

# Beef Cattle Nutrition and Greenhouse Gas Production

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National Animal Nutrition Program-Climate Smart Feed Management

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Natural Resources Conservation  
Service CONSERVATION PRACTICE  
STANDARD FEED MANAGEMENT  
CODE 592 (au)

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- Manipulating and controlling the quantity and quality of available nutrients, feedstuffs, ingredients, or additives fed to livestock and poultry.



Cow-Calf



P.C.: beef

Backgrounding



P.C.: Eric Duell

Stocker



P.C.: Jana Block

Feedlot



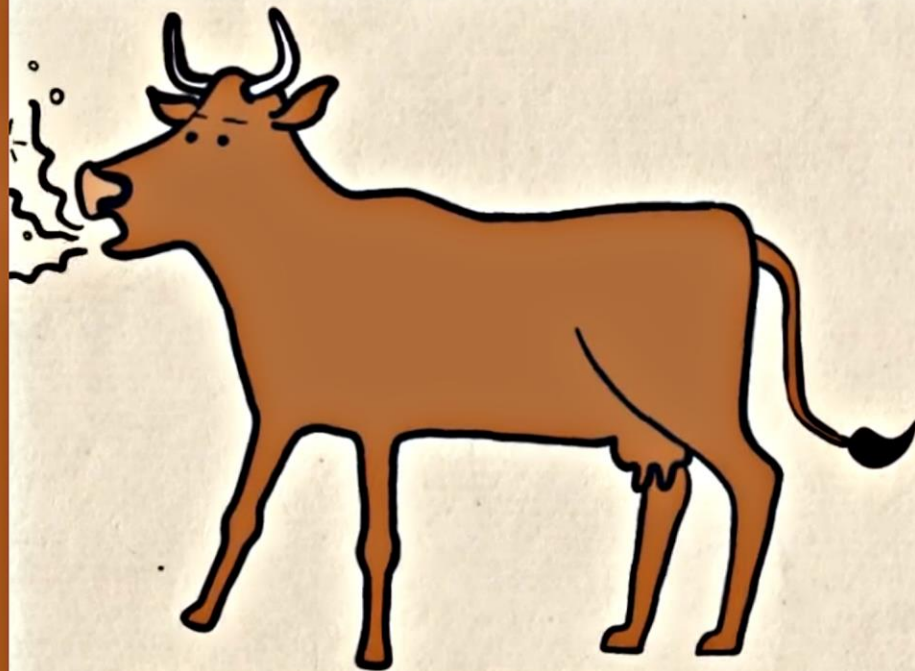
Maintenance



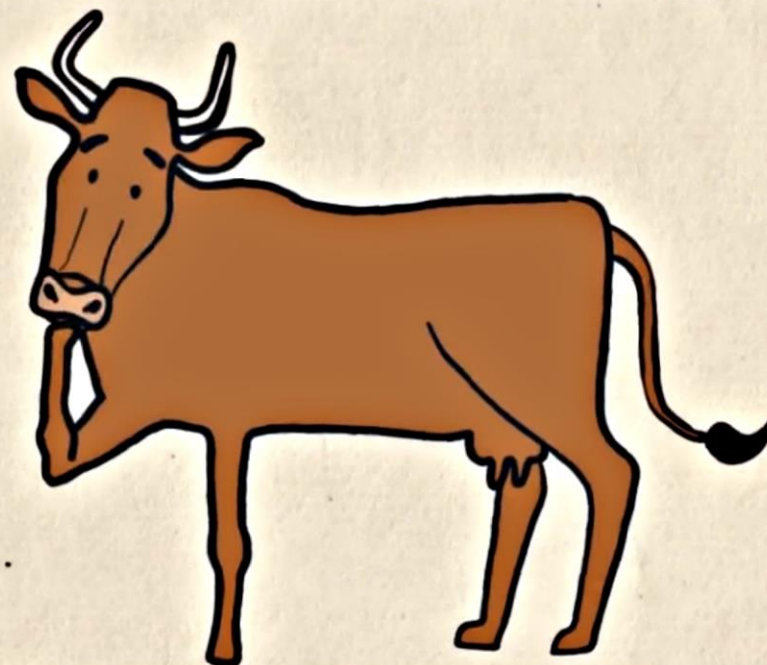
Positive Plane of Nutrition



Nutrient Management/Loss



**Cut greenhouse  
gas emissions**



**Cut greenhouse  
gas emissions**

Why Should I Care?



# COW-CALF ENTERIC EMISSIONS AND DRY MATTER INTAKE



# DRY MATTER INTAKE (DMI)

- Essential for stocking rate calculations
- Intake varies
  - Environment
  - Physiological stage
- Challenging to measure DMI on rangelands
  - Several methods
  - Estimate
- Important to determine nutrient supply and evaluating feed efficiency

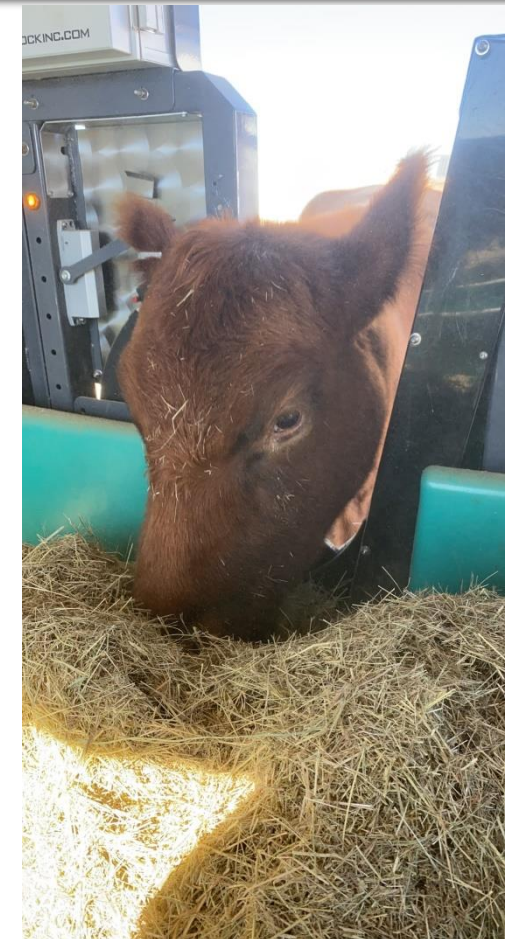
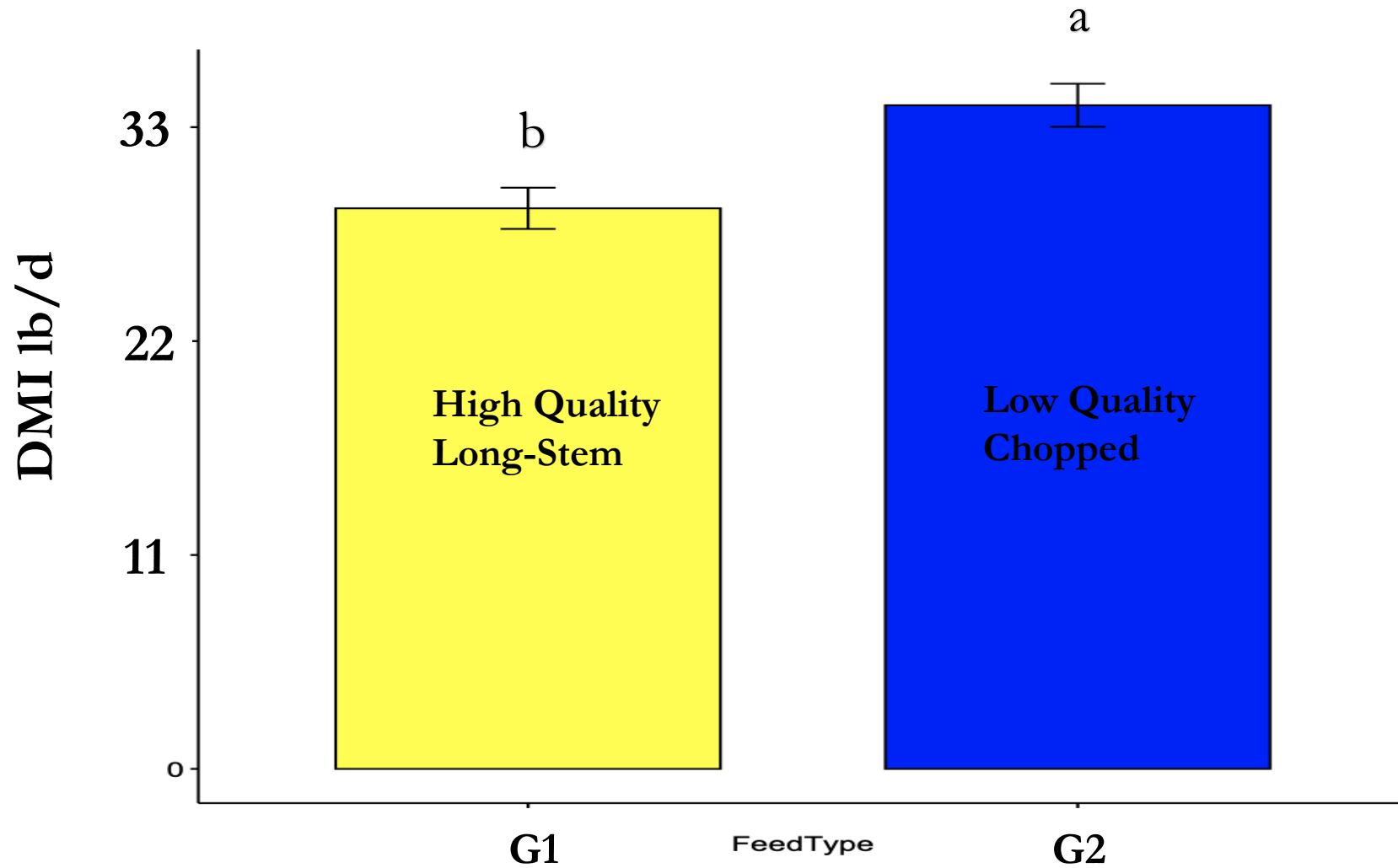


# ON FARM MEASUREMENT TOOLS FOR GHG



# DMI BY TREATMENT

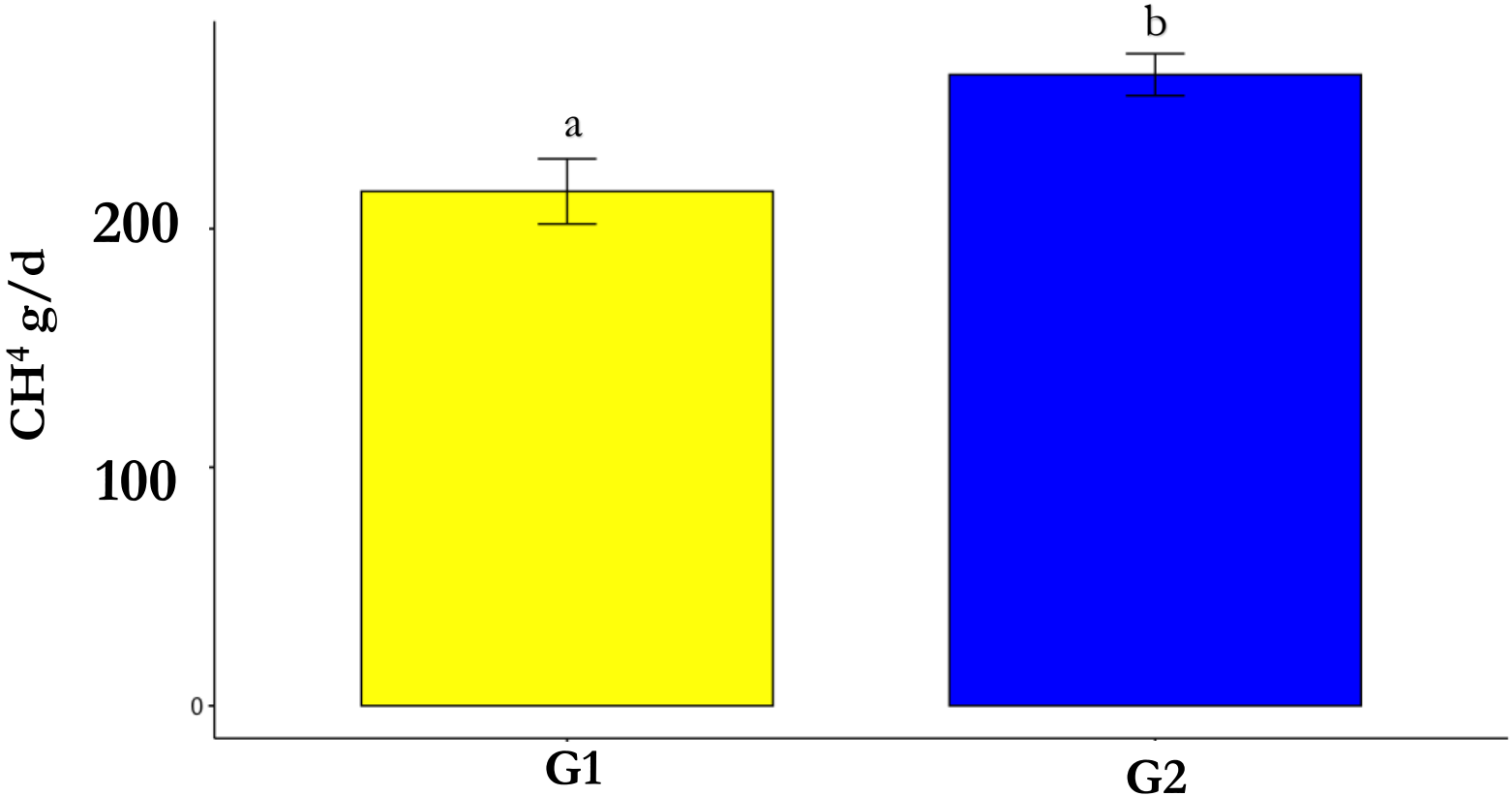
<u>Feed Treatment</u>	<u>%DM</u>	<u>%CP</u>	<u>%TDN</u>
Grass Hay 1	93.3	13.9	55.4
Grass Hay 2	93.4	5.6	47.6



P < 0.05



# CH<sub>4</sub> BY TREATMENT



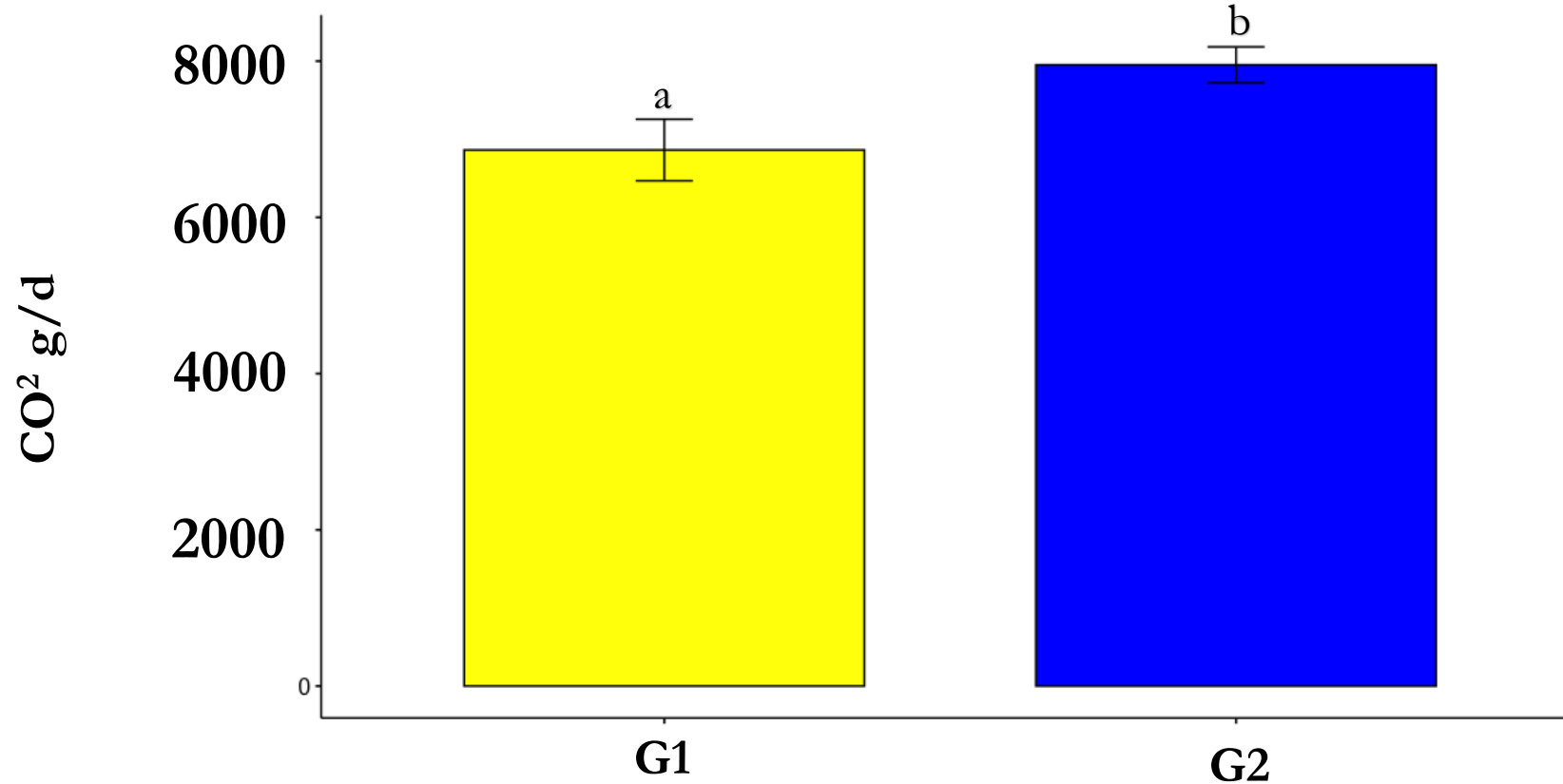
309 g/d (McGinn et al., 2021)

143.6-372.7 g/d (Min et al., 2022)

P < 0.05



# CO<sub>2</sub> BY TREATMENT



8,223 g/d (McGinn et al., 2021)

P < 0.05





**Pregnant Cows and  
Different Feeding  
Strategies**

# Winter-feeding high concentrate diets reduces enteric methane emissions pre- and post- calving in beef cows

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College of Agriculture, Food and Environmental Sciences



Winter feeding \$

Nutrient requirements



Dry-lot period

Corn vs. hay



Enteric CH<sub>4</sub> emissions

## OBJECTIVES

Determine the effects of winter-feeding high forage (2.02 Mcal/kg dietary ME) vs. high concentrate (2.84 Mcal/kg dietary ME) diets pre- and post- calving on enteric CH<sub>4</sub> emissions, DMI, and performance of beef cows.

## MATERIALS AND METHODS

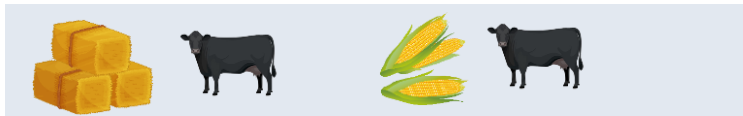


Table 1. Experimental diets

Ingredients, % DM	Treatments <sup>1</sup>	
	HFOR	HCON
Grass hay	55	10
Corn silage	30	10
Dry rolled corn	-	70
DDGS	10	5
Liquid supplement <sup>2</sup>	5	5
Crude protein	11.50	11.24
Dietary metabolizable energy, Mcal/lb	0.91	1.28

<sup>1</sup>Due to bunk capacity and workflow to mix diets and feed the cows, corn silage was incorporated in the high forage diet. The HFOR diet was 70% forage, with 55% NDF and 10% starch. The high concentrate diet was 15% forage, with 19% NDF and 55% starch.

<sup>2</sup>Liquid supplement provided minerals and vitamins to meet or exceed NRC requirements for gestating and lactating cows.

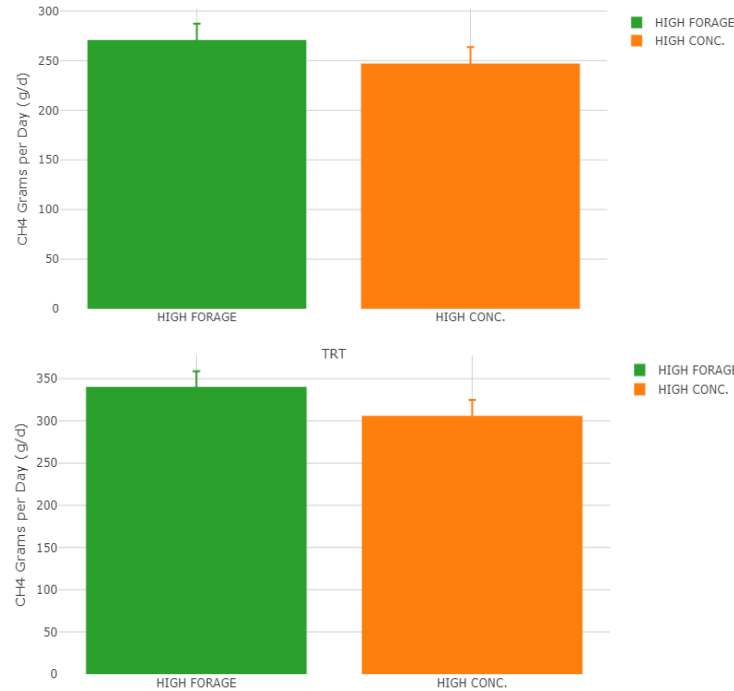


Figure 1. Effects of winter-feeding high forage and high concentrate diets on enteric CH<sub>4</sub> emissions pre- (A) and post- calving (B).

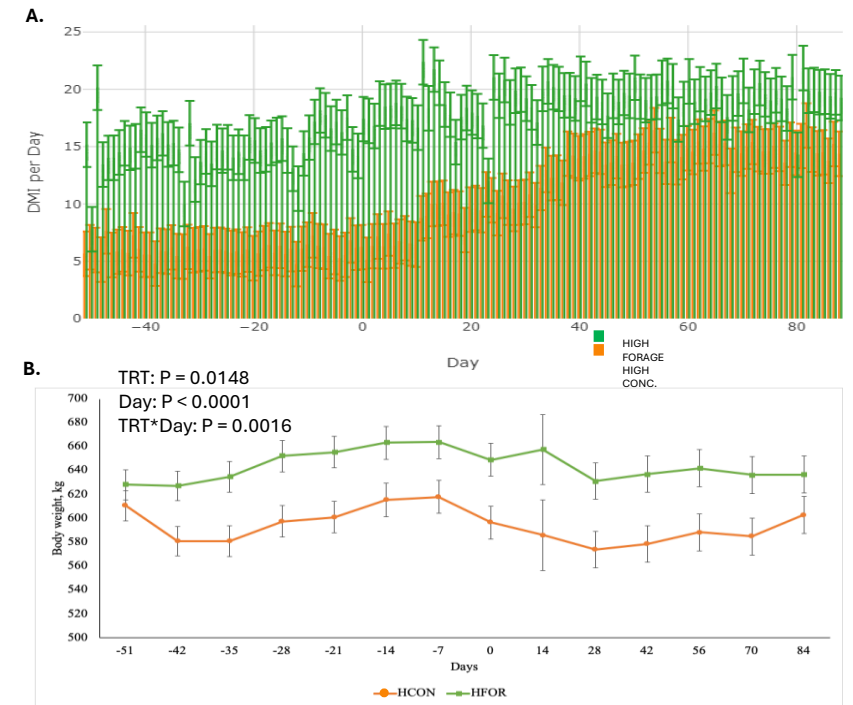


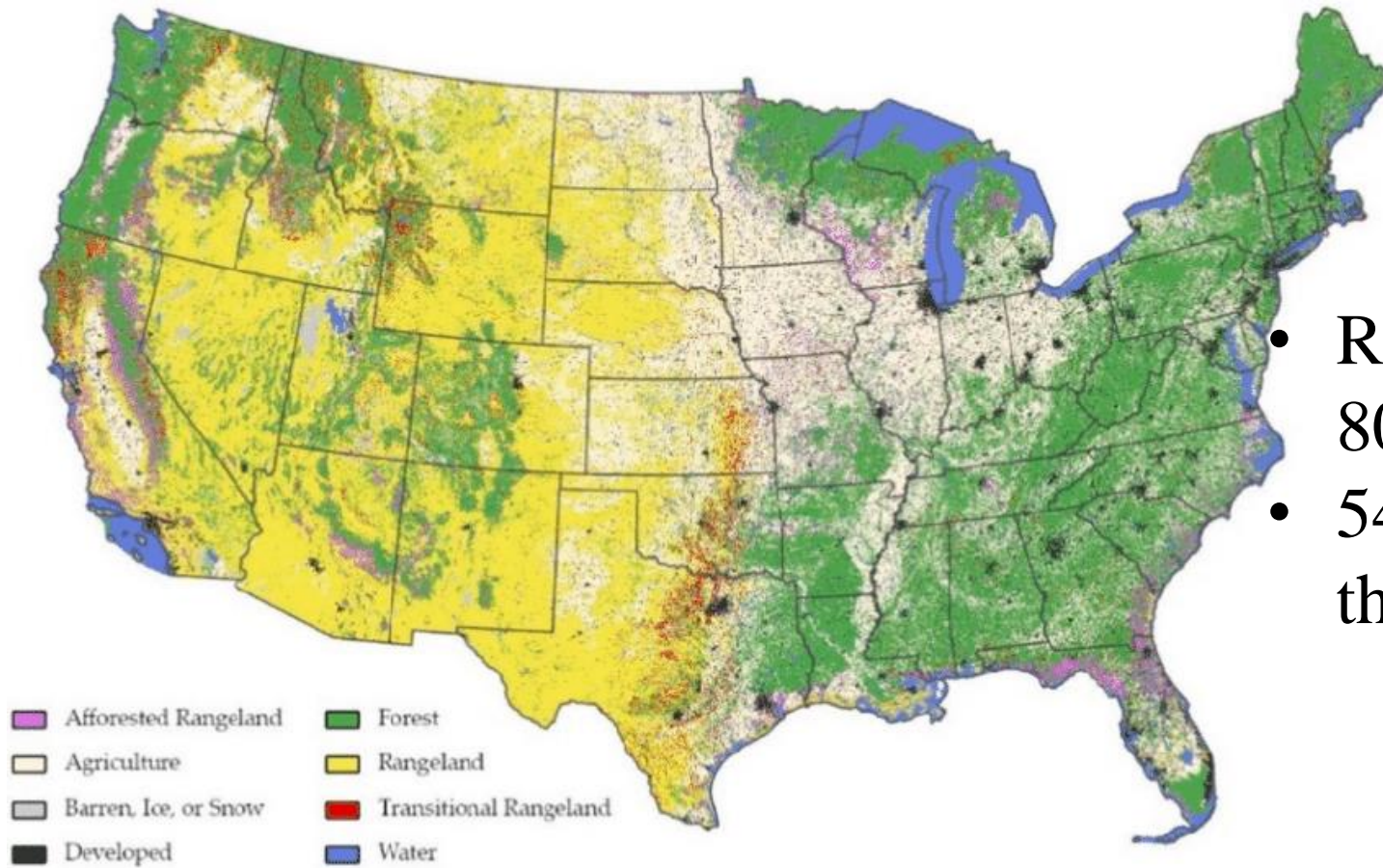
Figure 2. Effects of winter-feeding high concentrate or high forage diets on dry matter intake (A) and body weight (B) from d 51 pre-calving through d 84 post-calving.

## ECONOMIC TOOL

	\$/hd/d	\$/ton DM	\$/ton AF	total \$/hd	\$/treatment
<b>HFOR</b>	1.54	164	140	212	4887
<b>HCON</b>	1.33	177	131	183	4228

<sup>1</sup>Hay prices were based on average price of grass hay on winter 2023 SD. Prices of other dietary ingredients were the average of current prices in SD, ND, IA and MN.

# **Yearling Stocker Steers**



- Rangelands globally account for 80–85% of feed needs for livestock.
- 54% of the total agricultural land in the US is rangeland.

(Holechek et al., 2020) (Rangelands Atlas, 2021)

# INTRODUCTION

“ Does a management intervention (CPS) maintain or improve meat quality and cattle productivity?”

-Dr. Amanda Blair/Rancher  
Meat scientist



## Stocker Cattle

(n=135)



## Feedlot Cattle

(n=96)

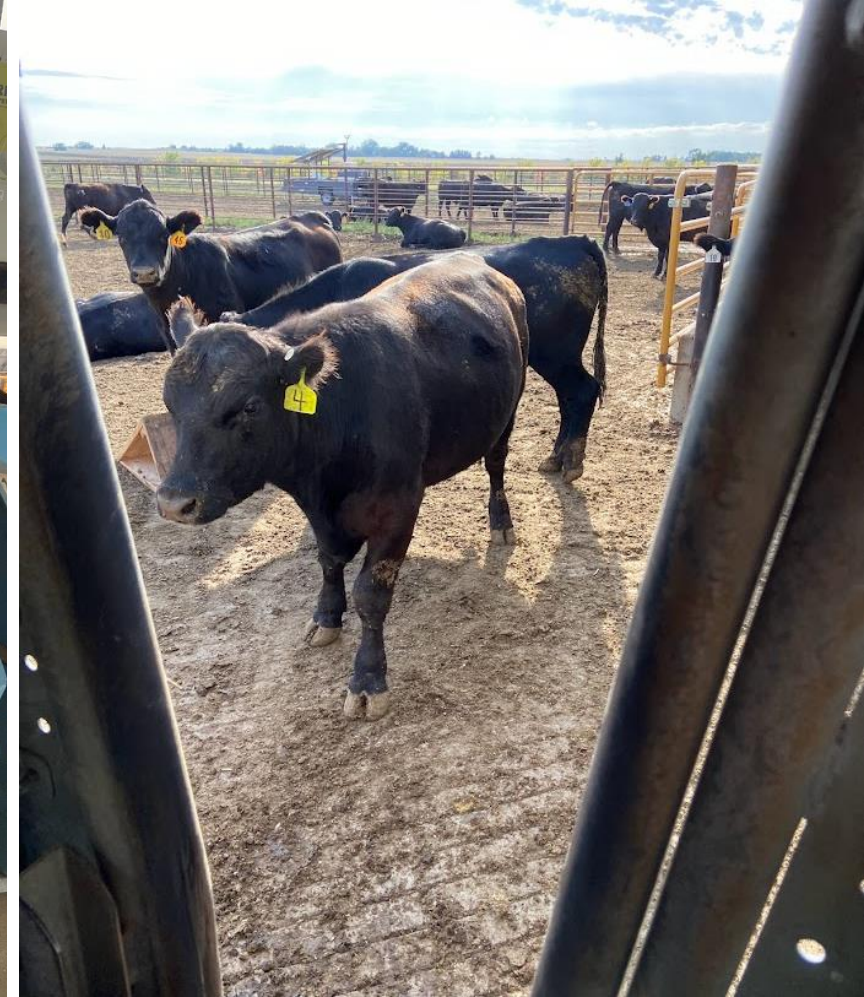


## Slaughtered Cattle

(n=96)



Grazing Treatments: Light, Medium, and Heavy Stocking Rates



## Assessing the carry-over effects of precision livestock technology on steer performance and carcass characteristics

MORENO, E. R.V., MENENDEZ III, H.M., BRENNAN, J.R., HUSMANN, A.L., DOTTS, H. OLSON, K., BLAIR, A. EHLERT, K.,  
WANG, T. LEFFLER, A.J., WAFULA, W., PARSONS, I.L., GUARNIDO-LOPEZ, P., TEDESCHI, L.O., AND SMITH, Z.K.



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## Diet

<b>Item</b>	<b>1 to 7d</b>	<b>8 to 14d</b>	<b>15 to 21d</b>	<b>22 to 130d</b>
<b>Dried Roll Corn, %</b>	32	42	52	62
<b>Dried Distiller grains plus solubles, %</b>	26	20	20	15
<b>Liquid Supplement, <sup>2</sup>, %</b>	6	6	6	6
<b>Hay, %</b>	28	18	8	3
<b>Corn silage, %</b>	14	14	14	14

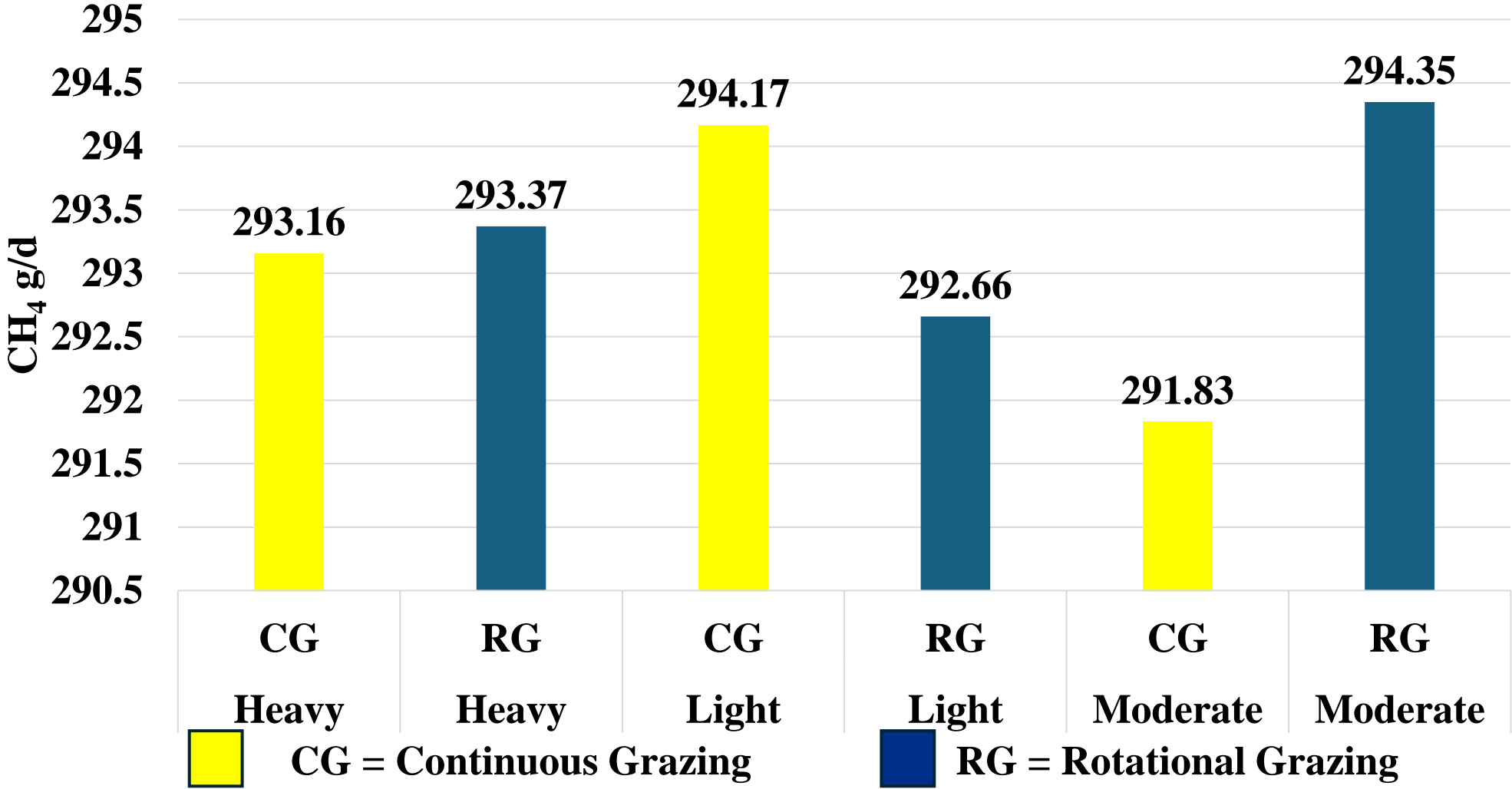
<sup>1</sup> All values on a DM basis.

<sup>2</sup> Provides monesin sodium at 30 mg/907 kg DM basis; vitamins and minerals to meet the nutrient requirements for growing and finishing steers (NASEM, 2016).

- The diet provided on average 13.7% CP, 17.2% NDF, and 1.36 Mcal/kg NEg.

# Results: Emissions (CH<sub>4</sub> and CO<sub>2</sub>) production rate

Interactive means CH<sub>4</sub>



(*P* ≥ 0.15)

# Thank You!



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