CLIMATE CHANGE ADAPTATION PROGRAM

Using Management Intensive Grazing for Adapting to and Mitigating Climate Change

Project Fact Sheet

Funding for this project has been provided by the Governments of Canada and British Columbia through Growing Forward 2, a federal-provincial-territorial initiative. The program is delivered by the Investment Agriculture Foundation of BC.

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Using Management Intensive Grazing for Adapting to and Mitigating Climate Change

Farm Adaptation Innovator Program: Research Factsheet

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Geographic Applicability	This study was conducted in the Central Interior and findings may be applied to other regions in BC which have similar grasslands ecosystems
Commodity relevance	This study was conducted on grazing lands used by cattle and also applies to grazing lands used for other livestock
Project Timeline	August 2013- August 2017

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Hotter and drier summer conditions and reduced winter snowpack are becoming more common in the Central Interior. This trend is expected to continue with climate change, along with more frequent extreme precipitation events. As a result, grazing lands may become vulnerable to water stress, soil erosion and decreased productivity.

The main purpose of this research was to test whether the adoption of intensive (grazing) management (IM), as opposed to extensive (grazing) management (EM), practices might be used as a tool to mitigate climate change through soil carbon sequestration and adapt to climate change by creating more resilient ecosystems in combination with domestic grazing animals.

Study Objectives

- test whether there were differences in soil carbon between IM and EM pastures
- test whether IM was an effective adaptive management practice in the context of climate change
- determine how effective other variables (e.g. moisture content, species diversity) are for deducing soil carbon levels
- test methods that combine direct methods (soil sampling and analysis) with indirect methods (remote sensing and plant communities)

Design

Using traditional soil sampling methods, plant community composition and remote sensing, the research assessed soil carbon at six cattle ranching operations in the Central Interior of BC; specifically focusing on the comparison between intensively managed (IM) and extensively managed (EM) pastures and how this impacts climate change adaptation and mitigation

Cattle were moved from one IM paddock to the next 2-7 times per week. EM pastures were grazed over longer time frames (weeks to months), were larger in size, and in some cases were also hayed 1-3 times per year.

Limitations

The site conditions observed in this study were highly variable throughout and within study locations. Influential variables such as plant species (native and/or agronomic), natural moisture vs. irrigation, historical land use, etc. all make it difficult to draw conclusions about the influence of any one variable on soil carbon. In addition, a longer time frame is necessary to better quantify the affects of management type on soil carbon sequestration.

Climate Adaptation and Mitigation Implications

Benefits associated with greater soil carbon include soil moisture retention, erosion control and species biodiversity. Altering land management practices to increase the amount of carbon stored in the soil also means removing it from the atmosphere and reducing greenhouse gases.

Key Findings

- The data supported intensive management as an improved adaptive management practice to increase carbon levels found in the soil and decrease soil compaction in the 0-10 cm depth range.
- Total carbon was found to be 28% greater under IM and organic carbon averaged 13% greater when compared to EM.
- Because pastures with lower initial carbon are known to have the greatest potential for improved carbon sequestration, adoption of more intensive management practices in extensively managed pastures have the potential to produce significant results.
- Soil carbon varied significantly by depth and management, with greatest total and organic carbon levels occurring closest to the soil surface (0-10 cm).
- Total carbon was found to be significantly greater under IM practices in deeper soil depths (10-30cm) when compared to EM
- Intensive management may therefore be a viable strategy for climate change mitigation if land use changes occur on a large scale.

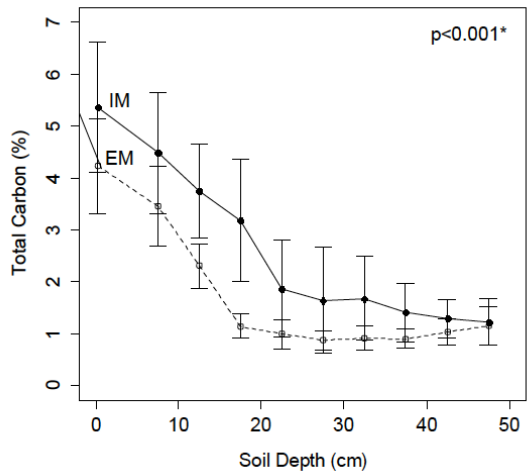

Figure 1: Mean total carbon by depth and management across all study sites.

Next steps

- Improve methods of soil carbon prediction with remote sensing and plant community composition
- Undertake manipulated grazing trials to control for all variables to isolate the effects of grazing management alone
- Include specific examination of IM on drylands, since they compose much of the grazed lands. Many of these arid landscapes possess significant potential for large increases in soil carbon

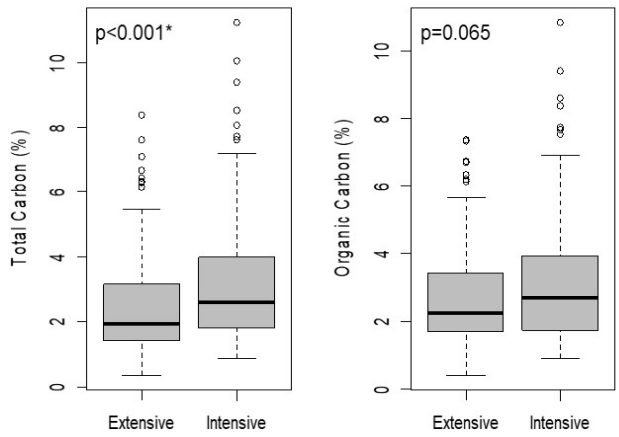

Figure 2: Total Carbon (TC) and Organic Carbon (SOC) percentages by management

Definitions

Intensive Management (IM) or (MiG): The frequent, planned movement of cattle between relatively small pastures or paddocks. May be accompanied by inputs such as irrigation, soil amendments, and seed, to increase vegetation productivity.

Extensive Management (EM): The grazing of small numbers of cattle over large acreages for the duration of the growing season.

Total Carbon (TC): measured as the percentage of elemental carbon, and soil organic carbon.

Soil Organic Carbon (SOC): enters the soil through the decomposition of plant and animal residues, root exudates, living and dead microorganisms, and soil biota.

Carbon Sequestration: Carbon sequestration is the process involved in carbon capture and the long-term storage of atmospheric carbon dioxide.

For more information:

The complete report may be found on this link:

www.bcagclimateaction.ca/project/FI01

Follow these links for additional information on related topics:

www.bcagclimateaction.ca/documents/FarmPractices-MIG.pdf

Funding and support for this project was provided in part by:

Growing Forward 2 · Investment Agriculture Foundation of British Columbia · ardcorp · Climate Action Initiative BC Agriculture & Food · British Columbia · Canada