



Climate Action Genomics Initiative Climate-Smart Agriculture and Food Systems

Funding Overview

EXECUTIVE SUMMARY

Genome Canada is launching a new Climate Action Genomics Initiative funding opportunity in May 2022.

Climate change poses a significant risk to our agricultural systems, impacting the availability of food and other vital resources, from fuels to the raw materials used to develop everyday products.

The [Canadian Net-Zero Emissions Accountability Act](#) calls for ambitious action to reduce emissions in the agriculture sector. New technologies, products and approaches are required to reduce emissions while maintaining productivity and competitiveness given Canada's global leadership in feeding the world. Canada's food systems and other agriculture processes must be resilient and sustainable given global shifts in environmental, geopolitical and climate conditions.

In response to this major challenge, Genome Canada's latest large-scale genomics initiative supports climate change mitigation and adaptation through strategic investments in climate-smart agriculture and food systems.

The new opportunity, called the Climate-Smart Agriculture and Food Systems initiative (hereafter "the Initiative"), is investing \$30M in cutting-edge genomic research and innovation to reduce greenhouse gas emissions and the carbon footprint of Canada's food production systems—building their resiliency, environmental sustainability and economic viability.

A distinguishing feature of the Initiative is that it funds a portfolio of interdisciplinary projects and helps coordinate and connect their efforts with cross-cutting programs for knowledge mobilization, data coordination and implementation across Canada. This portfolio approach allows benefits from one solution to translate into other food production systems or supply chains and cascade impact throughout the broader food system.

The Initiative will deploy a number of funding opportunities that will make up the portfolio.

At the outset, these will include:

- Funding for Interdisciplinary Challenge Teams [available now](#).

- Funding for a Data Coordination Centre, coming in summer 2022.
- Funding for a Knowledge Mobilization and Implementation Coordination Centre, coming in summer 2022.

Genome Canada is looking forward to working with diverse partners—including academic, public, private, industry and non-profit players—in funding a portfolio of genomics research and innovation projects that deliver solutions to reduce the carbon footprint of Canada’s food production systems.

1. OVERVIEW

Climate change poses significant risks to Canada’s agriculture systems. Its impacts may affect the yield and availability of agricultural products, including foods, fuels and fibres. More frequent extreme weather events, changes in the timing and duration of growing seasons, shifting patterns of precipitation, and an increasing incidence of disease, pest and invasive species infestations are just some of the consequences of a changing climate that will challenge the sustainable production and growth of agriculture and aquaculture.

Capture fisheries are subject to drastic changes in availability, while aquaculture is the fastest-growing food production sector in the world. Consequently, it is essential to find strategies to increase their production efficiency, quality, stability and sustainability without compromising the health and safety of people and the environment. The effective uptake of such strategies and solutions into food production processes will require the cost-effective and straightforward deployment of technologies by users. Societal acceptance of some genomics-based technologies could be a challenge.

The agriculture sector contributes significantly to climate change impacts, generating about eight per cent of Canada’s greenhouse gas emissions overall and specifically 29 per cent of its CH₄ emissions and 78 per cent of its N₂O emissions.¹ At the same time, Canadian agriculture systems have the potential to sequester and store large amounts of atmospheric carbon in perennial crops and soils.

The *Canadian Net-Zero Emissions Accountability Act* calls for more ambitious action to reduce emissions in the agriculture sector (to help Canada move toward net zero by 2050) and for maximizing the potential of agriculture soils to sequester carbon.² New technologies, products and approaches are required to reduce emissions while maintaining productivity and competitiveness.

Innovation for climate-smart agriculture and food systems can help guide the actions needed to transform agriculture systems toward green and climate-resilient practices to

¹ Environment and Climate Change Canada. (2021). *Greenhouse gas sources and sinks: executive summary 2021*. <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2022.html>

² Environment and Climate Change Canada. (2022). *2030 Emissions Reduction Plan: Canada’s Next Steps for Clean Air and a Strong Economy*. [Canada-2030-Emissions-Reduction-Plan-eng.pdf](#)

ensure food security in a changing climate.³ It is essential to ensure that Canada's food systems and other agriculture processes are resilient and sustainable in a world that is changing quickly due to shifting environmental, geopolitical and climate systems. Mitigating the impacts of climate change requires a transition to a sustainable, circular, net-zero carbon economy. Genomics and biotechnology provide biological innovation solutions that will support this transition and allow Canada to build on its strengths in agriculture and food production systems while attenuating the impacts of climate change.

Along with Genome Canada's other challenge-driven initiatives (CanCOGeN and All for One), the Climate Action Genomics Initiative (CAGI) – Climate-Smart Agriculture and Food Systems ("the Initiative") will work across the ecosystem to mobilize academic, public, private and non-profit sector partners to tackle complex challenges in health, climate change and food security collectively. The Initiative builds on recent investments in climate change adaptation and biodiversity through previous funding opportunities.

2. OBJECTIVE

The overall objective of the Initiative is to support the development and application of genomic⁴ tools and technologies to mitigate the carbon footprint and greenhouse gas emissions of Canada's food production systems, thereby ensuring that they are economically viable and environmentally sustainable.

In particular, the Initiative will focus on genomic tools and technologies that will help mitigate climate change by reducing greenhouse gas emissions (namely CO₂, CH₄ and N₂O) or enhancing their capture and storage.⁵ The Initiative aims to:

- Reduce greenhouse gas emissions and the carbon footprints of food production and inputs manufacturing.
- Enhance carbon sequestration to improve performance, mitigate climate impacts and support healthy ecosystems.
- Build resilient, sustainable food systems that reduce environmental impacts and greenhouse gas emissions.
- Result in novel, nature-based solutions and processes that can replace traditional consumptive production processes with sustainable and circular solutions for the environment and economy.

Given the highly connected, integrated nature of our food systems, mitigating the emissions or sequestration associated with a certain species, system, process or input will impact the

³ Food and Agriculture Organization of the United Nations. (n.d.). *Climate-Smart Agriculture*. <https://www.fao.org/climate-smart-agriculture/en/>

⁴ The term genomics is defined here as the comprehensive study, using high throughput technologies, of the genetic information of a cell or organism and its functions. The definition also includes related disciplines, such as epigenomics, metabolomics, metagenomics, proteomics, transcriptomics, bioinformatics and synthetic biology, as long as the link to genetic information is clear.

⁵ NASA Global Climate Change: Vital Signs of the Planet. (n.d.). *Responding to Climate Change*. <https://climate.nasa.gov/solutions/adaptation-mitigation/>

entire ecosystem. Potential benefits from one approach or solution may change other production systems or supply chains and cause cascading impacts throughout the broader system. The CAGI approach will bring together diverse stakeholders to support these connection and translation efforts through coordinated research and implementation activities to create impact at the whole food production system level.

3. PORTFOLIO APPROACH

A distinguishing feature of the Initiative will be the creation of an integrated portfolio of projects. By adopting a portfolio approach, it will be possible to synergize the deliverables of the component projects toward broader national impacts that manifest value beyond the deliverables and outcomes generated by each individual project.

Mechanisms will be put into place to ensure that teams working on funded projects within the portfolio have the opportunity to connect, convene and learn from each other regularly so the group can collectively support the Initiative's research, knowledge mobilization⁶ and implementation, and data-generating and -sharing activities.

4. CROSS-CUTTING ELEMENTS: DATA COORDINATION AND KNOWLEDGE MOBILIZATION AND IMPLEMENTATION

Another distinguishing feature of the Initiative will be the funding of two cross-cutting coordinating centres focused on data and knowledge mobilization and implementation. These centres will connect projects, support the coordination of project research activities, add value to project outputs, and address gaps to create portfolio coherence in achieving impacts.

Data are a central component of the Initiative: they will act as a bridge and connector between projects and as an output supporting the ability to achieve and measure impact. The Data Coordinating Centre will develop and implement standards, protocols, methods, tools, resources and processes to maximize the potential from data assets generated through portfolio activities.

In order for the portfolio of projects to achieve the intended collective impact—and uptake of the research by users—it will be critical to support and fund knowledge mobilization and implementation at the portfolio level and across the research projects. The Knowledge Mobilization and Implementation Coordinating Centre will help drive the adoption of genomics solutions and mobilizing knowledge to build public awareness of, and literacy in, genomics.

⁶ In the context of this initiative, knowledge mobilization encompasses a wide range of activities relating to the production and use of research results, including knowledge synthesis, dissemination, transfer, exchange and co-creation or co-production by researchers and knowledge users. See https://www.sshrc-crsh.gc.ca/funding-financement/policies-politiques/knowledge_mobilisation-mobilisation_des_connaissances-eng.aspx#a1.

5. FUNDING OPPORTUNITIES

There is approximately \$30 million available from Genome Canada to support the Initiative.

The Initiative will deploy a number of **funding opportunities** that will make up the portfolio. These will include Interdisciplinary Challenge Teams (ICTs), a Data Coordination Centre (DCC), and a Knowledge Mobilization and Implementation Coordination Centre (KMICC).

Interdisciplinary Challenge Teams

ICTs comprise researchers and users who work together to address specific questions related to the Initiative and to deliver innovative genomic solutions that support mitigation and climate action. Approximately \$24 million will be available from Genome Canada; co-funding will be required.

Data Coordination Centre

Cross-cutting funding will support a DCC to develop and implement a portfolio data plan that includes aspects of data governance, data management and data analytics. Where appropriate, the centre will be responsible for harmonizing data processes (e.g., standards, metadata, protocols) and developing a single point of entry for data resources (e.g., data sets, tools, pipelines). The DCC will work with projects in the portfolio to address data-sharing challenges (between projects and with the wider community) and build national data assets that benefit Canadian and global climate action communities. Approximately \$4 million is expected to be available from Genome Canada; co-funding will be required.

Knowledge Mobilization and Implementation Coordination Centre

Cross-cutting funding will support a KMICC to provide technical, administrative and coordinating support for the portfolio of projects related to these types of activities. The KMICC will work closely with the ICTs to coordinate and support knowledge mobilization and implementation activities and research activities related to genomics and its ethical, environmental, economic, legal and social aspects (GE³LS), and to provide other expertise, direction and leadership across the portfolio. Approximately \$2 million is expected to be available from Genome Canada; co-funding will be required.

Genome Canada will also develop mechanisms to incentivize partnership development with industry, governments or other funders. This will ensure the implementation of the portfolio deliverables and facilitate their market adoption to expand the breadth of impact on Canadian society.