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Predicting beef carcass retail yield from hot carcass traits

Abstract

Hot carcasses from 288 steers were used to develop equations to predict weights and percentages of trimmed retail cuts. and trimmable fat yields from hot carcass traits. Independent variables examined were: (1) 12-13th rib fat probe; (2) IO-11th rib fat probe; (3) external fat score; (4) percent kidney knob; (5) hindquarter muscling score, and (6) carcass weight. Right sides of carcasses were fabricated into boneless cuts trimmed to .3 in. fat and weighed. Then. cuts were totally trimmed (.0 in.) and reweighed. Multiple regression equations developed from these variables accounted for 95 and 90% of the variation in total weight of retail cuts at .3 and .0 in. trim levels. respectively. Furthermore, equations accounted for 58 and 52% of the variation in percent yield of trimmed retail cuts at .3 and 0 in. trim levels. respectively. Equations developed for trimmable fat accounted for 74 to 76% of the variation in pounds and percentages at both trim levels. Our "hot carcass" equations were equivalent to USDA equations that are based on chilled, ribbed-carcass traits in their ability to predict yields of trimmed retail cuts and trimmable fat.

Keywords

Cattlemen's Day, 1990; Kansas Agricultural Experiment Station contribution; no. 90-361-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 592; Beef; Hot beef carcass; Fat probe; External fat score; Retail yield; Regression equations; Carcass traits

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PREDICTING BEEF CARCASS RETAIL YIELD FROM HOT CARCASS TRAITS

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Summary

Hot carcasses from 288 steers were used to develop equations to predict weights and percentages of trimmed retail cuts, and trimmable fat yields from hot carcass traits. Independent variables examined were: (1) 12-13th rib fat probe; (2) 10-11th rib fat probe; (3) external fat score; (4) percent kidney knob; (5) hindquarter muscling score, and (6) carcass weight. Right sides of carcasses were fabricated into boneless cuts trimmed to .3 in. fat and weighed. Then, cuts were totally trimmed (.0 in.) and reweighed. Multiple regression equations developed from these variables accounted for 95 and 90% of the variation in total weight of retail cuts at .3 and .0 in. trim levels, respectively. Furthermore, equations accounted for 58 and 52% of the variation in percent yield of trimmed retail cuts at .3 and 0 in. trim levels, respectively. Equations developed for trimmable fat accounted for 74 to 76% of the variation in pounds and percentages at both trim levels. Our "hot carcass" equations were equivalent to USDA equations that are based on chilled, ribbed-carcass traits in their ability to predict yields of trimmed retail cuts and trimmable fat.

(Key Words: Hot Beef Carcass, Fat Probe, External Fat Score, Retail Yield, Regression Equations, Carcass Traits.)

Introduction

Hot processing and hot-fat trimming of beef carcasses are two practices that warrant consideration by the beef processing industry. Economical benefits of trimming and fabricating hot carcasses include reduced energy costs, space requirements, and labor. However, a barrier to the widespread application of these practices is the inability to yield and(or) quality grade hot carcasses.

USDA yield grades accurately predict yields of boneless, closely trimmed retail cuts. Data are taken on ribbed, chilled carcasses at the same time quality grades are determined. If carcasses are hot-fat trimmed, USDA yield grades cannot be assigned, but quality grades can. Our objective was to determine if subjective and objective measurements of fat and muscling on hot carcasses could be used to accurately predict yields of trimmed retail cuts and fat trim, and thus allow yield grading of hot carcasses.

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Experimental Procedures

Data were obtained from 288 carcasses from steers sired by 11 sire breeds mated to Hereford and Angus dams. Steers were slaughtered at the Roman L. Hruska U.S. Meat Animal Research Center's abattoir. After carcasses were washed, hot carcass data were obtained. Fat depth (in.) was taken between the 12th and 13th ribs (12RFD) at about 4.7 in. from the dorsal spinous processes and also between the 10th and 11th ribs (10RFD) at about 4 in. from the dorsal spinous processes. Overall carcass fatness was appraised visually and assigned an external fat score (EFS) from 0 to 9 (0=none and 9=excessively thick). Percent kidney knob (%KK) was estimated to the nearest .1%. Hindquarter muscling (HQMS) was scored [on a scale from 1 to 10 (1=extremely thin and 10=extremely thick)] independently of weight and frame size .

At 24 hr postmortem, carcasses were ribbed, and cold carcass data were obtained. Fat depth at the 12th rib over the ribeye was measured and adjusted for abnormal fat deposits over the carcass. Ribeye area was measured on the right side, and %KK was estimated to .1%. Then, USDA equations were used to predict trimmed retail cuts and fat trim.

The right side of each carcass was fabricated into boneless, trimmed retail cuts. Cuts were trimmed to .3 in. fat cover, weighed, then trimmed free of all surface fat (.0 in.) and reweighed. Weights of fat trim also were recorded.

Results and Discussion

Regression equations formulated from hot carcass measurements are reported in Table 16.1. That table presents the constants, calculated from our hot carcass measurements, that can be used in equations to predict the yield of retail cuts or fat trim. The R^2 values show the relationship between calculated and observed values for hot carcass and USDA chilled carcass data, respectively. For example, the regression equation using 12RFD, EFS, %KK, HQMS and carcass weight (CWt), obtained on hot carcasses, appeared to be as accurate in predicting total pounds of trimmed retail cuts at .3 in. fat trim as the USDA equation using chilled carcass measurements (R^2=.95 vs R^2=.96, respectively).

We conclude that hot carcass data can be used to predict yields of trimmed retail cuts and trimmable fat with similar accuracy to chilled carcass data used in the present (USDA) system.

Table 16.1. Equation Constants and R^2 Values for Predicting Pounds[a] and Percentages of Closely Trimmed Retail Cuts and Trimmable Fat

Item	Y intercept	12 RFD	10 RFD	EFS	%KK	HQMS	CWt	R^2
.3 TRC[bc], lb	14.9	−16.9	—	−3.8	−2.9	2.4	.34	.95[e]
.3 TRC, lb (USDA)								.96[f]
.3 TRC, %	76.5	−3.76	−3.16	−.96	−.98	.5	—	.58
.3 TRC, % (USDA)								.58
.0 TRC, lb	25.5	—	−17.2	−5.7	−3.6	2.87	.3	.90
.0 TRC, lb (USDA)								.91
.0 TRC, %	73.4	—	−6.1	−1.6	−1.3	.66	—	.52
.0 TRC, % (USDA)								.54
.3 Fat[d], lb	−43.76	18.7	10.11	4.6	3.26	−1.95	.09	.85
.3 Fat, lb (USDA)								.84
.3 Fat, %	−.91	5.4	3.4	1.2	.96	−.55	.01	.76
.3 Fat, % (USDA)								.75
.0 Fat, lb	−38.4	22.6	18.2	4.7	2.4	−1.5	.09	.84
.0 Fat, lb (USDA)								.87
.0 Fat, %	5.1	6.7	5.7	1.3	.76	−.34	—	.74
.0 Fat, % (USDA)								.79

[a]Equations for predicting pounds were developed from side weights; to calculate carcass pounds, multiply by 2 as in the example equation below.
[b]Trimmed retail cuts.
[c]Example equation: lb retail cuts, trimmed to .3 in. = 2 [14.9 − 16.9(12RFD) − 3.8(EFS) − 2.9(%KK) + 2.4(HGMS) + .34(CWt)].
[d]Trimmable fat.
[e]Relationship of predicted to actual value, hot carcass data.
[f]Relationship of predicted to actual value, current USDA cold carcass data.