

Predicting voluntary dry matter intake of *Bos indicus* cattle: a case for conceptual models

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1- Introduction

Cattle reproductive and productive performance in the (Sub-)Tropics is mainly determined by the voluntary dry matter intake (VDMI). Conceptual mathematical models (CMM) have been suggested as a reliable option for predicting VDMI, as they are population independent and use simple mathematical equations and parameters.

❖ Therefore, this study assessed the reliability of three CMM to predict VDMI of non-grazing and grazing cattle in Niger and Mali.

2 - Methodology

• Conrad et al.(1964)(C1 and C2 is adapted from original):

$$\text{VDMI} = \text{lower of } 0.0107\text{LW}/(1-D) \text{ and } \text{DDM}/D$$

where 0.0107 (increased to 0.0116 for C2) is the daily faecal output (g/kg LW), LW liveweight (kg), D digestible fraction, and DDM digestible DMI (kg/d)

• M4 modified Mertens(1987):

$$\text{VDMI} = \text{average of } 0.0135\text{LW}/\text{NDF} \text{ and } \text{ME}_{\text{req}}/\text{ME}_d$$

where 0.0135 is the capacity of neutral detergent fiber (NDF) intake (g/kg LW), the NDF concentration in the diet (g/kg DM), ME_{req} the animal's metabolizable energy (ME) requirements (MJ/d) and ME_d the dietary ME concentrations (MJ/kg dry matter). Daily maintenance ME_{req} was estimated as 0.631 MJ ME/kg LW^{0.75} and ME_{req} for gain as 0.0243 MJ ME/g LW

Statistical analysis

Datasets:

- Niger: 52 stall-fed zebu (LW=285kg ± 74.12kg), pearl millet leaves, bush hay and green fodder.
- Mali: 45 grazing zebu cattle (LW=236kg ± 27.58kg)

Mean Bias (MB), Root Mean Square Error of Prediction (RMSEP), Relative Prediction Error (RPE)

Models ranking

Models applied

3 - Results

- Statistically, the most accurate results were for grazing cattle, ranked as: M4, C2 and C1.
- There is an inversion in the ranking between C1 and C2, for grazing and non-grazing cattle.
- M4 for grazing cattle is the only reliable model (RPE<20% of RMSEP).

Table 1. Statistical evaluation of three CMM applied in two datasets, grazing and non-grazing cattle, to calculate VDMI in semi-arid Tropics.

	Stall-fed cattle			Grazing cattle		
	C1	C2	M4	C1	C2	M4
Mean Bias (kg/animal a day)	-1.50	-1.90	-0.80	1.85	1.48	-0.11
RMSEP (kg/animal a day)	1.90	2.20	1.30	2.04	1.72	1.12
RPE (% of RMSEP)	40.80	48.30	28.60	33.26	28.01	18.33
Ranking	2	3	1	3	2	1

4- Conclusion

❖ The most promising model is M4 (RPE<20%), while C2 and C1 could be further refined to improve the accuracy of their predictions.