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# The influence of breed on the meat content of beef carcasses for export

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## ABSTRACT

Ten sire breeds were used over Angus cows to generate crossbred and purebred Angus calves in 1973 and 1974, the steers of which ( $N = 229$ ) were slaughtered at about 20 months of age in the autumns of 1975 and 1976. There was a 35 kg (14.5%) range in hot carcass weight from the lightest (Angus x Angus) to the heaviest group (Blond d'Aquitaine x Angus cross). The average lean and fat content in the dissected left hind quarters were 65% and 15%, with a range of 2% from the L to G export grades for both lean and fat levels. In contrast to these narrow ranges, the averages of sire breeds were from 68.3% to 59.4% (range 8.9%) for lean content and from 13.0% to 21.3% (range 8.3%) for fat content. Sire breed rankings for lean content were: Blond d'Aquitaine (68.3%), Charolais, Limousin, Maine Anjou, Simmental, South Devon, Angus, Friesian, Hereford, Jersey (59.4%). An example is given of the potential impact of sire breed on saleable meat weight. Although the Blond d'Aquitaine-cross carcass was 16.4% heavier than the Angus carcass, it contained 22.5% more saleable meat and involved the trimming of fewer kg of fat (using presumably less labour). The additional saleable meat per kg of carcass (+5.2% or 68.3% v 64.9% lean) suggests that a premium of 9.8 ¢/kg could be paid to the farmer for Blond d'Aquitaine crosses over a schedule price of \$1.85/kg for Angus cattle. In the freezing works, where breed is often not known, conformation should be used to identify the leaner carcasses. An average premium of 3% for good conformation and a discount of 3% for poor conformation would more fairly reward producers.

**Keywords** Beef, saleable meat, fat trim, breeds, conformation, export grades.

## INTRODUCTION

Bass *et al.* (1976) demonstrated that carcasses of steers, sired by Continental beef breeds and reared at pasture, were heavier and leaner than the traditional Angus and Hereford x Angus when slaughtered at 20 months of age. Results from trials in the United Kingdom support these observations (Allen, 1984). The continental cross animals also had better conformation.

In cattle there is a strong association between breed, conformation and saleable meat yield. Kempster and Harrington (1980) suggested that, within the abattoir, carcass conformation should be used as an indicator of breed, given the relationship between these factors.

In the United Kingdom, a two-way classification system, involving fatness and conformation, is used to value carcasses. In New Zealand carcasses are valued according to a fatness grading (M, L1, L2, P1, G, T or E) and carcass weight within a fat grade. Conformation scoring is applied to the L and P grades, but with only 2 levels rather than the 5 found in both the United Kingdom and Australian systems.

This work, in re-examining the data presented by Bass *et al.* (1976) looks at the influence of breed, and thus indirectly conformation, on meat yield

within the beef export grades. Producers of Continental cross cattle, while not numerous, have claimed that such carcasses are undervalued by the freezing works. If such claims are well founded there is a strong case for applying a conformation score across all grades, in order to identify the higher yielding carcasses, as suggested by Kempster and Harrington (1980) and Colomer-Rocher *et al.* (1980). The ultimate aim within the meat industry should be for producers to be paid on the weight of saleable meat, rather than the weight of carcass.

## MATERIALS AND METHODS

### Experimental Cattle

The design of the experiment which generated the cattle was described by Baker and Carter (1982). Briefly, Angus cows at Tokanui Research Station were allocated at random in 1972 and 1973 to semen from bulls of 10 breeds; Blond d'Aquitaine, Charolais, Limousin, Maine Anjou, Simmental and South Devon (six new or imported breeds), and Angus, Friesian, Hereford and Jersey (4 local breeds). A total of 229 steer calves born in 1973 and 1974, were allocated to 1 of 2 post-weaning grazing groups, at Tokanui or Rukuhia Soil Research Stations. They were subsequently allocated at about

20 months of age to further groups, balanced for breed, age of dam and birth date, for slaughter in the autumns of 1975 and 1976 at the Ruakura Experimental Abattoir.

### Slaughter Procedures

The slaughter and dissection procedures were described by Bass *et al.* (1975; 1976). The New Zealand commercial cut system (Everitt and Jury, 1964) was applied to the left hind quarter (LHQ) of each carcass, in order to obtain the proportion of saleable meat (SM%) and excess fat (Fat%) in the LHQ. The fat depth at position D was also taken on each carcass.

Although the current New Zealand export grading system (M, L, P, G, T and E grades; Woods *et al.*, 1986) was not in use in 1975, the distributions of carcasses within the current grades have been approximated by using D fat depth as an indicator, thus grade M <1 mm, grade L 1-3 mm and grade P 4-12 mm.

### Statistical Analyses

Least squares analysis was used to fit a model which accounted for year of birth, age of dam, rearing location, age at slaughter, sire breed and export grade. The effect of adjusting for hot carcass weight (HCW) was also examined on the predicted values for SM% and Fat% in the LHQ.

## RESULTS

No Jersey cross carcasses were allocated to the L grade. The values for SM% for each sire breed x export grade are shown in Table 1. As expected from previous work (Woods *et al.*, 1986) SM% decreased from the leanest L grade to the fattest T grade.

**TABLE 1** Percent lean tissue in the left hind quarter of carcasses from each breed and fat grades L, P, G and T.

Sire breed	Export grade			
	L	P	G	T
Blond d'Aquitaine	69.3	68.3	67.8	67.2
Charolais	68.1	67.1	66.6	66.1
Limousin	67.7	66.7	66.2	65.6
Maine Anjou	66.7	65.7	65.2	64.7
Simmental	66.3	65.3	64.8	63.9
South Devon	65.9	64.9	64.4	63.9
Angus	65.9	64.9	64.4	63.9
Friesian	63.9	62.9	62.5	61.9
Hereford	62.9	62.4	61.9	61.4
Jersey	—	59.4	59.0	58.4

Actual values for SM% were higher than those from half-carcasses reported by Woods *et al.* (1986) because the lean content in the hindquarter is greater than that in the fore and thus the side. Nevertheless, the differences do indicate, within each export grade, the range in values to be found among breeds. The leanest carcasses came from the Blond d'Aquitaine cross while the Angus, used as the baseline, ranked ahead of the Hereford cross and also the Friesian and Jersey crosses. Over all breeds, SM% varied by 9% units, while the range across grades was, on average 2% units. Adjusting for HCW caused the differences to widen slightly because HCW within breed was negatively correlated with SM%. The ranking remained the same.

Values for Fat% (Table 2) mirrored the changes observed for SM% in going from the leanest L to fattest T grades. Because fat was the most variable component of carcass composition the range in excess trim due to sire breed was slightly greater than SM% at 3.7% units. However, the range among breeds within a grade (8.3% units) was twice this.

**TABLE 2** Percent excess (trimmed) fat in the left hind quarter of carcasses from each breed and fat grades L, P, G and T.

Sire breed	Export grade			
	L	P	G	T
Blond d'Aquitaine	11.5	13.0	14.3	15.1
Charolais	12.3	13.8	15.1	15.9
Limousin	12.5	14.0	15.3	16.1
Maine Anjou	13.2	14.7	16.0	16.8
Simmental	14.2	15.8	17.1	17.9
South Devon	13.3	14.9	16.1	17.0
Angus	13.7	15.3	16.5	17.4
Friesian	15.9	17.5	18.8	19.6
Hereford	16.8	18.4	19.7	20.5
Jersey	—	21.3	22.6	23.4

The ranking for carcass weight (Table 3) was not exactly the same as for SM%. The Blond d'Aquitaine cross was both heaviest and leanest. The Limousin cross ranked as sixth heaviest, but third leanest, supporting other data showing that the Limousin cross was leaner than expected from its mature size.

## DISCUSSION

In the study of Woods *et al.* (1986) the L fat grade showed a large difference in yield between L1 (good) and L2 (poor) conformation carcasses. In addition, the L2 animals were more often of dairy origin. These data indirectly support the findings of Allen

**TABLE 3** Hot carcass weight (kg) for each breed in export fat grades L and P, and sire breed mean at 610 d.

Sire breed	Export grade L	Export grade P	Sire breed mean
Blond d'Aquitaine	228	253	249
Charolais	222	247	243
Limousin	217	242	230
Maine Anjou	220	244	241
Simmental	227	252	248
South Devon	200	224	220
Angus	193	217	214
Friesian	215	240	237
Hereford	213	227	224
Jersey	—	221	218

(1984) that conformation has an influence on saleable meat yield and is associated with breed. The results of the present study show the significant influence of breed on SM% within any fatness grade. Bass *et al.* (1981) observed that a higher proportion of the Continental cross carcasses had scores at the better conformation level than the Hereford, Friesian or Jersey crosses. There is a clear link between SM% and breed, via conformation (Kempster and Harrington, 1980).

Given that SM% in the hind quarter can vary among breeds by over 8% units (or 3.4% compared with the Angus and 5% in relative terms) it is evident that the current grading system is not adequately rewarding the leaner carcasses. Nor is it discounting the overfat, lower yielding carcass within a grade.

If a producer is to be adequately rewarded for supplying the raw material preferred by the ultimate consumer, the freezing works should pay on the weight of saleable meat recovered from a carcass. Even at the same HCW, this can vary by 8.9% units amongst the breeds in this study.

One way of doing this, particularly where breed is unknown, is to apply a conformation score in addition to a fatness x weight grid. While the Blond d'Aquitaine cross was the extreme example in this study, the premium required (as c/kg HCW) to achieve the same price for its saleable meat was 5% above the base price for carcasses of the same HCW. If a schedule of 185¢/kg HCW was operating, using the Angus as the base line, a 220 kg carcass would be valued at \$407. Assuming a yield of 64.9% (Table 1), the saleable meat in this carcass is valued at 295¢/kg. If the saleable meat from the Blond d'Aquitaine carcass was valued at the same price per kg, the total value of that carcass, at 220 kg HCW and 68.3% yield, is calculated as follows:

$$\begin{aligned} \text{Weight of saleable meat} &= 220 \times 0.683 \\ &= 150.3 \text{ kg.} \\ \text{Value} &= 150.3 \times \$2.85 \\ &= \$428.36 \end{aligned}$$

Thus, the additional saleable meat is valued at an extra \$21.36. This is a premium of 5.2% or 68.3/64.9. This should be a minimum advantage, because, as Bass *et al.* (1976) showed, the Continental breeds were heavier at the same age (Table 3) and may therefore fall into a higher weight category. This could add another 10¢/kg HCW, giving the producer approximately \$103 more.

As noted here, and elsewhere (Allen, 1984), the Limousin cross was higher yielding than its size indicated. Others, such as the Simmental, Hereford, Friesian and Jersey crosses were lower yielding than expected. If conformation scoring was used to achieve a more equitable payment for saleable meat content, and a 3 point scale used, these data suggest that good conformation carcasses are worth a premium of 3%, and poor conformation carcasses a discount of 3% on the schedule price.

The results of this work clearly show that breed can have a large influence on SM% when carcasses are graded according to fatness. The work also suggests that to encourage the production of high yielding carcasses, a conformation score could be used to apply both premiums and discounts for carcasses of any fat grade and weight.

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