Evaluation of Individual Feed Intake, Body Composition, and Performance of Performance-Tested Angus Bulls during a 14-year Period

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Summary

Two hundred fifty-five purebred Angus bulls had their performance tested by the Wardens Farm in Council Bluffs, Iowa over a 14-year period. The bulls feed intake was recorded individually, and performance and ultrasound measurements were determined. Performance and body composition data were used to estimate required feed intake by Perry and Fox (1997) model, and estimated and observed DMI were compared. Average estimated DMI was 25.84 lbs/day and average observed Dry Matter Intake (DMI) was 24.93 lbs/day. The results indicated that the model is promising in estimating feed intake of purebred Angus bulls, but a few adjustments may be needed in certain situations to increase accuracy in estimating intake of bulls.

Introduction

Wardens Farm has been performance testing and evaluating their genetics for over 35 years. In addition to birth and growth records, they have collected feed efficiency data from their bull test program for 19 years and have been carcass testing and ultrasounding for over 10 years. The Wardens Farm uses their own top bulls as well as proven sires in its A. I. program. The strategy is using artificial insemination in one heat cycle and then using their own bulls for clean up. Wardens Farm is concerned with beef quality and in 2000 it had over 100 steers in the Iowa Beef Tenderness and Carcass Evaluation Project.

Perry and Fox (1997) developed a model to predict feed intake of feedlot cattle. The model was designed to predict individual feed required for the observed body weight and average daily gain of growing cattle. The system also allows comparing predicted DMI and actual DMI for a pen of animals or an individual animal. The objective of the model of Perry and Fox (1997) was to provide a method for allocating feed to individuals fed in a group and to compute cost of gain in marketing programs based on individual animal management. The system allows sorting cattle into optimal feeding and marketing groups, which usually is made possible by feeding cattle from different owners in a pen. Ribeiro-Filho (2002) used the model developed by Perry and Fox (1997) to compare estimated and observed feed intake of individually fed feedlot steers. He observed that the model was adequate in predicting individual DMI of steers in a pen, and there was no significant difference between observed and predicted average DMI.

Data from the Wardens Farm bull test over 14 years were used to evaluate the accuracy of the Perry and Fox (1997) model in estimating feed intake requirements of purebred Angus bulls and comparing estimated and observed feed intake.

Materials and Methods

Two hundred fifty-five Angus bulls were tested over a 14-year period. The bulls were fed by Pinpointer System (PLM Corporation, Cookeville, TN). The Pinpointer provides feed to a group of animals, but records feed intake information on each individually. Data from each bull's visit to the Pinpointer is retrieved and stored in a small computer, and the access to the feed is restricted to one animal at a time. The bulls were fed a commercial bull ration containing 0.763 Mcal of NEm/lb and 0.485 Mcal of NEg/lb. In addition, 4 lbs/d of alfalfa hay were fed for each bull.

DMI, average daily gain (ADG), and feed efficiency (FE) were measured. Ultrasound images of longissimus muscle (ribeye) and subcutaneous fat thickness (backfat) were taken between the 12th and 13th ribs at the end of the test. Carcass weight and yield grade were estimated. Performance and body composition data were used to estimate feed requirement by Perry and Fox (1997) model as reported in Ribeiro-Filho (2002). The relationship between estimated and observed individual DMI for all 255 bulls on test was determined by least squares procedure.

Results and Discussion

Average estimated DMI was 25.84 lbs/d and average observed DMI was 24.93 lbs/d for all tested bulls. The average ADG was 3.47 lbs and FE was 6.72 (feed/gain). The relationship ($R^2 = 0.44$) between observed and predicted individual DMI is shown in Figure 1. The model seemed to underpredict feed intake for the lower intake bulls and overpredict feed intake for the higher intake bulls. However, considering that feed intake is influenced by several factors and its variability is usually high, the difference between the averages for estimated and observed DMI was acceptable. The performance and body composition data per year are shown in Table 1.

Table 1. Performance and body composition of the bulls on test.

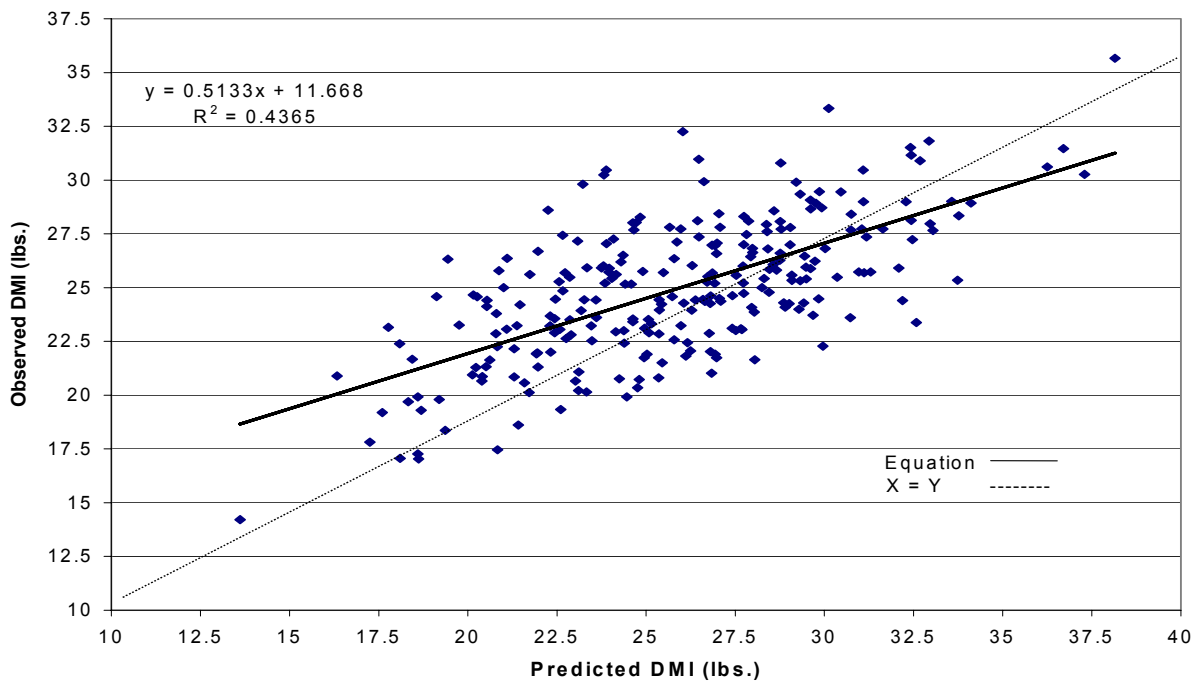|	Year of Test													
	1988	**1989**	**1999**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1998**	**1999**	**2000**	**2001**	**2002**
No. animals	15	15	16	15	15	14	14	15	15	15	15	31	30	30
Initial Wt.lbs.	665	672	694	697	680	701	816	710	711	767	719	815	736	718
Final Wt. lbs.	1074	1058	1126	1074	1123	1073	1171	1144	1155	1139	1143	1227	1118	1165
DOF[a]	140	140	140	140	112	112	112	112	112	112	112	112	112	112
ADG, lbs.	2.92	2.76	3.09	2.69	3.96	3.32	3.17	3.88	3.96	3.32	3.79	3.68	3.41	3.99
DMI, lbs.	23.17	18.48	19.09	21.86	22.68	22.22	24.16	22.1	22.04	21.69	23.15	23.9	25.34	25.46
FE,feed/gain	7.93	6.70	6.19	8.12	5.73	6.69	7.62	5.70	5.56	6.53	6.12	6.50	7.43	6.38
Backfat, inch	0.20	0.27	0.18	0.36	0.26	0.33	0.42	0.38	0.46	0.24	0.33	0.43	0.34	0.46
REA, sq.inch	12.01	12.73	13.03	13.7	12.44	11.65	11.66	12.77	14.18	11.85	12.39	14.68	14.18	13.78

[a] Days on feed or duration of the test.

Implications

The results indicated that the model developed by Perry and Fox (1997) is promising in estimating DMI of purebred Angus bulls. Based on the results of this study, actual measurement of feed intake may result in more rapid genetic improvement than estimates based on the current model. The model was developed for commercial feedlot cattle, and it may need a few refinements to be used for bulls.

References

Perry, T. C., and D. G. Fox. 1997. Predicting carcass composition and individual feed requirement in live cattle widely varying in body size. J. Anim. Sci. 75:300-307.
Ribeiro-Filho, C. C. 2002. Effects of dietary energy and animal frame size on feed intake, body composition and plasma concentrations of insulin and leptin in beef steers. Ph.D. Dissertation. Iowa State University, Ames, IA.

Figure 1. Relationship between observed and predicted individual DMI for all bulls on test.

$y = 0.5133x + 11.668$
$R^2 = 0.4365$