

IDENTIFYING SOURCES OF YIELD ADVANTAGE IN BEEF CARCASSES ENTERED IN A COMMERCIAL BONE-OUT COMPETITION

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SUMMARY

In 30 carcasses involving 7 breed types entered in a domestic bone-out competition, 6 carcass components - saleable beef yield, total cuts, hindquarter cuts, forequarter cuts, manufacturing meats and fat trim - were studied in an effort to identify sources of commercial superiority in yield. Piedmontese cross-bred car-cases, with significant advantages in proportions of saleable beef yield, total cuts and forequarter cuts, and a significantly lower fat trim were the greater yielding carcasses. There was evidence that this superiority was primarily because of heavy muscling. Limousin cross-bred and Charolais car-cases were generally similar to the Piedmontese cross-bred carcasses but each yielded a significantly lower proportion of saleable beef yield. Charolais cross-bred and Poll Hereford carcasses were the lowest yielding group, particularly in terms of saleable beef yield, total cuts and hindquarter cuts.

The carcasses of European breeds of cattle held a distinct yield advantage over those entered in this domestic bone-out competition.

Keywords: saleable beef yield, commercial differences, breeds

INTRODUCTION

Each year the Royal National Association (RNA) of Queensland and the Queensland Livestock and Meat Authority hold a bone-out competition for beef car-cases suitable for the domestic market. The entrants' pens of 3 cattle are slaughtered, dressed, chilled and boned out, using standard procedures (Anon. 1987). The saleable beef yield components (hindquarter cuts, forequarter cuts and manufacturing meats) are priced differentially, and the total car-case value is then related to chilled car-case weight to give a price per kilogram of chilled side weight which enables all entries to be placed in an order of merit for commercial yield. While this is a logical commercial approach to evaluation, it does not identify exactly where or why commercial superiority exists among carcasses.

The following study was conducted on car-cases entered in the 1995 RNA domestic bone-out competition to define, more clearly, where important commercial differences occurred.

MATERIALS AND METHODS

Ten pens of cattle, constituting 7 breed types (see Table 1), were entered in the competition. The value of each carcass was decided by a differential pricing system for components, which remained the same for all carcasses (Table 2).

Table 1. Details of cattle entered in the 1995 Royal National Association of Queensland bone-out competition for domestic market cattle

Breed or breed type	Number	Chilled carcass weight (mean) (kg)	P8 fat depth range (mm)	Saleable beef yield to bone ratio
Charolais	6	228.1	5-9	4.50 ^{ba}
Charolais cross-bred	6	228.9	6-11	4.31 ^b
Limousin x Droughtmaster	3	220.1	8-12	4.55
Limousin x Santa Gertrudis	3	225.7	8-12	4.07 ^b
Limousin cross-bred	3	241.6	7-18	4.58
Piedmontese cross-bred	3	217.7	4-7	5.02 ^a
Poll Hereford	6	224.7	5-10	4.11 ^b

^A Values within columns bearing different superscripts are significantly different ($P < 0.05$).

Because saleable beef yield is usually influenced by degree of fatness of the carcass (Murphey *et al.* 1960; Preston and Willis 1970; Kempster 1978), the percentages of various carcass components (saleable beef yield, total cuts, hindquarter (HQ) cuts, forequarter (FQ) cuts, manufacturing meats and fat trim) were regressed on rump P8 fat thickness (Moon 1980), treating all 30 carcasses as a group. The 10 "pen" groups of car-cases were placed in their 7 represented "breed type" groups and a test between means of car-case components was applied using Tukey's Studentized Range (HSD) Test (Table 3). Because of close similarities in data and results between groups of similar genotype, the 7 "breed type" groups were contracted into 4 "breed" groups featuring the predominant genotype. This resulted in "Charolais", "Limousin", "Piedmontese" and "Poll Hereford" groups in which the means of the carcass components were re-tested (Table 4).

Table 2. Prices paid for components of beef carcasses suitable for the domestic market

Carcass component	Price (c/kg)
Hindquarter cuts ^A	713
Forequarter cuts ^A	459
Manufacturing meats ^A	342
Fat	17
Bone	8

^A Differential prices applied within each of these components.

RESULTS

Regressions of the percentages of saleable beef yield, total cuts, HQ cuts, FQ cuts, manufacturing meats and fat trim on rump P8 fat thickness were non-significant.

Table 3 shows the results of the comparison of means for the above 6 carcass components in the 7 "breed type" groups.

Table 3. Tukey's HSD test for differences in means of carcass components in 7 "breed type" groups

Carcass component (%)	"Breed type" groups ^A						
	Char.	Char.x	Lim./Dr.	Lim./S.G.	Lim.x	Pied.x	Poll H.
Saleable beef yield	77.66 ^{bb}	76.61 ^b	78.32	77.31 ^b	78.48	80.55 ^a	77.29 ^b
Total cuts	52.80	51.67 ^b	53.51	52.15	52.23	54.00 ^a	51.78
HQ cuts	28.13	26.99 ^b	29.06 ^a	28.77	28.29	28.33	26.96 ^b
FQ cuts	24.67	24.68	24.45	23.38 ^b	23.94	25.67 ^a	24.82
Manufacturing meats	24.86	24.94	24.81	25.16	26.25	26.55	25.51
Fat trim	5.09	5.62 ^b	4.46	3.71	4.38	3.42 ^a	3.91

^A Char. Charolais; Char.x Charolais cross-bred; Lim./Dr. Limousin x Droughtmaster; Lim./S.G. Limousin x Santa Gertrudis; Lim.x Limousin cross-bred; Pied.x Piedmontese cross-bred; Poll H. Poll Hereford.

^B Values within rows bearing different superscripts are significantly different ($P < 0.05$).

Table 4 shows the results of the comparison of means of the carcass components in 4 "breed" groups. In the bone-out competition where placement was determined by differential pricing and tissue distribution differences, the Piedmontese cross-bred carcasses were placed first followed by Limousin x Droughtmaster, Charolais, Charolais, Limousin cross-bred, Limousin x Santa Gertrudis, Charolais cross-bred, Poll Hereford, Poll Hereford and Charolais cross-bred carcasses. The results of the yield study agreed closely with the competition placements, though not precisely.

Table 4. Tukey's HSD test for differences in means of carcass components in four "breed" groups

Carcass component (%)	"Breed" groups			
	Charolais	Limousin	Piedmontese	Poll Hereford
Saleable beef yield	77.14 ^{ba}	78.04 ^b	80.55 ^a	77.29 ^b
Total cuts	52.24	52.63	54.00 ^a	51.78 ^b
HQ cuts	27.56 ^a	28.71 ^a	28.33 ^b	26.96 ^b
FQ cuts	24.68	23.92 ^b	25.67 ^a	24.82
Manufacturing meats	24.90	25.41	26.55	25.51
Fat trim	5.35 ^a	4.18 ^b	3.42 ^b	3.91 ^b

^a Values within rows bearing different superscripts are significantly different at the following levels of significance: Saleable beef yield ($P < 0.001$); HQ cuts and fat trim ($P < 0.01$); FQ cuts and total cuts ($P < 0.05$).

DISCUSSION

The breed-ignored regressions of percentage saleable beef yield, total cuts, HQ cuts, FQ cuts, manufacturing meats and fat trim on rump P8 fat thickness were not significant, suggesting that fat thickness would not play a major role in yield differences among the lightweight, low-fat carcasses entered in this competition. Apart from the Limousin cross-bred carcasses, in which the P8 fat thickness range extended from 7 to 18 mm, all groups had similar, narrow, ranges of fat thickness which could be expected to reduce the influence of this measurement in deciding yield differences.

The percentage saleable beef yield of the Piedmontese cross-bred carcasses was significantly greater than that of the other "breed types", except for Limousin x Droughtmaster and Limousin cross-bred groups. This yield advantage was attributable mainly to an increased percentage of total cuts which, in turn, was due largely to an elevated percentage of FQ cuts. For the expensive cuts of the HQ, the proportion in the Limousin x Droughtmaster carcasses was significantly higher than in the Charolais cross-bred and Poll Hereford groups. The percentage of manufacturing meats did not vary significantly among breeds but Piedmontese cross-bred carcasses had significantly less fat trim than the Charolais cross-bred group. Studies of these groups, termed "breed types", suggested that Piedmontese cross-bred cattle had yield advantages over the Limousin types, which were generally superior in yield to the Charolais and Poll Hereford groups. The method of placing carcasses in the bone-out competition, based on differential pricing, was generally confirmed by the yield studies.

When analyses were conducted again on the basis of prevailing genotype, loosely termed "breeds" (Table 4), the Piedmontese carcasses had a higher saleable beef yield than the other 3 "breeds" ($P < 0.001$), attributable mainly to a greater percentage of total cuts. Limousin carcasses had a significantly greater percentage of HQ cuts than the other "breeds". There were no significant differences in the proportion of manufacturing meats but Charolais carcasses had more fat trim than the other groups.

In the characters of commercial importance which were examined in this study, the carcass groups separated basically into 3 groups. The Piedmontese cross-bred carcasses showed a yield advantage over the Limousin types which, in turn, were generally superior to the Charolais and Poll Hereford groups. The Piedmontese cross-bred carcasses entered in this competition were the progeny of Piedmontese bulls so there was no information available on the yield performance on the maternal side of the cross.

Muscle-bone ratio, which is a carcass measurement of particular importance in yield studies (Hankins *et al.* 1943; Berg and Butterfield 1966, 1976) could not be determined in these carcasses. However, saleable beef yield-bone ratio, which could be measured, should be a useful substitute in these low fat, lightweight carcasses. The Piedmontese cross-bred carcasses, with the lowest levels of fat and a saleable beef yield-bone ratio significantly greater than that of the other groups except Limousin types, appeared to owe their yield advantage to greater muscling.

Carcasses with a high content of European beef breeding show ideal characteristics to satisfy current domestic consumer requirements. Because buyers want highly muscled carcasses with a relatively low fat content, European breeds, with fast muscle growth tendencies and a low fat finish at domestic carcass weights, are ideal types. They are likely to be efficient beef producers and frequent winners in domestic carcass competitions which emphasise yield.

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