2018 Large-Scale Applied Research Project Competition : Genomics Solutions for Agriculture, Agri-food, Fisheries and Aquaculture

List of Registrations

No.	Administrative Genome Centre	Co-Lead Genome Centre	Project Leader		Project Leader		Lead Organization*	Lead Agriculture and Agri-Food Canada (AAFC) Research and Develoment Centre (RDC), if applicable	Title of Project	Keywords (for Proposed Investigation)		Keywords (for Proposed Integrated GE^{3}LS Investigation)	
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1	Genome British Columbia	Genome Alberta	Abbott	Wade	Hallam	Steven	University of British Columbia	Lethbridge RDC	Genome-enabled glyco-technologies and host-adapted innovation platforms to develop antibiotic-free applications for the Canadian swine industry	1. Antibiotic-free pork 2. Glyco-based technologies 3. Functional genomics and metagenomics 4. Metabolic pathway reconstruction 5. Increased resilience of swine production systems	1. Synthetic carbohydrate chemistry 2. Fluorescence-assisted cell-sorting sequencing (FACSeq) 3. Swine intestine fosmid libraries and functional screening 4. Software development and integration 5. Integrated swine production system models	1. Model swine production systems 2. Market factors that affect antibiotic-free production systems 3. Health-risk management practices 4. Societal assessment of antibiotic use in Canada 5. Economic benefits of antibiotic-free swine production	1. Bio-economic modelling of production herd data 2. Carcass-level simulations of profitability 3. Estimation of domestic and export market effects 4. Consumer and stakeholder survey using Q-methodology 5. Stakeholder technology consensus conference
2	Genome British Columbia		Birol	Inanc	NA	NA	University of British Columbia		PeptAid – Antimicrobial Peptides To Replace Antibiotics in Farm Veterinary Practice	Antibiotic resistance; Antimicrobial peptide discovery; Antimicrobial peptide design; Food production from animals; Automation	Machine learning; Genome mining; Robotics; MIC/MBC screening assays	Animal welfare; Social acceptance; Livestock production practices	Case based reasoning; Practical ethics; Behaviourism
3	Genome British Columbia		Bohlmann	Joerg	Page	Jonathan	University of British Columbia		Genomic Improvement of Cannabis for a Regulated Industry	cannabis varieties, metabolism, cannabinoids, terpenes, biotic stress	genomics, transcriptomics, proteomics, metabolite analyses, biochemistry	industry development, legal conditions, societal conditions	legal analysis, stakeholder consultation
4	Genome British Columbia		Castellarin	Simone Diego	Bohlmann	Joerg	University of British Columbia		Adaption of Canadian Viticulture to Climate Change	Grapevine, Wine, Climate Change, Drought, Abiotic Stress	Transcriptomics, Metabolomics, Water Relations, Plant Physiology, Climate Modeling	Economic impact of climate on viticulture Environmental impact of viticulture Impact of climate resilient varieties Impact of mitigating viticultural practices Optimal mix of varieties for future climate scenarios	Econometrics, portfolio management, numerical simulations
5	Genome British Columbia		Cross	Stephen	NA	NA	University of Victoria		Applied Genomics and Integrated Multi-Trophic Aquaculture Production as a Comprehensive Adaptive Strategy to Coastal Climate Change	Enhancing growth in coastal aquaculture – diversifying with the integration of seaweed production; Adaptive, genomic strategies for a changing ocean environment	Developing a genomics strategy/approach for isolating superior traits in seaweeds, using: (i) double digest restriction site associated DNA sequencing (ddRADseq) to identify candidate genes that are associated with environmental variability; (ii) SNP markers derived above to detect quantitative trait loci for temperature and salinity stress; (iii) development of a kelp germplasm to evaluate as a best-performer broodstock bank for a changing coastal environment	What are the economic benefits of this approach to coastal communities across Canada? Integrated production – business risk mitigation? Sector development and growth, seafood production security through diversification? What are the impacts of public perception – use of genomics? Investigation of consumer values and beliefs on food choices, food production practices. Market opportunities and addressing eco-consumer preferences.	Social assessment – public engagement, consultation (surveys, workshops) Economic assessment – economic and business modeling
6	Genome British Columbia	Genome Prairie	Deyholos	Mike	Booker	Helen	University of British Columbia, Okanagan	Saskatoon RDC and Ottawa RDC	Project BLUE (Breeding *Linum usitatissimum* Enhancements)	linseed, climate change, disease resistance, northern adaptation, abiotic stress	reverse genetics, epimutation, QTL mapping, GBS, genomic selection	regulation of new plant breeding strategies, understanding regulator decisionmaking processes, consumer decision making, genomics communication	policy analysis, cost-benefit analysis, behavioural economics
7	Genome British Columbia		Dossett	Michael	NA	NA	University of the Fraser Valley	Kentville RDC	Integrated genomics strategies supporting the development of raspberry cultivars with improved quality attributes and economic value	Raspberry, Marker-assisted Breeding, Disease resistance, Fruit quality	Reference Genome, transcriptome, Pangenome, Genome Wide Association Study, RNA-seq	What characteristics are most important in raspberry value chain; What are the barriers to adoption of genomic tools for raspberry breeding and the resulting cultivars?	Surveys, focus groups, socioeconomic analysis
8	Genome British Columbia		Lu	Xiaonan	Finlay	Brett	University of British Columbia		Application of microbiome approaches to reduce the resistome in soil, water and fresh produce	Bacterial antimicrobial resistance (AMR), resistome, microbiome, food safety, environment	Whole genome sequencing, metagenomics, portable and rapid detection techniques, bacteriophage control methods, advanced animal manure processing technologies	- effects on Canadian economy of rapid detection of bacterial antimicrobial resistance in agri-foods - governmental regulation changes that affect developing technology for animal waste processing and pathogen detection - potential institutional and trade implications of fresh produce - effect on policy making for foodborne illnesses	Economic modeling, international comparative legal and policy analyses, cost-effectiveness analyses, market research analyses, interdisciplinary research
9	Genome British Columbia		Marlatt	Vicki	Albright	Lawrence	Simon Fraser University		Enhanced and Sustainable Production of Farmed Sockeye Salmon as a Human Foodfish	freshwater farmed Sockeye salmon, selective breeding, higher yield, higher flesh lipid content, delayed maturation	genome sequencing, selective breeding, comparative genome wide association studies	foodfish, food security, improved environmental sustainability of farmed fish	surveys of perception of fish farm users and potential users; chemical, physical and biological characterization of receiving waters and sediments; economic analysis

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10	Genome British Columbia		Moore	Jonathan	Beacham	Terry	Simon Fraser University		Applying Genomic Tools to Improve the Viability of Pacific Salmon Fisheries	Mixed-stock fishery, salmon, eulachon, biodiversity, sustainable development.	Single nucleotide polymorphism, genetic stock identification, spatial mapping.	Common pool resources, socio-ecological systems, environmental decision-making, food security.	Co-management, spatial planning, participatory engagement, environmental law.
11	Genome British Columbia		Pelletier	Nathan	John	Church	University of British Columbia		Improving the Tolerance to Climactic Extremes in Beef Cows Using Metabolomics	Cattle, heat, stress, genetics, selection; management	metabolomics, ethology, blood biomarkers, phenotyping spectrometry	Production efficiency metrics (e.g. average daily gain, residual feed intake, etc.), climate change, profitability and resource/environmental impacts, mitigation strategies	life cycle costing and assessment, GIS modelling, economic modelling, scenario modelling
12	Genome British Columbia		Rieseberg	Loren	Todesco	Marco	University of British Columbia	Saskatoon RDC	Genomics of Resistance to Filamentous Pathogens in Wild and Cultivated Sunflowers	Biotic stress resistance, agricultural genomics, evolutionary genomics, wild and cultivated sunflowers, trade-offs	Multi-parent advanced inter-cross (MAGIC) populations, association mapping, high-throughput genotyping and patho-testing, population genomic analyses, physiology and transcriptional regulation of plant-pathogen interactions	Access and benefit sharing, crop yield models, genomic data sharing, climate change impacts on pathogen distribution, economic impact of yield/resistance trade-offs	Literature review, model development, model simulations, policy analysis, interviews
13	Genome British Columbia		Russello	Michael	Hinch	Scott	University of British Columbia (Okanagan)		Enhancing the sustainability and productivity of kokanee as a strategic food source	Conservation genomics; Physiological genomics; Genotype-environment associations; Climate change; Kokanee salmon	SNP, indel and structural variant discovery by next generation sequencing; High-throughput SNP genotyping-by-sequencing; Population genomics; Transcriptomics using FIT-CHIPs; Metabolic and swim performance experiments	Indigenous and rural communities utilization of enhanced food availability; Indigenous and local knowledge use to develop sustainable food; Risk and social trust studies; Adaptive governance models for climate change and food security	Knowledge mobilization approaches; Decision theory and scenario development; Risk and social trust theory; Surveys and structured interviews with rural, indigenous and other stakeholder communities
14	Genome British Columbia		Satterfield	Terre	Kandlikar	Milind	University of British Columbia		Addressing Trade-Offs in the Governance, Innovation, Application and Social Mandate for Genomic Technologies in Agriculture	Digital sequence information (DSI), access and benefit sharing, regulatory responses and outcomes, food security, environmental footprint, risk and policy analysis, risk perception, consumer perception	Expert interviews, epistemic communities, meta-analysis, global data, representative surveys, stakeholder deliberation, legal analysis	All works is integrated GE3LS thus same as above for questions and methods	
15	Genome British Columbia		Tseng	Michelle	Marshall	Kate	University of British Columbia		Sustainable algae- and pulse-based aquaculture feed	Temperature-dependent fatty acid production, microalgae omega-3, sustainable aquaculture feed, pulse-based protein digestion, Atlantic salmon transcriptomics	Evolve and resequence, fatty-acid genomics, RNA-seq, Salmon transcriptomics, Population genomics of pulse-protein digestion	Environmental effects of algae- and pulse-based aquaculture feed; Environmental effects of pulse and algal production; Human perceptions of aquaculture feed alternatives	Participatory research methods, Community consultation, Scenario analysis, Multiple regression analysis of aquaculture feed waste
16	Genome British Columbia		Wang	Siyun	Haney	Cara	University of British Columbia	Summerland RDC	Tactical Microbiome Engineering for Enhanced Quality and Safety of Fresh Produce	Plant microbiomes, plant pathogens, foodborne pathogenic bacteria, spoilage-associated microorganisms, bacteriophages	Whole genome shotgun sequencing, bacteriophage based biocontrol, functional genomics	macroeconomic consequences, institutional and trade implications, potential regulatory changes, economics of foods safety, consumer behavior	International comparative legal and policy analysis, value chain analysis, macroeconomic modeling, benefit-cost analysis
17	Genome Alberta		Ametaj	Burim	Wishart	David	Univeristy of Alberta		Novel metabolomic tests for diagnosis of pregnancy in dairy cows	1. Identify metabolomic multiplexed (multiple metabolites) signatures to be used for pregnancy diagnosis in blood, urine, and milk 2. Develop a multiplexed cow-side test for pregnancy diagnosis 3. Develop an infrared nanosensor technology for identification and measurement of top metabolites related to pregnancy 4. Develop a central lab mass spec test for pregnancy diagnosis 5. Validate the new technologies in a large number of dairy cows	1. Identify top most important metabolites of pregnancy in blood, urine and milk by VIP (i.e., variable importance in projection) analysis 2. Multiplexed dip-stick technology 3. Infrared nanosensor technology 4. ROVC analysis and algorithms for accuracy of the multiplexed pregnancy tests 5. Collecting blood, urine, and milk samples and validating all the three new technologies developed	1. What are the barriers for application of the new nanosensor and other metabolomics technologies in dairy industry? 2. What are the economical requirements of metabolomics-based bovine blood, urine, and milk test? 3. What are the contributions of the new metabolomics test on job creation in high tech market and veterinary medical aspects? 4. What are the advantages of using a nanosensor as part of the milking robotic system; a cow-side test, or a central lab test? 5. What is the pathway to validation and implementation?	1. Identification of barriers for implementation of the new technologies 2. Identify the level of investment needed for mass production of the new technology and adoption from dairy producers 3. Determine how these new technologies will affect job creation and technology market 4. Determining the benefits of dairy producers in using the new tests 5. Identify step-by-step map for implementation of the new technology

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18	Genome Alberta	Ontario Genomics	Barkema	Herman	Baes	Christine	University of Caglary		Genomics Solutions for Reducing Antimicrobial Use in Dairy Cattle	1) Antimicrobial resistance; 2) Antimicrobial resistance genes; 3) Disease susceptibility; 4) Resistome; 5) Surveillance.	1) Database of disease susceptibility; 2) Genomic selection; 3) Metagenomics; 4) Shotgun sequencing; 5) Whole-genome sequencing of hosts.	1) Cost-benefit analysis of implementing surveillance of resistance genes into ongoing surveillance systems; 2) Effective communication with dairy producers in terms of antimicrobial use and resistance; 3) Engagement of dairy genetics providers to disseminate disease susceptibility information; 4) Effect of reduction of antimicrobial use on animal welfare; 5) Environmental impact of antimicrobials.	1) Autoregressive conditional models on longitudinally collected data; 2) Cost-benefit analysis; 3) Stochastic and/or deterministic simulation studies; 4) Generalized linear mixed models; 5) Communication training for farm animal health advisors (i.e. veterinarians) and evaluation of effect on farm parameters.
19	Genome Alberta	Ontario Genomics	Barreda	Daniel	Dixon	Brian	Univeristy of Alberta		DGRI: Dynamic genomic-based approaches for the regulation of fish immunity	Salmon aquaculture health; fish immunity; dynamic thermoregulation; disease resistance; vaccination efficiency; broodstock robustness; climate change.	Microbial genome sequencing, CDR3-length spectratyping and pyrosequencing; CRISPR/Cas9 and reporter fish cell lines; RNA-seq; qPCR; multi-parameric characterization of immune cell function; salmonid behavioural analysis; in vivo environmental challenges and infection trials.	1-Evolving views on aquaculture-wild stock interactions, farming of native vs. imported salmon species, and climate adaptation strategies; 2-Comparative effects/influences of Federal policy regimes compared to Atlantic and new BC provincial regulations: implications on social license, threat / risk perception and opportunities for application of genomic knowledge; 3-Evolving partnerships with indigenous/First Nation: implications for policy and aquaculture industry development.	Semi-structured interviews with representatives of key local stakeholder groups, expert elicitation techniques, etc.
20	Genome Alberta	Ontario Genomics	Basarab	John	Berry Canovas Stothard	Donagh Angela Paul	Alberta Agriculture & Forestry	Lethbridge RDC	gCalfCrop90: Genomic tools to increase calf crop, feed efficiency and sustainable beef production	Fertility haplotypes, structural variants, retained heterozygosity as related to cow lifetime productivity, feed efficiency, methane mitigation	Sequencing to identify causative mutations and epigenetic aberrations, find structural variants and perform functional predictions and validations using inhouse software, genomic indicators of heterosis, genomically enhanced breeding values (gEPDs), replacement heifer selection and cow culling indices	Impact of genomic tools on greenhouse gas emissions, animal health, welfare and net return; genomic tools include indicators of heterosis and retained heterozygosity, gEPDs and replacement heifer and cow value and carbon indices	Conjoint analysis, economic surplus model, efficiency analysis (stochastic frontier analysis/data envelopment analysis), simulation modeling
21	Genome Alberta	Genome Prairie	Dyck	Michael	Harding Kemp	John Bob	Univeristy of Alberta		PIG-OMICS: Precision selection and management of pigs for improved health outcomes	1. Developmental origins of pig health; 2. Precision strategies to improve disease resilience; 3. Gut microbiota and immunity; 4. Alternatives to antibiotic use and reduced antimicrobial resistance; 5. Reduced environmental impact	1. Disease challenge; 2. Health phenotyping, infrared thermography, machine learning and computational biology; 3. Transcriptomics and metagenomics; 4. Genotyping and genome wide association; 5. Genomic evaluation and selection	1. Examining pig producer behavior change given impact of different approaches to disease resilience; 2. Design of public policy to encourage adoption of different technology packages given public and producer attitude; 3. Investigate societal value of different combinations of technologies, outcomes and public policies; 4. Ethics of different animal welfare outcomes from different disease resilience and environmental enhancement combinations; 5. Role of different types of communication in changing behavior (public or producer) in technology adoption for disease resilience purposes.	1. Farm level optimization modeling; simulation modeling of market outcomes (production attributes, eg. environment or animal welfare) with different adoption levels across regions/country; 2. Economic experiments with students, public and producers; 3. Policy design and evaluation; 4. Development of communication methods/content with producers to enrich social networks, and public understanding of production

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22	Genome Alberta		Ellert	Benjamin	Lanoil	Brian	University of Alberta	Lethbridge RDC	Soil Gas Omics: Soil microbiology and greenhouse gas exchange between agricultural land and the atmosphere	Soil, microbiome, greenhouse gas emissions, biogeochemistry	Flux chambers, gas chromatography, metagenomics, nanopore sequencing	• reducing the environmental footprint of crop production through reduced GHG emissions, resulting in improved sustainability; • advancing genomics research on soil microbial communities related to agricultural production and environmental protection ; • elucidating the linkages among changes in agricultural management, soil metagenomics and soil greenhouse gas emissions; • evaluating innovative and user-friendly approaches to soil metagenomics (e.g. nanopore sequencing in relation to more established method e.g. Illumina) to guide agricultural management; • can the soil microbiome be reliably characterized and manipulated to achieve predictable improvements in soil health?	• comparison of contrasting agricultural systems to quantify the environmental benefits of promising practices; • quantitative assessment of soil organic carbon stocks by soil coring and application of the equivalent soil mass approach • soil greenhouse gas flux chambers with chromatographic analyses of concentrations to determine emissions from contrasting systems at periodic intervals; • soil metagenomic information from innovative and accessible approaches such as nanopore sequencing; • stakeholder engagement sessions to evaluate the receptivity of agricultural producers and food consumers to new information on the soil microbial basis of food production
23	Genome Alberta		Harrynuk	James	Uhrig	Glen	Univeristy of Alberta		GroCAN: Innovative Omics-derived solutions for Cannabis production in Canada	Plant and Crop Science, Biotechnology, Advanced Compound Chemistry, Agronomy	Functional Plant Genomics, Plant Genetics, Chromatography-Mass Spectrometry, Advanced Microscopy & Spectroscopy, Advanced Phenomics	Science informed implications of recreational cannabis use, product reliability and standardization, societal implications of cannabis legalization, health implications of improved products	Environmental scan, public focus groups and surveys, economic evaluation and knowledge translation, cost-benefit analysis, real world reviews
24	Genome Alberta		Laurie	John	Uhrig	Glen	University of Alberta	Lethbridge RDC	ccBRED wheat: a circadian clock atlas to breed for sustainably high yields	Wheat; circadian clock; yield, traits; sustainability	CRISPR; RNA-seq; proteomics; mutagenesis; breeding	feasible pathways; adoption; market access	Communication; surveys; econometric modelling; institutional analysis
25	Genome Alberta		McAllister	Tim	Guan	Leluo	University of Alberta	Lethbridge RDC	HealthECattle: Improving Health, Efficiency and welfare of Cattle through systematic genomic characterization of the bovine interactome	1). Bovine interactomes (host transcriptomes and microbiome) in the gut, respiratory tract, and hoof of beef cattle; 2). Bovine genotypes – microbiome interactions for improved feed efficiency and reduced methane emissions. 3). Microbiome of bovine respiratory disease (BRD), host stress and regulatory mechanisms in respiratory and gut mucosal immunity; 4). Role of microbial-host interactomes and immunity in liver and hoof health; 5). Alternatives to antimicrobials that promote health and wellness in beef cattle by creating robust microbiomes.	Metagenomics, comparative genomics, acidosis and BRD, stress physiology, bovine genetics and functional genomics	1) Is there a real need for alternatives to antibiotics given public pressure to stop usage? 2) Does the public perceive tradeoffs between use of omics technologies and ruminant health and welfare? 3) Will producers adopt the use of multiple omics data in selective management, the use of public policy and supply chain interactions to reduce barriers to adoption in the beef sector? 4) What is the public support for the use of the many omics technologies in beef production to produce the public goods, reduce methane emissions, improve animal welfare and/or reduced antibiotic use? 5) What is the social value of an enhanced understanding of the bovine interactomes (science output) as well as the application of this information in reducing stress, disease, infection, lameness and methane emissions of cattle?	1) Farm level optimization (selection of particular outcomes of personal interest) and simulation modeling of decision making, 2) Producer surveys and focus groups to establish range of attitudes and barriers to adoption of this type of information in selective management/nutrition, 3) Public surveys and economic experiments to establish value of the science

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26	Genome Alberta	Ontario Genomics Genome Quebec Genome British Columbia	Miglior	Filippo	Stothard Sirard Cerri	Paul Marc-André Ronaldo	Univeristy of Guelph		Integrating genomic approaches to improve dairy cattle resilience: A comprehensive goal to enhance Canadian dairy industry sustainability	1) Development of genomic evaluation for novel traits to be incorporated in a selection index for overall resilience in dairy cows (i.e. the capacity to adapt rapidly to changing environmental conditions while maintaining or increasing levels of production and reproduction); 2) Identification and implementation of new female phenotypes for fertility to enhance selection accuracy for estrous expression, embryo survival and to minimize irregular estrous cycle; 3) Improvement of cow health and environmental efficiency by broadening resistance to disease, enhancing feed efficiency and tolerance to heat stress, while decreasing methane emissions; 4) Profiling of the microbiota of the rumen, udder and reproductive tract and development of integrated approaches to study host-microbiota interactions	1) Genomics; 2) Epigenomics; 3) Metagenomics; 4) Bioinformatics; 5) Selection Index	1) Assess potential short- and long-term socio-economic impacts of selective breeding (based on genomic technologies) for resilience traits in dairy cattle in terms of the impact under current and future anticipated environmental scenarios; 2) Define the scale of impact/implications at the market-level of the adoption of genomic selection for resilience in terms of prices, costs, structure of Canadian dairy industry; 3) Assess the relative preferences of farmers for resiliency traits, and resiliency traits relative to production traits; 4) Assess the attitudes of consumers and their willingness to pay for the producer adoption of resiliency traits, particularly if optimal public trait selection differs from industry trait selection due to values and time horizons; 5) Define the factors that influence public support for the application of genomic technologies in	1) Econometric and simulation market level models that allow measurement of the socio-economic impacts of genomic selection for resilience under different environmental scenarios and in different policy contexts (supply management versus unregulated); 2) Farmer and consumer surveys; 3) Public and dairy producer focus groups; 4) Public and producer economic experiments.
27	Genome Alberta	Ontario Genomics	Plastow	Graham	Pick	Charles	Univeristy of Alberta		The “omics” of grazing: A path forward to cattle productivity, ecosystem goods and services and long term sustainability.	Rangeland Health and Productivity; Environmental Goods and Services; Native and Tame Pasture; Forage and Beef Cattle Improvement; Climate Change Resilience and Sustainability.	Forage and Cattle Phenomics; Computational Biology, Genotyping and Sequencing; Metagenomics; Genomic Selection & Gene Editing; Speed Breeding	Understanding behaviour of the public, primary producers and the supply chain in the application of these technologies; implications of the application of technologies for public trust and support; determining the private and social values of using ‘omics to achieve optimal pasture management in the context of tradeoffs between the environment and industry productivity	Public focus groups, surveys & economic experiments to determine stated and revealed behavior; rancher and cow-calf producer focus groups, surveys, modeling to measure impact (production, environmental goods and services) of different practices across time; experiments with farm input suppliers (breeding companies etc.) to determine likely competitive strategies for sales/promotion of different technologies to farmers
28	Genome Alberta	Ontario Genomics Genome Quebec	Topp	Ed	Willing Harel	Ben Josée	University of Alberta	London RDC	ARMoR [Antimicrobial Resistance: Management of Risks in food production]	Ecology of antibiotic resistance farm to fork; reduction in antimicrobial use; risk assessment; alternative production practices; antibiotic resistance in animal-crop farming systems	Animal microbiome manipulation; nutritional interventions; immunotherapeutic interventions; (meta)genomics; risk modelling	Economic costs of antibiotic resistance; economic opportunities associated with reduction in antibiotic use	Representative farm modelling; partial equilibrium market models
29	Genome Alberta		Willing	Ben			University of Alberta		Pig Gut microbial ecosystem therapeutics (PGmet): Development of microbiome-based therapeutic approaches to support swine health and productivity	Swine gut health; Microbiome ecosystem therapeutics (MET); MET as a preventative/therapeutic tool in lieu of antibiotics in young pigs; MET in breeding herds to promote vertical transmission of resilient/productive microbiomes from grandparents to the next generations; MET in sows across parities	Metagenomics and culturomics for strain level isolation and characterization of consortia of core species (CCS) of pig gut, vaginal tract and mammary glands microbiomes; Metabolomics of CCS to assess their ability to produce inhibitory metabolites that suppress/modify virulence characteristics of common pig gut pathogens; Whole genome sequencing of CCS members to confirm safety via absence of antibiotic resistance genes and virulence factors; In vivo studies to test the efficacy of CCSs.	Regulatory competitiveness, innovation lag, risk assessment, policy framework	Policy analysis, impact assessment, surveying

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30	Genome Prairie		Anzar	Muhammad	Adams	Gregg	University of Saskatchewan	Saskatoon RDC	Seminal microbiome in bovine and bison bulls – for fertility prediction	Bovine and bison bulls, semen, microbiome, fertility, semen quality	Semen collection; PCR amplification of bacteria 16S rDNA; high throughput sequencing, 16S metagenomics analysis; bacterial markers for male fertility	Public acceptance; Adoption by industry; Risks of microbiome analysis	Simulation modelling; Surveys of companies and producers; Public surveys; Market level modelling
31	Genome Prairie		Bett	Kirstin	Vandenberg	Albert	University of Saskatchewan		Enhancing the Value of Lentil Variation for Ecosystem Survival (EVOLVES)	Crop wild relatives, seed quality, environmental sustainability, genetic improvement, lentil breeding	Whole genome sequencing, novel phenotyping tools, molecular breeding tools, database development and integration	Technology adoption, decision making, choice, behavioral economics, innovation policy	Applied behavioral experiments, mobile behavioral laboratory, surveys of plant breeders
32	Genome Prairie		Datla	Raju	Kochian	Leon	University of Saskatchewan		Improving Photosynthetic Efficiency in Canadian Crops	Photosynthesis, crop performance and yield, genomics, agriculture, climate change	Omics technologies, single cell genomics, gene discovery and characterization, Photosynthetic efficiency, breeding	Regulatory competitiveness, innovation lag, genome editing, international regulations, uncertainty	Impact assessment, policy analysis, case studies, surveys, policy landscape assessment
33	Genome Prairie	Genome Atlantic	Gerdts	Volker	Beattie	Mike	University of Saskatchewan		Accelerated aquaculture vaccine development through genomics (AquaVac)	Vaccines, immunity, manufacturing, stress, antigen discovery	Accelerated aquaculture vaccine development through genomics	Acceptance of novel vaccine technologies by both the industry and the consumer; Increasing aquaculture yield and acceptance by raising healthier fish and reducing environmental disease risk	Economic analysis, Regulatory and Policy analysis, Consumer surveys and Behaviour analysis
34	Genome Prairie	Genome Alberta	Gomis	Susantha	Careem	Faizal	University of Saskatchewan		**A**nti-**M**icrobial use reduction in **P**oultry production **U**sing **L**eading-edge omics-based biomarkers for **E**arly detection and management of **S**ubclinical and acute infections**.**	Innovative poultry production without AMU, monitoring poultry health and performance, improved profitability, environment friendly sustainable poultry production through OMICs approach	Metabolomics, lipidomics, transcriptomics, biomarkers, factors altering metabolome	Innovative poultry production without AMU, monitoring poultry health and performance, improved profitability, environment friendly sustainable poultry production through OMICs approach	Metabolomics, lipidomics, transcriptomics
35	Genome Prairie	Ontario Genomics	Gutwin	Carl	Parkin	Isobel	University of Saskatchewan	Saskatoon RDC	Crop Adaptation and Polyploid Evolution (CAPE): New genomics tools to realise the impact of genome duplication	Polyploid evolution, trait improvement, genome visualization, comparative genomics, Brassicaceae species	ONT sequencing, bioinformatics, HiC, RNASeq, genotyping interspecific crosses	Identify the range of arguments for and against GM crops; Evaluating key societal positions impacting science adoption; Assess the evidence base of these key positions (i.e., do people get the facts right)	Social media analyses; stakeholder interviews; public engagement; quantitative analyses
36	Genome Prairie		Kochian	Leon	Helgason	Bobbi	University of Saskatchewan		Using root microbiome genomics to improve root health and nutrient acquisition in the rotation crops of Western Canada	Root microbiome; root-microbe signaling; seed microbiome; cropping systems and microbiome; root exudate effects on microbiome composition and function;	Phylogenetic sequencing; RNAseq of root microbiome; imaging and quantification of root architecture; cyclotron-based imaging/quantification of 11C-labeled photoassimilate flux to root and rhizosphere; cyclotron-based 13N quantification of free-living and nodule-based root N2 fixation; 13C and 15N stable isotope analysis to link nutrient turnover with keystone taxa in the root microbiome; translational tools and technologies	Climate change; carbon sequestration in soil; economic value of crop rotation; improved soil health through root microbiome management	Farm survey, impact assessment, modelling
37	Genome Prairie	Ontario Genomics	Monreal	Carlos	Adl	Sina	University of Saskatchewan	Ottawa RDC	The microbiomes and *omic* components of soil nitrogen cycling, plant health and growth promotion. Furthering knowledge for the resilience of soils, the health of crops and food security.	Soil microbiome, omics of the soil nitrogen cycle, plant pathogen infection-defense, growth promotion, cropped and native soil rhizosphere.	Next-generation sequencing of soil 16S rDNA and 18S rDNA, ^{13}C and ^{15}N isotopes in active microbiomes and nitrogen cycling, metabolites by chromatography and mass spectrometry, gene transcriptomics and proteomics of N cycling, plant growth hormones, soil-borne pathogens.	Soil microbiomes under cereal - pulse crop rotations and native rhizospheres, microbial-gene systems and soil-plant N cycling, biomarkers for N cycle and plant pathogen defense mechanism, soil benefitial microbiomes interaction with *Fusarium sp. and* plant growth promotion.	Mass spectrometry/mass spectrometry of soil solution metabolites, alkaloids and arachidonic acid chemical signals, *nifH - gls - gln - amo* A - *nxr* A soil genes, discriminant analysis and principal component-factor analysis interactions
38	Genome Prairie		Phillips	Peter	Smyth Castle	Stuart David	University of Saskatchewan		VALGEN 2.0: Tools to optimize Canadian agrifood innovation	Regulation, governance, precision agriculture, competitiveness, innovation	Regulation, governance, precision agriculture, competitiveness, innovation	Regulation, governance, precision agriculture, competitiveness, innovation	Regulation, governance, precision agriculture, competitiveness, innovation
39	Genome Prairie	Ontario Genomics	Pozniak	Curtis	Cloutier	Sylvie	University of Saskatchewan	Ottawa RDC	4DWheat: Diversity, Discovery, Design and Delivery	Wheat Diversity · Gene regulation · Gene cloning · Recombination · Germplasm	*De novo* sequencing · Transcriptomics · Hi-C · Bioinformatics · Phenomics	Benefits of wheat genetic advancement, profitability, risk reduction, carbon, natural capital, genomics and the diversity of elite wheat varieties, international wheat testing protocols and new variety adoption	Econometric estimation · Inter-D modelling · International comparisons · Social network analysis · Expert interviews

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40	Genome Prairie		Sharbel	Tim			University of Saskatchewan		Genetic fixation of complex genotypes in crops: enabling technology to harness biodiversity and feed the world	Apomixis, heterosis, niche breeding, biodiversity, seeds	Single molecule sequencing, CRISPR, epigenome profiling, evolutionary genomics, proteomics	1. How will apomixis technology adoption differ between farmers in advanced and emerging economies?; 2. How will the IP reflected in locally adapted novel germplasm developed by farmers be shared if adopted by industry for apomictic breeding?; 3. How will apomixis technology be shared between industrial partners?; 4. How will apomixis technology advances be communicated, in light of IP protection, in order to advance the technology most efficiently?	Socio-economic studies; social network analysis; behavioural experimentation; surveys
41	Genome Prairie		Sharpe	Andrew	Hegedus	Dwayne	University of Saskatchewan	Saskatoon RDC	**E**nabling **P**rotein **O**ptimization for the **C**anola **H**arvest (EPOCH)	Seed protein modification; gene editing; genome structural variation; gene expression and regulation; genome visualization	Oxford Nanopore Technologies; RNASeq; HiC; CRISPR; bioinformatics	Consumer preferences for plant-based protein; farm-level adoption; supply-chain flexibility; social acceptance of gene-editing	Market analysis; consumer surveys; supply-chain analysis; demand estimation; regulatory impact assessment.
42	Genome Prairie		Unniappan	Suraj			University of Saskatchewan		AquaGENE	Aquaculture, Growth, Reproduction, Nutrition, Health	Microarray, RNA sequencing, iTRAQ mass spectrometry, Protein arrays, Metabolomics	Hormones, Genes	Hormone administration, Gene modifications
43	Genome Prairie	Genome Alberta	Waldner	Cheryl	Otto	Simon	University of Saskatchewan	Lethbridge RDC	Genomic ASSETS (Antimicrobial Stewardship Systems from Evidence-based Treatment Strategies) for Livestock	veterinary medicine; antimicrobial resistance; antimicrobial use and stewardship; diagnostic testing strategies; bovine respiratory disease (BRD)	nanopore; shotgun metagenomic sequencing; epidemiology; bioinformatics; recombinase polymerase amplification;	incentives for and barriers to genomic technologies adoption; cost-benefit analysis; attitudes to and factors influencing diagnostic testing and antimicrobial use; antimicrobial resistance and antimicrobial use impact on market access	mixed methods – quantitative surveys, qualitative interviews & focus groups; simulation modeling and complex systems science tools; epidemiology; economic analysis
44	Genome Prairie		Warkentin	Tom			University of Saskatchewan		Pea Quality 'Omic Determination (PeQuOD)	Genomics, pea, plant-based protein, amino acid balance	Re-sequencing, SNP chip, genomic selection, *in vitro* digestibility of protein, amino acid analysis	Dietary substitution, valuation of non-market environmental benefits, valuation of health benefits	Hedonic willingness-to-pay consumer survey, experimental economics, natural capital augmented cropping system evaluation, economic/nutrition health-benefit meta analysis
45	Ontario Genomics		Charles	Trevor	Antunes	Pedro	University of Waterloo	Harrow RDC and London RDC	Enhancing Food Security through Microbiome Management in Controlled Environment Plant Agriculture	Hydroponic microbiome characterization and modeling; Microbiome monitoring and pathogen early warning; Microbiome optimization; Microbiome impact on taste and nutritional quality	Microbiomics and metagenomics sequencing and bioinformatics; Data analytics and machine learning; Metabolomics; Genome sequencing; Real-time microbiome monitoring	Food security in remote communities; Public trust and acceptance of microbiome design; Regulatory issues with respect to microbiome-based products; Patent / IP issues with microbiome design	Community outreach; Consultation with regulatory agencies; Consultation with end users
46	Ontario Genomics	Genome Quebec	Ekker	Marc	Vanderberg	Grant	University of Ottawa		Development of novel Bioconfinement strategies for farmed fish.	Bioconfinement, Induced sterility, germ cell development, gene drive, genetically modified organisms.	CRISPR-Cas9, gene drive, whole genome sequencing, transgenic animals	Safety, biodiversity and environmental issues of genome editing procedures. Environmental impact of gene drive strategies.	Applied ethics, Ethical discourse analysis
47	Ontario Genomics		Fan	Ming	Master	Emma	University of Guelph	Ottawa RDC Guelph RDC Sherbrooke RDC	Functional Genomics of Gut Alkaline Phosphatases in Pigs	Alkaline phosphatases for digestive dephosphorylation of endotoxins; toll-like receptors in mediating inflammatory responses and gut health; intestinal fermentation, nutritional and physiological responses; recombinant alkaline phosphatases as novel exogenous feed enzymes; antimicrobial resistance, efficiency of nutrient utilization in pigs and sustainable pork production	Functional genomics; protein engineering of enzymes via mutagenesis and chimeragenesis; biochemical and molecular characterization of target enzymes; pig growth and production efficacy, nutritional, immunological and physiological analyses; gut microbial metagenomics and meta-transcriptomic analyses	Cost and profit analyses of currently available alternatives to in-feed uses of antimicrobials in pig production; quantitative economics of using supplemental alkaline phosphatases in pork production; governmental regulatory barriers of using novel and biologically engineered recombinant microbial feed enzymes; consumer acceptance or preference for the technology relative to antibiotic use and the potential impact on demand	Techno-economic modeling and life cycle assessment; cost - profit and value-chain analyses of pork production cycle; economic impact of food safety risks; identification of novel feed regulations; consumer surveys to assess acceptance, perspectives and willingness to pay for novel enzyme technology

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48	Ontario Genomics	Genome Alberta	Goddard	Ellen	Weersink	Alfons	Univeristy of Guelph		Public Policies to Foster Agricultural Genomic Innovation	(1) Return on investment to genomics research in plants and animals, (2) barriers to adoption of genetic technologies and solutions in agriculture, (3) innovation governance models for innovation in genetic technology through public and private value chains, (4) risk assessment and management with genetic technologies and together with existing frameworks, public policy formation and (5) evaluation of public policies with genetic innovation as part of the policy toolbox	(1) econometrics, (2) bio-economic modeling including Monte Carlo simulation, (3) meta-analysis, (4) case studies (5) Consumer panels/surveys, Delphi expert assessments	N/A	N/A
49	Ontario Genomics	Genome Quebec	Goodridge	Lawrence	Levesque	Roger	McGill University		Stopping Enteric Infections Early (Sentinel) through Improved Traceability of Contaminated Foods	Rapid omics-based identification of contaminated food, traceability, blockchain, artificial intelligence analysis	Metagenomics and proteomics analysis of raw sewage for foodborne pathogens, development of droplet digital whole genome sequencing approaches, social media analysis, economic sales data analysis	Ethical, legal and social implications of social media analysis to identify foodborne outbreaks, data privacy, data ownership	Comparative legal methods, qualitative research, systematic review
50	Ontario Genomics		Grbic	Miodrag	Grbic	Vojislava	Western University	Ottawa RDC London RDC Harrow RDC Summerland RDC	Precision agriculture – pest xenogenomics for development of novel tools for crop protection	xenobiotic responsiveness/detoxification enzymes (e.g. CYP450, GST, esterases); pesticide resistance; plant-derived biopesticides; RNAi; two-spotted spider mite	RNASeq, SNP genotyping, metabolomics, plant biochemistry, chemical/dsRNA screens	Economic assessment of the commercial value of new technology; Cost versus reliability of monitoring pesticide resistance; application management; ownership and use of data; establishment of good/best practices; barriers to entry	economic modeling, stakeholder and end user surveys, discreet choice experiments
51	Ontario Genomics	Genome BC	Guttman	David	Subramanian Bakkeren	Gopal Guus	University of Toronto	Ottawa RDC Summerland RDC	Exploiting Microbial Genomics for Crop Immunization	Comparative pathogenomics; Effector-variant and virulence-factor compendiums; Microbiome exploitation; Plant immunity; Novel resistance gene discovery	Comparative genomics, Transcriptomics, Proteomics, Metabolomics; Host-induced gene silencing	Improving quality assurance and safety of grains; Evaluate market access issues of germplasm developed with generated technology; Evaluate economic impact of various pathogens and their diseases and of the pro-posed methods to mitigate the risks	Assessment of the regulatory landscape; Market opportunities and competition; Value proposition analysis (includes consumer input); Pathway to commercialization
52	Ontario Genomics		Hajibabaei	Mehrdad	Phillips	Lori	University of Guelph	Harrow RDC Ottawa RDC Saskatoon RDC Swift Current RDC Summerland RDC	AgroEcoNet: Genomic-enabled analysis of biodiversity networks sustaining agriculture and ecosystem equilibrium	1. Agricultural soil biome; Phylogenetic and trait-based microbiome assemblage; Best management practices; Soil health and resilience; Disease and pest regulation 2. Beneficial ecosystem services in soil and water; Ecological Goods and Services; Refugia; Invertebrates; Agri-ecosystem resilience	1. Nested micro-plot and field based BMP experiments; Archive soil samples; Droplet digital qPCR; Metabarcode sequencing (prokaryotes & eukaryotes); Targeted metagenomics and metatranscriptomics (prokaryotes & eukaryotes) 2. Field and landscape level BMP experiments; GIS supported biota-soil-water-land-use mapping; metagenomics and metabarcoding (prokaryotes & eukaryotes); transcriptomics (prokaryotes & eukaryotes); sequence capture	Valuation of natural biological capital; Identification and valuation of best management practices (BMPs); Estimation of Ecological Goods and Services provided by alternative BMPs; Agro-ecosystem resilience; Grower and consumer adoption of practices	Economic modeling such as optimization, simulation, econometrics; Stakeholder research including surveys, focus groups, expert assessment, forecasting
53	Ontario Genomics		Heath	Daniel			University of Windsor		Environmental DNA ("eDNA"), meta-barcoding and transcriptional profiling to improve sustainability of freshwater fisheries and fish culture.	Freshwater fisheries; Adaptive potential; Invasive species; Environmental stress; Fish culture	Environmental DNA; Transcriptional profiling; Meta-barcoding; Fish PCR primer database; Stock assessment	Effective resource management; Ethical considerations; Social acceptance; Indigenous Natural Resources; Environmental impacts	Cost-benefit models; Surveys; Case studies; Regulation review; Decision trees and models
54	Ontario Genomics	Genome BC Genome Quebec	Inglis	Debra	Úrbez Torres Moffett Lévesque	José Ramón Peter André	Brock University	Summerland RDC	Genomics Research for Advancements in Protection from Viruses and Insects of National Economic Significance in grapevine (GRAPeVINES)	plant health; pathogen and insect detection; virus and insect genomics; plant genotyping; genomic-based epidemiology	whole genome sequencing; RNA sequencing; Comparative genomics; Bioinformatics; Large-scale diagnostics	grapevine virus economic thresholds; regulatory plant protection policy; consumer awareness and impact on purchasing; viruses and vine health and wine quality; environmental economics	Economic impact models; environmental impact on agricultural practices; epidemiology modeling; consumer behaviour

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55	Ontario Genomics		Lu	Ray	Sullivan	Brian	University of Guelph		Improvement of animal health, well-being and meat quality by reducing stress in pigs using modern genomic technologies	Stress; animal welfare; resilience; meat quality; animal health	Molecular genetics; DNA marker; CRISPR genome editing	Modern Genetic Breeding; Animal Welfare; Stress and Disease Resilience; Herd Management	Ethics; Public Perception and Engagement; Producer Perception and Engagement; Survey; Communications with Producers and Consumers
56	Ontario Genomics	Genome Quebec	Lukens	Lewis	Singh Tinker	Jaswinder Nicholas	University of Guelph	Ottawa RDC	Functional genomic targets for delivery of improved Canadian barley a	Barley; oat; yield; grain quality; environmental adaptation	Genome diversity; biostatistics; environmental response; gene editing; quantitative genetics	How do economic factors enhance or lessen the uptake of plant genetics research advances? How do different modes of communication affect public perceptions of new genome technologies?	Econometrics; quantitative modelling of policy issues; social communication models; innovative participatory methodologies
57	Ontario Genomics		Marsolais	Frédéric	Eskandari	Milad	University of Guelph	London RDC	Improving soybean protein composition through genomics	seed protein concentration; essential amino acids; seed protein variants; functional properties	plant genetic resources; biochemical analysis; genome-wide association studies; genome editing; genome resequencing	Biotechnology regulation; public acceptance; socio-economic impact; sustainable value-chain integration; genome-edited soybean ethics	Regulatory analysis; sustainable value-chain integration analysis; risk analysis; socio-economic analysis; participatory scenario-based foresight analysis
58	Ontario Genomics		Parkinson	John	Sharif	Shayan	The Hospital for Sick Children		Microbiome manipulations to enhance poultry production	Microbiome; Livestock gut health; Community metabolism; Probiotic consortia; Pathogen resistance	Metabolic reconstruction; Flux balance analysis; Community network analysis; Metatranscriptomics; Genomics	Regulation; Livestock Welfare; Antibiotic resistance; Food safety; Food security	Taste panels; Qualitative studies; Market analysis
59	Ontario Genomics	Genome Quebec Genome Alberta	Saville	Barry	Carisse Chatterton	Odile Syama	Trent University	St-Jean-sur-Richelieu RDC Lethbridge RDC	E-genomics-Enabled Mitigation of Fungal Crop Disease	Fungal crop disease management, molecular aerobiology, emerging diseases, pathogen population monitoring, fungicide resistance management	Metabarcoding, metagenomics, spore monitoring and quantification (DNAbased), short and long read sequencing, field experiments	Technological adoption, farm decision-making, consumer preferences, agricultural marketing	Econometric models of technology adoption; social learning models, qualitative research; consumer surveys; market surveys
60	Ontario Genomics		Saxena	Praveen	Regan	Sharon	University of Guelph		NUTCRACKER: Genomics of abiotic and biotic stress in Hazelnut	Creation of improved Hazelnut cultivars that are cold tolerant and Eastern Filbert Blight resistant for the emerging hazelnut industry in Canada	DNA finger printing, whole genome assembly, transcription profiling, and soil microbial analysis using high-throughput sequencing	Cost/profit/economic impact assessment/evaluation of hazelnuts in Canada; Investigation of land use policies; Geographic/climate competitive advantage Barriers to converting farmland to hazelnut plantations; Farming incentives	Stakeholder engagement through surveys and interviews; market assessment via literature and indicators; scan of domestic/international policies that might be reused to encourage land use diversification and adaptive management in the face of a changing climate; synthesis analysis to determine sectoral impacts, economic modeling
61	Ontario Genomics		Simmons	Denina	Kirkwood	Andrea	University of Ontario Institute of Technology		Non-lethal monitoring tools to determine the exposure and health effects of harmful algae blooms on fish populations in the Great Lakes	Harmful Algal Blooms, Wild Fish Health, Freshwater Fisheries, Algal Epibiome, Fish Gut Microbiome	Epigenetics, Proteomics, Metabolomics, Metataxonomics, Metagenomics	Socio-Economic impacts, commercial and sports fisheries, human health, community vulnerability perceptions	Community/Stakeholder Surveys and Interviews, Quantitative and Qualitative analytical techniques
62	Ontario Genomics	Genome Atlantic Genome BC	Somers	Daryl	Myles Singh	Sean Amritpal	Vineland Research and Innovation Centre	Summerland RDC	Modernizing Canadian Apple Breeding throught Genomics	High through put Phenomics; disease; traits; breeding tools; varieties	Genotyping by sequencing; spectroscopy, image analysis, disease screening	Variety adoption, market access, business model, traits, preference	A mixer of empirical-analytical approaches and Interpretative methods (network data analysis)
63	Ontario Genomics		Van Coeverden de Groot	Peter			Queen's University		A Sustainable Fishery for Nunavumiut	Sustainable Arctic fisheries; variance in Arctic fisheries; non-invasive exploratory fisheries; genetic estimates of fisheries data; climate change and disturbance	Biological properties of fish & costs of harvesting; sensitivity of fisheries evaluation to parametric variance; genetic assay from finclips & slime; SNP's, NGS, DNA methylation & immunogenetic's, investigation of parametric heteroscedasticity and climate	Validity of 5 years fish population Catch Per Unit Effort (CPUE) data for DFO commercial fisheries licensing; utility of genetically derived fisheries parameters for broader fisheries evaluation; traditional Inuit fishing practice, parametric variation and fisheries evaluation	Inter-annual variability in Arctic fish biology will be reflected in annual CPUE and the validity of DFO's requirement of 5 years of CPUE for fisheries in the face Arctic climate change will be determined; the impact of variability in other measures used in a comprehensive harvest evaluation will be determined; current Gjoa Haven Nunavumiut fishery practice and the 'cost' of alternative fishery practice will be integrated with variance in fish biology to produce realistic harvest scenarios for Arctic fisheries and will provide a road map for other Arctic communities as they seek to develop this resource the face of climate change.

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64	Ontario Genomics		Weretilnyk	Elizabeth			McMaster University		Improved Climate Change Resilience, Optimized Productivity and Sustainability (Improved C^2ROPS) for Canadian Agriculture	Abiotic and biotic stress tolerance, nutrient use efficiency, molecular breeding, plant-soil interactions	Genotyping by sequencing, automated phenotyping, transcriptomics, metagenomics	Regulatory competitiveness, climate change, innovation lag	Modelling, surveying
65	Ontario Genomics	Genome BC	Zayed	Amro	Foster	Leonard	York University	Lacombe RDC	BeeCSI: 'Omic tools for assessing bee health	Pollinator health; stressors; biomarkers; diagnostics; microbiome	Transcriptomics; Proteomics; Microbiome profiling; Machine learning	Bee health assessment; Micro- and Macro-scale industry benefits; Health Economics	In-depth stakeholder interviews; Continuous stakeholder engagement; Cost benefit analysis; Mathematical modelling; Early adoption testing
66	Génome Québec		Belzile	François	Bélanger	Richard	Université Laval	London RDC Ottawa RDC	SoyABIO: Applying genomics to develop soybean varieties with increased resistance to abiotic and biotic stresses to realize soybean's full potential in Canada	Soybean, abiotic stress, biotic stress, phenomics, crop rotation	Genomics-assisted breeding, SNP-based diagnostics, metagenomics, phenotyping root architecture and function, avirulence/effector genes	Soybeans, cropping systems, natural capital, risk reduction, trade	Inter-D crop enterprise analysis, portfolio analysis, farm surveys, environmental accounting, trade policy modeling
67	Génome Québec		Bernatchez	Louis	Moore	Jean-Sébastien	Université Laval		**FISHES**: Fostering Indigenous Small-scale fisheries for Health, Economy, and food Security	Northern indigenous communities; inland and coastal fisheries; commercial, recreational and aboriginal (CRA) fisheries; definition of conservation units, bio-indicators for sustainability; enhancement effectiveness of resource management	Whole genome (re)sequencing; SNP discovery, annotation and (high/low throughput genotyping); population genomics, mixed stock fisheries management; genome wide association studies; environmental DNA	Traditional knowledge systems; subsistence and small-scale fisheries ; food security/sovereignty and social well-being; cultural resilience and adaptation to change; socio-ecological systems	Co-production of knowledge through interviews, surveys and focus groups; contaminant analysis; participatory mapping and visualization; statistical modelling of social well-being and assessment of potential social and economic impacts.
68	Génome Québec		Bureau	Thomas			McGill University		Novel DNA conferring beneficial traits to economically important crops	Abiotic stress, drought, flooding, temperature extremes, Brassicaceae crop	Phenomics, bioinformatics, functional genomics, phenotyping	Agronomic traits, food security, consumers, farmers, breeders	Ex-ante review with a cost-benefit
69	Génome Québec		Fernandez-Prada	Christopher			University of Montréal		Guaranteeing sustainable poultry productions through exosome-based genomics	Discovery and implementation of: (i) novel exosome-based biomarkers for the rapid diagnostics of Eimeria parasites and (ii) drug-resistance biomarkers. Development of (iii) exosome-based vaccines against protozoan parasites. Evaluation of: (iv) the impact of these technologies as an alternative to antiparasitic drugs	i) Isolation and characterization of exosomes naturally secreted by protozoans (by genomics, proteomics and lipidomics analyses) = biomarkers + enriched components; (ii) evaluation of the inflammatory response induced by exosomes in vitro and in vivo; (iii) animal trials to establish immunization regimes; (iv) validation of biomarkers in clinical samples	Evaluation of the impact and cost-effectiveness of exosome-based technologies in terms of: (i) sensibility, specificity, and precision of new diagnostic tests; (ii) impacts of new vaccines on animal health and welfare and on antimicrobial resistance; and (iii) cost and benefits. To explore: (iv) potential social and economic barriers to implementation of these genomic tools; and (v) translational pathways including social and economic factors to guarantee the durable uptake of novel diagnostic tests and vaccines.	(i) Epidemiological modeling to test the impacts of new vaccines on animal health and welfare and levels of antimicrobial resistance; (ii) Cost-effectiveness analysis; (iii) Mixed-methods research to evaluate socioeconomic factors that will drive the uptake of novel technologies; (iv) evaluation of impacts, potential costs and benefits and innovation acceptability using mixed-methods research
70	Génome Québec		Gagnon	Carl	Harel	Josée	University of Montréal	Sherbrooke RDC	Microbiota Intervention to Improve Swine Production (MIISP)	Manipulation of animal microbiota to increase farm productivity; Mitigation of mycotoxin contaminated feed; Improvement of vaccination efficacy against porcine reproductive and respiratory syndrome (PRRS) virus; Improvement of swine resilience against infectious diseases	Microbiota intervention; Fecal microbiota transplantation (FMT); Metagenomic, 16S genomic and metabolomics; Experimental infections in swine; Evaluation of animal health parameters and immune response; Evaluation of mycotoxins in feed and animal	Determine ethical and legal issues in microbiota manipulation safety practices and regulations; Quantify and model the economics of microbiota intervention and reduction of antibiotics used in animal production	Reviews using published literature and document databases;Comparative analysis; Workshops and discussion group with stakeholders; Personal and group interviews; Surveys with and without stated choice
71	Génome Québec		Hogue	Richard			Institut de Recherche et de Développement en Agroenvironnement		Genomic tools to preserve agricultural lands in Quebec	Soil microbial ecology / Soil quality / Agri-environment / Biological indicators	DNA high-throughput sequencing / Bioinformatic & Biostatistic of Compositional Datasets / Soil Microbiome Analysis	Politics of land management / Profitability of ecosystems services / Adoption and barriers of rotations / externalities and soil degradation costs	Logistic regression /Cost-Benefit Analysis /Land-use change/ Socio-economic-environmental model of land management
72	Génome Québec		Ibeagha-Awemu	Eveline	Costa*	Marcio	Université de Montréal*	Sherbrooke RDC	Gut microbiota manipulation to support immune development, health and productivity of dairy animals and environmental health	Gut microbiome, immune development/productivity, health (diarrhea and John's disease), environmental health/pathogen free manure, calf/cow/one-health-approach	Metagenomics, metatranscriptomics/transcriptomics, metabolomics, high solid-anaerobic-digestion, bioinformatics/big data integration	Macro-economic impact/role of dairy value chain in the one-health for all approach, cost-benefit analysis of adjusted farm practices to stimulate immune development and reduce environmental pathogen load, cost/benefits of OMICS tools to address microbial dysbiosis related diseases and antimicrobial resistance, cost benefit analysis of treating cow manure to eliminate pathogens from cattle barns/environment/ground water and its reuse. What are the policy and regulatory considerations of fecal microbiota transplantation in cattle?	Cost-benefit analysis, input-output modelling, computable general equilibrium, representative farm modeling, comparative legal assessment of laws, regulations and policies/content analysis/systematic review

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73	Génome Québec		Kushalappa	Ajjamada C.	Diallo	Abdulaye B.	McGill University		Changing climate and multiple disease resistant cisgenic wheat cultivars through genome editing	Multiple disease resistance; Mycotoxin reduction in wheat grains; Functional genomics; Resistance metabolites; Molecular biology	Metabolo-transcriptomics; Genome and gene sequencing; Genome editing; CRISPR-Cas9 with geminivirus vector; edited genic marker assisted breeding	How cisgenic cultivars differ from transgenic/GMOs; Do the cisgenic cultivars have NOVEL traits hindering environmental release; Do the cisgenic cultivars have detrimental food/feed ingredients; How are genome edited crop regulated; what are the economics, ethical, legal and social implications of cisgenic wheat	Comparative law; semi-structured interviews; Survey of social perception; economics of cisgenic wheat cultivars; Cisgenic crops in organic farming
74	Génome Québec		Martin	Vincent			Concordia		Bioprocess development for cheese whey valorisation	Lactose fermentation, organic acids, metabolic engineering, systems biology, bioprocess development	High throughput strain engineering, high throughput strain screening, genome foundry, fermentation, metabolic modeling	Regulation and public policy updating, regulatory transfers, learning from scientists, risk perception	Analysis of legal documents, semi-structured interviews with regulators and industry, survey of scientists, public opinion survey
75	Génome Québec		Sauvé	Sébastien			Université de Montréal		Promoting a Greener Agriculture	Soil nutrients cycle, soil health, pesticides, fertilizers, agricultural practices	Amplicon sequencing; Strain-resolved metagenomics; Biodegradation; Biomonitoring; Agricultural best practices evaluation	What are the costs and benefits of conventional agriculture versus greener agronomic practices? What are the externalities caused by massive chemical inputs on soil genomic diversity, indigenous plants and animal diversity? What are the socioeconomic impacts of different scenarios of improved agricultural practices?	Cost-benefit analysis; Cost-effectiveness analysis; socioeconomic impacts evaluation; scenario-based modeling approach; landscape modelling
76	Génome Québec	Ontario Genomics	Smith	Donald L.	Wilkins	Olivia	McGill University	London RDC	Genomics for sustainable control of bacterial pathogens of tomato and potato	Biocontrol, metagenomics, metatranscriptomics, phytomicrobiome, functional genomics	RNA-sequencing, metagenome sequencing, regulatory network inference, fermentation platform technologies, microbial scale up production	- Assessment of economic aspects of the resulting technology; - Determination of factors affecting long-term social license in this area; - Understanding the ability of these approaches to reduce pesticide use in greenhouse tomato production and associated environmental benefits; - Consultations and analysis regarding policy needed to support development in this area; - Evaluation of public acceptability of the use of modified (genomics) microbial strains versus compounds/materials produced by them in fermenters	- Public surveys in the form of questionnaires (Delphi method); - Economic modeling related to the company partner and production practices; - Policy analysis; - Economic considerations regarding the production sector, including both technology and social perspective effects; - statistical approaches
77	Génome Québec	Genome Atlantic	Stromvik	Martina	Tai	Helen	McGill University	Fredericton RDC	Revolutionizing Potato Variety Development for Climate Smart Agriculture	'Omics-assisted potato breeding; Climate Smart potato traits; Potato processing traits; Diploid potato inbreeding traits; Stress resistance	Genome sequencing; Bioinformatics; Transcriptomics, Metabolomics, Proteomics; Plant imaging; Genetic mapping	Socioeconomic analysis; Transitioning the potato crop from tetraploid breeding to diploid inbreeding; Technology evaluation and adoption; Impact analysis of new breeding technology on industry	Economic assessment; Multi-criteria analysis; Stakeholder analysis; Adaptive capacity assessment; Interviews, discussion groups
78	Génome Québec		Surget-Groba	Yann	Filteau	Marie	Université du Québec en Outaouais		Mapping Maple Trees: Genomic approaches to improve maple syrup traceability and quality	Maple Syrup quality; Maple Syrup traceability; Maple genetic and microbiome diversity; Physiology of sugar production	Sequence capture; metagenomics and metatranscriptomics; sap metabolomic analysis; GWAS; Microbial growth competition assays	Cost-benefit analysis of innovative genomics and microbiology practices; Adaptation capacities of maple syrup producers; Conditions for protected designations of maple syrup; Social acceptability of innovative practices	Cost-benefit analysis; Survey and discourse analysis; Labeling economics
79	Génome Québec	Genome Alberta	Tsang	Adrian	McAllister	Tim	Concordia	Lethbridge RDC	Probiotics, prebiotics, microbiomes and gut health in livestock	Effects of commercial probiotics and prebiotics; development of effective probiotics and prebiotic formulation; gut health; microbiomes	Metagenomics; metatranscriptomics; exoproteomics; metabolic profiling; bioinformatics	Public acceptance of the use of probiotics and prebiotics; producers' acceptance readiness of the use of new probiotics and prebiotics; economic impact; environmental impact	Public engagement; consultation of producers; economic modelling; environmental sampling

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80	Génome Québec		Yergeau	Etienne	Lacroix	Monique	Institut national de la recherche scientifique	St-Jean-sur-Richelieu RDC	The vegetable microbiota: from the farm to the shelf	Vegetable production and processing, soil and plant microbiome, vegetable microbiome, food waste, foodborne pathogens	Metagenomics, metatranscriptomics, amplicon sequencing, bacterial genomics, synthetic communities	Discuss the ends and means of the research with team of co-researchers. Develop systematically the substantial values involved in the research. Identify potential users from the start. Identify the conditions of their potential appropriation and use of the research. Collect their input at all the significant phases of the research. Identify eventual key barriers of microbiota modification at the user's level	Systematic ethical development and argumentation. Applied ethics of science communication. Identification and mobilization of potential users at the regional levels, on a representative but qualitative basis. Organized argumentative forums, transcriptions (if required) and discourse analysis
81	Genome Atlantic		Beiko	Robert	Bradbury	Ian	Dalhousie University		Informing Canadian fisheries management and stock assessment with low-coverage whole genome sequencing	Fish stock structure, local adaptation, response to climate change, effects of fisheries on genetic composition of populations	Whole genome sequencing, Low-depth DNA sequencing, genome assembly bioinformatics, climate-change modeling, fisheries stock assessment	Integration of traditional knowledge, assessment of regulatory impacts, benefits of fisheries stability,	Consultations with Indigenous groups, Arctic fisheries, local governance
82	Genome Atlantic	Ontario Genomics	Columbo	Stefanie	Boulding	Elizabeth	Dalhousie University		Farmed salmon with enhanced tolerance to plant-based diets	Aquaculture, fatty acid synthesis, fish oil, omega-3, salmon	Single nucleotide polymorphism, chip, molecular markers, selective breeding	Cost saving, fish oil, fisheries capacity, production efficiency, sustainability	Economic modelling, fisheries projection models
83	Genome Atlantic		Rise	Matthew	Taylor	Richard	Memorial University		Development of an omics-based platform for high-throughput evaluation of Canadian sourced feed ingredients	Health additives, lipidomics, genomics, nutrigenomics, database creation	In vitro and in vivo models, fish immunity, chemical analysis, bioinformatics, transcriptomics	Economic and social benefits, enterprise development, sustainability, ethics and consumer acceptability	Value chain analysis, enterprise survey, stakeholder analysis

* Lead Organization eligible to receive and administer Genome Canada's funds