RELATIVE ECONOMIC VALUES OF BEEF CATTLE TRAITS FOR USE IN SELECTION PROGRAMMES

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Summary

The effect on sale value of a range of characteristics of beef cattle has been examined in herds of pulled and horned Herefords on a property on the southern tablelands of New South Wales. Estimated slaughter values for 249 heifer, steer and bull weaners and 219 yearling heifers were available. Actual sale prices were obtained for 213 yearling bulls sold for breeding.

The relationships between these values and a range of measured characters and visual scores were estimated by multiple regression analyses.

Body weight was the main character affecting value of weaners (11 cents per kg) and yearling heifers (9 cents per kg) within years. Conformation and condition were important for weaners, since there was discrimination against poor type animals. Neither of these characters affected the value of yearling heifers.

In contrast, conformation (scored from 1 to 9) was extremely important in yearling bulls, with an average increment of $264 between scores. Weight gains also had a significant though less important effect on price.

From differences in the relative importance of conformation and body weight of slaughter and breeding cattle, it is concluded that many commercial producers do not base their breeding policies on a realistic assessment of economically important characters.

I. INTRODUCTION

Knowledge of the economic value of measurable production traits and of subjectively assessed characteristics of beef cattle is necessary for determining breeding goals. Estimates of genetic and phenotypic parameters of various beef cattle traits are becoming available in Australia. They are available also in other countries for breeds common in Australia. However, before these parameters can be used to construct efficient breeding plans, estimates of relative economic weightings are required.

This paper examines the variation in price for both slaughter and stud cattle that is associated with a number of characters. The effects of change in each character and its relative contribution to total variation in price are given to allow the derivation of economic weightings that could be used in the construction of selection indices.

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II. MATERIALS AND METHODS

(a) Animals

The data for this analysis were obtained as part of a performance recording scheme that had been in operation since 1956 in a Hereford herd on the southern tablelands of New South Wales. Individual prices, measurements and scores were recorded on 249 weaner bulls, steers and heifers, 2 19 yearling heifers and 213 yearling bulls born from 1960 to 1968.

Calving extended from July to September each year and calves were weaned at approximately 6 months of age. Selected male calves were not castrated and were sold as breeders at 14 months. Steers were sold at weaning. Heifers, if not required as herd replacements, were sold at approximately 18 months.

All animals were grazed on improved pastures, with supplements in periods of feed shortage.

(b) Records

At weaning and at yearling age, all animals were weighed and scored for conformation, body condition, coat type and coat colour, with the exception that body condition was not recorded for yearling bulls. Additional scores of the extent of eyelid pigmentation and the value of their sires were recorded for the yearling bulls.

Conformation was visually assessed and followed the system presented by Guilbert and Hart (195 1) and applied in this herd as described by Williams and Murphy (1958). For the present analysis, each of the three grades (A, B and C) were divided into three subgrades and the total range coded into scores from 1 to 9 where 9 represented the ideal.

Condition was visually assessed as follows: 0 emaciated, 1 poor, 3 backward store, 5 forward store, 7 fat (prime), 9 over-fat.

Coat type was subjectively scored through a range of 0 to 9. This range corresponded to the scores 3 to 7 in the system of Turner and Schleger (1960).

Coat colour was subjectively scored through a range of 0 to 9 where 0 represented light red, and 9 dark red.

Of the bulls used in this study, 43 were polled Herefords, the remainder were homed Herefords.

(c) Price Data

At weaning and at yearling age, each animal was valued by both a livestock agent and a stockman who were asked to estimate the value of the animal as though it were being sold through the local sale yards for slaughter. The values used in these analyses were the average of the two estimates. Prices for bulls were set by the owner at the end of a post-weaning test, and were actually received at sale.

(d) Statistical Analysis

Non-orthogonal analysis of variance was used to determine the significance of the increased variation due to omitting each of the factors while retaining all others in a multiple regression model. Factors (or variables in the case of weight and measures of weight gain) were omitted from the final regression equation if the increased variation could have occurred by chance more often than 10 per cent of the time.

III. RESULTS AND DISCUSSION

The average estimated sale values for weaners and yearling heifers were \$45.89 and \$65.96 respectively. The average price received for bulls was \$722.46. Least square estimates of the effects of the various characters on sale value and price are shown in Table 1. Only those effects which were significant ($P<0.05$) are listed. Summaries of the analyses of variance are given in Table 2.

Year of birth, sex, body weight, herd conformation, condition and coat colour all had a significant effect on the value of weaners. Of these, year and weight accounted for the largest proportion of variation. The constants for conformation and condition indicated that weaners with low scores were discriminated

TABLE 1

The effects of various characters on cattle sale values (\$) *together with standard errors* (*SE*)

Factor	Weaners		Yearling Heifers		Yearling Bulls	
	Effect (\$)	SE	Effect (\$)	S.E.	Effect (\$)	SE
Constant	20.32	1.22	52.8	7.43	—723	1122.5
Year of birth						
1960		—		—	—379	36.0
1961		—	1.5	0.24	— 4	72.5
1962	3.11	0.32	3.9	0.32	489	264.9
1963	2.90	0.29	—5.4	0.36	123	87.4
1964	—6.01	0.39		—	196	33.3
1966		—		—	—552	83.5
1967		—		—	— 47	82.6
1968		—		—	176	85.6
Sex						
Heifer	0.28	0.42		NA		NA
Steer	0.47	0.45		NA		NA
Bull	—0.76	0.28		NA		NA
Body weight (per kg)	0.112	0.0059	0.085	0.0067	—31.31	8.296
Daily gain-weaning to yearling (kg/day)		—		—	615	114.2
Wt./day-of-age (kg/day)		—		—	1490	277.0
Age (per day)		ns	—0.017	0.0067	4.17	1.12
Herd				ns		ns
Horned	0.74	0.29		ns		ns
Poll	—0.74	0.28				
Conformation score						
1	—3.66	1.13		—		—
2	—1.31	0.57		ns		—
3	0.58	0.38		ns	—558	95.6
4	0.61	0.40		ns	—470	67.3
5	1.16	0.45		ns	—377	57.8
6	0.95	0.56		ns	—216	60.0
7	1.64	1.09		ns	135	72.4
8		—		ns	452	105.3
9		—		—	1026	252.3

TABLE 1 (Cont.)

Factor	Wearners		Yearling Heifers	Yearling Bulls
Conditions score	Effect ($)	SE		
2	—8.60	1.32		—
3	—1.89	1.09	—	—
4	2.12	0.52	ns	—
5	2.26	0.59	ns	—
6	2.26	0.60	ns	—
7	2.70	0.86	ns	—
9	1.13	2.03	ns	—
Coat colour score				
3	—0.35	0.86	ns	—
4	—1.91	0.65	ns	ns
5	0.51	0.43	ns	ns
6	1.01	0.52	ns	ns
7	1.26	0.50	ns	ns
8	0.55	0.80	ns	ns
9	—1.08	2.01	—	ns
Coefficient of determination (%)	92.2		62.5	63.7
Mean ($)	45.89		65.96	722.5
No. of animals	249		219	213

— =not recorded.
NA = not applicable
ns = factor not significant ($P>0.05$).

against to a maximum of $4.72 and $11.30 per head respectively. However, no greater value was set on high scores than on intermediate scores. As there were few animals with low scores, these characters accounted for only a small proportion of the variation in value. There was a tendency for discrimination against the extremes in coat colour (both very light and very dark red) but this character was relatively unimportant. Coat type did not significantly affect value.

The only factors significantly affecting the value of yearling heifers were years, weight and age. In this case, the average value of an increase in bodyweight (9 cents per kg) was similar to that for weaners (11 cents per kg). In contrast to weaners, conformation and condition scores did not influence estimated value of yearling heifers. However, there were no animals with low scores in this group.

The most important character affecting the price of breeding bulls was conformation, with an average increase of $264 between scores, over the range 3 to 9. The spread in price increased between the higher grades indicating that buyers were prepared to pay proportionately more for the small number of extremely desirable animals. This feature has been observed in other studies of this type in the United States (eg Marlowe 1969).

Components of weight had a significant effect on the price of yearling bulls. The two measures of weight gain (weaning to yearling and weight-per-day-of-age) each had large positive regression co-efficients, but the analysis of variance showed

TABLE 2

Summary of analysis of variance of cattle sale values

Source of Variance	Weaners		Yearling Heifers		Yearling Bulls	
	d.f.	M.S.	d.f.	M.S.	d.f.	M.S.
Year of birth	2	512.37	2	475.94	7	82.15
Sex	2	19.36		NA		NA
Body weight	1	1046.64	1	627 31	1	83.82
Daily gain-weaning to yearling		—		—	1	246.97
Wt./day-of-age		—		—	1	246.97
Age		ns	1	44.30	1	119.55
Herd	1	37.62		ns		ns
Conformation	6	14.73		ns	6	150.94
Condition	6	51.01		ns		—
Coat colour	6	14.27		ns		ns
Coat type		ns		ns		—
Eyelid pigmentation		—		—		ns
Age of dam		—		—		ns
Value of sire		—		—		ns
Residual (including non-significant characters)	224	4.69	241	6.68	195	7.85
Standard deviation ($)		2.17		2.58		28.0
Coefficient of determination (%)		92.2		62.5		63.7

— = not recorded.
NA = not applicable.
ns = affect not significant ($P>0.05$), included with residual.

that conformation was more important. Though negative and significant, the effect of body weight was unimportant when the weight gain indices were included in the same multiple regression equation. It was the practice of this breeder to consider both conformation and weight gain in setting sale price.

Age accounted for a small proportion of the variation in price, purchasers of bulls for breeding paying more for older animals. This contrasts with the preference for younger animals in both classes of slaughter cattle.

None of the other factors examined: age of dam, value of sire, herd, coat colour or eyelid pigmentation had a significant effect on the price paid for yearling bulls.

IV. CONCLUSIONS

In the commercial segment of the industry, body weight was the main character affecting sale value of slaughter cattle. Conformation and condition would be important only if there were large numbers of poor type animals.

In contrast, conformation was of overwhelming importance to buyers of breeding bulls. Other known important characters, such as eyelid pigmentation

(French 1959), were not related to price. These facts indicate that many commercial producers do not base their breeding policies on a realistic assessment of economically important characters.

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