



TO: The Standing Senate Committee on Agriculture and Forestry on the subject of its study on status of soil health in Canada

BRIEF FROM GENOME CANADA

Dear Committee Members,

Genome Canada welcomes and supports the soil health study currently undertaken by the Standing Senate Committee on Agriculture and Forestry. We recognize the importance of soil health and the soil microbiome as one of our greatest opportunities on the pathway to climate change mitigation - this is where genomics research, tools and technologies can have a major impact (including in carbon capture potential, soil fertility and providing soil-based resiliency solutions to heat and water stressors).

[Genome Canada](#) is a national not-for-profit organization addressing Canada's greatest challenges and opportunities through research and innovation in genomics and associated biosciences. With a 21-year track record of impact across sectors, a pan-Canadian network of six regional Genome Centres, and strong partnerships across the public, private, non-profit and academic sectors at home and internationally, we translate research into real-world impact in health, climate action and food security.

Canada's Genomics Enterprise - comprised of Genome Canada and the six regional Genome Centres - has more than 20 years of deep expertise and experience in delivering impact for sustainable agriculture and food security through genomics. Seizing new opportunities for genomics applications to drive sustainable agriculture and Canada's climate action was a core message from the recently released [Pan-Canadian Genomics Strategy What We Heard report](#).

We have evolved our model to drive a mission-driven approach to genomics research and innovation to meet Canada's biggest challenges. Genome Canada's new [Climate Smart Agriculture and Food Systems Challenge](#) exemplifies this transformative potential and the pan-Canadian delivery of impacts for sustainable agriculture through genomics-enabled research and innovation and multi-stakeholder engagement.

Genome Canada and the six regional centres actively engaged with Agriculture and Agri-Food Canada (AAFC) on its recent *Sustainable Agriculture Strategy* (SAS) consultations, in which soil health is one of the focus areas. In our [submission](#), we recommended the strategy "must prioritize investment in, and supports for, genomics research, tools and technologies that enhance the sustainability and



GenomeCanada

resiliency of traditional practices and processes with a particular focus on soil health”. We made the following points:

- Soil health and the soil microbiome can be one of our greatest opportunities on the pathway to mitigation—this is where genomics research tools and technologies can have a major impact (including in carbon capture potential, soil fertility and providing soil-based resiliency solutions to heat and water stressors).
- Pesticide reduction, fertilizer management, optimizing water management, and improving plant and animal biodiversity can all be improved through genomics research and the application of biotechnological tools and solutions.
- It is possible to use genomics to inform the reclamation of natural grasslands, forests and other managed or farmed ecosystems. Reclamation is a complex process involving myriad interactions at the ecosystem level. This complexity requires the power of genomics to enable the scale and scope of data and machine learning required to secure nature’s health. These tools will be even more critical as climate change increases the pressure on food production, biodiversity and natural ecosystems. • Genomics and biotechnology can support improved carbon sequestration in soil by increasing the amount that is stored and the time period for which it is held.
- The soil profiling efforts led by AAFC can be enhanced with the integration of genomics and metagenomics data to complement AAFC’s long history of research in this area. An integrated chemical/biochemical/genetic soil health atlas program would connect these communities to create novel solutions.
- The previously mentioned technology and processes behind environmental DNA (eDNA) monitoring systems are critical to capturing the biodiversity of soil via quality-controlled data adhering to standards required for rapid and responsive policy decisions—not to mention farm-level decisions required of farmers to ensure the success of their season’s work.

Some of Genome Canada’s current funded soil health projects include:

- [**New integrative microbiome genomics approach for more sustainable alfalfa \(Genome Quebec\)**](#)

Alfafa offers excellent agronomic performance in addition to being drought resistant and carbon sequestering. The sustainability and optimal performance of alfalfa relies on soil health, the persistence of Rhizobia, and the functional



GenomeCanada

balance of beneficial vs. harmful microorganisms in the alfalfa soil microbiome. The goal of the project is to apply an integrative microbiome genomics approach to develop a tool for Québec producers that helps them determine the impact of agronomic management and practices and soil health on productivity, quality and the persistence of alfalfa to increase their competitiveness and optimize their management of more sustainable alfalfa.

- **Field validation of technologies for anaerobic benzene and alkybenzene bioremediation (Ontario Genomics)**

There are thousands of sites in Canada contaminated with benzene, and the alkylbenzenes toluene, ethylbenzene, and xylenes (collectively known as BTEX), negatively impacting soil and groundwater resources. Current BTEX remediation technologies are often too costly and not applicable at the many sites with prevailing anoxic conditions. This project's goal is to demonstrate the efficacy of a broader set of novel and specialized anaerobic bioaugmentation cultures in pilot trials at three different benzene contaminated sites. The team will use metagenome-enabled analysis, groundwater modeling, and tracking of the microbial populations and functional genes associated with anaerobic BTEX biodegradation in the subsurface to improve overall remediation outcomes and to restore ecosystem health.

Genome Canada would be pleased to appear as a witness – along with some of our funded leading researchers in this space - before the Committee to offer our expertise and insights on genomics applications in improving soil health, and how it can drive innovation in our agriculture, forestry, and biodiversity sectors.

Sincerely,

Pari Johnston

Vice-President, Policy and Public Affairs