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## Predicting Voluntary Dry Matter Intake of *Bos Indicus* Cattle: a Case for Conceptual Models

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### Abstract

Productive performance of cattle in the (Sub-)Tropics is largely determined by their voluntary dry matter intake (VDMI). Conceptual mathematical models (CMM) have been suggested as a reliable option for predicting VDMI, although they have only been evaluated using meta-data. The present study assessed the reliability of three CMM to predict VDMI of 52 stall-fed ( $LW = 277.2 \pm 74.1$  kg) and 45 grazing cattle ( $LW = 237.7 \pm 27.7$  kg) from ICRISAT near Niamey, Niger, and the Station du Sahel in Niono, Mali, respectively. The CMM of Conrad et al. (1964) (C1), the modified Conrad et al. (1964) (C2), and modified Mertens (1987) (M4) were selected based on their reported adequacy to predict VDMI of cattle kept under tropical conditions. For C1 and C2, VDMI is estimated as  $0.0107 * LW/(1-D)$  and as  $DDM/D$ , where 0.0107 (increased to 0.0116 for C2) is the daily fecal output (g/kg LW), LW liveweight (kg), D digestible fraction per unit of ingested dry matter, and DDM digestible DM intake (kg/d). For C1 and C2, the lower VDMI estimate of the two equations was retained as predicted VDMI, while for M4, DMI is the mean of equations,  $0.0135 * LW/NDF$  and  $ME_{req}/ME_d$ , where 0.0135 is the maximum intake of neutral detergent fiber (NDF) intake (g/kg LW), NDF the NDF concentration in the diet (g/kg DM),  $ME_{req}$  the animal's metabolisable energy (ME) requirements (MJ/d) and  $ME_d$  the dietary ME concentrations (MJ/kg DM). Daily  $ME_{req}$  for maintenance was estimated as  $0.631$  MJ ME/kg LW<sup>0.75</sup> and for gain as  $0.0243$  MJ ME/g LW gain. The CMM were statistically evaluated through the mean bias (MB), root mean square error predicted (RMSEP), and relative prediction error (RPE).

The CMM predicted VDMI more accurately for grazing than stall-fed animals. For both datasets, the M4 had lower MB (-0.11 and -0.8 kg/animal day) and RPE (18.33) than C1 and C2 (MB > 1.4 kg/animal day and RPE > 1.48). Therefore, M4 is the most reliable CMM however, further evaluation using better data is needed under stall-fed conditions.

**Keywords:** *Bos indicus*, conceptual models, voluntary dry matter intake