Quantifying Soil Carbon, Greenhouse Gas Emissions and Surface Albedo as a Function of Grazing Management Practices in Canadian Grassland Ecosystems

PROJECT DESCRIPTION

This is a module of a University of Alberta's multidisciplinary project entitled "Grassland soil organic carbon, greenhouse gas emissions, water infiltration and biodiversity under grazing management practices in Canadian grasslands".

Increasing soil carbon (C) storage, reducing greenhouse (GHG) emissions and improving the overall farming efficiency, needs to be refined and developed as best management practices (BMP) to mitigate the effects of climate change in the agricultural sector (Desjardins et al., 2001). Grasslands have been recognized for many ecological goods and services (EG&S) such as regulating water quality and flow, C sequestration and storage, wildlife habitats, and maintenance or enhancement of biodiversity (Bailey et al., 2010). Better rangeland management can improve these services and increase rangelands C sinks to mitigating the effects of climate change.

Adaptive multi-paddock grazing (AMP) is a potential cattle management practice to increase soil organic carbon (SOC), improve water holding capacity and increase nutrient availability compared to continuous grazed or non-grazed rangelands (Teague et al., 2011). Vegetation recovery is faster in AMP after intensive grazing thus surface reflectance will be higher that may compensate for the CO2 emissions in terms of radiative forcing (RF). Despite grasslands being one of the largest land resources in the world, yet their role as net sinks or sources of GHG is essentially unknown, especially for N2O and CH4 (Liebig et al., 2009). Recent studies on grassland managements consider GHG emissions (e.g. Braun et al., 2013; Rochette et al., 2014) but the studies on cooling services provided by the surface albedo is rare. A study on open lichen-spruce boreal woodlands (Bernier et al., 2011) showed that albedo compensated net RF compared to closed-canopy forests.

In this study, we will measure - 1) SOC down to one meter depth, 2) field GHG effluxes, and 3) surface albedo of rangelands under different grazing managements to test if the AMP management is superior to continuous grazing management. Our hypotheses are -1) AMP grazing has higher SOC and lower GHG emissions compared to traditional continuous grazing

practices and, 2) AMP ranches have higher surface albedo compared to traditional continuous grazed ranches.

FACULTY-DEPARTMENT

Agricultural, Life and Environmental Science - Renewable Resources

OPEN TO STUDENTS FROM THE FOLLOWING INSTITUTIONS

Chinese universities participating in the *Double First-Class Initiative*.

DESIRED FIELD OF STUDENT STUDY

A background in soil science, plant science, ecology or environmental science is desired. Someone who has experience in soil and greenhouse gas sample collection and lab analyses would be preferred.

INTERNSHIP LOCATION

Edmonton Campus

NUMBER OF INTERNSHIP POSITIONS

2

INTERNSHIP DATES

Start: July 2, 2019

End: October 2, 2019

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.