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Evaluation of a beef cattle finishing simulation model for intake and live weight gain prediction under different herbage and maize grain allowances

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Key words : evaluation , model , intake , beef cattle , herbage allowance

Introduction Most animal grazing models require in advance measures or estimates of animal intake and feed quality to predict animal performance . An intake model linked to an animal performance model are the key components for whole-farm simulation . Model evaluation is not a straightforward issue as individual herbage and maize grain intake are not always readily available . The objective of this study was to develop and to evaluate a beef cattle finishing model for predicting herbage intake and animal performance under different herbage and maize grain allowances .

Material and methods Intake and diet selection in the model are functions of grazing management , sward and animal characteristics and are represented formally by a Potential intake (I_P) , an intake associated to rumen fill capacity (I_F) that incorporates DM digestibility (D) of the herbage and D and amount of supplement . Finally factor ($O-1, f_{HA}$) linked to leaf allowance (kg DM/100 kg LW) and leaf mass (kg DM/ha) . Herbage intake (I_H) is estimated as $I_H = \{ \text{Min}(I_P, I_F) f_{HA} \}$. When maize grain is fed , I_H is corrected for substitution rate (SR) . The SR is estimated in a two-step procedure from unsupplemented intake . Live weight gains and the updated animal liveweights are estimated daily i.e. simulated animals gain or loose weight , depending on their nutritional balance associated with animal characteristics and the corresponding individual ME and CP eaten daily (Freer *et al.* 1997) . The model was evaluated (Mayer & Butler 1993) against experimental data shown in Table 1 (Machado 2004) obtained from a combination of herbage allowances (2.5 to 7.5 kg DM/100 kg LW) and maize grain allowances (from 0 to 1.2 kg DM/100 kg LW) where intakes was estimated from a combination a n-alkane and ¹³C markers .

Table 1 Experimental data for model evaluation .

	Exp .1	Exp 2
Animal class	heifers	steers
Duration (d)	49	57
Treatments (replicated)	4	6
Pre-grazing leaf mass (kg DM/ha)	2452	682
Pre-grazing sheath & stem mass (kg DM/ha)	1866	1011
Pre-grazing dead mass (kg DM/ha)	1013	658

Results Figure 1 shows the fitted regressions without an intercept (intercepts were not significantly ($P > 0.05$) different from zero) , where a significant ($P < 0.05$) agreement was obtained between modelled and observed experimental values for LWG (slope 0.98 ± 0.08 , R^2 0.93) and herbage intake (slope 0.93 ± 0.04 , R^2 0.98) .

Conclusions The model in its present state of development can reproduce experimental information under a wide range of grazing conditions (including maize grain supplementation) with acceptable accuracy and without bias .

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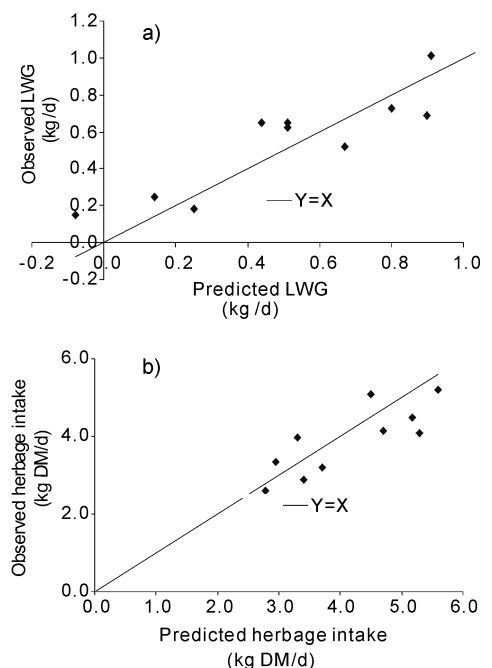


Figure 1 Regressions of observed data on predicted (model) results for a) LWG and b) Herbage intake .