UNEXPECTED CONSEQUENCES OF SELECTION FOR PRODUCTION IN A COMMERCIAL BEEF CATTLE HERD

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Summary

Published results on fertility and mature size from the National Cattle Breeding Station, "Belmont" and a commercial beef cattle property, "Mt. Eugene" are discussed.

In respect to differences in fertility between genotypes anomalies between results from research station data and those found on a commercial property were only apparent. The differences could be accounted for by the masking effects of management and phenotypic gains made by selection.

A decline in mature body size of breeding cows noticed in a commercial herd which was contrary to scientific expectations was verified by analyses of data collected at the research station.

The implications of anomalies between research results and results obtained under industry conditions are discussed.

I. INTRODUCTION

Research aimed at improving the efficiency and increasing the productivity of the primary industries has not always found ready acceptance by either producers or by extension officers. This has- been particularly evident in the highly tradition bound industry, beef cattle breeding, where selection is mainly on breed standards of excellence, which at best are poorly correlated to efficient beef production.

The reasons for the low acceptance of scientific results may in part be due to a lack of confidence of the primary producers brought about by anomalies between scientific results and results obtained by the industry.

This paper examines apparent deviations from scientific expectations for reproduction and mature size found under industry conditions and discusses the reasons for, and the implications of these.

II. ANIMALS AND ENVIRONMENTS

The data were collected on the commercial cattle property "Mt. Eugene" and the National Cattle Breeding Station, "Belmont". The breeding programmes, management and environments of the properties were described by Seifert, Rudder and Layworth (1974) and Kennedy and Turner (1959) respectively. Both properties are situated in Central Queensland and have similar climatic environments.

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A three breed rotational crossbreeding system is used at Mt. Eugene. Brahman and Hereford form the two major sire breeds while a third tropical genotype is being sought. Santa Gertrudis were first used as a third sire breed but did not meet the requirements for fertility and were replaced by Droughtmasters and Belmont Reds. Multiple sires are used over a five month mating period extending from October to February. Stringent culling for reproductive failure is practised.

At Belmont, F1 Brahman x British (Hereford and Shorthorn) and Africander x British were produced using pure bred Brahman and Africander bulls. The F1’s were mated inter se to produce F2 and subsequent generations were similarly produced. No selection was applied in the F1 and F2 generations. Sires were mated singly to 30 to 35 cows over a seven week period from January to February.

The Droughtmaster and Santa Gertrudis breeds were derived from inter se matings of 3/8 to 5/8 Brahman x Shorthorn crosses. They are therefore genetically on average similar to the Belmont Brahman x British crossbred populations.

III. RESULTS AND DISCUSSION

Case 1:

At Belmont, Seifert and Kennedy (1972) and Seebeck (1973) found a significant decline in fertility from the F1 generation (81%) to the F2 generation (61%) in Brahman x British cattle, while the fertility of Africander x British (Belmont Red) cattle remained consistently high (76% and 77% respectively). Working with Brahman x British cattle at Mt. Eugene Rudder, Seifert and Maynard (unpublished) recorded calving rates of 79%, which is higher than Belmont F2 Brahman crossbreds (61%). Management practices at Mt. Eugene which differed from Belmont were the use of multiple sire mating groups, mating yearling heifers, and a longer mating season. Stringent analyses of the Mt. Eugene data revealed that F1 generation Brahman x British cattle had calving rates of 67%, while genotypes similar to the Belmont F2 Brahman x British cattle had calving rates of 78%. These reproductive levels are markedly higher than those for the Belmont F2 Brahman x British at 61%. In addition to differences due to management practices the apparent dichotomy between the results is partly explained by significant genotype x age of cow interaction. In the Mt. Eugene herd genotype differences were large, and consistent with the Belmont results in the first and second matings, but were virtually absent in the mature cows. This showed that the phenotypic fertility of the subfertile genotypes was repeatable and was improved by selection. This selection was deliberately not done at Belmont.

Assuming that Droughtmaster and Santa Gertrudis on average genetic constitution are representative of Brahman x British cattle, the subsequent comparisons of the fertility of one-year-old maidens and two-year-old lactating cows at Mt. Eugene confirmed the genotypic differences found at Belmont. The pregnancy rates for the daughters of the sire breeds were as follows: Belmont Red 86%; Brahman 63%; Droughtmaster 75%; and Santa Gertrudis 71% (Rudder et al., 1976). The Belmont Red, being genetically less related to the Brahman than the Santa Gertrudis and Droughtmaster, may have exhibited a degree of heterosis.
In the absence of comparative data subjected to stringent analyses it is understandable that producers and extension officers question research results. Casual perusal of these data suggests a marked difference between results obtained in the commercial situation and in the research situation. Although the magnitude of the differences were much larger at Belmont, the differences at Mt. Eugene were consistent with those found at Belmont.

**Case 2:**

Selection on growth performance is being advocated as a means for increasing productivity. However, the high genetic correlation between growth and mature size (Mason 1951) and the consequent undesirable effects of large mature size, in particular the maintenance requirements of the breeding herd, has concerned some research workers (Cartwright 1970). Carpenter, Brown and Fitzhugh (1971) also found that cows with heavier weights at maturity tended to be slightly older at first calf, wean heavier progeny, have longer calving intervals and produce fewer calves relative to their years in production. This suggests that selection for high growth rate which is genetically highly correlated with large mature size could actually lower productivity.

Casual observations at Mt. Eugene indicated that the cow size of the herd had declined, although above average performance recorded bulls had been used. Because of the stringent culling practice all cows had reared a calf. It therefore appeared that mature cow size was reduced as a result of each cow rearing a calf each year. This hypotheses was investigated by Seifert and Rudder (1975) analysing data from Belmont.

Weights of five-year-old Brahman crossbred cows that all had three chances to calve were analysed. Level of calving had a highly significant effect on mature weight of the cows. Cows having had 0, 1, and 2 calves were 138 kg, 88 kg and 31 kg heavier than cows that had 3 calves. The overall mean weight of the herd was 173 kg and these differences represented body weight advantages of 39%, 19% and 7% to the irregularly calving cows. It was also found that there was virtually no relationship between fertility and body weight at weaning or two-year-old, and that if any, heavier females enjoyed some fertility advantage. Furthermore at three-year-old Brahman cross cows that had just calved were 19.6 kg ($P < 0.05$) heavier than those that had failed to calve. The analyses appear to confirm the casual observations made at Mt. Eugene and the results of Carpenter, Brown and Fitzhugh (1971), but indicate that cow size was a **phenotypic** consequence of frequency of calving rather than the cause of lower reproductive efficiency.

Critical analyses of data revealed that anomalies between research and industry results were only apparent. The anomalies between research and industry experience on fertility was largely due to the masking of genotypic weaknesses by phenotypic selection and management practices. The anomaly between scientific expectations for mature size and the practical experience supported by research data also indicates a similar masking effect of the management.

The Mt. Eugene management system has also shown that within beef cattle populations a large amount of phenotypic variation exists, This is particularly evident for reproductive characters, which have a low heritability, but where it is possible to utilize the phenotypic variation to maximize economic gains. Selecting animals that produce...
efficiently within the available environments is therefore possible, and
the need to alter the environment to achieve the desired production is
not always necessary.

The results also highlight the need for close co-operation between
scientists, extension officers and primary producers. To avoid mis-
understanding industry, results should be critically analysed and
cautiously interpreted. Similarly applied scientific results should be
evaluated as to their importance in practical terms. Failure to co-
operate at all levels will only make the objective of providing the
industry with new and more efficient practices, based on scientific
results, remote.

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