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Using Precision Technology to Measure Cattle Methane Emissions and Intake on Western South Dakota Rangelands

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Objective

Determine the relationship between methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), and hydrogen (H_2) emissions and dry matter intake (DMI) of dry beef cows to develop a mathematical model that predicts DMI from enteric emissions.

Study Description

Cattle DMI is an essential component of calculating cattle stocking rates, determining nutrient requirements, and evaluating feed efficiency. Cattle DMI and digestion of forages impact enteric greenhouse gas (GHG) emissions; a major public and environmental concern. Increased GHG levels indicate energy loss during the rumen fermentation process. Obtaining data for rangeland cattle DMI and GHG emissions is needed to understand and enhance individual animal performance and reduce negative environmental impacts. We will develop enteric emissions and DMI relationships by conducting three feeding trials using the GreenFeed and SmartFeed Pro (C-Lock Inc. Rapid City, SD). The GreenFeed will measure real-time gas fluxes and the SmartFeed Pro will measure daily intake by calculating disappearance from the feeder. The three feeding trials will consist of dry beef cows (n = 12) receiving low, high, and intermediate quality forages treatments with a 15 day adjustment period and a 15 day period of collection. Using these data, regression, artificial neural network, and dynamic-mechanistic models will develop and assessed to identify a model that accurately and precisely predicts forage DMI for dry beef cows on pasture.

Take Home Points

This study will help improve research capabilities on extensive rangeland systems, enhance knowledge of GHG and energy loss for grazing beef cattle, and increase our ability to manage range beef on an individual level to lower cost, optimize resources, and enhance environmental sustainability.