

Extension for proposal submission - new deadline April 14th, 2020

Request for Proposals Evaluation of Best Approaches to Improve Agricultural Soil Health in Canada

Project Scope

Canadian farmers can both reduce the impacts of climate change on agricultural production and reduce emissions by adopting practices that improve soil health and have economic benefits like improving water holding capacity, nutrient use efficiency and yield consistency. Existing federal, provincial and local government policies and industry initiatives support practice change, but need improvement and innovation to be more effective in supporting and increasing adoption.

This project aims to summarize the science on soil health practices, document the programs, policies and initiatives in place targeting soil health, identify innovative and successful policies, assess the extent of adoption, summarize the barriers to adoption, and identify improvements to policies that would support accelerated practice changes to benefit soil health. Recommendations would be proposed in all areas.

Objectives of Project:

- Confirm the approaches and range of agricultural practices that benefit soil health across Canada through the review and summary of existing research and quantify the environmental effects;
- Document current programs, projects and initiatives targeting soil health, and assess the state of soil health practice adoption by compiling and summarizing existing information on the state of adoption of these practices across Canada;
- Identify and summarize what is known about the barriers to adoption of the soil health practices through review of existing knowledge in industry, government and academic documents, and key informant interviews;
- Examine improvements and innovation in how government policy, and industry and farm group initiatives support soil health practice change and overcome barriers by reviewing approaches in Canada and other jurisdictions, industry and academic recommendations and key informant interviews.
- Develop recommendations for each of the four areas above, in collaboration with the clients and advisory group.

Submission of Proposals

Deadline for proposal submission: April 14th, 2020

Deadline for project completion: September 30, 2020

Proposals should be submitted by April 14th, 2020 by email to afeuillet@equiterre.org with the subject line "Response to RFP" and follow the proposal format outlined in Section 4 of this Request for Proposals.

A question and answer teleconference session regarding the RFP will be available on March 23 at 11:00am EST. Please RSVP to participate to afeuillet@equiterre.org.

Introduction

Canada's farmers are on the frontlines of worsening climate impacts, and adaptation strategies are urgently needed to maintain yields, harvests and on-farm profitability. Losing productivity as a result of increasing climate risks negatively affects farm families' livelihoods, the profitability of the agriculture sector, the viability of Canada's rural communities, farmers' mental health and Canada's GDP.

Canada's agricultural GHGs currently represent 10.1% of Canada's emissions (not including several sources¹), but are projected to increase to 2030. GHGs associated with animal production (CH₄ and N₂O, from manure management and enteric fermentation) will continue to remain the largest source in Canadian agriculture, but these emissions are projected to decrease to the Paris targets over time. The projected GHG increase is largely due to increased emissions from crop production, which include not only CO₂ but also the much more potent GHG, N₂O.

An important means to reduce the GHG footprint of crop production (and some animal production) is through soil health² strategies. Soil health strategies increase carbon sequestration underground which not only serves to take carbon out of the atmosphere, contributing to Canada's climate mitigation goals, but also increases on-farm resilience (water management, nutrient management, etc.), helping to meet the sector's urgent climate adaptation needs. Furthermore, soil health strategies tend to also reduce overall GHG emissions (e.g. reduction of N₂O emissions, on-farm fuel use, fertilizer and pesticide use, etc.), which leads to even more gains towards Canada's global commitments to climate stabilization. While some of Canada's soils have shown significant gains in soil health, many are losing organic matter and degrading. There is a significant untapped potential to improve soil health, not only as a means to sequester more carbon but also to use nutrients more efficiently and reduce overall emissions from the sector (AAFC 2016, FAO 2015).

Founded in 1993, Équiterre is the largest French speaking environmental organization in Canada with a long-standing focus on climate change and agriculture, raising awareness and advocating for public policies that support the long-term sustainability of agriculture and a healthy climate. With offices in Montreal, Quebec and Ottawa, Équiterre's general mission is to offer concrete solutions to accelerate the transition towards a society in which individuals, organizations and governments make ecological choices that are both healthy and equitable.

Over the next three years, Équiterre's Power of Soils project³ will build the necessary evidence to comprehensively advocate for policies, strategies, programs, funding, education, research and tools that support a widespread transition to a more resilient and low-GHG agriculture sector, particularly through

¹ Current agriculture sector emissions calculations from crop production do not account for the additional elements of agriculture's GHG footprint inherent in Canada's crop production today including, for instance, the manufacture of mineral fertilizers in Canada and fluxes in soil carbon, which are both accounted for under other Canadian inventories.

² Soil health is defined here as "the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans" (Natural Resources Conservation Service of the USDA) and includes physical, chemical and biological aspects such as soil carbon, aggregation, microbial biomass, water holding capacity and other features.

³ Greenbelt Foundation is the Ontario partner for the Power of Soils project, seeking to ensure the project is beneficial and provides helpful options for Ontario farmers and stakeholders.

improved soil health strategies that increase carbon sequestration, reduce the overall GHG footprint, and minimize other environmental risks and trade-offs. To this end, this project will convene experts including farmers, agronomists, scientists (public and independent) and other stakeholders (the leading food industry, commodity associations, ENGOs, etc.) in order to: (1) identify farm management approaches that improve soil health and reduce the GHG footprint of Canada's agricultural sector, (2) communicate these management approaches with farmers and other interested stakeholders, (3) advocate for the supporting conditions and innovative policies required for widespread adoption of these management approaches, and (4) raise awareness among citizens that agriculture can be part of Canada's climate solution.

Three separate components of the overall project are underway. This RFP deals with the first component (the others are modeling of GHG emission scenarios and a review of options for improving business risk management programs to assist soil health).

Research Project Overview and Context

This project will identify approaches and practices that improve soil health, minimize other ecosystem trade-offs and risks, and reduce GHG emissions, through a synthesis of existing research. Where possible and necessary, these practices or approaches will be regionally or sector specific.

The research will quantify the environmental benefits (and risks) that are associated with the practices and approaches, in terms of GHG reductions, carbon sequestration, and other environmental indicators (where possible) in terms of water quality and management, biodiversity, etc. Individual practices may have merit on their own, but are generally applied as a system in an agronomic plan, cropping plan or Environmental Farm Plan. As much as possible, the practices and approaches must be effective, feasible and affordable for widespread adoption across major regions in Canada. Ongoing research offers new ways to improve practices and their efficiency and the project will identify future opportunities suggested by research.

Adoption of best or beneficial management practices (BMPs) by farmers to improve soil health has been promoted under different federal and provincial programs in Canada for decades, as it has in other jurisdictions across the developed and developing world. Adoption levels for some practices in some regions are impressive (e.g. no-till in the prairie provinces), and modest but growing for other practices such as cover crops. This project seeks to identify ways to spur a major leap forward in adoption of soil health approaches.

The project will summarize the extent to which these practices and approaches are currently adopted in Canada, and summarize the literature on barriers and opportunities for adoption, summarizing programs and/or policies that have achieved successful results to encourage adoption/reduce barriers. This will include summary of the policy, program and education tools used in different jurisdictions, their outcomes and their strengths and weaknesses. The purpose is to identify new and innovative approaches for Canada.

The results of this synthesis of peer-reviewed literature and secondary literature will be summarized into a position paper by Équiterre to inform advocacy on programs and policies, and to engage with stakeholders.

The following further elaborates the five project subsections (tasks) linked to the overall project objectives.

Task 1: Confirming Soil Best Practices and Evaluating Their Benefits to Soil Health

Improving soil health requires a comprehensive, systems approach to production and soils that considers all aspects of the production system and agroecosystem. For each farm, a customized, holistic approach is needed integrating a suite of beneficial practices aimed at long-term soil health. Key principles guide this systems approach, build soil organic matter, minimize soil disturbance, keep the soil covered as much as possible, diversify crops to increase diversity in the soil, and keep living roots throughout the year as much as possible. Farmers use different tools to create this kind of plan including agronomic plans, cropping plans, Environmental Farm Plans, soil health plans and others. The specific suite of practices needed for each field or farm are identified in these plans. The project will summarize different tools used across Canada and in different jurisdictions to implement the soil health approach.

A range of farm and cropping best or beneficial management practices (BMPs) are commonly identified for improving soil health and increasing soil organic matter, including no-till, strip tillage, diverse crop rotations, cover crops, nutrient management, organic amendments, and others (e.g. Ontario Ministry of Agriculture, Food and Rural Affairs 2018). Extensive scientific literature and syntheses of research exists on many of these practices and their impact on GHG emissions and soil carbon (e.g. Yanni et al 2018), and will be summarized. Regional climate, soil characteristics, technology and many other parameters influence the size of effect practices can have on soil health and this must be synthesized. As a result, there are large regional differences in some practices and the relative benefits they provide for soil health and GHG emission reduction in different parts of Canada (e.g. Liang et al. 2020). A summary and synthesis of scientific knowledge on the benefits of the range of recommended practices will be developed. Where possible and necessary, these practices or approaches will be regionally or sector specific. Gaps in knowledge will be identified.

The scope and emphasis is on cropping and soil management in this project rather than livestock. However, rangeland, perennial forage, pasture and hay crops and related practices are important in building soil health and within the scope of this project. Similarly, the use of manure as an organic amendment is key to building soil ecosystems and is in scope. More specific livestock systems and technologies such as feedlots, manure storages, anaerobic digestion and others are out of scope.

The research will identify and where possible quantify the environmental benefits (and risks) that are associated with the practices and approaches, in terms of GHG emissions reductions, soil carbon sequestration, and other environmental indicators such as water quality (e.g. phosphorus abatement), water quantity management, biodiversity, etc., and will comment on where there are gaps in research and/or issues with measurement/monitoring/data collection that limit the availability or potential for quantification. As much as possible, the practices and approaches must be effective, feasible and affordable for widespread adoption across major regions in Canada. Different regions may have different preferred suites of BMPs. The table below illustrates some well known soil health practices that have benefits well documented in the literature.

Examples of Well-documented Soil Health Practices (illustrative, not comprehensive)

- Diverse Crop Rotations (as least 3 crops)
- Cover Crops
- No Till
- Strip Till
- Equipment to reduce soil disturbance (e.g. no till seeders/drills, roller/crimpers, residue choppers/ spreaders)
- Organic amendments (manure, compost etc).
- Crop nutrient management (e.g. 4Rs)
- Nitrogen Fertilizer stabilizers
- Integrated pest management approaches
- Structural erosion control (in conjunction with agronomic controls)
- Buffer strips / wind strips / windbreaks
- Land retirement (e.g. highly erodible land, stream buffers)
- Intensive rotational grazing
- Biological inoculants
- Regular soil testing
- Soil compaction prevention (e.g. inflation-deflation systems, controlled traffic)

Task 2: Document Current Programs, Projects and Initiatives Targeting Soil Health, and Assess the State of Soil Practice Adoption in Canada

In order to assess the potential for climate mitigation and adaptation in agriculture, the current status of adoption of different practices and trends must be assessed. The project will gather and summarize existing information about the extent of adoption of soil health practices by farmers across Canada. Much of this information is available in federal and provincial publications, the published and secondary literature or public data sets (e.g. Census of Agriculture, Statistics Canada publications, Farm Management Survey, AAFC publications). AAFC reports on the Environmental Sustainability of Agriculture (e.g. AAFC 2016) provide extensive data now available publicly. Regional studies by industry, government and academia can supplement this data (e.g. Kynetec Canada 2018). Some regions and practices may not have sufficient information to assess the level of adoption and that can be identified as a data gap. The data will be summarized and if possible mapped to illustrate the state of practice adoption in Canada. These data will also inform the GHG modelling component of the larger project.

Task 3: Assess Knowledge about Barriers to Adoption of Soil Health Practices in Canada

Barriers to adoption of practices beneficial to soil have been identified in many publications (e.g. Dessart et al. 2019; Prokopy et al. 2019) and the project will summarize this knowledge. Barriers include such factors as cost of implementation, maintenance, lack of technical advice, management complexity, education, lack of acceptance of practices by peers, social network influences, complexity of incentive applications, policy and regulatory barriers, and other factors (e.g. Weber 2017). Because of the diversity of agriculture, barriers will vary between farmers, farm types, regions, commodities and other factors. Each practice will have specific barriers associated with it such as access to equipment (e.g. strip tillage), while there are more general barriers to behaviour change. Behavioural economics and psychology are

increasingly becoming important factors to consider in BMP adoption and have been reviewed (e.g. Dessart et al. 2019; OECD 2012). Some research has included interviews, surveys or focus groups with farmers and their advisors, and recent work suggests this can be an important means of identifying specific barriers (e.g. Augustyn 2018). After review of existing research, key informant interviews will be conducted to further refine barriers to adoption. The extent of key informant interviews will be arranged with the client. The design of policy and program tools benefit from knowledge and origins of barriers to adoption and possible solutions.

Task 4: Policy Approaches to BMP Adoption

A variety of public policy tools are used across Canada and elsewhere to promote and incentivize adoption of practices by farmers. Risk assessment tools, cost sharing grants, demonstrations, extension, technical advice, workshops, peer-to-peer learning, and area-based payments are all among the many approaches used in Canada (e.g. OMAFRA 2018, AAFC 2011, OECD 2010, 2012). Similar and different approaches are used in the US, Europe, Australia, Japan and other OECD countries, and have been reviewed extensively (e.g. Dessart et al. 2019, AAFC 2011, OECD 2010). Canada can learn from the experiences of other jurisdictions.

Initiatives are also undertaken by the agriculture and food industry, sometimes in partnership with government (e.g. 4Rs program, sustainability initiatives). Increasingly processors, retailers and food industry consortia are leading initiatives to promote soil health among their producers and producer organizations as part of sustainability work.

The project will review the policy approaches used across Canada in different provinces as well as those in other OECD countries. Existing reviews and assessments can be drawn upon (e.g. OECD, FAO, EU, USDA) and those published in academic evaluations (e.g. Boxall 2018). Analysis should be done to identify innovative and effective tools and approaches that could be used in Canada that are not currently in use or are underused, to identify the opportunities for implementation.

Task 5: Recommendations

The project will prepare recommendations based on the reviews in the four areas. Recommendations will be developed in collaboration with the clients and the advisory committee(s). Recommendations should be evidence-based and reflect the diversity of Canada, its regions, agriculture and farmer characteristics.

The results of this synthesis of information, peer-reviewed literature, and government and industry publications will be summarized into a position paper by Équiterre to inform advocacy on programs and policies, and to engage with stakeholders.

Target Deliverables and Milestones Schedule

The project requires concentrated work on the topic areas concurrently to meet the requirements of the overall project. The following table outlines the proposed timing for project milestones and deliverables. In addition to the specific meetings identified with milestones, monthly meetings of the contractor and clients will help manage the project.

Milestone	Date
RFP circulated to potential contractors	March 2020
Contractor selected	April 2020
Contract awarded	April 2020
Project initiation meeting	April 2020
Advisory Committee meeting	April 2020
Interim report	July 2020
Meeting on Review of Interim Report	July 2020
Draft Final Report	August 2020
Review of final report	August 2020
Final Report	September 2020
Presentations	September 2020

The deliverables will be:

- 1/ an interim report with the presentation of preliminary results, presented as a report and presented to advisors;
- 2/ a final report and executive summary that can be used directly by Équiterre for policy advocacy;
- 3/ a presentation with supporting PowerPoint, including slides with key findings and summaries that can be directly used by Équiterre for policy advocacy.

Proposal Format

Proposals submitted should not exceed 30 pages and address all work items identified including personnel assigned to each task and timelines for each. Expertise of each team member should be provided and related to each task.

Proposals should be submitted by **April 14th**, 2020 by email to afeuillet@equiterre.org with the subject line "Response to RFP".

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Budget

Budget: \$25 000 - 35 000

Eligibility

Contractors should have expertise and experience in the areas of agriculture science, agronomy, soil science, social science, market research, public policy analysis and environmental science. Demonstrated experience and leadership on projects of similar focus and scope is an advantage.

References:

[References and citations are provided to illustrate the type of research and documents that would be reviewed in completing this project. Illustrative, not comprehensive.]

Agriculture and Agri-food Canada. 2016. Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series - Report No. 4.

Agriculture and Agri-food Canada. 2013. Ecological Goods and Services - Policy Considerations for Canadian Agriculture. Agriculture and Agri-Food and Federal-Provincial Ecological Goods and Services Working Group.

Boxall, P. 2018. 'Evaluation of agri-environmental programs: can we determine if we grew forward in an environmentally friendly way?' Canadian Journal of Agricultural Economics Vol. 66, No. 2, pp. 171-186.

<https://doi.org/10.1111/cjag.12170>

Dessart, F. J., J. Barreiro-Hurlé and R. van Bavel. 2019. Behavioural factors affecting the adoption of sustainable farming practices: a policy oriented review. European Review of Agricultural Economics 46 (3) 417–471.

<https://doi.org/10.1093/erae/jbz019>

Food and Agriculture Organization of the United Nations. 2015. Status of the World's Soil Resources.

<http://www.fao.org/news/story/en/item/357059/icode/>

Kynetec Canada. 2018. 2018 Environmentally Sustainable Agriculture Tracking Survey. FINAL Report, Submitted to Alberta Agriculture and Forestry. Kynetec Canada, Guelph, ON.

Liang, B.C., A.J. Van denBygaart, J.D. MacDonald, D. Cerkowski, B.G. McConkey, R.L. Desjardins, D.A. Angers. 2020. Revisiting no-till's impact on soil organic carbon storage in Canada Soil and Tillage Research, 198, April 2020, Article 104529, <https://doi.org/10.1016/j.still.2019.104529>

Ontario Ministry of Agriculture, Food and Rural Affairs. 2018. New Horizons: Ontario's Agricultural Soil Health and Conservation Strategy. <http://www.omafra.gov.on.ca/english/landuse/soilhealth.htm>

Organisation for Economic Co-Operation and Development (OECD) 2012. Farmer Behaviour, Agricultural Management and Climate Change, OECD Publishing. <http://dx.doi.org/10.1787/9789264167650-en>

Organisation for Economic Co-Operation and Development (OECD). 2010. Guidelines for Cost-effective Agri-environmental Policy Measures.

Prokopy, L.S., K. Floress, J.G. Arbuckle, S.P. Church, F.R. Eanes, Y. Gao, B.M. Gramig, P. Ranjan, and A.S. Singh. 2019. Adoption of agricultural conservation practices in the United States: Evidence from 35 years of quantitative literature. Journal of Soil and Water Conservation 74(5):520-534.

Augustyn, C. 2018. "Enhancing Grower Adoption of Soil Best Management Practices Through Target Audience Segments." Prepared for Farm and Food Care Ontario, February 2018.

Statistics Canada. 2019. Farm Management Survey 2017. Statistics Canada, Catalogue no. 11-001-X, Ottawa, Canada.

Weber, M. 2017. "Understanding Farmer Motivation and Attitudes Regarding the Adoption of Specific Soil Best Management Practices. Background Literature Review," report prepared for Farm and Food Care Ontario, December 18, 2017.

Yanni, S., Rajsic, P., Wagner-Riddle, C., Weersink, A. 2018. "A Review of the Efficacy and Cost-Effectiveness of On-Farm BMPs for Mitigating Soil-Related GHG Emissions," Working Papers 276270, University of Guelph, Institute for the Advanced Study of Food and Agricultural Policy.