Evaluation of a Beef Cattle Finishing Simulation Model for Intake and Live Weight Gain Prediction under Different Herbage and Maize Grain Allowances

Claudio F. Machado
Massey University, New Zealand

Stephen T. Morris
Massey University, New Zealand

J. Hodgson
Massey University, New Zealand

H. Berger
Massey University, New Zealand

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C.F. Machado ; S. T. Morris ; J. Hodgson ; H. Berger
Faculty of Veterinary Sciences. Tandil-Argentina (UNCPBA), Massey University, NZ.
E-mail xmachado@vet.unicen.edu.ar

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 $I_H = \{Min(I_P, I_F)\ f_{HA}\}$. 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.

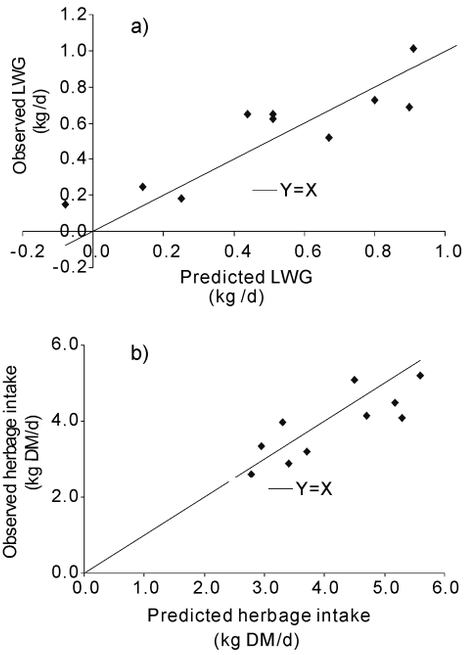

Figure 1 *Regressions of observed data on predicted (model) results for a) LWG and b) Herbage intake.*

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