# PER HECTARE PRODUCTION FROM TWO CROSSBREEDING SYSTEMS COMPARED WITH A STRAIGHTBRED SYSTEM

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## INTRODUCTION

There are over 70 cattle breeds registered in Australia with the breeds of British origin forming the basis of the cattle herd. In the early 70's considerable interest was generated with importations of semen from Europe. At the same time results from the U.S., New Zealand, and Australian work, indicated the high productivity of females derived from crossing dairy and beef breeds. Although differences in fertility, growth and carcass characteristics of cattle breeds and crosses have been documented around the world. However, very few experiments have established the relative productivity on a per hectare basis. Many beef producers are not convinced of the role of crossbreeding because they cannot relate the research findings to economic returns on a per hectare basis.

## AIMS

The experiment reported here was designed to evaluate beef production from two terminal sire systems; one using a small hybrid dam (Jersey Hereford); and the other, a larger hybrid dam (Simmental Hereford) in comparison to that from a British breed straightbred (Hereford) system.

## MATERIALS, METHODS AND RESULTS

Production from heifers, 2 year old cows, adults (3-9 years of age) were assessed as separate phases of the experiment.

Heifers (mated at approx. 15 months of age.)

Commenced in 1978 with assembly of 8 month old Hereford x Hereford, Jersey x Hereford and Simmental x Hereford heifers at Struan Research Centre. Chinball harnesses fitted to teaser bulls were used to detect oestrus. All heifers were exposed to Hereford bulls in June 1979 for a 9 week mating period during which nutrition was poor. Calves were all run together with their dams until slaughtered at 10 months of age. The heifers did not grow sufficiently during the period from December 1978 to mating in June 1979 which resulted in low numbers of calves born in 1980. There was also considerable variation in the age at 1st oestrus (Table 1). Simmental-Hereford heifers did not commence oestrus cycles until they were significantly heavier and older than Herefords and Jersey Hereford heifers. A total of three Jersey-Hereford, four Simmental-Hereford and six Hereford calves were assisted at birth or died prior to eight months of age. Simmental-Hereford and Jersey-Hereford dams reared calves which were more than 19% heavier than Hereford calves when mated to Hereford bulls.

Two year old cows - Cows mated at approx. 24 months of age

Commenced in 1980 when the crossbred dams were mated to Charolais sires and Herefords to Herefords. Calves were all run together with their dams until weaning when half were slaughtered and half were grazed together at pasture until 18 months of age. Slaughter groups were divided using weaning weight and meritronic fat thickness measures to give groups with the same mean liveweight and subcutaneous fat thickness. Both pre mating weights and weight gain over the mating period were sufficient to result in high calving percentages for each breed group. Straightbred Hereford calves were significantly lighter at birth and weaning than the crossbred calves (Table 2). Crossbred progeny were significantly heavier and had heavier carcasses than Herefords. Calves from Simmental cross cows had significantly less fat than Herefords. Those from Jersey-Herefords were fatter than Herefords as weaners but leaner than Herefords at 22 months of age (Table 3).

Mature cows (3 - 9 years of age and grazed at 2 stocking rates)

Commenced in 1982 when an area of Struan Research Centre was divided into 12 paddocks and 10 cows were allocated to each paddock at stocking rates of 1.0 or1.2 cows per hectare. There are two replicates of each treatment. Cows were mated for a nine week mating period commencing in the first week of June each year. Artificial insemination following synchronised oestrus was used during the first week after which bulls were allocated to each group of cows in an attempt to ensure that several bulls were responsible for calves sired in any paddock. New bulls were purchased each year such that more than 30 sires per breed were used overall. Calves from the 1981 matings were slaughtered in two age groups, half at weaning (8 months) and half at 16 - 20 months of age. All subsequent calf crops were slaughtered at weaning. Results for the first 7 years of this phase are presented in Tables 4 & 5.

DISCUSSION

Throughout the trial the crossbred cows produced calves with greater weaning weights, dressing %, carcass weight, length and carcass weight per mm length irrespective of stocking rate. Such carcasses are in high demand for the domestic beef market although at the higher stocking rate particularly, the Simmental cross cows produced carcasses which were leaner than is required for the majority of this trade. The Hereford cows produced calves of lighter weights which would normally be weaned and grown out to more suitable weights as was done with the first two calf crops in this study.

Differences in fertility and deaths noted have affected production per hectare. At the lower stocking rates the Herefords and Jersey Herefords became very fat and there was a carry over of dry feed in the first years of the trial which may have lowered production. Deaths of cows were mainly due to grass tetany which affected the very fat cows in some seasons and those under stress of calving and poor pasture conditions at other times. The fact that the cows were confined to the same area for 7 years affected the outcome and was a major reason all cows received hay supplements during the critical feed period.

The Charolais Simmental Hereford system resulted in the greatest carcass wt/ha/year (168) followed by Charolais Jersey Hereford (160) and the Hereford (141). Gross margins per adult cow favoured the Charolais Simmental Hereford system at 1 cow per hectare but gross margin per hectare favoured the Charolais Jersey Hereford system at 1.2 cows/hectare. However, when the two stocking rates were averaged the gross margin per hectare favoured the Charolais Simmental Hereford. As heifers were all run together at the start of the trial, information on heifers has not been included in the gross margin calculations.

TABLE 1 Liveweights and age at first observed oestrus and calf production from Hereford, Jersey-Hereford and Simmental-Hereford heifers

| | Hereford | Jersey-Hereford | Simmental-Hereford |
|---|---|---|---|
| No. of heifers | 52 | 54 | 52 |
| Initial wt. 6.12.78 (kg) ± S.D. | 212 19a* | 207 30a | 218 29a |
| Premating wt. 13.6.79 (kg) ± S.D. | 219 20a | 216 26a | 234 29b |
| Postmating wt. 19.9.79 (kg) ± S.D. | 263 25a | 264 28a | 300 47b |
| Age at 1st oestrus (days) ± S.D. | 347 100a | 312 64a | 478 128b |
| Wt. at 1st oestrus (kg) ± S.D. | 242 32a | 229 30a | 305 61b |
| Calves born | 12 | 36 | 5 |
| Birth wt. (kg) ± S.D. | 27.9 1.7a | 27.5 3.5a | 28.0 3.3a |
| 244 day wt. (kg) ± S.D. | 229 32b | 272 23a | 285 38a |
| 284 day wt. (kg) ± S.D. | 255 32b | 297 25a | 313 45a |
| Carcass wt. (kg) ± S.D. | 111 16b | 139 14a | 149 25a |
| Fat thickness (mm) ± S.D. | 3.5 2.0 | 6.6 2.2 | 4.4 2.7 |

* Within rows, values followed by different letters differ significantly ($p<0.05$)

TABLE 2 Pre and post mating weight and subsequent calving performance of two year old cows

| | Hereford | Jersey-Hereford | Simmental-Hereford |
|---|---|---|---|
| No. of dams | 51 | 53 | 48 |
| Premating wt. 21.5.80 (kg) | 316 23a | 327 29a | 367 37b |
| Postmating wt. 27.8.80 (kg) | 365 32a | 355 32a | 414 39b |
| Calving percentage | 96 | 83 | 86 |
| Calves born | 50 | 45 | 39 |
| Birth wt. (kg) ± S.D. | 34.4 3.5c | 38.2 5.9b | 41.4 4.9a |
| 222 day wt. (kg) ± S.D. | 201 19b | 264 27a | 271 27a |

TABLE 3 Slaughter data for 10 and 22 month old progeny from two year old cows

| | Hereford x Hereford | | Charolais x Jersey-Hereford | | Charolais x Simmental-Hereford | |
|---|---|---|---|---|---|---|
| (a) 10 month slaughter | | | | | | |
| **STEERS** | | | | | | |
| No. | 14 | | 13 | | 12 | |
| Carcass wt. ± S.D. | 114b | 14a | 167b | 13 | 172b | 18 |
| Fat thickness ± S.D. | 2.1a | 0.8 | 3.0a | 1.4 | 1.7b | 1.1 |
| **HEIFERS** | | | | | | |
| No. | 11 | | 9 | | 7 | |
| Carcass wt. ± S.D. | 113b | 15 | 154a | 16 | 153a | 19 |
| Fat thickness ± S.D. | 4.0 | 1.4 | 4.4 | 2.1 | 3.1 | 2.3 |
| (b) 22 month slaughter | | | | | | |
| **STEERS** | | | | | | |
| No. | 13 | | 13 | | 12 | |
| Liveweight | 432b | 27 | 505a | 46 | 521a | 34 |
| Carcass wt. | 215b | 14 | 260a | 23 | 270a | 22 |
| Fat thickness | 7.0b | 2.4 | 4.0a | 1.5 | 3.8a | 1.8 |
| Dress % | 50b | 1.2 | 52a | 1.8 | 52a | 1.4 |
| **HEIFERS** | | | | | | |
| No. | 10 | | 8 | | 7 | |
| Liveweight | 410b | 20 | 468a | 40 | 471a | 45 |
| Carcass wt. | 201b | 14 | 232a | 21 | 241a | 27 |
| Fat thickness | 8.7b | 1.9 | 5.4a | 1.5 | 6.1b | 3.1 |
| Dress % | 49a | 1.5 | 50a | 1.5 | 51b | 1.6 |

*Standard deviation from mean

TABLE 4 Performance of mature cows (3 and 9 years 1982-88 at two stocking rates at Struan Research Centre).

| Cow Breeding | Hereford x Hereford | | Jersey x Hereford | | Simmental x Hereford | |
|---|---|---|---|---|---|---|
| Stocking rate | 1.0 | 1.2 | 1.0 | 1.2 | 1.0 | 1.2 |
| Weaning % | 81 | 86 | 77 | 86 | 84 | 82 |
| Mean liveweight of cows when calves weaned (kg) | 643 | 611 | 561 | 524 | 646 | 585 |
| Death rate of cows* | 3.6 | 2.1 | 3.6 | 5.7 | 2.9 | 2.1 |
| Cull % of cows* | 4.3 | 5.0 | 1.4 | 0 | 4.3 | 3.6 |
| Carcass weight of cull cows (kg) | 283 | 256 | 272 | 250 ** | 283 | 256 |

* Based on 20 original cows per stocking rate treatment over 7 years. Main cause of death was attributed to grass tetany and involved either very fat or very poor cows soon after calving.

** Based on liveweight of cows in the plots.

TABLE 5 Performance of calves from cows aged between 3 and 9 years (1982-88) at two stocking rates at Struan Research Centre

| Breeding System | Hereford x Hereford | | Charolais Jersey Hereford | | Charolais Simmental Hereford | |
|---|---|---|---|---|---|---|
| Stocking rate cows/ha | 1.0 | 1.2 | 1.0 | 1.2 | 1.0 | 1.2 |
| No. of calves | 114 | 121 | 108 | 120 | 118 | 115 |
| Weaning wt. of calves (kg) (approx. 220 days) | 291 | 271 | 319 | 315 | 338 | 318 |
| Carcass weight (kg) | 157 | 148 | 181 | 180 | 195 | 180 |
| Dressing % | 53.2 | 53.1 | 55.2 | 55.5 | 55.9 | 54.4 |
| Fat thickness mm | 7.1 | 6.1 | 5.3 | 5.3 | 4.8 | 3.6 |
| Carcass length mm | 919 | 909 | 970 | 968 | 976 | 963 |
| Carcass wt/mm | 0.17 | 0.16 | 0.19 | 0.19 | 0.20 | 0.19 |
| Carcass wt/hectare/yr (kg) | 126 | 155 | 136 | 183 | 161 | 174 |
| Hay fed Tonne/cow/year | 0.43 | 0.46 | 0.45 | 0.53 | 0.48 | 0.57 |
| Gross Margin/cow | 270 | 269 | 291 | 305 | 352 | 304 |
| Gross Margin/hectare | 270 | 323 | 291 | 367 | 352 | 365 |