Evaluation of an automated system for monitoring water intake in group-housed beef cattle

Abstract ID #:879440

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Introduction

- Water is the most essential nutrient for animals being indispensable for health and production. However, very seldom water intake is assessed likely due to being overlooked for many years, the lack of accuracy of assessment methods and intrinsic dynamicity of intake patterns.

Objective

- Evaluate the accuracy and precision of an automated water trough system (Intergado, Pro-Eficiência Solução para Agronegócios S.A., Betim, Minas Gerais, Brazil) for measuring water intake (WI) of beef cattle.

Material and Methods

- The dataset was obtained from 13 Angus x Hereford registered crossbred breeding bulls over a 90 d research trial;
- Animals were consuming beardless wheat (*Triticum aestivum*) hay near maintenance requirements with free access to water and a trace mineral block;

- The animals were assigned to 1 of 2 shaded pens provided with a total of eight automated water trough systems;
- Voluntary visits: animal ID, water consumed (L), and initial BW (kg);
- The final BW was determined following each drinking event by accounting for weight of water disappeared upon drinking (±0.050 kg), scale recorded weights (±0.500 kg), and flow of water consumed (L/s).

- Data were analyzed based on plotting observed against predicted for the identity line (slope = 0 and intercept = 1) and goodness-of-fit, both were assessed using the Model Evaluation System (Tedeschi, 2006).
- Differences were considered significant at $P \leq 0.10$.

Results

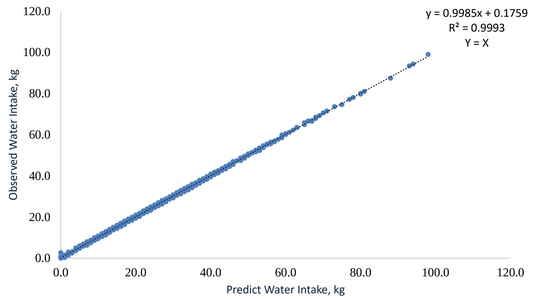

Figure 1. Comparasions between predicted and observed water intake from Intergado System for crossbred bulls. The dotted line represents the equality line, a point in this line represents similar values to predicted and observed water intake.

Table 1. Descriptive statistics of observed water intake from Intergado System and parameters of regression and accuracy for estimated daily water intake by body weight method from Intergado System.

Item[1]	Observed[2]	Estimated
Mean, kg	23.95	23.81
Standard deviation, kg	15.41	15.43
Minimum, kg	0.1	0.0
Maximum, kg	98.98	98.00
Regression analysis		
Intercept		
Estimate	-	0.1759
Standard error	-	0.023
P-value (H_0: $\beta_0 = 0$)	-	0.00001
Slope	-	
Estimate		0.9885
Standard error		<0.001
P-value (H_0: $\beta_1 = 1$)	-	0.0658
R^2	-	0.999
Model traits		
Mean bias (Y - X)	-	0.140
MSPE, kg	-	0.187
Root MSEP, % of WI observed	-	1.805
Partition of MSEP, %		
Squared bias	-	10.46
Systematic bias	-	0.29
Random error	-	89.23
MEF		0.999
CCC (0 to 1)		0.998
β (0 to 1)		0.999
C_b (0 to 1)		0.999

[1]/R^2 = coefficient of correlation; MSPE = mean square error of prediction; MEF = model efficiency statistic; CCC = concordance correlation coefficient; β correlation coefficient estimate; C_b = bias correction factor.

[2]/1042 water intake events; n = 13, thirteen crossbreed bulls.

Conclusion

- The Intergado automated water trough system can precisely and accurately be used to measure water intake (CCC>0.99) by beef cattle with expected mean bias of 140 mL.

Reference

- Tedeschi, L. O. 2006. Assessment of the adequacy of mathematical models. Agric. Syst. 89:225–247. doi:10.1016/j. agsy.2005.11.004.

Acknowledgment

- USDA Grant # 2018-67016-27912.

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