BCRC

BEEF CATTLE RESEARCH COUNCIL

2020/21 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) is a national industry-led funding agency that funds leading edge research and technology transfer activities to advance the competitiveness and sustainability of the Canadian beef cattle industry. 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 14 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 2020/21, the BCRC received on average $0.67 (unaudited) of every $2.50 of the Canadian Beef Cattle Check-Off collected by the provinces. This funding was leveraged with the Agriculture and Agri-Food Canada (AAFC) Canadian Agricultural Partnership (CAP) funding, where industry contributed 26% or $1.16 million and government contributed 74% or $3.27 million. In addition, the BCRC leveraged the Canadian Beef Cattle Check-Off for an additional $3.4 million in research funding from government and industry partners through initiatives outside of the Beef Science Cluster.

This report covers the period April 1, 2020 to March 31, 2021. 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 III (ii) of this report covers the projects managed by the BCRC and funded under the third Beef Science Cluster. There were 23 research and extension Cluster projects reporting activities between April 1, 2020 and March 31, 2021. The third year of the five-year Cluster program has now been completed, with some preliminary findings reported and included in Section III (ii). For example, researchers used modern forage breeding tools to look at developing new alfalfa varieties that are less susceptible to stressful conditions. This research sets the foundation to breeding alfalfa and creating future varieties that will be better able to tolerate drought and flood conditions. Related to forestry grazing, another team is evaluating the potential for increased forage productivity in mid-rotation native forested rangeland sites through an integrated forage, cattle and timber management approach. The preliminary findings indicate that strip thinning in general increases diversity and abundance in the number of plant species observed. A listing of all Beef Science Cluster project details and a link to each project factsheet, highlighting background, objectives and what the researcher will do under each project, is included in Section III (ii)).

Section III (iii) of this report includes a list of the BCRC priority research projects funded by Canadian Beef Cattle Check-Off dollars and other industry investments through the BCRC's annual call for proposals. In

2020/21, the BCRC received 83 letters of intent from research teams across Canada. Of these, 49 research teams were invited to submit a full proposal, 47 forwarded a proposal and funding was approved for 25 projects in February 2021. All successful applicants secured funding from other sources (government and industry), matching the Canadian Beef Cattle Check-Off dollars at a minimum of 1:1. Several 2019 and 2020 projects which were expected to start as early as April 2020, were delayed due to COVID-19 impacts and/or inability to secure matched funding, but many projects got underway and continued throughout the year. One such project compared the nutrient density, nutritional value and relative cost of beef to other proteins. The results suggest that beef can cost-effectively address vitamin B12, zinc and iron inadequacies in Canadian diets. Another project is comparing yield, quality, and other factors of hybrid rye with barley, and early results indicate that open pollinated rye and hybrid rye yield as much as barley with consistent or greater forage quality. A summary of BCRC research projects, including the project title, fact sheet link and budget is included in section III (iii).

The BCRC continued to support the implementation of long-term research capacity in 2020/21. A third Chair position was approved at the University of Saskatchewan, College of Agriculture and Bioresources to expand the agronomic research capacity and to bring together expertise at the University of Saskatchewan and beyond to fill the gaps in forage research and disseminate findings to industry. Funding for this Chair is provided from a combination of contributions from the BCRC ($2.5 million), the Saskatchewan Cattlemen's Association ($1 million) and the Saskatchewan Ministry of Agriculture (a minimum of $750,000 over five years with potential for an additional five-year commitment). See section III (iv) for additional details on research capacity investments.

In addition to the knowledge and technology transfer activities under the Beef Science Cluster, such as the development and distribution of articles, decision tools, videos, blog posts and webinars, Knowledge and Technology Transfer (KTT) continued to be advanced through a Canadian Beef Technology Transfer Network. In 2020/21 the BCRC approved funding for four technology transfer and production economics projects, and more than 80 individuals participated in an online annual meeting that facilitated communication and collaboration. See section III (v) for details on the KTT program and project highlights.

Funding was also approved for six 2020 Proof of Concept (POC) projects - short-term (six months to one year) POC-based research to help inform whether it is worth pursuing as a larger, more defined research investment in that area. See section III (vi) for a complete list of the POC projects and preliminary research highlights. The BCRC also continued to support priority surveillance networks related to production limiting diseases and antimicrobial resistance and use. In 2020/21, work on the Canadian Cow-Calf Cost of Production Network continued, and funding for three additional surveillance projects was approved. This marks the first year the BCRC invested in surveillance projects outside of the Cluster program. See sections III (vi) and (vii) for details on the surveillance research network and related projects.

The BCRC continues to oversee the Verified Beef Production Plus (VBP+) program. See section IV for an update on the progression of VBP+ programming.

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, 2021. The Canadian Beef Cattle Check-Off funding allocated to research programming in 2020/21is highlighted in various sections of this report, and is projected at **$4,542,363.**

I. Background

The Beef Cattle Research Council (BCRC) funds leading-edge research to advance the competitiveness and sustainability of the Canadian beef cattle industry. In 2020/21, the BCRC received on average $0.67 (unaudited) of every $2.50 of the Canadian Beef Cattle Check-Off. This funding is leveraged under various programs to maximize producer returns on their check-off investment. The BCRC leveraged the industry Check-Off dollars with Agriculture and Agri-Food Canada (AAFC) Canadian Agricultural Partnership (CAP) Science Cluster funding in 2020/21, where industry contributed 27% or $1.2 million and AAFC contributed 73% or $3.2 million. In addition, the BCRC leveraged the Canadian Beef Cattle Check-Off for an additional $3.4 million in research funding from government and industry partners through initiatives outside of the Beef Science Cluster.

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 and maximizing the benefits of 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. The BCRC continues to lead the implementation of the *Canadian Beef Research Strategy and Technology Transfer Strategy*, working in partnership with other beef research funding agencies across Canada, to be more efficient with limited funding and ensure key research, capacity 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.

This report covers the period April 1, 2020 to March 31, 2021. During this period, the BCRC's research and extension programming was funded through the Canadian Beef Cattle Check-Off, AAFC under CAP, and other national and provincial industry partners. Programs were 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.

II. Research Activities

i. Introduction

This report highlights the BCRC research activities supported by the Canadian Beef Cattle Check-Off, and other industry and government partners for the period April 1, 2020 to March 31, 2021. During this period, the BCRC provided funding to beef research projects under the Agriculture and Agri-Food Canada (AAFC) Beef Science Cluster program and additional projects based on specific needs and opportunities identified by the beef industry.

This April 1, 2020 to March 31, 2021 reporting period marks the third year of the five-year Beef Science Cluster program - a $21.7 million dollar program, with AAFC contributing $14.1 million and industry contributing $7.6 million over the five years. Under this Cluster program, there are 24 research and extension projects reporting activities between April 1, 2020 and March 31, 2021. Most of the projects are funded over the five-year period, with a few projects wrapping up in 2021 and 2022. The reportable annual results for the multi-year projects remain very limited, with the majority of meaningful results presented upon project completion.

Outside of the Cluster program, researchers were awarded funding during 2020/21 through the BCRC's annual open call for proposals. Under the 2020 open call for proposals, the BCRC received 83 letters of intent from research teams across Canada. Of these, 49 research teams were invited to submit a full proposal, with 47 forwarding a proposal for funding. All proposals addressed priority outcomes as defined by the BCRC, under program areas relating to Animal Health & Welfare, Beef Quality, Food Safety, Environmental Sustainability, Feeds & Feed Efficiency, Forages & Grassland Productivity, Surveillance, Technology Transfer and/or Production Economics. The BCRC engaged internal and external peer reviewers in the proposal selection process, and the BCRC funding was approved for 25 projects in February 2021. In addition to these projects funded under the annual call for proposals, eight additional initiatives were approved for funding over the next two years that are either internal initiatives or priority initiatives presented to the Council outside of the call for proposals. For all of proposals outside of the Cluster program, it was required that applicants leverage the Canadian Beef Cattle Check-Off by securing funding from other federal and provincial governments and/or industry funding programs, and the Check-Off dollars were leveraged on minimum at a 1:1 ratio.

The tables in the following sections ii to vii summarize the BCRC funded research projects by program area. The project title, timelines, budget and link to each available project factsheet are listed. The factsheets provide the background, objectives and what the researcher will do under each project. The Research Highlights section highlights selected research results and benefits to the Canadian beef industry. More detailed results on all projects are available from the BCRC upon request.

ii. Beef Science Cluster III

Summary of Beef Science Cluster Research Projects

Project title	Factsheet	2020/21 budget ($)	2020/21 actual ($)	2020/21 NCO funds ($)
Beef Quality and Food Safety				
BQU.08.17 *Development of prediction tools to optimize carcass value*	BQU.08.17	189,515	189,515	60,375
BQU.10.17 *Canada's National Beef Quality Audit at Retail and Processing*	BQU.10.17	55,619	55,619	20,000
FOS.01.17 *If E. coli shed by cattle is becoming resistant to antimicrobial interventions in abattoirs, how best to raise the hurdles?*	FOS.01.17	218,063	218,063	102,348
FOS.07.17 *Identification of genetic and microbial markers for E. coli O157 super-shedders through longitudinal biopsy and monitoring*	FOS.07.17	146,765	146,765	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*	ANH.04.17	170,316	170,316	27,000
ANH.05.17 *Identification of treatment strategies for the most common causes of lameness in feedlot cattle*	ANH.05.17	84,285	84,285	66,000
ANH.06.17 *Effect of rest stop duration and quality on the welfare of cattle transported by road*	ANH.06.17	272,569	238,777	104,456
ANH.13.17 *Mycoplasma bovis pneumonia in beef cattle*	ANH.13.17	140,726	140,726	0
ANH.21.17 *The Canadian Cow-Calf Surveillance Network*	ANH.21.17	377,919	377,919	64,882
ANH.30.17 *Investigating antimicrobial resistance (AMR) and virulence factors of Mycoplasma bovis*	ANH.30.17	76,925	76,925	20,000
AMR.10.17 *Characterizing the microbiome of beef cattle to identify risk factors that affect respiratory health*	AMR.10.17	128,881	128,881	57,375
Feed Production and Efficiency				
FDE.01.17 *Determining the minimum fibre requirement for feedlot cattle and improving the empirical prediction of ruminal pH*	FDE.01.17	268,863	268,863	51,575
FDE.06.17 *Genetic analyses of feed intake, feed efficiency, female fertility, and cow lifetime productivity in beef cattle raised under two environments*	FDE.06.17	220,989	220,989	56,000

FDE.09.17 *Further strategies to enhance the use of wheat grain in feedlot diets*	FDE.09.17	89,850	89,850	25,000
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*	FDE.13.17	20,010	20,010	0
FDE.14.17 *Evidence-based prebiotic and probiotic solutions for improving gut health and feed efficiency in cattle*	FDE.14.17	137,319	137,319	32,569
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*	FRG.01.17	339,080	339,080	55,030
FRG.02.17 *Novel sainfoin cultivars for enhancing production efficiency of pasture and beef cattle and building capacity in forage breeding*	FRG.02.17	171,866	158,440	68,960
FRG.06.17 *Improving abiotic stress tolerance in alfalfa through the simultaneous down-regulation and/or genome editing-mediated knockout of multiple genes*	FRG.06.17	80,025	80,025	0
FRG.09.17 *Sustaining the legume component of grazed pasture mixtures for summer grazing and stockpiling complex mixtures in Eastern Canada*	FRG.09.17	256,475	214,697	8,222
FRG.11.17 *Increasing fall productivity in winter-hardy alfalfa by selecting for reduced fall dormancy*	FRG.11.17	142,258	142,258	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)*	FRG.20.17	67,850	67,850	0
ENV.07.17 *A regionalized life cycle impact assessment model for the quantification of Canadian Beef production impacts on biodiversity*	ENV.07.17	87,296	87,296	33,196
ENV.09.17 *Assessment of occurrence of synthetic hormones (melengestrol acetate & trenbolone acetate) and the beta-agonist (ractopamine) in cattle operations and associated environments*	ENV.09.17	167,925	167,925	50,000
ENV.15.17 *Economic and environmental impacts associated with removal of growth-enhancing technologies in the Canadian beef cattle industry*	ENV.15.17	207,248	207,248	80,211
Knowledge and Technology Transfer				
TEC.01.17 *Enhancing Technology Transfer in the Canadian Beef Industry (see details below)*	TEC.01.17	245,569	245,079	99,509
Science Coordination				
SCI.01.17 *Science Coordination*	N/A	171,866	156,442	36,146

Research Highlights:

ANH.21.17 The Canadian Cow-Calf Surveillance Network **-** Cow-calf health blog

Cheryl Waldner (Western College of Veterinary Medicine, University of Saskatchewan) surveyed western Canadian cow-calf producers about vaccine use. The majority of producers vaccinated both cows (91%) and replacement heifers (96%) against BVD and IBR. Nearly all producers vaccinated calves against clostridial diseases (97%). Most producers vaccinated calves against BVD (82%) and IBR (85%) at least once. Only a third of producers provided a booster vaccination for these diseases.

Earlier studies reported vaccination rates below 50% for reproductive diseases in cows and heifers, below 90% for clostridial diseases, and below 50% for respiratory diseases in calves. This study suggests that vaccination rates are going up, which is a step in the right direction. It also suggested that work could be done to encourage producers to provide recommended booster vaccinations against respiratory viruses to help reduce the need for antibiotic treatments.

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

Murray Jelinski (Western College of Veterinary Medicine, University of Saskatchewan) studied resistance to antibiotics commonly used to control and treat BRD. Veterinarians sampled healthy, sick, and dead feedlot cattle between 2006 and 2018. Resistance to macrolide antibiotics was compared among groups, and changes in antibiotic resistance over time were examined.

Macrolide resistance was highest in *M. bovis* from dead cattle that failed to respond to repeated antibiotic treatments, intermediate in sick cattle that had been treated, and lowest in healthy cattle, although some cattle likely arrived at the feedlot carrying macrolide resistant *M. bovis*.

Macrolide resistance was significantly higher in *M. bovis* in 2017-18 than in 2007-08, and *M. bovis* resistant to one macrolide antibiotic were usually resistant to the other macrolides as well.

Rotating classes of antibiotics used in feedlots may help maintain their effectiveness rather than relying solely on macrolides.

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

Dr. Xianqin Yang (Agriculture and Agri-Food Canada, Lacombe) and co-workers studied whether *E. coli* have become more heat-resistant and whether ground beef cooking recommendations are still appropriate.

E. coli from two federally inspected packing plants, feedlot cattle or transport trailers were exposed to 60◦C for 6 minutes to assess heat resistance and examine them for heat resistance genes. Hamburger was inoculated with two heat-resistant strains to see if they could survive heating to 71◦C.

97% of *E. coli* were killed in under 2 minutes at 60◦C. Most (98%) *E. coli* lacked heat resistance genes and were killed in a minute or less at 60◦C, while the 2% carrying heat resistance genes were killed in under 3 minutes. Heat resistance of Shiga-toxin-producing *E. coli* (STEC) had not increased between 2002 and 2017. Cooking inoculated hamburgers to an internal temperature of 71◦C killed over 99.9999% of heat-resistant *E. coli*.

Carcass and equipment cleaning practices have not selected for heat-resistant *E. coli*, and current beef cooking recommendations to cook ground beef to at least 71°C internal temperature and muscle cuts to 63°C, are still appropriate.

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

Dr. Stacy Singer (Agriculture and Agri-Food Canada, Lethbridge) and her team used modern forage breeding tools to develop new alfalfa varieties that are less susceptible to stressful conditions such as drought and flooding. This team found 2 different genes that when down-regulated in alfalfa led to improvements in drought and flooding tolerance, respectively. This will serve as the foundation to breeding alfalfa and creating future varieties that will be better able to tolerate drought and flood conditions.

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) - Factsheet

Lauchlan Fraser (Thompson Rivers University, Kamloops) and his team have been assessing the potential for silvopasture, forestry grazing, in mid rotation conifer stands. They tested the influence of strip thinning at 10 m, 15 m and 20 m widths on forage productivity and soil carbon and nitrogen sequestration. From field results so far, they have found that thinning in general increases diversity and abundance in the number of plant species observed, and that while the 20 m strips had the highest biomass yield, the 15 m strips produced more species richness and diversity.

Beef Science Cluster III Budget overview

Most Cluster projects are running as scheduled. The COVID-19 related interruptions did occur, but most researchers were able to manage their projects and conduct the research within their respective institution safety protocols. In some cases, protocols and methods had to be shifted and certain activities delayed, but the researcher's showed great resilience during the pandemic and they remained very committed to meeting their deliverables for March 31, 2021. A portion of the funding for some Cluster projects was deferred to 2021/22, however the research will still be completed within the Cluster timeframe (program ending March 31, 2023) and the deliverables will not be impacted. The expectation is that all AAFC Cluster funding will be expended by March 31, 2023. If any projects are underbudget for 2020/21, that portion of National Check-Off funds may be deferred allowing researchers to utilize the funding in subsequent years. It is expected that the total five-year industry contribution through National Check-Off funding and other industry sources will also be expended by the end of the Cluster program on March 31, 2023. The utilization of deferred funding was successfully demonstrated through the first two science clusters administered by the BCRC.

Total funding (industry and AAFC) on Cluster III projects in 2020/21is projected at $4,431,162

Total 2020/21 projected National Check-Off funding for Beef Cluster III projects = $1,160,854

iii. Priority Research Projects

The BCRC is funding the following projects. All projects are funded jointly by Canadian Beef Cattle Check-Off dollars leveraged with at least 50% funding from government and/or industry partners. The project list below includes the February 2021 BCRC approved projects, many of which are yet to be contracted. The project title, National Check-Off funding and fact sheet link for each project is listed below.

BCRC Priority Research Projects

Project #	Project title	Project end date	Total NCO funding ($)	2020/21 NCO funding ($)	Factsheet
AMR.02.18	Use of bacteriophage-derived lysins in combatting multi-drug resistant (MDR) pathogens that cause bovine respiratory disease (BRD)	Sep 2022	97,565	0	Factsheet
ANH.01.19	A screen for drugs that reveal Mycoplasma bovis to the bovine immune system: a novel approach to vaccine development.	Sep 2023	71,250	0	Factsheet
ANH.02.19	Application of a multi-omics strategy to investigate liver abscess development in beef cattle	Mar 2025	419,250	254,625	To be developed
ANH.03.20	Scratching the surface: Investigating the Prevalence, Nature, and Potential Causes of Itchy Cattle	Mar 2024	280,000	205,000	To be developed
ANH.04.18	Comparison of immune response and respiratory disease-sparing effect of homologous and heterologous prime-boost vaccine programs in beef calves	Jul 2023	47,350	0	Factsheet
ANH.07.18	Effect of feeding ergot alkaloids on ruminal metabolism, growth performance, health and welfare of beef cattle: How much is too much?	Mar 2022	185,500	61,130	Factsheet
ANH.08.20	Infectious causes of calf diarrhea (scours) and efficacy of current vaccination strategies to prevent scours in beef calves in Western Canada (phase 1)	Mar 2024	108,738	79,053	To be developed
ANH.10.19	Antimicrobial use and resistance in cow-calf herds: Will anything change after the switch to prescription only sales of medically important antimicrobials?	Aug 2023	143,070	0	Factsheet
ANH.11.19	Surveillance of antimicrobial use and antimicrobial resistance in Canadian feedlot cattle; expansion of bovine respiratory disease pathogen susceptibility testing	Mar 2022	45,800	0	Factsheet
ANH.12.20	Investigating foot rot and its microbiological relation to digital dermatitis	Dec 2023	97,394	73,046	To be developed
ANH.17.20	Assessment of animal condition and welfare outcomes to improve timely euthanasia in feedlot cattle	Mar 2024	105,625	0	To be developed
ANH.18.19	Development of multiplex recombinase polymerase amplification (RPA) assays for the detection of antimicrobial-resistant (AMR) bacterial pathogens causing bovine respiratory disease (BRD).	Jul 2023	64,023	0	Factsheet

ANH.19.18	Characterization and optimization of visual pen checking criteria to improve BRD treatment outcomes in feedlot cattle	May 2023	86,496	0	Factsheet
ANH.20.20	Rapid characterization of the viral microbiome in arriving feedlot calves to inform vaccine gaps and risk assessment for bovine respiratory disease	Apr 2024	227,010	170,257	To be developed
ANH.22.18	Determining the effect of stress on the respiratory microbiome of cattle during transportation	May 2022	79,480	0	Factsheet
ANH.23.19	Stocking density and feed bunk space as a risk factor for liver abscesses	Mar 2024	56,215	42,161	To be developed
ANH.25.19	Surveillance of antimicrobial use and antimicrobial resistance in Canadian feedlot cattle	Mar 2023	0	0	To be developed
ANH.25.20	Comprehensive evaluation of the effect of extended-term delivery of local anesthetic on mitigating the pain caused by castration	May 2024	79,055	54,291	To be developed
ANH.29.20	Insights into environmental transmission of Escherichia coli in beef production	Mar 2024	84,000	0	To be developed
ANH.30.20	Antimicrobial use and resistance in eastern Canadian cow-calf herds - establishing a baseline for antimicrobial stewardship	Mar 2023	155,745	0	To be developed
BQU.02.18	Nutrient density and nutritional value of Canadian beef products	Apr 2020	27,025	0	To be developed
BQU.03.19	Validation of rapid evaporative ionization mass spectrometry (REIMS) for tenderness prediction	May 2022	154,735	0	Factsheet
BQU.09.18	Developing a Canadian Total Quality Management System for Beef Processing	Jun 2022	79,460	7,946	Factsheet
ENV.02.18	The impact of agricultural land conversion on carbon stocks across Canada, with a focus on grazing lands	Apr 2022	166,150	24,922	Factsheet
ENV.03.18	Performance, Environmental and Economic Benefits of BioChar Supplementation in Beef Cattle Grazing Systems	Dec 2022	121,018	0	Factsheet
ENV.03.19	Prairie Ecosystem Services Project: Quantifying the contribution of wetlands in livestock production landscapes.	Mar 2024	190,555	142,916	To be developed
ENV.07.19	Watershed-scale assessment of water and nutrient dynamics of pastures utilized by beef cattle	May 2023	134,389	100,792	Factsheet
ENV.07.20	Quantifying the effects of adaptive multi-paddock grazing on soil carbon sequestration and soil organic matter quality	Mar 2024	108,162	0	To be developed
FDE.01.19	Canola supplementation of cows in late gestation leads to increased calf growth and modification of epigenetic, gene expression, and blood metabolite profiles.	Jul 2026	137,074	0	To be developed
FDE.03.18	Use of high-moisture corn products for finishing cattle and corn stover to extend the grazing season for pregnant beef cattle	Sep 2023	142,146	0	Factsheet
FDE.03.19	Improving feed efficiency in the cow herd: Individual cow variability in fibre digestibility, feed efficiency, and methane emissions.	Nov 2023	7,500	0	To be developed

FDE.04.20	Level of fat from canola seed supplementation in pregnant beef cow diets - Effects on cow and calf performance	Aug 2026	209,105	0	To be developed
FDE.05.20	Development and demonstration of a genomics-enhanced whole herd genetic management platform to improve beef production efficiency and quality	Aug 2024	318,900	0	To be developed
FDE.06.19	Evaluating new next-generation strategies to boost breeding efficiency for Feed and Forage Production in Barley and Triticale.	Feb 2024	265,500	162,341	To be developed
FDE.07.20	Examining the microbial basis of forage digestion efficiency in beef cattle	Mar 2025	214,434	0	To be developed
FOS.01.18	Persistence of Shiga toxin-producing Escherichia coli (STEC) in Cattle and Association with Clinical Infections in the Same Geographic Region	Mar 2023	97,875	6,269	Factsheet
FOS.01.20	In-Plant Validation of Harvest Processing Equipment Sanitization Best Practices	Dec 2023	105,047		To be developed
FOS.04.18	Shiga-toxigenic E. coli persistence mechanisms and surface biofilm detection using near-infrared spectroscopy on beef processing facilities.	Mar 2022	130,725	0	FOS.04.18
FRG.01.20	Collaborative testing and development of forage barley varieties for western Canada	Mar 2024	44,425	0	To be developed
FRG.03.18	Improving vegetative biomass yield and digestibility in alfalfa for enhanced livestock production.	Aug 2024	159,300	110,850	To be developed
FRG.08.18	Assessing the impact of grazing annual forage cover crops in an integrated crop-livestock system	May 2023	195,350	15,200	Factsheet
FRG.08.19	Forage Potential of Hybrid Fall Rye (HR) in Alberta and Saskatchewan	Mar 2023	87,692	8,769	Factsheet
FRG.09.18	Enhancement of total lipid content/composition in non-GMO alfalfa and sainfoin for improved energy density and reduced methane emissions	Mar 2024	182,188	0	Factsheet
FRG.09.19	Corn intercropping strategies for extended winter grazing of beef cattle	Mar 2025	91,066	0	To be developed
FRG.11.20	Complex forage blends: reducing supplementation costs through strategic forage selection	Mar 2025	166,782	0	To be developed
FRG.12.20	Quantifying the economic benefits and carbon capture efficiency of including forages in cropping systems: A test using long-term data from the Breton plots	Mar 2024	62,662	0	To be developed
FRG.14.20	Identification of genetic factors contributing to abiotic stress tolerance in intermediate wheatgrass	Mar 2024	21,500	16,125	To be developed
MISC.01.18	Support for the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS): Beef Feedlot Antimicrobial Resistance (AMR) Surveillance Framework Development,	Mar 2023	Managed by BCRC and funded externally		N/A
MISC.02.18	Validation of the safety and effectiveness of peroxyacetic acid for the European Food Safety Authority (EFSA)	Mar 2021	112,300	9,350	To be developed
MISC.01.20	Assessment of Data Availability for Eastern Canada Feeder and Calf Price Indices	Apr 2021	216,500	138,000	To be developed
MISC.02.20	Packing Plant Ventilation	Mar 2021	11,971	11,971	To be developed

MISC.03.20	Remote Inspection & Grading Pilot Project	Jul 2023	201,779	111,627	To be developed
CgFARAD	Canadian global Food Animal Residue Avoidance Database	Ongoing	7,500	7,500	N/A

Total 2020/21 projected National Check-Off funding for ongoing Priority Research projects = $1,814,141.

Project Highlights:

BQU.02.18 Nutrient density and nutritional value of Canadian beef products - **Blog Post**

Dr. Ben Bohrer (University of Guelph) compared the nutrient density, nutritional value and relative cost of beef to other proteins. The results suggest that beef can cost-effectively address vitamin B12, zinc and iron inadequacies in Canadian diets.

A Canadian would need to eat 160 g of nuts or 500 g of legume vegetables to get as much protein as 100 g of beef provides. In doing so, they would consume twice as many calories from legume vegetables or four times as many calories from nuts as from beef. Neither plant source provided vitamin B12, but beef met consumer's daily requirements. Beef contains 25% to 100% more zinc than nuts or legume vegetables, and iron from beef is more digestible and easily absorbed by humans than plant-sourced iron. The 500g of legume vegetables cost nearly the same as 100g of beef and 140g of nuts cost twice as much.

FRG.08.18 Assessing the impact of grazing annual forage cover crops in an integrated crop-livestock system - **Factsheet**

Dr. Jillian Bainard (Agriculture Agri-Food Canada, Swift Current) and her team are looking at incorporating cover crops into crop rotations and the role that plays on animal, soil, and plant productivity and quality. They are using both research plots and producer farms.

This project has faced problems with both drought and weed pressure that resulted in some sites being dropped in the current years as well as COVID-19 impacting farm site management. Data collection was limited in 2020 due to travel restrictions within AAFC but researchers were still able to achieve deliverables. There are still two years of data left to collect as well as additional data from these years to analyze but at this point data suggests that an annual cereal rotation is the most productive system.

FRG.08.19 Forage Potential of Hybrid Fall Rye (HR) in Alberta and Saskatchewan - **Factsheet**

Dr. Vern Baron (Agriculture Agri-Food Canada, Lacombe) and his team are conducting a study to compare yield, quality, and other factors of hybrid rye with barley. Plots have been established in Lacombe, Lethbridge, and Swift Current. Early results indicate that open pollinated rye and hybrid rye yield as much as barley with consistent or greater forage quality. Hybrid rye appears to be as hardy as open pollinated rye meaning it should provide greater flexibility with early spring seeding.

The 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 provides the beef industry's contribution to maintain this important capacity.

COVID-19 Impacts on new projects

The COVID pandemic resulted in delays to project start and/or end dates for 11 projects. The delays varied from reporting extensions to research start dates being postponed for up to one year. These projects will be reported on in subsequent results reports.

iv. Research Capacity

As reported last year, the BCRC began the process of developing Research Chairs in partnership with key research institutions through a competitive call for proposals in 2018. The intent of the BCRC investment 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 Chair appointments which were selected in 2019 secured matching funding in 2020. The hiring processes intended for 2020/21 were delayed due to COVID-19 but they are now either hired or going through the interview process.

The 2019 Chairs include:

- Beef Production Systems Chair "*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*", University of Alberta. Dr. Gleise M. Silva was hired in April 2021 to fill this position.
- Chair in One Health and Production-Limiting Diseases 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*", Western College of Veterinary Medicine, University of Saskatchewan. Dr. Cheryl Waldner was hired in January 2021 to fill this position.

A third Chair position was approved in 2021 at the College of Agriculture and Bioresources to expand the agronomic research capacity at the University of Saskatchewan. This Integrated Forage Management and Utilization Chair will be a joint appointment between the Department of Plant Sciences and the Department of Animal and Poultry Science. The position will bring together expertise at the University of Saskatchewan and beyond to fill the gaps in forage research and disseminate findings to industry. Funding for this Chair will be provided from a combination of contributions from the BCRC ($2.5 million), the Saskatchewan Cattlemen's Association ($1 million) and the Saskatchewan Ministry of Agriculture (a minimum of $750,000 over 5 years with potential for an additional 5-year commitment). This Chair is structured to be a long-term (~30 year)

investment where the BCRC's investment, along with matching industry and government funds are invested and the interest earned from those investments will be utilized to extend the chair beyond the typical 10-year format we have supported previously, to ideally 30 or more years depending on interest rates and investment performance.

BCRC Research Capacity Projects				
Project #	**Project title**	**Project end date**	**Total NCO funding ($)**	**2020/21 NCO funding ($)**
CHAIR.01.18	Beef Cattle Research Council Industrial Research Chair in One Health and Production-Limiting Diseases (the "NSERC Chair")	Dec 2024	750,000	150,000
CHAIR.02.18	BCRC - Hays Chair in Beef Production Systems	Mar 2030	1,500,000	150,000
CHAIR.01.20	Integrated Forage Management and Utilization Chair	Mar 2030	2,500,000	0

Total 2020/21 National Check-Off funding for Research Capacity projects = $300,000.

v. Knowledge and Technology Transfer

The BCRC funds Knowledge and Technology Transfer (KTT) activities and projects under the Cluster III program and also external to the Cluster program. All projects are funded jointly by Canadian Beef Cattle Check-Off dollars leveraged with at least 50% funding from government and/or industry partners.

Cluster III program

Under the Cluster III program, activities completed in 2020/21 include the development, maintenance and distribution of extension resources including articles, decision tools, videos, and webinars.

Six webinars were held featuring producers, researchers, veterinarians, and other experts. More than 1,200 individuals were in attendance during the live presentations, the majority of which identified as being a cattle producer. Views of the recordings available online continually increase. Webinar survey results indicate that the expectations of the majority of participants are met or exceeded, and participants note that they had learned something new and/or intended to make production changes based on the information or motivation provided.

New resources developed include 15 research results summary fact sheets, three production topic webpages, 12 e-newsletters, 12 articles for *Canadian Cattlemen - The Beef Magazine*, 84 blog posts, three infographics, an interactive decision-making tool, a set of radio clips and one video.

The short, practical video demonstrates proper newborn calf resuscitation techniques to producers. It was released in January 2021 and features a veterinarian and a cattle producer, the two most influential sources of information for beef producers. The video was seen more than 64,200 times across social media platforms with numerous shares and positive comments by producers and veterinary clinics.

An interactive webpage that helps Western Canadian producers select forage species most appropriate for their conditions was developed with a number of collaborators and funding partners. Website traffic and

anecdotal feedback from producers has been very positive. A nationwide version is expected to launch by 2023.

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

In addition to the production and distribution of extension resources, six scientists participated in the Beef Researcher Mentorship program, which engages researchers who study cattle, beef, genetics, feed or forage production with producers and other Canadian beef cattle industry stakeholders. Following a competitive application process, participants are paired with two mentors, develop a roadmap to identify goals and plans to achieve them, and are provided a small travel budget. Participants report having gained a large amount of practical knowledge about Canadian beef production and realities and having built a network of people that supports their ability to conduct research and communicate results of priority and relevance to the industry.

Activities internal to BCRC

Over the last several years the BCRC has also invested in internal activities to develop content, decision making tools, and resources that are aligned with key extension priorities identified by industry. During 2020/21, two internal activities were advanced. One was an initiative on ***Eastern content expansion*** which focused on improving the visibility and uptake of the BCRC content by beef producers in Ontario, Quebec, and Atlantic provinces through a focus on:

- Resource modification and/or development to ensure relevance to eastern Canadian producers
- Decision making tools modification and/or development including data gap assessment and scenario development
- Webinar and other modular resource development to support regional extension program delivery
- Eastern extension network expansion to grow awareness of the BCRC resources

Given the tremendous interest in this project and the number of priorities identified by the stakeholder advisory group, this project will continue into 2021/22 to allow for the comprehensive development of content and resources.

The second internal activity was an ***Enhancing extension through veterinary collaboration*** project. Industry surveys have repeatedly demonstrated that producers look to veterinarians for advice and information on many topics including animal health, nutrition, feeding strategies, and productivity. Veterinarians are often stretched for time and do not have expertise in all areas. This project is intended to identify opportunities where veterinarians can further inform and persuade producers to adopt practices or technologies that benefit them and the industry - creating awareness of existing BCRC resources and developing new resources where appropriate. This project was delayed in its start-up in 2020/21 due to the transition of extension contractors to fill a maternity leave. Through interviews, a survey, and focus groups, information has been gathered from more than 120 veterinarians about their needs. Dozens of veterinarians have indicated their interest in collaborating on the development of tools and resources in 2021/22.

Activities external to BCRC

The ***Canadian Beef Technology Transfer Network*** continued in 2020/21, in recognition that further resources are necessary to expand the reach of the BCRC's extension initiatives while supporting external initiatives through national and/or regional networks to encourage the broader and more rapid uptake of relevant technologies and practices. The Network brings together groups and individuals actively involved in knowledge and technology transfer that support 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. In 2020/21, more than 80 individuals participated in an online annual meeting that facilitated communication and collaboration.

Under the 2020 network call for proposals, which ran in tandem with the 2020 priority research project call for proposals, three proposals were funded. It is important to note that the funding of KTT activities through a call for proposals is a relatively new and unique concept. This has limited the number of proposals funded, as extension groups learn about the program and parameters, and identify matching funding. The BCRC staff focused on creating awareness and working directly with potential applicants during the past year.

BCRC Knowledge and Technology Transfer Projects

Project #	Project title	Project end date	Total NCO funding ($)	2020/21 NCO funding ($)	Factsheet
ECON.01.20	Estimation of Economic Impact of the Canadian Cattle Industry	Apr 2021	49,968	49,968	Full report pending
KTT.01.18	Early Calf Health and Survival Management Risk Assessment Tool	Jul 2022	36,656	0	Factsheet
KTT.01.19	The Value of Record Keeping for Decision-Making on Canadian Cow-Calf Farms and Ranches	Jul 2022	40,950	16,950	Factsheet
KTT.04.19	Evaluating Premiums for Weaned Calves Marketed with Value-Added Management Characteristics	Mar 2022	10,500	0	Factsheet
KTT.05.18	An Interactive Tool to Inform Johne's Disease Control in Beef Herds: What to Test, When and How Often	Aug 2021	17,850	0	Factsheet
KTT.02.20	The Big Beef Podcast	Mar 2023	14,556	10,917	To be developed
KTT.04.20	Leveraging the Canadian Beef Improvement Network's (CBIN's) Collaboration and Resources to Advance Genetic Improvement Across the Canadian Beef Industry	Mar 2023	49,864	42,384	To be developed
KTT.05.20	Canadian Forage U-Pick: Expanding the Western Canadian Forage U-Pick tool to include Eastern Canada	Mar 2022	43,450	0	To be developed

Total 2020/21 projected National Check-Off funding for Knowledge & Technology Transfer projects = $120,219.

Project highlights:

ECON.01.20 Economic Impact of Livestock Production in Canada – A Regional Multiplier Analysis

Dr. Suren Kulshreshtha and team at the University of Saskatchewan updated a suite of multipliers for the Canadian beef industry to account for direct, indirect, and induced impacts on contributions to the economy and employment. For Canada in the 2018-20 period, the cattle sector contributed $51.6 billion in goods and sales, contributed $21.8 billion to gross domestic product at market prices, including $11.7 billion in labour income, and is directly or indirectly associated with creation of 347,352 full-time equivalent jobs (includes direct, indirect and induced impacts). Further analysis is being completed with scenarios going out to 2030. The full report is expected to be released summer 2021.

KTT.04.19 Evaluating Premiums for Weaned Calves Marketed with Value-Added Management Characteristics **- Factsheet**

Kathy Larson (University of Saskatchewan) and her team are analyzing lot listing report details and resulting prices for weaned calf lots sold through online video auction platforms from August to December for 2016 through 2020. Their analysis will determine which attributes of weaned calf lots marketed via electronic auction are associated with higher or lower prices. Reporting on the frequency with which sellers use additional characteristics to describe their animals, and the price impacts associated with the characteristics, can inform producers as to whether they should implement value-added practices on their operation, as well as ensure the practices/characteristics are declared at time of sale. Early analysis has shown how attribute reporting has changed over the 5-year period, including an increase in consignors noting their VBP+ participation in their lot description from 2.3% in Fall 2017 to close to 15% in 2020.

vi. Proof of Concept

The BCRC funded the proof of concept (POC) projects listed below, including five projects approved for funding in 2020. This funding supports short-term (six months to one year) proof of concept-based research to help inform whether it is worth pursuing as a larger, more defined research investment in a particular area where there is greater uncertainty but also potential opportunity or the need for validation trials. The POC projects are funded jointly by Canadian Beef Cattle Check-Off dollars leveraged with provincial and federal government and/or industry partner funding, with some being funded solely by private industry.

BCRC Proof of Concept Projects					
Project #	**Project title**	**Project end date**	**Total NCO funding ($)**	**2020/21 NCO funding ($)**	**Factsheet**
POC.01.19	Using genetic algorithms to predict antibiotic resistance levels in Canadian feedlot cattle to promote individual animal diagnosis and prevent unnecessary antibiotic use	Jan 2021	50,000	10,000	Factsheet
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.	Mar 2020	49,830	0	To be developed
POC.02.19	Marbling relationship between Canadian and Japanese grade sites	Mar 2022	49,856	0	To be developed
POC.02.20	Safety and Immunogenicity of an Ocular Vaccine Delivery Vehicle	Feb 2022	49,680	42,228	To be developed
POC.04.18	Exploring options for BRD diagnostics 2.0 – a point of care metagenomic nanopore sequencing pilot study	Mar 2021	0	0	Factsheet
POC.05.19	Evaluation of feedlot water bowls for pen-level surveillance of antimicrobial-resistant bovine respiratory pathogens	Dec 2021	50,000	0	Factsheet
POC.06.18	Enhancing the bovine respiratory microbiome through promoting commensal bacterial growth	Jul 2020	0	0	Factsheet
POC.06.19	Evaluation of a Remote Early Disease Identification (REDI) system to identify feedlot cattle with bovine respiratory disease (BRD)	Mar 2023	50,000	0	To be developed
POC.08.18	Exploring corn intercropping strategies to increase protein and profitability of beef cattle grazing	Mar 2020	0	0	Factsheet
POC.08.20	Will recurrent selection for improved salt tolerance interact with soil microbe to enhance alfalfa performance, root development and nodule formation under salt stress?	Mar 2022	27,640	23,494	To be developed
POC.09.19	Chemical free sanitizers to prevent E. coli contamination and reduce food waste	Jun 2021	50,000	0	Factsheet
POC.14.20	Effects of maternal supplementation of vitamin A during late gestation on intramuscular fat deposition in the offspring	Jul 2022	49,772	0	To be developed
POC.15.20	Development and Evaluation of a Novel Optical Sensor Thermometer for the Measurement of Core Body Temperature in Cattle	Mar 2022	50,000	42,500	To be developed
POC.16.20	Broad-spectrum immunity to enteric pathogens by training innate intestinal immunity in young calves	Jun 2022	49,450	42,033	To be developed

Total 2020/21 projected National Check-Off funding for Proof of Concept projects = $160,255.

Project Highlights:

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 - Factsheet

Dr. Xianqin Yang and her team at Agriculture Agri-food Canada Lacombe conducted this study to see if adding "good" bacteria (*Carnobacterium Maltaromaticum*) to meat would inhibit the growth of pathogenetic bacteria like E.Coli. At the low levels used in this study, the C. Maltaromaticum was able to establish on the meat products but was unable to prevent long term spoilage. A consumer panel was unable to detect differences in inoculated and non-inoculated beef products. This indicates that while the levels used in this study were ineffective, future research is needed to determine if higher levels would result in long term spoilage prevention.

POC.08.18 Exploring corn intercropping strategies to increase protein and profitability of beef cattle grazing - Factsheet

Drs. Emma McGeough and Yvonne Lawley (University of Manitoba) conducted this study to see if high protein legumes could be planted between the rows of corn crops for winter grazing. Despite severe drought conditions, researchers were able to establish the legumes and feed tests showed that pastures would produce high quality feed. This has led to another BCRC funded project, FRG.09.19, in which they will look at intercropping legumes over multiple years, with cattle grazing, and different agronomic measures such as row spacing.

vii. 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 2020/21, work on the Canadian Cow-Calf Cost of Production Network continued, and funding for three additional projects was approved.

The Cost of Production Network managed by Canfax Research Services (CRS), through its development of economic baseline data and analysis, supports industry competitiveness with a goal to have Canadian beef cattle cost of production data in every province/ecoregion to guide technology transfer and research priorities. In 2020/21, the Canadian Cow-Calf Cost of Production Network was established with 115 producers contributing to 30 typical farms. Five nutritionists reviewed the rations to ensure they were adequate to meet the animals needs at various stages of gestation. This provided baseline data for roughly five production systems, and while not exhaustive, this gives a range of situations that producers face. The Farm Summaries are expected to be published in June 2021. This establishes a foundation for future analysis about the impact of adopting different recommended practices, recognizing that the cost:benefit of adoption will vary for different production systems.

The agri benchmark model utilized in the Cost of Production Network allows for ten years of cash flow simulation for scenarios examining adoption of production, management, or technology. Initial data collection also included qualitative questions around willingness to adopt certain practices that would inform which types of production systems would face the most barriers to adoption. Short surveys were given around producer mindset (101 responses), production practices (84 responses), environmental practices (100 responses), and Dairy-Beef (6 responses). In 2021/22, work will continue in developing the future farm scenarios for the 30 typical farms established and to collect data for another 13 or 26 farms with targeted production systems identified. Four graduate students (Dalhousie University, University of Manitoba and University of Saskatchewan) have started thesis projects utilizing the Cost of Production Network data with funding from

the Alberta Beef Producers. Topics to be addressed include: Success factors for small operations in eastern Canada, economic viability of dairy-beef operations in the Maritimes, win-win scenarios that reduced cost of production and net GHG emissions.

This fiscal year is the first in which specific projects outside of the Science Cluster have been invested in through the BCRC's surveillance research network. Additional programs will be evaluated in coming years and selected based on key priorities where it is viewed that industry funding will assist in ensuring surveillance is advanced within government and industry frameworks.

Funding for three 2020 projects as listed in the table below was approved in February 2020. The projects include 1) a Western Canadian Animal Health Network beef network which connects farmers, specialists, and information systems to improve cattle health in western Canada; 2) continuation of bovine respiratory disease pathogen isolation and susceptibility testing; and 3) a pilot sentinel surveillance project evaluating AMR risk for calves prior to feedlot entry.

BCRC Surveillance Projects

Project #	Project title	Project end date	Total NCO funding ($)	2020/21 NCO funding ($)	Factsheet
SURV.01.18	The Canadian Cow-Calf Cost of Production Network	Jun 2023	310,500	105,000	To be developed
SURV.01.20	The Western Canadian Animal Health Network (WeCAHN) beef network: connecting farmers, specialists and information systems to improve cattle health in western Canada	Mar 2023	93,738	0	To be developed
SURV.02.20	Surveillance of antimicrobial use (AMU) and antimicrobial resistance (AMR) in Canadian feedlot cattle; continuation of bovine respiratory disease pathogen isolation and susceptibility testing	Jan 2026	370,434	0	To be developed
SURV.03.20	Respiratory pathogens in calves at weaning: A pilot sentinel surveillance project evaluating AMR risk for calves prior to feedlot entry	Apr 2023	62,137	46,603	To be developed

Total 2020/21 projected National Check-Off funding for Surveillance Research Network = $151,603.

III. Verified Beef Production Plus

In addition to sponsoring research and technology development in support of the Canadian beef industry, the BCRC oversees the Verified Beef Production Plus (VBP+) program. The BCRC funding facilitates the ongoing operation of the national VBP+ program, including the maintenance of a national standard, maintenance of the national CORS data management system and national website, and coordination of provincial delivery, audit systems, and record keeping.

With the successful transition of certification services from provincial delivery agents to VBP+ Delivery Services Inc. (VBP+ Inc.) of all provinces but Quebec and the Maritime provinces, certification activities were steady for the 2020-2021 year. It is anticipated that agreements with Les Producteurs de bovins du Québec, to provide services to francophone producers, will be completed soon.

As of April 2021, there were 1,314 active certified operations in Canada, representing 1,605,615 head under the management of VBP+ certified operations. New metrics being collected from producers annually will include the number of acres (grazing and feed production) under the management of VBP+ certified operations. 19,971 producers have completed historic VBP and VBP+ training.

The electronic audit management platform was launched in June 2020 and auditors and reviewers have been transitioned and trained on its use. Key features of the platform include complete scoring across all audit questions (in alignment with the CRSB standard), an integrated risk matrix tool for consistent corrective action determination and a robust data reporting dashboard. The data reporting dashboard includes all key performance indicators, which will be used to direct internal reviews and producer education efforts through both VBP+ and other avenues such as the BCRC extension programming.

The electronic audit management platform has been a valuable asset to continue to deliver certification services during the COVID-19 pandemic. With travel limited or restricted in some areas the CRSB issued an exemption in 2020 to allow for remote auditing within their framework. VBP+ and VBP+ Inc. staff and auditors have been piloting remote and virtual audit methodologies and technologies over the past eight months. The project will look at the effectiveness and limitations of three different technologies and develop methodologies for review. Positive outcomes could include the use of remote/virtual auditing within the audit cycle for easier access to remote areas and grouping of on-farm audits within a region, to keep certification costs reasonable. Producer and auditor guides will be developed and shared with other commodities and certification bodies if requested.

Development of revised producer training platforms and resources has been a key piece of work over the past year. The revised VBP+ audit standard will be reflected in the new online and in-person training and includes resources and education to assist producers in achieving certification and best management practices to be considered for their operations for continuous improvement. It is expected that the new training will be launched in the summer of 2021.

Other key pieces of work over the past year include development of a producer portal to manage certification and training activities and a comprehensive communications strategy. The communications strategy includes a survey of food industry stakeholders and amplifiers around the perception and value of VBP+ training, development of key performance indicators assessed against nationally available datasets and targeted message development, including message testing.

VBP+ and VBP+ Inc. continue to strive to provide the best value for Canadian beef producers. There are now three packer/processor initiatives that are seeking to source cattle from VBP+ certified producers, in addition to the Cargill Certified Sustainable Sourcing program which has been the longest standing. While training, other than online, has been sidelined due to the pandemic, our provincial coordinators have been busy with requests for assistance for producers seeking certification, indicating strong producer support for the program.

Total 2020/21 projected National Check-Off funding for VBP+ = $390,000

IV. BCRC Administration and Management

The BCRC is overseen by an operating committee of 14 cattle producers, who 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 and extension programming 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 the BCRC staff, CCA, the Canadian Beef Advisors, the 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 Operations Manager supports the development and implementation of BCRC's business planning, budget management, and reporting processes. The Extension and Communications Director and Science and Extension Coordinator support the Technology Transfer & Knowledge Dissemination Strategy. In March 2021, a Technical Director joined the BCRC team on a part-time basis to support the development and advancement of research and technical analysis related to beef quality, food safety, animal health and technical barriers to trade. In addition to these positions, administrative, financial, and technical expertise support the BCRC operations.

The BCRC Executive Director also oversees the VBP+ Business Manager who works with various contractors and is directly responsible to deliver the national VBP+ program and oversee VBP+ Delivery Services Inc. the wholly owned non-profit responsible for delivery of VBP+ audit delivery.

A Science Advisory Panel comprised of industry, academic and governmental scientific expertise, continues to support the BCRC's research program. 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.

National Check-Off funding directed to the BCRC general administration and management expenses for 2020/21 is projected at $445,291.

V. Financial Notes

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 year-to-date expenditures, as of publication date, and do not reflect the entire fiscal year. Due to the nature of the BCRC's funding cycle, this will result in a variance in our reporting from this report and the close of our year end on June 30th, as a large volume of our contracting new projects occurs between May and June of each year.

The BCRC 2020/21 financial summary and CCA audited financial statements will be available to the Agency after August 2021.

Projected Canadian Beef Cattle Check-Off funding allocated to research programming in 2020/21 is outlined in various sections of this report and includes the following:

Beef Science Cluster research projects = **$1,160,854**

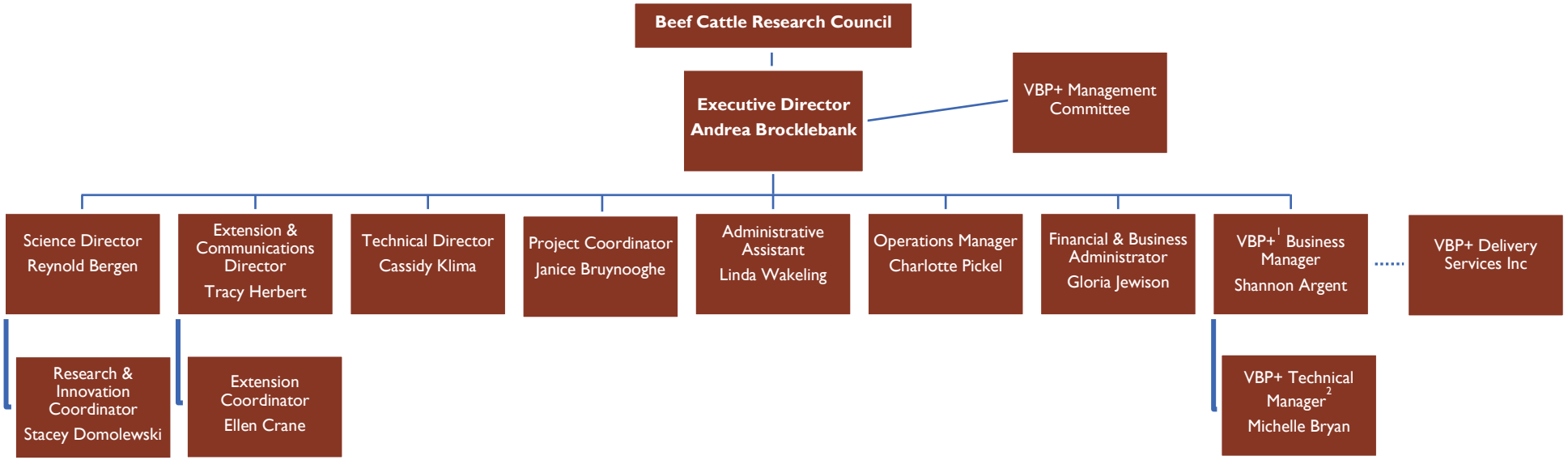
Other BCRC research projects = **$2,546,218**

Verified Beef Production Plus = **$390,000**

BCRC general program management and administration = **$445,291**

Total Beef Cattle Check-Off funding - **$4,542,363**

VI. Appendix – BCRC Organization Chart



Note: In addition to permanent positions, BCRC and the VBP+ Program hire services from various experts, on a contractual basis as required
May 17, 2021