UNIVERSITY OF ALBERTA

Rangeland Research Institute

Methane Emissions from Commercial Beef Cows During Open-Range Grazing in the Parkland

Prepared by Amir Behrouzi, Dr. Edward Bork, Dr. John Basarab, and Dr. Carolyn Fitzsimmons

Greenhouse gas (GHG) emissions from beef cattle represent less than 4% of all agricultural GHGs in Alberta or about half of agricultural GHGs emissions. However, cattle are widely recognized for their role in contributing to GHGs, including CH_4 (methane) and CO_2 production. Considerable interest exists in reducing the footprint of the CH_4 output from beef cattle, including incentives for reduced days on feed.

Several studies have quantified CH_4 emissions from beef cattle, including at the Kinsella Research Ranch. However, this work has concentrated on animals held in drylot, where the amount and composition of feed intake can be closely tracked using technologies such as automated feeding stations (GrowSafe System, Vytelle). Given that commercial cattle spend a large portion of their production lifecycle grazing on diverse pastures, understanding whether and how feed efficiency in drylot and methane emissions reflect associated animal performance (methane emissions per average daily weight gain) on pasture remains essential.

In this study, the University of Alberta is using GreenFeed emissions monitoring (GEM) system (C-Lock Inc). The GEM system is an automated head-chamber and measures CH_4 and CO_2 emissions from a large number of animals in both drylot and pasture conditions. The system uses spot sampling to measure eructation and exhalation gases while providing pelleted feeds in small amounts to encourage animals to visit system multiple times per day.

GreenFeed emissions monitoring system

Experimental Approaches:

Crossbred replacement beef heifers and cows (60 head/year) that have been measured for feed efficiency in drylot (RFI_{fat} - residual feed intake adjusted for off-test backfat thickness), are monitored for CH_4 and CO_2 production while simultaneously grazing native rangeland containing a diverse mix of habitats and forages over three years (2021-2023).

GEM system was used to quantify CH_4 and CO_2 from cattle grazing on open rangeland

The GEM system quantitatively measures individual CH_4 and CO_2 emissions while grazing under two different foraging conditions:

- Summer (higher quantity and quality forage in Jul-Aug)
- Fall (higher quantity forage but lower quality forage in Sept-Oct).

Preliminary results (Year One)

In 2021, cattle CH_4 emissions increased from summer to fall with advancing vegetation senescence. In addition, cattle with lower RFI values (efficient animals) grazing on high quantity-low quality pasture in fall emitted less CH_4 and CO_2.

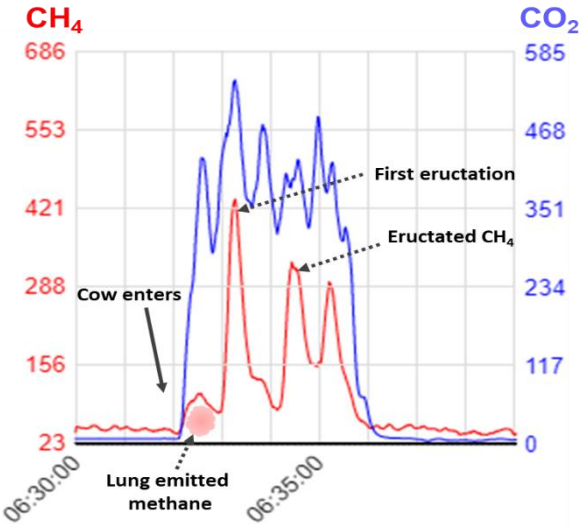

Figure 1. Typical CH_4 and CO_2 data obtained from the GEM, methane production, by source

Implications

The results of this study are expected to increase our fundamental understanding of CH_4 and CO_2 emissions associated with cattle while grazing on native rangeland, and where possible, examine how this contrasts with prior assessed CH_4 and CO_2 emissions and feed efficiency (RFI) tested in drylot. We will examine the relationship between CH_4 emissions and important economic traits (cow/calf weight gain), and utilize rumen microbial profiles to explore their contribution to differences in CH_4 and CO_2 emissions that exist among animals. Finally, using aggregate data from all animals throughout the study, we will test the possibility of identifying genomic markers from these animals that may make it possible in the future to select for lower GHG producing cattle.

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Contacts:
Dr. Carolyn Fitzsimmons, Agriculture and Agri-Food Canada & University of Alberta, cfitzsim@ualberta.ca
Amir Behrouzi, Graduate Student, University of Alberta, behrouzi@ualberta.ca