VALUE OF CONFORMATION IN NEW ZEALAND BEEF GRADING

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SUMMARY

Three systems for evaluating carcass conformation were tested on 230 crossbred steers. The N.Z. export grading 2-point system and a 7-point conformation classification system failed to separate carcasses with higher percentages of retail meat from those with lower percentages, unlike the Meat and Livestock Commission (M.L.C.) classification which was able to select carcasses with high percentages of lean meat. Objective measurements of area and depth of the hind limb were also significantly related to percentage meat. It is suggested that the M.L.C. area and depth conformation measurements may be useful in a beef classification system. The area measurements have the added advantage that they could be included in an automated grading system.

INTRODUCTION

Exported New Zealand beef is often purchased unseen on a weight and grade basis (Nicol, 1976). The N.Z. Meat Producers Board has devised a carcass grading system to allow purchasers to buy without inspecting the product and to provide a framework for rewarding farmers fairly by reflecting consumer requirements back to the producer (N.Z.M.P.B., 1975). These aims can be fulfilled only if a grading system provides a carcass description which is easily understood by all sections of the meat industry and which can be directly related to the situation in a variety of overseas markets.

Recently MacIntyre (1974) suggested the introduction of a separate conformation system into the New Zealand beef grading system. The N.Z. Meat Producers Board has in part implemented this in the revised New Zealand export grading system (N.Z.M.P.B., 1975).

The present study evaluates the ability of the New Zealand export conformation system, a 7-point conformation scale and the Meat and Livestock Commission (M.L.C.) conformation sys-

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tem to place carcasses of similar percentage composition into the same conformation class. Two objective measurements, the depth of the hind limb and area of the hind limb between anatomically defined points, were also related to the percentage composition of the carcasses.

MATERIALS AND METHODS

Steers by 10 sire breeds mated to Angus cows were included in this trial (Table 1). Details of management procedures and carcass composition measurements have been previously reported (Bass *et al.*, 1976).

TABLE 1: NUMBER AND BREED OF STEERS

Sire Breeds	*1975*	*1976*	*Total*
Simmental	32	24	56
Blond d'Aquitaine	14	8	22
Friesian	14	11	25
Charolais	7	4	11
Maine Anjou	9	8	17
Hereford	12	11	23
South Devon	8	4	12
Jersey	13	13	26
Limousin	9	8	17
Angus	11	10	21
Total	129	101	230

The steers slaughtered in 1975 were independently examined by three trained observers. They evaluated conformation of the hind limb on a seven point scale: Concave + (1), Concave (2), Concave − (3), Straight (4), Convex − (5), Convex (6) and Convex + (7). For the purposes of the N.Z. Export grades the premier grade 1 included the convex classes 5, 6 and 7 and grade 2 included the straight class 4 and the concave classes 1, 2 and 3.

In 1976 two trained observers using M.L.C. conformation scale (M.L.C., 1975) classified the hot right side of each carcass. Particular emphasis was placed on the dorsal view as this has been considered more useful for conformation assessment (G. Harrington, pers. comm.).

Detailed objective conformation measurements were also taken on the same carcasses. A steel pin was inserted along the posterior edge of the symphysis pubis in the hanging carcass (Fig. 1). The pin protruded exactly 12 cm from the surface of the symphysis pubis. A steel rule was placed from the free end of the pin to the tuber calcis and the measurements shown in Fig. 1

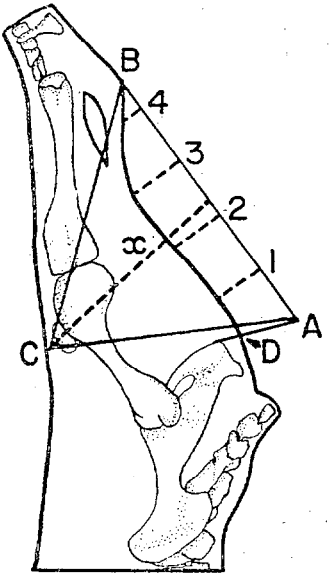

FIG. 1: *Hind limb conformation. Area* ABC, *depth* x.

were taken. These measurements allowed the area of triangle *ABC* and the area of carcass within the triangle to be determined. The depth (x) at the thickest point along the line from the mid-point of *AB* to *C* was also measured.

RESULTS

The percentage composition and carcass weights measured in the different classes of the N.Z. export and seven point conformation scale are shown in Tables 2 and 3. In both these conformation scales the convex carcasses were significantly heavier than those with concave conformation. The percentage composition of each of the classes shows that there were no differences between classes for percentage meat and excess fat, except the concave and lighter carcasses had higher percentages ($P < 0.01$) of bone than the convex and heavier carcasses. Covariance analysis showed no difference between sire breeds at the same carcass weight for percentage bone.

The percentage composition and weights of carcasses classified according to the M.L.C. system are reported in Table 4; in the present trial only carcasses in the M.L.C. classes 1, 2 and 3 were found. The convex class 3 had heavier carcass weights than the concave class 1. When the three M.L.C. conformation classes

were compared for differences in composition, results showed classes differed in percentage meat ($P < 0.01$) and excess fat ($P < 0.05$). The concave lighter carcasses had the lowest percentage of meat and the highest percentage of fat.

Although there were significant differences between M.L.C. conformation classes for percentage meat at the same carcass weight, these differences disappear when breed is allowed for

TABLE 2: COMPOSITION OF N.Z. EXPORT CONFORMATION CLASSES

	Conformation Class 1 (*Convex*)	2 (*Straight Concave*)	*RSD*	*Signif.*
No. carcass	25	104		
Hot carcass (kg)	256.7	235.2	27.5	***
% Composition left hindquarter:				
Meat	65.7	65.8	3.2	NS
Excess fat	16.4	15.3	3.57	NS
Bone	16.9	17.7	1.25	**

RSD = Residual standard deviation.
NS = Non-significant.

TABLE 3: COMPOSITION OF SEVEN CLASS CONFORMATION SYSTEM

	Conformation Class 1	2	3	4	5	6	7	*RSD*	*Signif.*
	Concave					*Convex*			
No. carcass	4	23	33	44	18	7			
Hot carcass (kg)	230	224	235	241	254	264	—	27.2	**
% Composition left hindquarter:									
Meat	66.4	64.1	66.1	66.5	65.3	66.6	—	3.12	+
Excess fat	14.7	16.8	14.9	14.8	16.7	15.8	—	3.54	NS
Bone	18.9	17.9	17.8	17.3	17.1	16.4	—	1.23	**

TABLE 4: COMPOSITION OF M.L.C. CONFORMATION CLASSES

	Conformation Class 1	2	3	*RSD*	*Signif.*
No. carcass	18	49	34		
Hot carcass (kg)	240	257	263	25.8	**
% Composition left hindquarter:					
Meat	60.2	62.4	64.2	3.8	**
Excess fat	20.3	17.7	17.2	4.1	*
Bone	19.6	19.8	19.0	1.9	NS

by covariance adjustment. This would suggest that breed is related to the M.L.C. conformation. The correlation between percentage meat and carcass weight is positive ($r = 0.42$) between breeds but negative ($r = -0.27$) within breeds.

The percentage of meat in the carcasses was significantly correlated with area of the carcass in triangle *ABC* ($r = 0.362^{***}$) and with depth of carcass *x* ($r = 0.278^{**}$). These measurements were also significantly related ($P < 0.001$) to the M.L.C. conformation classes.

The differences in percentage composition reported among the various conformation classes were not found within sire breeds. This may be related to the relatively low numbers of steers representing each sire breed.

DISCUSSION

In the three visually assessed systems those carcasses with concave hind limb conformation were lighter than those of other classes. This indicates that the trained observers found difficulty in separating conformation from overall size. This is unlikely to reflect solely the breed composition of the carcasses under test, as beef breeds such as the Angus and Limousin × Angus had a majority of straight or convex hind limbs but relatively light carcass weights.

In the 2-point N.Z. export and also the 7-point conformation systems there was a significant increase in percentage bone in the concave carcasses in comparison with the convex carcasses. This may reflect the fact that the percentage of bone decreases as carcass weight increases (Berg and Butterfield, 1976) because in the present study the concave classes had the lightest carcasses. Therefore, the carcass weight rather than the conformation may have resulted in differences in bone percentage.

The M.L.C. conformation system, on the other hand, selected heavy convex lean carcasses with a high percentage of meat, which ran contrary to the normal growth pattern of an animal, where percentage meat decreases with an increase in carcass weight (Berg and Butterfield, 1976). The apparent contradiction is obviously related to the breed composition of the carcasses in this trial, because the correlation of carcass weight and percentage meat pooled within sire breeds is negative as would be expected from the normal growth pattern of an individual whereas the between-breed correlation is positive. The reason for these results is related to the inclusion of the fast-growing, later "maturing" European breeds with the traditional early

"maturing" Angus and Hereford breeds in this trial. Although at present the traditional breeds form the major part of the New Zealand beef herd, there are increasing numbers of the recently-imported European breeds being used in New Zealand and as this trend is likely to continue we feel justified in criticizing the existing N.Z. conformation grading system from our data.

The results from this trial would indicate that between breeds the M.L.C. classification can select lean carcasses with a high percentage of meat although this selection may in part be related to the selection of heavier carcasses in the convex class. These results are in agreement with Harrington (1976) who stated that there may be between-breed relationships of importance which can be detected by visual appraisal of conformation. The present study also found no relation between conformation and composition within breeds, possibly because of low numbers of animals per breed.

As the area of the hind limb in triangle *ABC* was significantly related to percentage meat as well as the M.L.C. conformation, it would appear a relatively easy matter to produce an automated objective assessment of hind limb conformation by measuring the area of the shadow from the carcass. Such a measurement could automatically be adjusted for carcass weight or length of carcass.

The present results indicate that the M.L.C. conformation classification may be of use in assessing carcass composition in terms of percentage meat, whereas conformation in the N.Z. beef grading system has failed to separate carcasses with high meat yields from those with low yields.

MacIntyre (1974) reported the absence of evidence in New Zealand to support the belief that cuts from carcasses of good conformation are worth more than those with poor conformation. The present trial has shown that the two New Zealand conformation classes contain similar weights of saleable meat. It is therefore surprising to find that New Zealand exporters have paid up to 17.5% more for the same weight of the convex L1 carcasses in comparison with the L2 class carcasses, but at other times have paid higher prices for L2 carcasses.

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