Prediction of Yield Grade from Time on Feed, Final Weight and Daily Gain

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Story in Brief

Equations developed for predicting beef carcass yield from average daily gain, days on feed and final weight were tested using data from 1670 British, 315 Exotic X British crossbreds, and 138 Exotic breed type steers. These animals were from a variety of sources and had been used in nutrition trials.

Yield grades predicted from days on feed, final weight and daily gain were reasonably close to the yield grades determined by carcass measurements. However, when small groups of cattle were tested, correlation coefficients were lower indicating that equations were not as reliable. For groups of cattle which had yield grade values of 3.0 – 4.0, the difference between actual and predicted was less than .5 yield grade. Both overestimated and underestimated of carcass yield grade occurred with extreme yield grades (< 2.5 or > 4.5). Efforts to more accurately estimate yield grades of slaughter cattle with these extremes are needed.

Introduction

The demand for leaner beef continues to increase. By 1985, over 50 percent of the beef consumed in the United States is projected to be in the form of ground beef (80 percent lean, 20 percent fat).

To produce cattle this lean, management practices to efficiently produce acceptable lean beef need to be identified. Yield grade is an indicator of carcass cutability and reliability estimates the amount of lean and fat in a beef carcass. Identification of live animal characteristics which predict yield grade would be helpful in the production and market of lean beef.

Walters and Hintz (1981) developed two equations to predict carcass yield grade from live cattle traits. Many variables such as final weight, days on feed, average daily gain, birth weight, weaning weight (these variables squared and cubed), breed of sire, breed of dam, and interactions were considered as sources of variation. However, based on the coefficient of determination (R^2), the following two equations were developed. One is for British and one is for exotic X British breed type cattle.

The equations are as follows:

British (B):

$$YG = -7.1527 + .068 \times Day - .000234 \times Day^2 + .000000263 \times Day^3 + .0042 \times FWT + .2257 \times ADG;$$

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Exotic X British (ExB):

$$YG = -8.4625 + .068 \times Day - .000234 \times Day^2 + .000000263 \times Day^3 + .0042 \times FWT + .2257 \times ADG;$$

where Day = Days on Feed;
FWT = Final Live Weight in lb; and
ADG = Average Daily Gain in lb per day

The purpose of this study was to test the validity of these equations, using means and correlations to examine relationships between actual yield grade and the yield grade derived from the prediction equations, among cattle of various backgrounds, types and nutritional treatments.

Materials and Methods

Data sets used to test the effectiveness (validity) of the equations came from 16 independent OSU feedlot trials (Source I) and from progeny data from a 7-year beef cattle milk production study conducted at the Southwestern Livestock and Forage Research Station (Source II).

Source I included 2015 head of cattle representing 26 breeds or crosses, which were fed different energy and protein levels and feed additives. These steers entered the feedlot weighing from 440 to 880 lbs. and were fed from 110 to 201 days.

Source II consisted of 108 Herford X Angus and Hereford X Charolais crossbred steers, which had been weaned at 240 days of age and placed directly in the feedlot. Their feedlot rations ranged from 75 percent to 92 percent concentrates. All cattle had free access to feed and were slaughtered when their carcasses were estimated to grade low choice, which resulted in a range of feeding time from 87 days to 308 days.

Results and Discussion

More observations were available from Source I than from Source II (Table 1). Steers from Source II were placed in the feedlot at weaning, whereas the pre-feedlot history of Source I cattle is unknown. This explains why the initial weight is lighter for Source II than Source I cattle. Cattle from the milk level studies (Source II) were slaughtered when their carcasses were estimated to quality grade low choice while cattle from the OSU feedlot trials (Source I) were slaughtered in a group after a given number of days on feed. This explains why days on feed differ between the two sources.

The mean yield grade (PYG) predicted from live cattle traits was similar to the measured carcass yield grade (AYG) (Table 2). The smallest difference between PYG and AYG was within Source I when the ExB equation was used with ExB cattle. In both data sources the ExB equation underestimated actual carcass yield grade and the B equation overestimated AYG.

Although the mean PYG and the mean AYG are similar, the low simple correlation coefficients (Table 2) indicate that these equations are not valid for predicting the yield grade.

Table 1. Feedlot traits for steers in Source I and Source II by breed type

Breed type	N	Beginning weight lbs.	ADG lbs.	Days on feed	Final weight lbs.
Source I					
B[a]	1608	660 ± 2.7[c]	3.2 ± .01	138 ± .61	1115 ± 2.6
ExB	269	696 ± 3.7	3.3 ± .03	130 ± .56	1120 ± 5.5
E[b]	138	681 ± 5.8	3.3 ± .04	133 ± .09	1109 ± 8.4
Source II					
B	62	593 ± 10.9	2.6 ± .06	168 ± 5.6	1043 ± 21.1
ExB	46	588 ± 6.6	2.4 ± .06	190 ± 4.9	1057 ± 14.8

[a]B = British
[b]E = Exotic
[c]Standard Error

Table 2. Predicted vs actual yield grades and standard errors on British (B), Exotic X British (ExB) and Exotic (E) breed type cattle

	Breed type	N	Predicted yield grade (PYG)	Actual yield grade (AYG)	PYG-AYG	Correlation (actual vs predicted)
Source 1						
	B	1608	3.77 ± .01	3.27 ± .02	.5	.21
	ExB	269	2.43 ± .02	2.63 ± .04	−.2	.22
	E[a]	138	2.43 ± .04	2.86 ± .06	−.43	.19
Source 2						
	B	62	3.55 ± .13	3.07 ± .18	.42	.10
	ExB	46	2.61 ± .10	3.30 ± .14	−.69	.18

[a]Predicted yield grades were calculated from the equations developed from Exotic X British crossbred cattle.

The low simple correlation coefficients between PYG and AYG are partially explained by the data presented in Table 3 for cattle within Source 1 subdivided by yield grades. The difference between PYG and AYG was lowest for cattle with yield grades of 3.0 to 4.0. As the AYG increased, it was increasingly underestimated by the equation and as AYG decreased, it was increasingly overestimated. These results seem logical since the greater part of the cattle used to develop the original equations were within the 3.0 to 4.0 yield grade range. Overestimating and underestimating at the outer extremes may to be due to the small number of observations with high and low AYG, though the bias suggests that another equation might prove superior. Because of the low correlation coefficients between actual and predicted yield grade, it is felt that the existing equations would not be an adequate tool for estimating the yield grade of small groups of cattle. We therefore plan to refine the original equations by including additional live traits, such as initial weight, diet protein levels and ration energy levels, which were not available when the original equations were developed. Non-linear regression techniques may also be used in this refinement process.

Table 3. The predicted yield grade (PYG) and actual yield grade (AYG) for source I cattle over a range of yield grades averaged over breed types

N	AYG	PYG	PYG-AYG
11	1.5	2.90 ± .18	1.4
64	2.0	3.15 ± .09	1.15
82	2.5	3.12 ± .08	.58
111	3.0	3.51 ± .06	.49
101	3.5	3.70 ± .06	.2
62	4.0	3.87 ± .06	−.13
23	4.5	3.82 ± .12	−.68
4	5.0	4.00 ± .22	−1.00

Literature Cited

Walters, L. E. and R. L. Hintz. 1981. Okla. Agr. Exp. Sta. Res. Report MP-108:49.