Digestibility and metabolizable energy intake equations of tropical ruminant forages using nutrient concentration of cattle faeces

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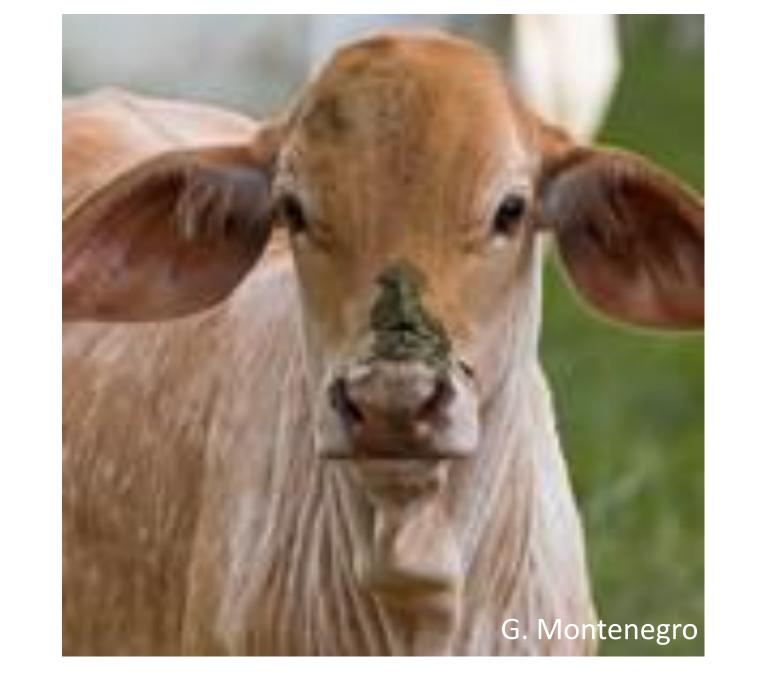
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Introduction

- smallholders use feeds of unknown or highly variable nutritive value undermining proper nutrition

Method

- *in vivo* studies with Friesian and/or Boran steers (n = 42):
- a. Protein-deficit: wheat only and with daily or bi-daily



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- determination of feed intake and accurate nutritive value in grazing animals is resource-intensive
- faecal collection and analysis is relatively easy
- prediction equations of feed nutritive value based on faecal nutrient concentration would be fast, cheap and routine

Objective

 prediction equations of dry matter digestibility (DMD), digestible organic matter in dry matter (DOMD) and metabolizable energy (ME) intake of tropical feedstuffs using cattle faecal nutrient concentrations

Findings

Table 1. Apparent digestibility (arithmetic mean ± SEM, g/100

Calliandra calothyrsus supplementation

- b. Energy-deficit: *Chloris gayana* at 40%, 60%, 80% and 100% of maintenance energy requirement
- c. Balanced: tropical grasses (*Pennisetum purpureum*, Brachiaria brizantha, C. gayana) planted alone or wih Lablab purpureus intercrop
- determination of feed and faecal proximate nutrient, fibre and energy concentration, DMD, DOMD and MEI
- faecal nutrient concentrations from a. and b. regressed against diet DMD, DOMD and MEI; c. for validation dataset
- equations were evaluated using root mean square prediction error (RMSE) and mean error (PE)

Table 2. Equations predicting DMD and DOMD (g/100 g DM) and ME intake (MJ/day) of feedstuffs using faecal nutrient concentrations from *in vivo* studies carried out at ILRI, Nairobi 2014-2017 (n = 92)

g) of diets fed to steers in three *in vivo* studies carried out at ILRI, Nairobi, Kenya 2014 – 2017 (n = 92)

	Study					
Parameter	N-balance	Sub-	Tropical			
		maintenance	grasses feeding			
		feeding				
DMD	57 ± 1.2	56 ± 0.9	59 ± 0.7			
OM digestibility	60 ± 1.1	60 ± 1.4	62 ± 0.7			
CP digestibility	15 ± 3.8	60 ± 1.5	64 ± 0.9			

CP = crude protein; DMD = dry matter digestibility; OM = organic matter

Discussion

- equations are weak but may be improved by using data from more test animals and more varied diets
- best predictors (whose analysis is simple, cheap and routine)
 were faecal DM, CP, NDF and ADF

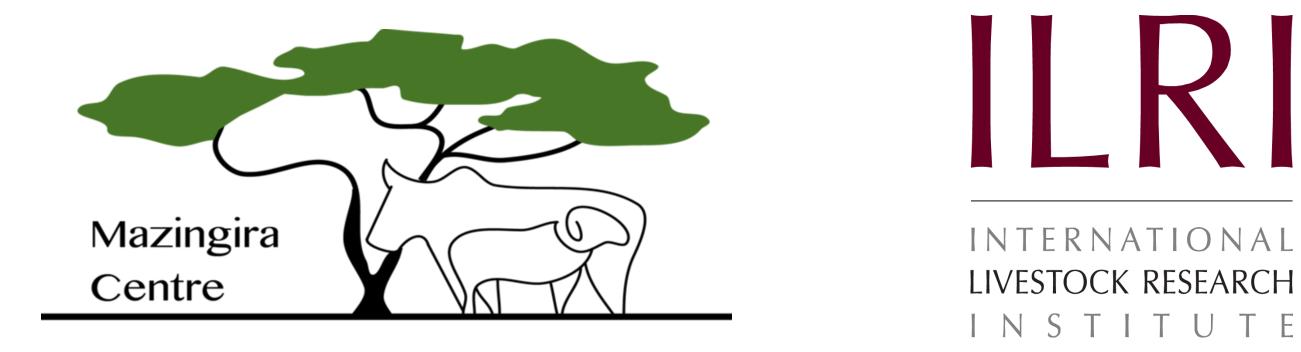
Parameter	Equation	Adj.	p-	r	RMSE	PE
		R ²	value			
DMD	53 – 0.3 fDM +	0.06	0.04	0.32	4.0	±5
	0.4 fNDF - 0.4 fADF					
DOMD	29 + 0.6 fNDF –	0.10	0.01	0.37	4.0	±5
	0.5 fADF + 1.0 fCP					
ME intake	75 – 1.8 fDM –	0.36	< 0.01	0.66	7.0	±22
	1.9 fADF + 1.8 fCP					

DMD, DOMD = apparent dry matter digestibility, digestible organic matter in dry matter; fADF, fCP, fDM, fNDF = faecal acid detergent fibre, crude protein, dry matter and neutral detergent fibrer; ME = metabolizable energy; PE = mean (predicted value – observed value); r = correlation coefficient between actual and predicted values; RMSE = square root (mean (predicted value – observed value)²)

Conclusion

- ideally, these equations are developed using a balanced ration at maintenance level
- low PE in digestibility equations demonstrate possibility of using cattle's faecal nutrient concentrations to predict apparent digestibility and ME content of feedstuffs
- however, equations developed from a large database of *in vivo* animal experiments with sub-optimal diets may better reflect prevailing conditions among smallholders
- this is a first step towards development of such a database and prediction equations

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