Enteric methane production from cattle fed on three tropical grasses in East Africa

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Introduction

- Livestock production is an important source of livelihood and nutrition to the vulnerable communities in the tropics, with more than 80% of subsistence farmers in Africa owning livestock (FAO, 2009).
- Ruminant production in Sub-Saharan Africa (SSA) is dominated by small and medium scale farmers – owning up to 70% of the cattle in the region.
- Low animal productivity – mainly as a result of low quantity and quality of feed.

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introduction

- Planted grasses form the main feed resource for cattle among smallholder farmers under crop- livestock systems in humid zones
- Changing climatic conditions and emerging diseases are negatively **affecting** productivity of commonly grown grasses (Napier and Rhodes var.)
- Led to Introduction of new/improved species that tolerate drought and diseases.
- For greenhouse gas reporting, many SSA countries – IPCC Tier 1- high uncertainty level

Aim of the present work

- To study the nutritive value of cultivated grasses in Kenya (inconclusive data available);
- To measure enteric methane emission from cattle fed planted grasses using methane respiration chambers – accurate in situ method - gold standard

Materials and methods

Animal feeding experiment;

- Animals: Growing Boran steers (n=18, live weight (LW): 216 ± 6 kg)
- Diets*:* Freshly cut *Pennisetum purpureum* var. Kakamega 1 (Napier), *Chloris gayana* var. Boma (Rhodes) or *Brachiaria brizantha* var. Xaraes (Brachiaria)

Napier

Rhodes

Brachiaria

Materials and methods

- Two feeding periods each running for 70 days.
- Parameters measured:

✓ Voluntary nutrient intake,

✓ apparent total tract digestibility,

✓ LW gain and,

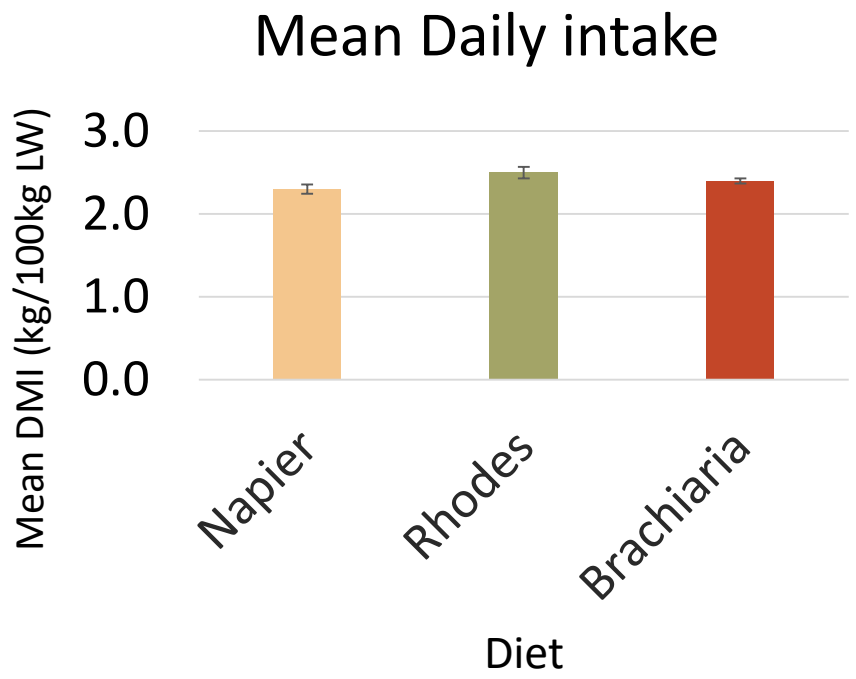
✓ enteric methane production (respiration chambers)

Results_ Chemical composition and intake

Table 1: Dry matter (DM), Organic matter (OM), crude protein (CP), Neutral and acid detergent fibre (NDF and ADF), and gross energy of Napier, Rhodes and Brachiaria grasses

Diet	DM (g/kg)	OM (g/kg)	CP (g/kg)	NDF (g/kg)	ADF (g/kg)	GE (Mj/kg)
Napier						
Rhodes						
Brachiaria	256±8	885±4	83±4	668±6	370±5	16.8±0.06

UNPUBLISHED DATA



- No difference on DM intake among the 3 treatments $P = 0.37$

Results _ Digestibility, weight gain and methane production

Table 2: Organic matter digestibility (DOM), average daily weight gain (ADG), methane yield (MY) (g/kg intake) and methane conversion rate (Ym) of Boran steers (*n*=18; Avg. 216 kg) fed on freshly cut Napier, Rhodes and Brachiaria grasses

Parameter	Rhodes	Napier	Brachiaria	SEM	P value	**IPCC (2019)**
DOM%	57.1[a]	64.0[b]			076	
ADG (g/day)						
MY (g/kg DM)						23.3
Ym (% of GEI)			9.03[a,b]	0.252	0.0127	7.0

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GEI: gross energy intake; SEM: standard error of mean; IPCC: Intergovernmental Panel on Climate Change

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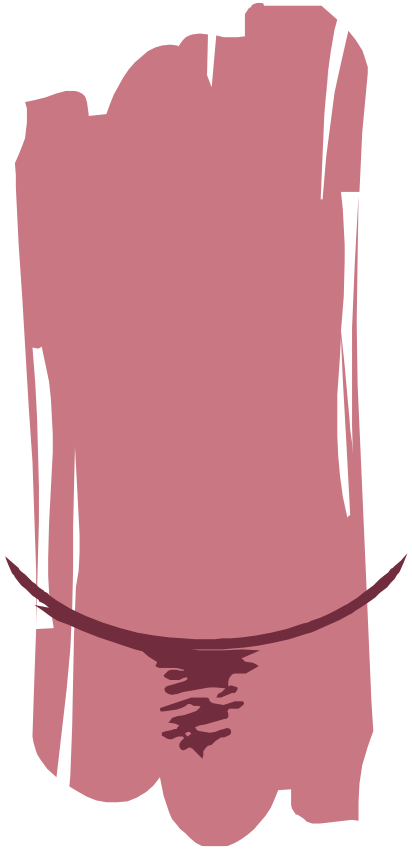
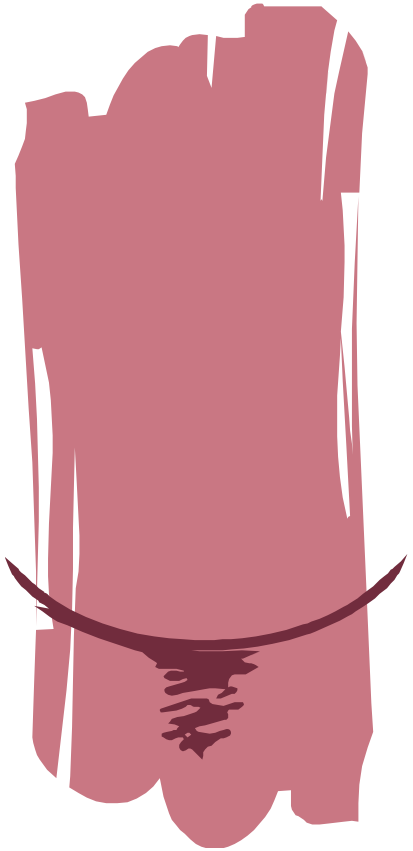
Conclusion



- Our findings suggest that East African cattle could be having higher emissions (MY and Ym) than currently estimated by IPCC 2019 (non-dairy cows on high forage diet) – need for more similar studies
- Improved Brachiaria grass species may only benefit livestock production if management and nutrient input match the species potential - need to integrate better fodder management – Native soils are known to be low in nitrogen

Opportunities going forward;

- Need more *on enteric methane emissions from Boran cattle in East Africa*
- Grass legume integration/ compatibility studies to improve the nitrogen status grass quality



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