The Relation of Lamb Quality Factors to Grade, Marbling, Carcass Value and Sensory Evaluations

D. H. Kropf, D. L. Mackintosh, C. S. Menzies,
Dorothy Harrison and Lois Anderson

This study was to determine quality factors most closely related to carcass grade, marbling in the rib eye muscle, and to tenderness.

A total of 376 crossbred lambs were slaughtered over 4 years at an approximate live weight of 90 lb. after carcasses chilled 48 hours. U.S.D.A. carcass grade and various quality scores were evaluated by a representative of the Federal Meat Grading Service. Carcasses were cut to wholesale cuts and weights obtained. The hotel rack was physically separated into fat, L. dorsi muscle, other lean, intercostal tissue, overflow fat and bone.

Loin roasts were cooked to a specified internal temperature under carefully controlled conditions and cooking and sensory data obtained. Correlation coefficients were calculated between factors studied and 4-year correlations were pooled.

Lamb carcasses used ranged from Low Choice to Average Prime with most grading High Choice or Low Prime.

Conformation score was most closely related to final carcass grade of all factors studied. Many fat factors were significantly related to carcass grade although none of the correlations were higher than .39 ($P < 1\%$). Conformation score was related to many finish factors. As fat increased, conformation score tended to improve. Higher grading carcasses tended to exhibit more marbling with correlations of .26** and .29** respectively, with rib eye marbling score and % fat in the rib eye sample.

Various quality factors were significantly related to marbling: Scores for external finish, feathering, overflow, fat streaking, kidney and pelvic fat, and percentage of separable fat in the hotel rack. Carcasses with a greater percentage of separable lean in the rack tended to exhibit less marbling.

Relationships of various quality factors to tenderness of lamb roasts were disappointingly low. Very few grade factors were significantly correlated. Marbling was highly significantly related to all 4 ways of evaluating tenderness, but even here the highest correlation was .28 which means that only 7.8% of variance in tenderness could be explained by marbling variations. However the quality range of the carcasses was rather small. Had a greater range in carcass grades been sampled, higher correlations may have resulted. Tenderness evaluations were closely related to each other. Juiciness and tenderness correlated positively.

** $P < 1\%$ and years not significantly different.

Table 60
Correlation Coefficients of Carcass Factors to U.S.D.A. Carcass Grade, Conformation Score and Marbling. 4 Years Data

	U.S.D.A. grade	Conformation score	Rib eye marbling score	Rib eye % fat
Conformation score	.57**	---	.14	.10
Amount external finish score	.36	.38**	.12*	.17*
Feathering score	.65	.03	.23**	.22**
Overflow fat score	.23**	.03	.11	.10
Fat streaking flank steak	.39**	.12*	.20**	:19**
Fat streaking, other flank muscle score	.38**	.07	.23**	.19**
Kidney and pelvic fat score	.29	.23**	.23	.30**
Rib eye marbling score	.26**	.14	---	.55**
Rib eye fat %	.29**	.10	.55**	---
Intercostal muscles fat %	.27	.16**	.22	.32
Rib eye area	.11	.14**	-.03	-.10
Fat thickness over rib eye	.27**	.19**	.19**	.30**
Overflow fat, gms.	.33**	.11*	.24**	.23**
% Separable fat, rack	.42	.30**	.32**	.37**
% Separable bone, rack	-.30	-.30	-.09	-.23**
% Separable lean, rack	-.30	-.17*	-.22**	-.28**
Wt. kidney knob	.28**	.22**	.29**	.37**

* P < 5% and years not significantly different.
** P < 1% and years not significantly different.

Table 61
Pooled Correlation Coefficients Between Tenderness and Lamb Quality Factors - 4 years' data

	Initial tenderness	No. of chews	Final tenderness score	W. B. shear value lb.
U.S.D.A. grade	.08	.10	.05	.03
Quantity of finish score	.00	-.01	.02	.02
Color reading flank steak	.07	-.04	.10	-.06
Color reading L. dorsi	.08	-.10	.06	-.12*
Feathering score	.06	-.04	.02	.02
Overflow fat score	.03	.02	.02	.08
Fat streaking flank steak score	.00	-.01	-.04	.11*
Fat streaking other flank muscles score	.03	-.04	.00	.04
Kidney and pelvic fat score	.07	-.06	.06	.04
Marbling score-12th rib rib eye	.28**	-.21**	.24**	-.14*
% fat, rib eye	.25**	-.23**	.22**	-.14*
Fat thickness over L. dorsi, in.	.04	-.04	.07	.07
Overflow fat, gms. in rack	.16**	-.19**	.12*	-.08
% separable fat, rack	.13*	-.10	.14*	.08
Weight, kidney knob, lb.	.15	-.14**	.17**	-.06
Days of age	.13	-.11	.11	-.05
Cooking time, min./lb.	-.20	.20**	-.18**	.11
% volatile cooking loss	-.24	.14*	-.16**	.07
% drip loss	-.06	.02	.02	.11
Shear value, ½ in cooked core, lb.	-.46	.47	-.46	---
Press fluid yield, ml/25 gm.	.18**	-.17**	.15**	-.10
Flavor intensity score	-.20**	.23**	-.23**	.05
Flavor desirability score	.37	-.38	.38	-.14*
Juiciness score	.35**	-.32**	.30**	-.12
Initial tenderness score		-.87	.91	.46
Number of chews			-.89	.47
Final tenderness score				.46

* P < 5% and years not significantly different.
** P < 1% and years not significantly different.