience is interested in a variety of topics, views per video are increasing, and social media stakeholder networks continually grows. A first of its kind literature review was completed to provide a comprehensive report of adoption rates on cow-calf operations across Canada. This March 2019 report - [Adoption Rates of Recommended Practices by Cow-Calf Operators in Canada, March 2019](#) - indicates trends where possible and highlights extension priorities and opportunities.

Section B of this report includes a list of all non-Cluster research projects funded by Canadian Beef Cattle Check-Off dollars and other industry investments. In 2018/19 researchers were awarded funding through an open call for proposals where BCRC received applications from researchers. This marks BCRC's first annual open call for proposals in over a decade, which is supported with BCRC's increased revenue resulting from the increase in the Canadian Beef Cattle Check-Off. The check-off funding is matched with government and other industry funding at a minimum 1:1 ratio for these projects. Under the open call for proposals, BCRC received 82 letters of intent from researchers across Canada. Of these, 44 researchers were invited to submit a full proposal, with 38 forwarding a proposal for funding. BCRC engaged internal and external peer reviewers in the proposal selection process, and in February 2019 funding was approved for 18 projects.

In addition to priority research projects funded through the call, new programs were launched under Research Capacity, Knowledge and Technology Transfer and Proof of Concept. Addressing the gaps in research capacity, a Beef Production Systems Chair at the University of Alberta and a Chair in One Health and Production-Limiting Diseases at the University of Saskatchewan are being proposed. Knowledge and technology transfer is being advanced through a Canadian Beef Technology Transfer Network which works to support the regionally limited, underfunded, and fragmented nature of beef extension across Canada. Extension projects also include economic-based decision-making tools for producers. Also being funded are short-term (six months to one year) proof of concept-based research to help inform whether it's worth pursuing as a larger, more defined research investment in that area. At the time of writing this report, the funding agreements for approved non-Cluster projects are being prepared or the matched funding is being confirmed by the researcher, with results to be included in future reports.

In addition to sponsoring research and technology transfer programs in support of the Canadian beef industry, the BCRC continues to oversee the Verified Beef Production Plus™ Program (VBP+). In August 2018 VBP+ was officially recognized by the Canadian Roundtable for Sustainable Beef (CRSB) as a Certification Body for the CRSB's Certified Sustainable Beef Framework, meaning that all VBP+ Certified Operations are also considered Certified Operations under the Certified Sustainable Beef Framework. This is a major positive step towards simplification of the sustainability initiative in the eyes of Canadian beef producers and accessibility for beef producers to the benefits of sustainable beef production. VBP+ also continues to be involved with the Canadian Beef Sustainability Acceleration (CBSA) pilot led by Cargill, in an effort to build the supply of beef intended to be able to meet the Certified Sustainable Beef Framework and define the infrastructure necessary for sourcing beef tracked through a fully certified value chain. VBP+ has chosen to move forward with the implementation of a two-stream approach to delivering the VBP+ program - auditing and training - and enhancing these areas was a focus for 2018/19.

The BCRC continues to take a leadership role in communicating the value of investments, including the Canadian Beef Cattle Check-Off, made in beef, cattle and forage research. Prepared by Canfax Research Services, a [BCRC 2013 to 2018 Research Results Report](#) summarizing the Cluster II 2013-2018 research activities was released in March 2019.

The fiscal year for the BCRC is July 1 to June 30, therefore the BCRC audited financial statements are not included in this report and are available upon request after August 31, 2019. The Canadian Beef Cattle Check-Off funding allocated to research programming in 2018/19 is discussed in various sections of this report and is estimated at \$3,641,535.

II. Background

The Beef Cattle Research Council (BCRC) funds leading-edge research to advance the competitiveness and sustainability of the Canadian beef cattle industry. The BCRC's mandate is to determine research and development priorities for the Canadian beef cattle industry and to administer Canadian Beef Cattle Check-Off funds allocated to research. In 2018/19, the BCRC received on average \$0.79 of every \$2.50 of the Canadian Beef Cattle Check-Off collected by the provinces. This funding is in turn leveraged under various programs to maximize producer returns on their check-off investment. In 2018/19, the BCRC leveraged Canadian Agricultural Partnership (CAP) government funding with industry dollars, primarily the Canadian Beef Cattle Check-Off, where industry contributed 35% and government contributed 65%. In addition to the AAFC funds leveraged through CAP, BCRC leveraged the Canadian Beef Cattle Check-Off with other government and industry, national and provincial funding.

As the national beef cattle industry research agency, the BCRC plays an important role in identifying the industry's research and development priorities and subsequently influencing public sector investment in beef cattle research. The BCRC facilitates and encourages collaboration and coordination among researchers, other funding agencies and industry on provincial and national levels, in order to maximize the benefits obtained from all investments within the Canadian beef cattle industry. The BCRC continues to lead the implementation of the *Canadian Beef Research Strategy and Technology Transfer Strategy*, working in partnership with industry and government beef research funding agencies across Canada, to be more efficient with limited funding and ensure key research, capacity, infrastructure and extension priorities are addressed.

In addition to funding research, the BCRC plays a leading role in increasing industry uptake of relevant technologies through the delivery of its knowledge dissemination and technology transfer strategy. This information sharing across a broad audience of producers, researchers, funders and policy makers supports communication networks across the country.

The BCRC is also responsible for the delivery of the Verified Beef Production Plus (VBP+) program, a program developed to educate producers and facilitate on-farm certification of practices related to food safety, animal care, biosecurity, and environmental sustainability. VBP+ training and certification are important in supporting industry's efforts to demonstrate to downstream supply chain stakeholders and consumers that Canadian beef is produced in a sustainable manner and that maintaining public trust is a priority.

In 2018/19, the BCRC's research and extension programming was funded predominantly through Canadian Beef Cattle Check-Off and AAFC under the Canadian Agricultural Partnership (CAP). Funding was also provided by provincial governments and industry partners. This report covers the period April 1, 2018 to March 31, 2019. Research programming during this period was centered around the following areas:

- Maintaining or improving competitiveness in the production of beef cattle – animal health, feed efficiency and feed production
- Supporting science-based policy, regulation and trade
- Supporting science-based public education and advocacy
- Supporting the Canadian Beef Advantage through continual advancements in beef quality and food safety, and
- Accelerating the adoption of new innovations in the Canadian Beef Industry.

III. Key highlights for the 2018/19 activities

A. Beef Science Cluster III projects managed by the BCRC and funded by government, industry and Canadian Beef Cattle Check-Off

This section provides a list of the projects funded under the Beef Science Cluster III. April 1, 2018 marked the start of the third, five-year, Beef Science Cluster under the Canadian Agricultural Partnership (CAP) program. This third Beef Science Cluster is a \$21.7 million program, with AAFC contributing \$14.1 million and industry contributing \$7.6 million over the five years. There are 25 approved projects managed by the BCRC under the third Science Cluster, and 24 of the 25 Cluster projects, as included in BCRC's 2018/19 business plan, reported activities between April 1, 2018 and March 31, 2019. Given that 2018/19 was the first year of a new Science Cluster, the multi-year projects were started well into the 2018/19 fiscal year and therefore the reportable results are very limited. The project status as well as a link to a factsheet on each project is highlighted below. The project factsheets provide the background, objectives and what the researcher will do under each project. A project summary table, including the project number, title, 2018/19 budget and actual expenditures, follows the progress summaries.

Beef Quality and Food Safety

BQU.08.17 - *Development of yield prediction tools to optimize carcass cut-out value*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Developing a tool to better predict carcass yield”](#)

BQU.10.17 - *Canada's National Beef Quality Audit at Retail and Processing*

This project will commence later in 2019. Interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“2021 National Beef Quality Audit at Retail and Processing”](#)

FOS.01.17 - *If E. coli shed by cattle is becoming resistant to antimicrobial interventions in abattoirs, how best to raise the hurdles?*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Understanding and preventing E. coli resistance at the abattoirs”](#)

FOS.07.17 - *Identification of genetic and microbial markers for E. coli O157 super-shedders through longitudinal biopsy and monitoring*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Identifying cattle that are more likely to be E. coli O157 super-shedders”](#)

Animal Health, Welfare and Antimicrobial Resistance

ANH.04.17 - *Assessing economic impacts and developing models for evidence-based decision support systems for sustainable parasitic roundworm control in Canadian beef cattle*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[What are the economic impacts of parasitic roundworms?](#)"

ANH.05.17 - *Identification of treatment strategies for the most common causes of lameness in feedlot cattle*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Identifying the best strategies for treating toe tip necrosis and digital dermatitis in feedlot cattle](#)"

ANH.06.17 - *Effect of rest stop duration and quality on the behaviour and welfare of cattle transported by road*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Effect of rest stop duration and quality during transport on cattle welfare](#)"

ANH.13.17 - *Mycoplasma bovis pneumonia in beef cattle*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Understanding Mycoplasma bovis pneumonia in beef cattle](#)"

ANH.21.17 - *The Canadian Cow-Calf Surveillance Network*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[The Canadian Cow-Calf Surveillance Network](#)"

ANH.30.17 - *Investigating antimicrobial resistance (AMR) and virulence factors of Mycoplasma bovis*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Understanding Mycoplasma bovis](#)"

AMR.10.17 - *Characterizing the microbiome of beef cattle to identify risk factors that affect respiratory health*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Characterizing the microbiome of beef cattle to identify risk factors that affect respiratory health](#)"

Feed Production and Feed efficiency

FDE.01.17 - *Determining the minimum fibre requirement for feedlot cattle and improving the empirical prediction of ruminal pH*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Determining the minimum fibre requirement for feedlot cattle”](#)

FDE.06.17 - *Genetic analyses of feed intake, feed efficiency, female fertility, and cow lifetime productivity in beef cattle raised under two environments*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Genetic evaluation of cattle raised under high vs. low input winter feeding systems”](#)

FDE.09.17 - *Further strategies to enhance the use of wheat grain in feedlot diets*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Strategies to enhance the use of wheat grain in feedlot diets”](#)

FDE.13.17 - *Identification of causal mutations located in distortion regions in beef cattle genome associated with bull and cow fertility and its links to feed efficiency*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Identifying causal mutations associated with bull and cow fertility and how they link to feed efficiency”](#)

FDE.14.17 - *Evidence-based prebiotic and probiotic solutions for improving gut health and feed efficiency in cattle*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Evidence-based prebiotic and probiotic solutions for improving gut health and feed efficiency in cattle”](#)

Forage Productivity and Environmental Sustainability

FRG.01.17 - *Development of native and tame forage varieties and mixtures for improved forage and environmental productivity and resilience*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“Development of native and tame forage varieties and mixtures for improved forage and environmental productivity and resilience”](#)

FRG.02.17 - *Novel sainfoin cultivars for enhancing production efficiencies of pasture and beef cattle and building capacity in forage breeding*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on [“New sainfoin varieties”](#)

FRG.06.17 - *Improving abiotic stress tolerance in alfalfa through the simultaneous down-regulation and/or genome editing-mediated knockout of multiple genes*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Improving abiotic stress tolerance in alfalfa](#)"

FRG.09.17 - *Sustaining the legume component of grazed pasture mixtures for summer grazing and stockpiling complex mixtures in Eastern Canada*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Keeping legumes in pasture stands longer](#)"

FRG.11.17 - *Increasing fall productivity in winter-hardy alfalfa by selecting for reduced fall dormancy*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Increasing fall productivity in winter-hardy alfalfa](#)"

FRG.20.17 - *Evaluating the potential for increased forage productivity in mid-rotation forested rangeland sites through an integrated forage, cattle and timber management approach*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Enhancing forage productivity in silvopasture systems](#)"

ENV.07.17 - *A regionalized life cycle impact assessment model for the quantification of Canadian Beef production impacts on biodiversity*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Quantifying the Canadian beef industry's impact on biodiversity](#)"

ENV.09.17 - *Assessment of occurrence of synthetic hormones (melengestrol acetate & trenbolone acetate) and beta-agonist (ractopamine) in cattle operations and associated environments*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Do synthetic hormones used in beef production have environmental effects when excreted?](#)"

ENV.15.17 - *Economic and environmental impacts associated with removal of productivity-enhancing technologies in the Canadian beef cattle industry*

This project is underway. The first year's data collection has been completed and interim or final results will be reported as they become available. For more information on this project, see our factsheet on "[Economic](#)

[and environmental impacts associated with removal of performance-enhancing technologies in the Canadian beef cattle industry”](#)

Knowledge and Technology Transfer

TEC.01.17 - Enhancing Technology Transfer in the Canadian Beef Industry

This project is delivered internally by the BCRC and is focused on working to enhance technology transfer in the Canadian beef industry through a broad range of activities. In year one, results include regular communication with industry through numerous presentations and regular social media activity, substantial enhancements to website functionality, and mentorship of four applied researchers by producers and other industry experts. The following new resources were also developed and distributed to industry:

Knowledge and Technology Transfer Resource	# Developed in 2018/19
Fact sheets – all available via http://www.beefresearch.ca/resources/fact-sheets.cfm	27
Interactive decision making tool - http://www.beefresearch.ca/blog/bull-selection-new-calculator-to-determine-the-value-of-a-bull/	1
Videos - https://www.youtube.com/playlist?list=PL16s0XbcZVlvC5PFzjni75vjsMIY2ERM5	6
Articles for Canadian Cattlemen's the beef magazine - http://www.beefresearch.ca/blog/tag/canadian-cattlemen-magazine/	12
Webinars - http://www.beefresearch.ca/resources/webinars.cfm	8
Blog posts - http://www.beefresearch.ca/blog/	39
Infographics - http://www.beefresearch.ca/resources/images.cfm	4
Radio clips	7

To measure and monitor adoption of various innovations by Canadian beef producers and other industry stakeholders, a first of its kind literature review was completed to provide a comprehensive report of adoption rates on cow-calf operations across Canada. This March 2019 report - [Adoption Rates of Recommended Practices by Cow-Calf Operators in Canada, March 2019](#) - indicates trends where possible and highlights extension priorities and opportunities in various regions across the country. This report will guide the BCRC's approach to extension and is expected to be utilized by the beef and forage extension community to inform both national and regional extension strategies and priorities.

While it is difficult to measure or qualify the adoption of innovative knowledge, especially in the short term, BCRC's technology transfer efforts appear to be successful due to consistently positive feedback from producers and other stakeholders, increasing website traffic, increasing subscribers and followers, and increasing levels of redistribution of our resources by other publications and organizations.

Further interim results and final results will be reported as they become available. For more information on this project, see our factsheet "[Enhancing Technology Transfer in the Canadian Beef Industry](#)".

Summary of Beef Science Cluster research projects

Project Number	Project description	2018/19 budget	2018/19 projected expenditures	2018/19 projected NCO funds
Beef Quality and Food Safety				
BQU.08.17	Development of prediction tools to optimize carcass value	276,602	276,602	50,730
BQU.10.17	Canada's National Beef Quality Audit at Retail and Processing	0	0	0
FOS.01.17	If <i>E. coli</i> shed by cattle is becoming resistant to antimicrobial interventions in abattoirs, how best to raise the hurdles?	224,340	224,340	86,000
FOS.07.17	Identification of genetic and microbial markers for <i>E. coli</i> O157 super-shedders through longitudinal biopsy and monitoring	65,720	65,720	25,000
Animal Health, Welfare and Antimicrobial Resistance				
ANH.04.17	Assessing economic impacts and developing evidence-based decision support systems for sustainable parasitic roundworm control in Canadian beef cattle	230,810	230,810	154,260
ANH.05.17	Identification of treatment strategies for the most common causes of lameness in feedlot cattle	229,428	229,428	70,000
ANH.06.17	Effect of rest stop duration and quality on the welfare of cattle transported by road	226,705	226,705	53,000
ANH.13.17	<i>Mycoplasma bovis</i> pneumonia in beef cattle	83,975	83,975	0
ANH.21.17	The Canadian Cow-Calf Surveillance Network	126,356	126,356	100,000
ANH.30.17	Investigating antimicrobial resistance (AMR) and virulence factors of <i>Mycoplasma bovis</i>	59,375	59,375	0
AMR.10.17	Characterizing the microbiome of beef cattle to identify risk factors that affect respiratory health	9,900	9,900	0
Feed Production and Efficiency				
FDE.01.17	Determining the minimum fibre requirement for feedlot cattle and improving the empirical prediction of ruminal pH	149,500	149,500	50,000
FDE.06.17	Genetic analyses of feed intake, feed efficiency, female fertility, and cow lifetime productivity in beef cattle raised under two environments	157,438	157,438	60,000
FDE.09.17	Further strategies to enhance the use of wheat grain in feedlot diets	42,700	42,700	5,000
FDE.13.17	Identification of causal mutations located in distortion regions in beef cattle genome associated with bull and cow fertility and its links to feed efficiency	170,660	170,660	50,000

FDE.14.17	Evidence-based prebiotic and probiotic solutions for improving gut health and feed efficiency in cattle	81,725	81,725	30,000
Forage Productivity and Environmental Sustainability				
FRG.01.17	Development of native and tame forage varieties and mixtures for improved forage and environmental productivity and resilience	272,675	272,675	2,000
FRG.02.17	Novel sainfoin cultivars for enhancing production efficiency of pasture and beef cattle and building capacity in forage breeding	110,150	110,150	65,000
FRG.06.17	Improving abiotic stress tolerance in alfalfa through the simultaneous down-regulation and/or genome editing-mediated knockout of multiple genes	73,810	73,810	13,000
FRG.09.17	Sustaining the legume component of grazed pasture mixtures for summer grazing and stockpiling complex mixtures in Eastern Canada	215,900	215,900	0
FRG.11.17	Increasing fall productivity in winter-hardy alfalfa by selecting for reduced fall dormancy	90,448	90,448	17,000
FRG.20.17	Evaluating the potential for increased forage productivity in mid-rotation native forested rangeland sites through an integrated forage, cattle and timber management approach (silvopasture)	59,800	59,800	0
ENV.07.17	A regionalized life cycle impact assessment model for the quantification of Canadian Beef production impacts on biodiversity	58,696	58,696	35,006
ENV.09.17	Assessment of occurrence of synthetic hormones [melengestrol acetate & trenbolone acetate) and the beta-agonist (ractopamine) in cattle operations and associated environments	109,325	109,325	50,000
ENV.15.17	Economic and environmental impacts associated with removal of growth-enhancing technologies in the Canadian beef cattle industry	84,755	84,755	50,000
Knowledge and Technology Transfer				
TEC.01.17	Enhancing Technology Transfer in the Canadian Beef Industry	302,748	291,866	89,118
Science Coordination				
SCI.01.17	Science Coordination	162,000	153,425	42,155
Total		3,675,541	3,656,083	1,097,269

Actual Cluster expenditures for 2018/19 were not available at the time of report preparation due to the lag in time from when the Cluster fiscal year is completed and when research institutions submit expenses. Most projects are running on budget and the expectation is that all AAFC cluster funding will be expended. If any projects are underbudget a portion of the national check-off funds may be deferred so that researchers can

utilize that funding in subsequent years, which is important given delays occurred in project start-up. It is expected that the total five-year industry contribution through check-off funding and other sources will be expended by the end of the cluster even if annual funding amounts shift to subsequent years. This was demonstrated through the first two science clusters administered by the BCRC.

Expenditures on Cluster III projects in 2018/19 are projected at \$3,656,083.

2018/19 Canadian Beef Cattle Check-Off funding to Cluster III projects is projected at \$1,097,269.

B. Non-cluster projects funded by the BCRC and industry

In addition to research projects funded within the Beef Science Cluster program, the BCRC and industry partners funded additional projects based on specific needs and opportunities identified by the beef industry. The projects managed by BCRC outside of the Science Cluster during 2018/19 are identified below. Some of these projects received funding from the Canadian Beef Cattle Check-Off while others were funded from various other industry sources.

During 2018/19 researchers were awarded funding through an open call for proposals where BCRC received applications from researchers. This marks BCRC's first annual open call for proposals in over a decade, which is supported with BCRC's increased revenue resulting from the increase in the Canadian Beef Cattle Check-Off.

Under the open call for proposals, BCRC received 82 letters of intent from researchers across Canada. Of these, 44 researchers were invited to submit a full proposal, with 38 forwarding a proposal for funding. All proposals addressed priority outcomes as defined by the BCRC, under priority areas relating to beef demand, industry competitiveness and productivity. BCRC engaged internal and external peer reviewers in the proposal selection process, and funding was approved for 18 projects in February, 2019. It was required that successful applicants leverage the Canadian Beef Cattle Check-Off by securing funding from other federal and provincial governments and industry funding programs. The check-off dollars were leveraged on minimum at a 1:1 ratio.

The following sections highlights the 2018 projects funded under the open call for proposals, as well as projects receiving funding from other industry partners and managed by the BCRC.

Special Projects

The following on-going project is managed by the BCRC, and supported with beef check-off dollars.

Canadian Global Food Animal Residue Avoidance Database – CgFarad

The Canadian global Food Animal Residue Avoidance Database (CgFARAD) plays an important role in the prevention of drug and chemical residues in foods of animal origin. Based at the Western College of Veterinary Medicine, University of Saskatchewan and the Ontario Veterinary College, University of Guelph, the CgFARAD service provides technical information and advice to Canadian veterinarians and government regulators on withdrawal issues relating to extra-label drug use and exposure to toxic chemicals in food animals. The clinical pharmacologists responsible for the CgFARAD are uniquely positioned to provide expertise to meet industry needs. The BCRC contributes \$7,500 to reflect the beef industry's contribution to maintaining this important capacity. Additional support is provided by other protein sectors and provincial and federal governments.

Project description	2018/19 budget	2018/19 projected NCO funds
Canadian Global Food Animal Residue Avoidance Database-CgFarad	7,500	7,500
Total	7,500	7,500

The following projects were funded by industry partners, beef check-off dollars, and other funding organizations and managed by the BCRC. BCRC's primary role for these projects is financial management and technology transfer upon completion. Reports on these projects are available upon request.

Project description	2018/19 budget	2018/19 projected expenditures	2018/19 projected check-off
Misc.03.17 Enhancing the efficiency of CVS grading data capture and reporting	46,575	46,575	0
Misc.01.18 Support for the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS): Beef Feedlot Antimicrobial Resistance (AMR) Surveillance Framework Development	154,000	154,000	0
MISC.02.18 Validation of the safety and effectiveness of peroxyacetic acid for the European Food Safety Authority	281,680	281,680	78,000
MISC.02.17 Assessing the potential implications of heat resistant <i>E. coli</i> (project has been extended and will be completed with prior fiscal funding)	84,000	84,000	5,000
Total	566,255	566,255	83,000

The budget for 2018/19 special research projects = \$573,755

The projected expenditures or deferred amounts total \$573,755

Canadian Beef Cattle Check-Off funding to special projects is projected at \$90,500

Priority Research Projects

BCRC approved funding in February 2019 for the following projects which will start April 1, 2019 or later. All projects will be funded jointly by Canadian Beef Cattle Check-Off dollars leveraged with provincial and federal government and industry partner funding. Although BCRC funding has been approved for all projects listed, the start dates for several of the projects will be delayed until the matched funding has been confirmed. In those cases where project start-up is delayed BCRC funding will be deferred. Progress on these projects will be included in the 2019/20 report.

Project description	2018/19 approved check-off funding
ANH.04.18 Comparison of immune response and respiratory disease-sparing effect of homologous and heterologous prime-boost vaccine programs in beef calves	40,248
ANH.07.18 Effect of feeding ergot alkaloids on ruminal metabolism, growth performance, health and welfare of beef cattle: How much is too much?	139,163

ANH.19.18 Characterization and optimization of visual pen checking criteria to improve BRD treatment outcomes in feedlot cattle	64,872
ANH.22.18 Determining the effect of stress on the respiratory microbiome of cattle during transportation	59,610
AMR.02.13 Use of bacteriophage-derived lysins in combatting multi-drug resistant (MDR) pathogens that cause bovine respiratory disease (BRD)	73,174
BQU.02.18 Nutrient density and nutritional value of Canadian beef products	22,971
BQU.09.18 Developing a Canadian Total Quality Management System for Beef Processing	59,595
ENV.02.18 The impact of agricultural land conversion on carbon stocks across Canada, with a focus on grazing lands	124,613
ENV.03.18 Performance, Environmental and Economic Benefits of BioChar Supplementation in Beef Cattle Grazing Systems	90,763
FDE.03.18 Use of high-moisture corn products for finishing cattle and corn stover to extend the grazing season for pregnant beef cattle	122,600
FRG.03.18 Improving vegetative biomass yield and digestibility in alfalfa for enhanced livestock production.	119,475
FRG.08.18 Assessing the impact of grazing annual forage cover crops in an integrated crop-livestock system	150,338
FRG.09.18 Enhancement of total lipid content/composition in non-GMO alfalfa and sainfoin for improved energy density and reduced methane emissions	136,641
FOS.01.18 Persistence of Shiga toxin-producing Escherichia coli (STEC) in Cattle and Association with Clinical Infections in the Same Geographic Region	74,306
FOS.04.18 Shiga-toxigenic E. coli persistence mechanisms and surface biofilm detection using near-infrared spectroscopy on beef processing facilities. Misc.03.17 Enhancing the efficiency of CVS grading data capture and reporting	98,044
Total	1,376,413

The table above includes the beef check-off funding approved for the initial funding contract payouts under the 2018 call for proposals. As stated previously, funding was approved in February 2019 and at the time of writing this report, the funding agreements are being prepared or the matched funding is being confirmed by the fund recipient (researcher). The approved funding listed above, if not disbursed by June 30, 2019, will be deferred to BCRC's 2019/20 fiscal year.

Canadian Beef Cattle Check-Off funding to priority research projects is projected at \$1,376,413

Note: the 2018/19 funding approved for priority research projects is higher than stated in the 2018/19 Business Plan due to the funding payout structure where 85% of funding approved is released at time of contract execution in the first year of the project.

Research Capacity

The BCRC identified that gaps in research capacity are a high priority and in 2018/19 began the process of developing Research Chairs in partnership with key Research Institutions through a competitive call for proposals. The intent of BCRC investments is to leverage other funding in the area of research capacity, such as the National Sciences and Engineering Research Council of Canada (NSERC) to implement long-term research capacity in areas of priority. The evaluation of Research Chair concepts by BCRC considers the incremental nature of the proposed research capacity, institutional investments, program support, and capacity priorities that have been identified by industry.

From the proposals submitted in 2018/19, two concepts were selected for further development with funding support to begin in 2019/20 upon successful completion of funding agreements and the procurement of matching government investments. A Beef Production Systems Chair is proposed to be established at the University of Alberta “to increase the competitiveness of those sectors of the Canadian beef industry that rely heavily on grazing-based forage resources, while maintaining a strong focus on beef production and market outcomes”. At the Western College of Veterinary Medicine, University of Saskatchewan, a BCRC Chair in One Health and Production-Limiting Diseases is proposed to be established with the goal “to increase capacity for applied field research and surveillance in specific priority areas outlined by the beef industry including: animal health and welfare, antimicrobial use, resistance and alternatives, and on-farm food safety”.

BCRC has conditionally committed \$150,000/year for five years to each of the Chair positions outlined above, with commitment conditional upon the Institution securing matching funds. Efforts are currently being led by the institutions, supported by the BCRC, to secure matching funds through sources such as the NSERC Industrial Research Chair (IRC) program with the goal of matching funds and the new Chair positions being in place in 2019/20.

With the funding support to research chairs beginning in 2019/20, no funding was allocated to research capacity projects in 2018/19.

Knowledge and Technology Transfer

In addition to the knowledge and technology transfer activities under the third Beef Science Cluster, such as the development, maintenance and distribution of articles, decision tools, videos, and webinars, knowledge and technology transfer in Canada's beef industry is being advanced through a Canadian Beef Technology Transfer Network. The Network, which the BCRC recently developed, works to support the regionally limited, underfunded, and fragmented nature of beef extension across Canada. The Network continually brings together groups and individuals actively involved in knowledge and technology transfer that supports Canadian beef producers and advances the Canadian beef industry. By facilitating greater communication and collaboration through the Network, resources and expertise are shared, undue duplication is avoided, and collaborative groups are empowered to develop effective resources and strategies that are applicable long-term across regions and in line with the Canadian Beef Research and Technology Transfer Strategy. The group continues to grow and identify valuable opportunities to communicate and collaborate with each other on beef and forage technology transfer initiatives.

To develop collaborative extension projects, including economic-based decision-making tools for producers, the council began launching calls for letters of intent for technology transfer and production economics projects in June 2018. The BCRC approved funding in February 2019 for the knowledge and technology

transfer projects listed below. All projects are one to two years in length, start between March 15, 2019 and September 1, 2019 and are funded jointly by Canadian Beef Cattle Check-Off dollars leveraged with provincial and federal government and industry partner funding. As these projects will be getting underway by the fall of 2019, results on these projects will begin to be included in the 2019/20 report.

BCRC also approved funding in February 2019 for the following proof of concept (POC) projects. This funding supports short-term (six months to one year) proof of concept-based research to help inform whether it's worth pursuing as a larger, more defined research investment in that area. All projects start between April 1 and July 1, 2019 and terminate March 31, 2020. Results on these projects will be included in the 2019/20 report. The POC projects approved in February 2019 were funded largely in part by a private industry partner, and as a result, beef check-off dollars will be funding only one of the four POC projects. Unused POC funding was reallocated to support additional projects in the broader 2018/19 project call for proposals.

Project description	2018/19 approved check-off funding
KTT.01.18 Early Calf Health and Survival Management Risk Assessment Tool	27,492
KTT.02.18 Forage U-Pick: A forage species selection, weed management, and seeding rate mobile site - a tool for western Canada	42,394
KTT.05.18 An Interactive Tool to Inform Johne's Disease Control in Beef Herds: What to Test, When and How Often	15,172
KTT.17.18 Canadian Beef Technology Transfer Network	70,000
POC.02.18 Exploring the potential of using Carnobacterium Maltaromaticum A5 as a bioprotective agent in meat plants to improve the safety and shelf life of meat.	49,830
POC.04.18 Exploring options for BRD diagnostics 2.0 – a point of care metagenomic nanopore sequencing pilot study	49,450
POC.06.18 Enhancing the bovine respiratory microbiome through promoting commensal bacterial growth	50,000
POC.08.18 Exploring corn intercropping strategies to increase protein and profitability of beef cattle grazing	46,954
Total	351,292

The total 2018/19 check-off funding approved for knowledge and Technology Transfer projects was \$351,292. As a result of private industry partnerships and investments of \$146,404 to these projects,

Canadian Beef Cattle Check-Off funding to Knowledge and Technology Transfer projects is projected at \$204,888.

Surveillance Research Network

A key priority identified in the Canadian Beef Research & Technology Transfer Strategy is supporting the establishment of priority surveillance networks related to production limiting diseases and antimicrobial resistance and use. The intent of these networks is to inform industry practice, policy, and future research priorities. In 2018/19, there were no investments in the establishment of surveillance research networks related to production limiting diseases and antimicrobial resistance and use. Although this area is a clear priority and future investment is required, current work proposed under the Beef Science Cluster III to establish a national cow-calf surveillance network and also ongoing discussions with the Public Health Agency of Canada and other government entities require further time to define where near-term industry investments in this area are most effective.

The BCRC did commit to support the establishment of a Cost of Production Network for five years in 2018/19. This was done in recognition that sound economic baseline data and economic analysis to create meaningful, relevant scenarios is a priority. The Cost of Production network is intended to support industry competitiveness by having Canadian beef cattle cost of production data in every province/eco-region to guide technology transfer and research priorities. The network will continue to be managed under Canfax Research Services (CRS). CRS has confirmed the commitment of provincial partners to support the development and implementation of the network and continues to work extensively with Agri-Benchmark, which provides oversight and internationally accepted standards and processes for the development of a country-specific network. Matching funding is being sought through CAP's Agri-Risk Initiatives Program (ARI) for this project, with an application submitted in 2018. Decisions through ARI have been significantly delayed and consequently project start-up and BCRC funding will be deferred to 2019/20.

With the funding support to the Surveillance Research Network delayed, no funding was allocated to research capacity projects in 2018/19.

Verified Beef Production Plus

The Verified Beef Production Plus (VBP+) program grew from its roots in the Quality Starts Here (QSH) program. QSH and its successors are an educational initiative to help the beef industry move toward the highest beef quality in the world through training and on-farm verification of practices relating to food safety and beef quality. The VBP+ program builds on the success of the QSH program by adding the ability to train producers and certify on-farm practices related to animal care, environmental stewardship and biosecurity, as well as food safety.



In August 2018 VBP+ was officially recognized by the Canadian Roundtable for Sustainable Beef (CRSB) as a Certification Body for the CRSB's Certified Sustainable Beef Framework. VBP+ had been working diligently with CRSB to achieve this recognition for a number of years. The milestone means that all VBP+ Certified Operations are also considered Certified Operations under the Certified Sustainable Beef Framework. We see this as a major positive step towards simplification of the sustainability initiative in the eyes of Canadian beef producers and accessibility for beef producers to the benefits of sustainable beef production.

VBP+ is also involved with the Canadian Beef Sustainability Acceleration (CBSA) pilot. The CBSA pilot is led by Cargill, BIXS, and VBP+ and hopes to: (i) build the supply of beef intended to be able to meet the Certified Sustainable Beef Framework; and (ii) figure out the infrastructure necessary for sourcing beef tracked through

a fully certified value chain. The CBSA pilot launched for an initial one-year period in October 2017. It has since been extended indefinitely while Cargill develops a program for certified sustainable beef, meaning that the pilot was successful and there is sufficient end-user demand. The current bottleneck remains having adequate numbers of calves qualifying, therefore, VBP+ is continuing its push to get more producers audited and fully certified.

The CBSA pilot has been successful at identifying potential areas of improvement throughout the certified sustainable beef value chain. In 2018/19 and moving into 2019 work has continued, involving CRSB and the CBSA pilot partners (including VBP+), to make these improvements and ensure that all parts of the value chain are well positioned to make it as easy as possible for Canadian beef producers to access the benefits of beef sustainability initiatives.

VBP+ has chosen to move forward with the implementation of a two-stream approach to delivering the VBP+ program, auditing and training. The auditing program will result in certified operations which qualify for the Certified Sustainable Beef Framework. In 2018/19 focus was placed on looking at how to transition current audit services, which are supported by VBP+ nationally and in large part managed provincial delivery agents. The intent is to look at a more efficient and standardized delivery model that better manages liability associated with end-user claims, as well as addresses current resource shortages to deliver the program. In 2018/19 an arms-length non-profit corporation VBP+ Delivery Services Inc (VBP+ Inc) was established to begin this transition. Moving forward efforts will be focused on transitioning audit delivery services from provincial delivery agents to VBP+ Inc. and ensuring a more self-sustainable funding model reliant on producer audit fees.

VBP+ plans to build on its existing training program with support from Agriculture and Agri-Food Canada through the Canadian Agricultural Partnership. The training will be improved by adding an assessment element, renewal criteria and further learning modules, and development of materials to improve the ease of delivery to producers. Work in 2018/19 focused on initiating development of enhanced training. Training will be delivered to individuals (as opposed to beef cattle operations) and will not be geared for value chain programs but rather for broad adoption by producers to improve production metrics industry-wide.

The VBP+ program is a core pillar in championing and verifying sustainable beef production. VBP+ will continually increase its ability to deliver knowledge and practices related to sustainable production to producers while concurrently, in concert with entities like the CRSB, Public and Stakeholder Engagement, and Canada Beef, help communicate the great job Canadian beef producers are doing on their farms and ranches to consumers and the public through various forms of verification and reporting.

The VBP+ project budget is aligned with the BCRC fiscal year, July 1 to June 30. Consequently the 2018/19 actual program expenditure will be finalized subject to the close of the year end on June 30th. **The 2018/19 Check-Off and industry budget for VBP+ was \$486,560, with expenditures projected at \$486,560.**

IV. BCRC administration and management

The BCRC is overseen by an operating committee of 12 cattle producers, which are appointed by the provincial producer organizations and proportionally represent the provincial allocation of the Canadian Beef Cattle Check-Off to research. The BCRC is led by an Executive Director who oversees research program development and implementation, playing a key role in establishing and refining industry research priorities in consultation with other stakeholders. The Executive Director acts as a liaison and facilitation link among the BCRC committee and BCRC staff, CCA, Canada Beef, Canadian Beef Cattle Research, Market Development and Promotion Agency, technical advisors, and national and provincial interest groups with similar research objectives. The Executive Director encourages coordination of priorities and funding allocations between agencies in alignment with the *Canadian Beef Research and Technology Transfer Strategy*.

Supporting the Executive Director, the BCRC Science Director and Research and Innovation Coordinator manage priority research projects as well as projects undertaken within the Beef Cattle Industry Science Clusters. The Extension and Communications Director and Science and Extension Coordinator support the Technology Transfer & Knowledge Dissemination Strategy. In addition, administrative, financial and technical expertise as required support the BCRC operations.

A Science Advisory Panel comprised of industry, academic and governmental scientific expertise, continues to support the BCRC research program development process. This expertise helps to ensure the delivery of research plans that are directed towards industry's research objectives and achieve the outcomes desired by industry.

Canadian Beef Cattle Check-Off funding directed to the BCRC general administration and management expenses for 2018/10 is projected at \$423,803.

V. Ongoing research performance reporting and evaluation

The BCRC has taken a leadership role in communicating the value of investments, including the Canadian Beef Cattle Check-Off, made in beef, cattle and forage research. The BCRC has an ongoing partnership with Canfax Research Services to develop and monitor a series of research indicators that aid in assessing the economic returns to beef research in Canada, developing the BCRC research priorities, and tracking the economic benefit of the BCRC funded research over the long term.

Prepared by Canfax Research Services, the [BCRC 2013 to 2018 Research Results Report](#) was released in March 2019. As stated in this report, evaluating the impact of research can be challenging due to the lag time between the investment into research, the successful completion of the study, the adoption by industry, and the presence of measurable results. The BCRC recognizes its responsibility to report quantified results of progress in each research area to stakeholders to optimize use of limited research dollars.

The 2019 Research Results Report highlighted that:

- I. tools and knowledge developed through the 2013-18 Animal Health and Welfare-related research:

- a. are being further developed into commercially available diagnostic tests (in the case of Johne's disease biomarkers, bovine respiratory disease and bovine enteric disease microarray chips)
 - b. will help industry develop producer recommendations to manage the risk of exposure to vectors of a de-regulated disease (tick-borne anaplasmosis)
 - c. inform the development of science-based pain management regulations, and
 - d. establish the foundation for a nationwide animal health surveillance network
2. tools and knowledge developed through the 2013-18 Forage and Grassland Productivity-related research:
- a. are being further developed into new commercially available forage varieties
 - b. will help industry develop silage management and winter grazing recommendations, and
 - c. inform the development of more productive forage seed mixtures
3. tools and knowledge developed through the 2013-18 Beef Quality-related research:
- a. are providing a foundation for validated genetic markers for beef tenderness
 - b. are being further developed into commercially available processes (application for HPP for marinated steaks submitted to Health Canada), and
 - c. will help industry develop recommendations to reduce the incidence of dark cutting beef
4. tools and knowledge developed through the 2013-18 Food Safety-related research:
- a. provide science-based evidence of food safety risks of Canadian beef, and
 - b. will help industry develop recommendations for food safety (efficacy of on-hide washes, dry chilling, and methods to inactivate bacterial spores) and antimicrobial resistance transmission
5. several technology transfer goals were delivered between 2013-18, including:
- a. regular communication with industry: BCRC led many beef research extension initiatives, with efforts recognized by the Agriculture Institute of Canada's 2016 Report as Canadian agricultural research dissemination best practices.
 - b. production of new resources including videos, decision making tools, webinars, fact sheets, and Bov-Innovation (engaging presentations (in-person or remotely), with scientific experts accompanied by early-adopting producers sharing their experiences and real-life lessons learned on their operations)
 - c. enhancements to website functionality: A new web tool for extension specialists to create and post fact sheets on BeefResearch.ca, improved display on mobile devices, website search functionality was improved along with search engine optimization.
 - d. engagement of researchers with industry
 - e. evaluation and modifications to the Knowledge Dissemination and Technology Transfer Plan, BCRC constantly analyzes and evaluates website usage statistics and feedback from producers, researchers, extension groups and other industry stakeholders.

The full 2018 research results report can be viewed at [BCRC 2013 to 2018 Research Results Report](#).

VI. Financial note

The fiscal year for the BCRC is July 1 to June 30 and therefore the BCRC audited financial statements are not included in this report. In many instances, the projected expenditures in this report reflect the July to June fiscal period. Consequently the 2018/19 actual expenditures are to be finalized subject to the close of the year end on June 30th. The 2018/19 financial summary for the BCRC will be available upon request after August 2019.

Projected Canadian Beef Cattle Check-Off funding allocated to research programming in 2018/19 is outlined in various sections of this report and includes the following:

Beef Science Cluster research projects - \$1,097,269
Other research projects – \$1,671,801
Verified Beef Production Plus - \$486,560
BCRC general program management and administration – \$423,803
Total - \$3,679,433