THE RELEVANCE OF CARCASE COMPETITIONS TO BEEF YIELD

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SUMMARY

Conformation, finish and dressing percentage which accounted for 65% of the points allocated in a beef carcase competition were each negatively associated with yield over most of that commercial phase of the animal's life known as "finishing".

INTRODUCTION

Beef price schedules, based on objective measurement, now exist in Tasmania and Queensland and are likely to become more widespread. Under such systems, beef "yield" is a major determinant of a grower's margin of profit. How closely do the many and varied criteria of carcase competitions, so popular at Australian agricultural shows, relate to commercial yield of a carcase? The characteristics (with points allocation) evaluated in this study were taken from the schedule of a Queensland agricultural show specifying a steer showing no more than two permanent teeth, suitable for local trade:

<table>
<thead>
<tr>
<th>Points</th>
<th>Conformation</th>
<th>Finish</th>
<th>Quality</th>
<th>Dressing percentage</th>
<th>Maturity at age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
<td>15</td>
<td>20</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

MATERIALS AND METHODS

Twenty steers of each of three breeds, Angus, Hereford and Friesian were slaughtered, dressed and chilled. Conformation score, fat finish (fat thickness at the 12th rib) and dressing percentage, the three objective criteria on the show schedule, were recorded. The conformation score allocated to each carcase was from 1 ("superior" conformation) to 3 (least desirable conformation).

Carcase composition was determined by total side anatomical dissection. Dressing percentage, fat thickness at the 12th rib, total dissected fat percentage and total dissected muscle percentage were regressed on yield, the latter being defined as all the side muscle, no bone and 20% of dissected side fat (kidney and channel fats excluded). This definition was based on consumer preference in South-east Queensland which is for carcases with about 20% fat. Conformation score was plotted against yield.

RESULTS

(i) Fat thickness and yield (Fig. 1a) Yield decreased linearly in Hereford, Angus and the breed-ignored groups by 0.55%, 0.69% and 0.52% respectively for every mm increase in fat thickness at the 12th rib. Friesian yield decreased also but the relationship in this breed was best described by a quadratic regression over its limited fat thickness range (2-12mm), maximum of the curve occurring at 5.8mm. Linear analysis beyond the maximum indicated a decrease in yield of 1.1% for each mm increase in fat thickness.

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Fig. 1a. Relationship between fat thickness and yield
Fig. 1b. Relationship between total dissected fat percentage and yield
Fig. 1c. Relationship between total dissected muscle percentage and yield
Fig. 1d. Influence of dressing percentage on yield

Hereford, Angus, Friesian, Breed-ignored

Breed-ignored yield % equations from Fig. 1 were:

1a. Yield % = 82.47 - 0.523 FT
1b. Yield % = 68.93 + 1.20 TDF% - 0.032 (TDF%)^2
1c. Yield % = 34.70 + 0.726 TM%
1d. Yield % = 124.2 - 0.804 DP

Fig. 2. Relationship between carcase yield and conformation score (most desirable conformation = 1, least desirable conformation = 3) in three breeds of steers, Hereford (■), Angus (A) and Friesian (●). Mean carcase yields: Score 1 (72.7%), Score 2 (78.9%), Score 3 (80.0%)
(ii) Total dissected fat percentage and yield (Fig. 1b) Quadratic regression best described the relationship between total dissected fat percentage and yield in Hereford, Friesian and breed-ignored groups with the maxima occurring at similar fatness levels and resulting in similar yields (Table 1).

TABLE 1 Relationship between carcass fat and yield

<table>
<thead>
<tr>
<th>Breed</th>
<th>Total dissected fat at curve maxima (%)</th>
<th>Yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hereford</td>
<td>18.5</td>
<td>80.0</td>
</tr>
<tr>
<td>Friesian</td>
<td>19.7</td>
<td>80.3</td>
</tr>
<tr>
<td>Breed-ignored</td>
<td>18.8</td>
<td>80.2</td>
</tr>
</tbody>
</table>

Linear regression analysis beyond the maxima indicated that the decrease in yield for each 1% increase in total dissected fat was 0.71%, 0.74% and 0.67% in Hereford, Friesian and breed-ignored groups respectively. The Angus steer group was best described by linear regression analysis where each 1% increase in total dissected fat resulted in a decrease in yield of 0.66%.

(iii) Total muscle percentage and yield (Fig. 1c) Regression analysis showed that an increase of 1% in total muscle resulted in an increase in yield of 0.63%, 0.91%, 0.47% and 0.73% in Hereford, Angus, Friesian and breed-ignored groups respectively. Three groups, Hereford, Friesian and breed-ignored showed a significant quadratic regression also, with maxima occurring at 63.3%, 62.0% and 64.9% of total muscle respectively, indicating that maximum yields had been reached in all but the Angus group.

(iv) Dressing percentage and yield (Fig. 1d) For each unit increase in dressing percentage the yield in Hereford, Angus and breed-ignored groups decreased by 1.0%, 1.0% and 0.8% respectively. The Friesian group's relationship was curvilinear with the maximum occurring at a dressing percentage of 57.5, beyond which linear regression analysis showed that for every 1% increase in dressing percentage, yield decreased by 1.1%.

(v) Conformation and yield (Fig. 2) Carcase conformation was negatively associated with yield. Conformation score 1 had a significantly lower mean yield (72.7%) than conformation scores 2 (78.9%) and 3 (80.0%), which were not significantly different from each other.

Conformation score was related to other (mean) objective carcase measurements as shown in Table 2.

TABLE 2 Conformation score and carcase measurements

<table>
<thead>
<tr>
<th>Conformation score</th>
<th>Yield (%)</th>
<th>Total muscle (%)</th>
<th>Fat thickness (mm)</th>
<th>Total dissected fat (%)</th>
<th>Dressing percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>72.7</td>
<td>52.7</td>
<td>16.7</td>
<td>33.3</td>
<td>61.4</td>
</tr>
<tr>
<td>2</td>
<td>78.9</td>
<td>59.3</td>
<td>10.2</td>
<td>23.1</td>
<td>50.5</td>
</tr>
<tr>
<td>3</td>
<td>80.0</td>
<td>62.7</td>
<td>4.7</td>
<td>17.7</td>
<td>56.1</td>
</tr>
</tbody>
</table>

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DISCUSSION

As fat thickness, total dissected fat percentage and dressing percentage increased, commercial yield decreased, regardless of whether the respective relationships were described in linear or quadratic terms. With fat thickness and total dissected fat percentage (Figs. 1a, 1b), which both appear to reflect "finish", maximum yields were recorded at relatively low values (3-6 mm fat thickness and about 19.0% total dissected fat). There is no doubt that these maxima were partly determined by the study's initial (local) market specification. However since specification is a feature of modern meat marketing it is legitimate, and economically desirable to study the growth and development of cattle in relation to specific markets.

When carcases grow beyond the relatively early stage of "finish" required for the local market, commercial yield decreases rapidly (at about 0.5% for every 1 mm increase in fat thickness, and at about 0.7% for every 1% increase in total dissected fat), a feature that does not appear to be clearly understood in the allocation of points in many carcase competitions. For every unit increase in dressing percentage, yield decreased by about 0.8% to 1.1% in the various groups (Fig. 1d), a pattern that is seldom reflected in the commercial evaluation of carcases, since most competitions award progressively more points for higher dressing percentages.

Unit increase in total muscle percentage was associated with an increase in yield of about 0.7% (Fig. 1c). Though all groups were best described by linear regression the Hereford, Friesian and breed-ignored groups were significantly curvilinear with maxima occurring at the upper end of the range of total muscle (62.0% to 64.9%). Muscle growth however is unlikely to have any major influence on conformation (Butterfield 1963; Charles and Johnson 1976). On the other hand, when cattle are being "finished", fat is growing at a much greater rate than muscle (Guenther et al. 1965) and therefore, it is more likely to influence conformation, Furthermore the anatomical location of fat, especially subcutaneous fat (Callow 1961), is likely to enhance its influence on conformation.

Conformation score (Fig. 2) (usually subjectively assessed) had a strong negative association with yield, a result brought about primarily by overfatness, yet it was allocated 40% of the total points of the competition.

CONCLUSION

There is a great need to rationalise the basis upon which carcase competitions are conducted. Conformation, finish and dressing percentage, which account for most of the points allocated in the typical carcase competition, appear to be replicate measurements, each negatively associated with the important commercial parameter, yield. A simple fat thickness measurement would probably provide a more accurate assessment of commercial yield than all three measurements together.

REFERENCES


