Possibility grows here.

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Standing Senate Committee on Agriculture and Forestry
The Senate of Canada
Ottawa, Ontario
Canada, K1A 0A4

Dear Honourable Senators,

Re: Greenbelt Foundation written submission to the Standing Senate Committee on Agriculture and Forestry on "Examine and Report on the Status of Soil Health in Canada."

Ontario's Greenbelt protects over 2 million acres of near-urban nature, farmland, and vibrant communities, within Canada's most urbanized region. Agriculture is an integral part of the Greenbelt, fostering rural prosperity and sustaining a significant agri-food sector in Ontario. Greenbelt agricultural includes 750,000 acres of some of Canada's most fertile farmland within one of its most favourable growing climates. In 2020, the Greenbelt's agri-food sector alone generated an estimated $4.1 billion in GDP and close to 59,000 jobs.[1] The natural advantages of unique soils, as in the Holland and Bradford marshes, and favourable climate, such as in the Niagara Tender Fruit Region, translate to a significant volume of produce grown in the Greenbelt relative to its farm area. Accounting for only 6.1 per cent of Ontario's farmland, Greenbelt farmers grow 52.6 per cent of all Ontario's fruit acreage and 10.7 per cent of Ontario's total vegetable acreage.[2]

The Greenbelt Foundation is a charitable organization dedicated to ensuring Ontario's Greenbelt remains permanent, protected, and prosperous. Our work centres on protecting and investing in the Greenbelt's agricultural, natural heritage, and water resource systems. We have placed significant emphasis on soil health in recent years as we are experiencing decreases in soil organic carbon and issues of erosion and compaction across the Greenbelt. The success of the Greenbelt's agricultural and agri-food sector is dependent on the continued stewardship of our vital soil resources. By implementing management practices that enhance soil health, we can help Canada meet its global climate change commitments and economic goals for the agricultural sector, while helping to ensure the long-term viability and resilience of agriculture in a changing climate. Our work has looked at soil health from different perspectives including scientific, economic, and the evaluation of policy and program design in the effort to scale the adoption of beneficial management practices (BMPs).

In collaboration with Équiterre, we published *The Power of Soil: An Agenda for Change to Benefit Farmers and Resilience* with input from an expert advisory panel made up of members from key agricultural organizations and research institutions from across Canada.[3] Our research found that through widespread adoption of BMPs across a broader spectrum of farmers, we can enhance

[1] Summit72 Advisory Services (2021). Understanding How Greenbelt Agriculture Feeds the Regional Economy. Greenbelt Foundation. https://www.greenbelt.ca/gb_agriculture_economic_impact
[2] JRG Consulting Group (2018). Agriculture Trends and Updates: Understanding the Greenbelt's Unique Advantages. Greenbelt Foundation. www.greenbelt.ca/ag_report_feb19
[3] Greenbelt Foundation and Equiterre. (2021). The Power of Soil: An Agenda for Change to Benefit Farmers and Resilience. https://www.greenbelt.ca/the_power_of_soil

agricultural productivity and climate resilience. This will require innovative policies and programs that attract many more farmers to voluntarily adopt BMPs motivated by knowledge access, removal of barriers, and creative financial incentives. The recommendations that came out of this landmark cross-jurisdictional report continue to inform our work and form the basis of our recommendations to the Senate Committee.

Key recommendations for the Standing Senate Committee on Agriculture and Forestry for consideration as part of the soil health study and final report include:

1. Align BMPs with farmers' business objectives.
2. Enhance federal and provincial policies and programs that prioritize and incentivize soil health.
3. Develop farm-scale soil health assessment to measure and track the impact of BMPs over time.
4. Develop a pan-Canadian soil health strategy.

Recommendation 1: Align BMPs with farmers' business objectives.

The number one consideration behind farmers' decision to adopt BMPs relates to the perceived economic costs and benefits. Healthy soil systems and productivity and profitability can happily coexist but understanding how to manage the risks associated with changing practices is critical to reduce costs. In partnership with University of Guelph researchers, our report *Towards a Business Case for Soil Health: A Synthesis of Current Knowledge on the Economics of Soil Health Practices in Ontario* summarizes what is known regarding the economics of soil health for grains and oilseed production in Southern Ontario.[4] **Much more research on the economics of soil health practices is needed in different regions and commodities in Canada**. To increase adoption potential, it is important to align BMPs with the farm's business objectives, including yields, productivity, and profitability.

Recommendation 2: Enhance federal and provincial policies and programs that prioritize and incentivize soil health.

To alleviate any perceived cost barriers, greater investment by provincial and federal government in financial incentives (i.e., government subsidies, credits, or loans) is needed. In Canada, agri-environmental programs are routinely oversubscribed with demand significantly outstripping available funding, demonstrating that farmers are eager to adopt BMPs on their farms. Several studies have found that financial incentives generally encourage farmers to move to sustainable practices. According to a 2018 study of 285 Québec agricultural producers, 75% of farmers would be motivated to adopt more sustainable farming practices if they had access to financial compensation during adoption, and/or to financial support on a yearly basis. However, the overall resources devoted to agri-environmental incentives in Canada remains low. Research suggests that the United States and Europe spend many times more than Canada on agri-environmental programs as a percentage of farm income.[5]

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[4] De Laporte, Aaron, et al. (2022). Towards a Business Case for Soil Health: A Synthesis of Current Knowledge on the Economics of Soil Health Practices in Ontario. https://www.greenbelt.ca/business_case_soil_health

[5] RBC Climate Action Institute. (2023). A New Ag Deal: A 9-Point Plan for Climate-Smart Agriculture. https://thoughtleadership.rbc.com/a-new-ag-deal-a-9-point-plan-for-climate-smart-agriculture/

To make advancements in soil health, we not only need increased investment from government, but innovation within financial incentive programs is needed. Funding programs need to appeal to producers with varying experience with soil health. Approaches could include:

- Small grant programs that encourage farmers that are new to soil health that have fewer pre-conditions and a simplified application process.
- Incentives that reward early adopters and harness their energy in leading and sustaining momentum in practice change and knowledge sharing. BMP implementation can be a long-term process that requires trial and error, but funding mechanisms could include:
    - Support for BMPs that have already been implemented but are being expanded or improved upon.
    - Consider the length of time that a BMP has been implemented when evaluating eligibility. This recognizes that some practices may take longer to implement effectively than others.

Programs also need to provide funding for the full suite of BMPs to allow producers to choose practices based on their production system, region, climate, and soil characteristics.

Agricultural training and extension services also play a vital role in assisting farms in adopting new practices but government programs supporting extension services and peer-to-peer learning have been substantially reduced over the past few decades. The use of provincial extension agents and researcher publications are no longer the primary ways of sharing information. Instead, private companies now train professionals to provide customer service related to input and equipment sales. This means that advice is often bundled with the product being sold and BMPs associated with indirect or longer-term economic rewards are not adequately supported. **Education and extension services pertaining to soil health are considered a gap in Canada, with too few professionals with expertise needed to support producers**.

Recommendation 3: Develop farm-scale soil health assessment to measure and track the impact of BMPs over time.

We need a baseline understanding of soil health across Canada to evaluate its current state and monitor changes. Within Ontario, we are seeing several signals of soil degradation including decreases in soil organic carbon as well as erosion and compaction issues. Farmers know their soil health is critical to maintaining the long-term sustainability and productivity of their agricultural land and are taking steps to adopt BMPs. If we understand what aspects of soil health are most compromised, we can use this data to direct funding and incentive programs towards those practices that would have the greatest impact. To develop a baseline understanding of soil health, we need standardized methods of assessing soil health. Coordination at the national level is needed, which could be addressed within a National Soil Health Strategy.

In addition to developing a baseline understanding of soil health, a national database with standardized approaches for measuring and reporting on soil health is needed to provide a clear understanding of soil health across Canada. Using standardized approaches will ensure data is interoperable between provinces and comparable to report on soil health at scale. A national body such as Agriculture and Agri-Food Canada could oversee the data and manage data collection from the provinces.

To better understand the status of soil health across Canada, farmers need standardized approaches to evaluating and monitoring soil health that are also scalable, cost-effective,

and reflect changes in management. There are various approaches used within Canada and in other jurisdictions, but without a standardized approach, we are unable to consolidate data and draw conclusions at scale. This requires an agreed upon set of soil health indicators to synthesize findings, compare datasets, and measure changes in soil health across Canada. Because different soil health indicators measure different soil functions, multiple indicators are needed. For example, organic carbon is a key component of organic matter that affects nutrient cycling, water holding capacity, and soil structure, while carbon mineralization reflects the size and structure of soil microbial communities. Work on this is already underway. For instance, the Soil Health Institute has evaluated over 30 soil health indicators from 124 long-term agricultural research sites across North America, including 17 sites in Canada, to identify a minimum suite of measurements that are cost-effective, scalable, and responsive to management.[6] The Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) has also developed a suite of indicators as part of their Soil Health Assessment and Plan which borrows from the USDA-NRCS Soil Health Division and Cornell.[7]

Recommended minimum suite of indicators from the Soil Health Institute	Recommended indicators from OMAFRA's Soil Health Assessment and Plan
• Soil organic carbon • Wet aggregate stability by slaking • Respiration (24-hour) • Available water-holding capacity (calculated from soil organic carbon and soil texture)	• Organic matter • Respiration (96-hour) • 7-day potentially mineralizable nitrogen • Wet aggregate stability by sieving • Permanganate-oxidizable carbon

Table 1. The Soil Health Institute and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) recommended soil health indicators.

Together with the Soil Health Institute, the Greenbelt Foundation piloted an approach across the Golden Horseshoe region of Ontario to benchmark soil health using both sets of indicators recommended by the Soil Health Institute and OMAFRA. This provides us with a regional assessment of soil health (current state and potential) and informs farmers how their management practices are impacting soil health. We are using the Soil Health Institute's sampling framework that groups soils based on their inherent properties such as texture and drainage due to their dominant influence on soil health. This allows us to compare soils that respond similarly to management. We further stratify sampling based on management data. These groups consist of baseline sites with common practices, sites with soil health practices, and reference or long-term perennial sites. By measuring groups under different management, we can quantify soil health within each group.

A soil health report tells producers how healthy their soil is and how healthy it could be to empower goal setting (Figure 1), along with a customized soil health management plan that

[6] Soil Health Institute. (2023). Recommended Measurements for Scaling Soil Health Assessment. https://soilhealthinstitute.org/our-work/initiatives/measurements/
USDA-NRCS announced in 2023 through CEMA 216 (https://www.nrcs.usda.gov/sites/default/files/2023-09/FY24-CEMA-216-Soil-Health-Test-10-23.pdf) that it will reimburse U.S. growers who use these indicators. Global consumer packaged goods companies, grocery retailers, and clothing brands are exploring how to integrate these measures and methods for goal setting into their organizations. These indicators are currently being adopted by the Agriculture and Food Laboratory at the University of Guelph.
[7] Belliard, Sebastian. (2023). Soil Health Assessment and Plan Guidebook. OMAFRA. https://fieldcropnews.com/2023/04/soil-health-assessment-and-plan-guidebook/

includes recommended BMPs to make targeted improvements in soil health.[8] An important aspect for successful adoption and implementation of BMPs relates to farmers' ability to track progress and evaluate impact over time. Farmers need tools that allow them to evaluate how their management practices are impacting their soil health to make informed management decisions. Our approach is unique in that we provide interpretable results showing how healthy the soil currently is, forecast potential improvements in soil health if BMPs are implemented, and deliver short-, medium-, and long-term BMP recommendations. Our program will evaluate the efficacy of this approach in motivating practice change with 300-500 farms across the Golden Horseshoe region.

Figure 1. Our framework for presenting soil health test results to producers. The brackets quantify ranges in soil health indicators for three different management systems. This allows a producer to see where they fall ("your soil") and set goals based on what is possible for their soil.

Preliminary results from the Golden Horseshoe show an increase in soil health indicators of 15%-25% due to the adoption of soil health practices. We found that on average, soil health management systems have **16% greater organic carbon, 15% stronger aggregate stability, and a 25% increase in respiration** when compared to baseline management systems (Figure 2). However, there is more room for improvement. When comparing baseline systems to undisturbed perennial systems, the potential room for improvement shows **77% greater organic carbon, 41% stronger aggregate stability, and 130% increase in respiration** is possible (Figure 2). This suggests that there is further possible innovation when it comes to improving soil health across the region. **This benchmarking campaign is a viable demonstration of what a national program could look like.** For more information about the program, please visit: www.greenbelt.ca/greenbelt_soil_health.

[8] Soil Health Institute. (2024). Establishing Soil Health and Carbon Benchmarks. https://soilhealthinstitute.org/our-work/initiatives/establishing-soil-health-and-carbon-benchmarks/

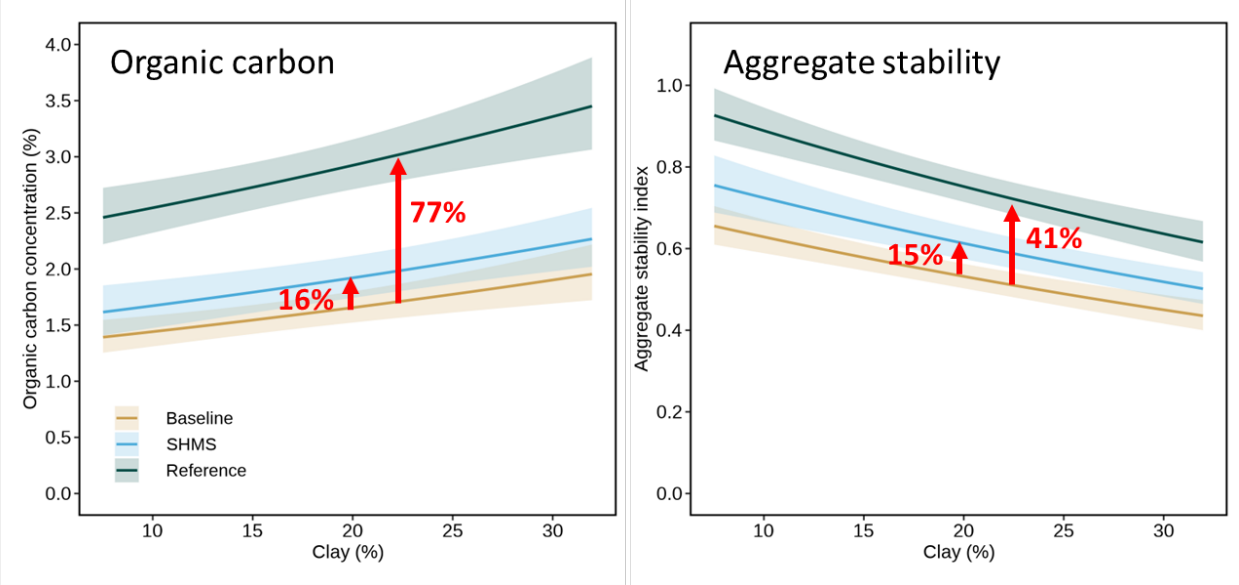

Figure 2. ***a)*** Organic carbon concentration and ***b)*** Aggregate stability of baseline management, soil health management systems, and reference management practices as a function of the inherent clay content of soils of the Golden Horseshoe, Ontario, Canada. Samples represent 124 locations, including farm fields, collected in 2023.

Recommendation 4: Develop a pan-Canadian soil health strategy.

To guide coordinated decision making and investment, we need a clear vision and strategy on soil health in Canada. The development of a National Soil Health Strategy should be led by a national organization in collaboration with the provinces and agricultural stakeholders, and be accepted by the sector. The Soil Conservation Council of Canada,[9] with Greenbelt Foundation support, has embarked on developing a National Soil Health Strategy which aims to articulate goals, objectives and actions around four main themes which include (1) science-based soil health actions, (2) learning, education and technology transfer, (3) supporting public and private interests in soil health, (4) and public engagement. The Ontario Ministry of Agriculture, Food, and Rural Affairs has also developed a provincial soil strategy for Ontario that guides research and investment in (1) soil management, (2) soil data and mapping, (3) soil evaluation and monitoring, (4) and soil knowledge and innovation. The strategic direction provided by a National Soil Health Strategy would address several of the challenges outlined above (i.e., standardized approaches to measure and assess soil health, nationally accepted soil health indicators, guided investment) and meet the opportunities before us.

Conclusion

The Senate Committee's work on soil health is vital to the future of agriculture and is an historic opportunity to influence a significant shift in practices. Canada has a strong reputation for agricultural sustainability and is in an excellent position to act on soil health. It is clear that greater investment by government in incentive and extension programs is needed and we have provided recommendations of how that could be done to promote greater adoption of BMPs. Through a landmark soil health assessment initiative, we have also demonstrated that benchmarking soil

[9] The SCCC was founded in 1987 by a group of individuals under the leadership of Senator Herb Sparrow to advocate for the importance of soil conservation on a national scale. They are the only national organization to concentrate on the issues of soil health and soil conservation across Canada.

health is possible. This represents an effective and efficient approach for scaling soil health assessment to broader geographies in a way that is meaningful to producers. We recommend scaling this approach within a National Soil Health Strategy to ensure standardization and interoperability. Change will take substantial and sustained action by farmers, government, agri-business, and farm organizations. We thank the Standing Senate Committee on Agriculture and Forestry for the opportunity to contribute to this important study on soil health.

Sincerely,

Shelley Petrie

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