INFLUENCE OF RATES OF REPRODUCTION, SURVIVAL AND GROWTH ON BEEF HERD PRODUCTIVITY IN A SUB-TROPICAL ENVIRONMENT

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SUMMARY

Three hypothetical beef herds were constructed to test the effects of differing mortality, reproductive and growth rates on whole herd productivity. Values for the productive traits depicted likely differences between fertile tropically adapted, sub-fertile tropically adapted, and temperate genotypes.

Reproductive differences between the two tropically adapted genotypes were masked by breeder-herd culling policies resulting in comparable profitability. Small variation in weights or prices between classes of sale cattle could bias profitability towards either genotype.

Higher growth rate and lower mortality rate of tropically adapted genotypes reflected marked increases in whole herd profitability when compared with temperate genotypes. It is probable that this increase has a compounding effect through investment of the extra profitability into income-generating property investment.

INTRODUCTION

A review of the literature shows that in tropical and sub-tropical environments, Bos indicus-Bos taurus cross bred cattle have demonstrated advantages in economically important traits when compared with Bos taurus cattle (Rudder 1978). The cross bred cattle show lower mortality rates, higher growth rates, equal or higher reproductive rates depending on the generation and source of Bos indicus content, and commercially comparable carcasses.

Bos indicus-Bos taurus cross bred cattle can be divided into two broad categories on the basis of their reproductive performance. F_1 Braham-British, F_1 and subsequent generations of Africander-British, and crosses between Braham-British and Africander-British cross breds express high reproductive rates relative to F_2 and subsequent generations of Braham-British and Braham back-cross cattle (Anon.1976; Rudder et al.1976). Differences in growth rates between these two categories are usually marginal (Rudder 1978).

Description of differences in each trait in isolation, while vaulable, provides an inadequate indication of the likely effects on whole herd output. This paper describes likely differences in productivity and profitability between herd models depicting fertile tropically adapted, sub-fertile tropically adapted and temperate genotypes in a sub-tropical environment,

MATERIALS AND METHODS

The herd models were constructed from a programme being developed by one of the authors (J. Neal). This programme is designed to use varying mortality, reproduction, and culling rates for each age of breeding cow represented. In the case of growing cattle, mortality rates can be varied according to age and age at sale can be varied to reflect different rates of growth.

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Inputs used to construct the hypothetical beef herds were inferred from the literature and are applicable to the 600 to 750 mm rainfall zone of central Queensland.

Assumptions common to all genotypes were:

. initial joining to calve at 2 yr of age with non-pregnant yearling heifers rejoined to calve at 3 yr;

. all 2 yr and older breeders culled if non-pregnant at end of joining, and all cows that were pregnant but failed to produce a calf were culled;

. final joining at 12 yr with those cows conceiving allowed to rear the resulting calf then fattened and sold at approximately 13 yr;

. culling for pyhsical defects which included physiological aging was 0.3, 0.4, 1.7, 1.9, 4.5, 36.6 percent for rising-2 yr, 3 yr, 4 yr, 5 yr, 6 to 10 yr, 11 and 12 yr pregnant cows. These cows reared their calves and were fattened for sale after these calves were weaned;

. losses from established pregnancy to weaning were assumed to be 11.0 and 5.0 percent for the first calving and subsequent calvings respectively;

. adult equivalents (A.E.) used to equalize herd size in terms of energy requirements were the same for each genotype. Each model was constructed to represent a herd of 2000 A.E. in June/July which is the beginning of the dry season;

. bulls were used at 3.0 percent of breeder numbers; and

. relativity between steer and cow prices was inferred from prices published by the Bureau of Agricultural Economics for the years 1970 to 1979 inclusive. These data indicate a relationship of $C = -3.456 + 0.959\ S (r = 0.996)$ when C and S represent cow and steer price in cents per kg live weight. The derived cow price was used for both cull cows and cull heifers because there is no evidence to suggest a significant difference on local markets.

Assumptions that varied according to genotype were:

. annual mortality rates of 2.8 percent for breeders aged 1 yr and 4 yr to 8 yr, 5.6 percent for breeders aged 3 yr, 8.4 percent for breeders aged 2 yr and 9+ yr were assigned to the model representing temperature genotypes. Comparable figures for tropically adapted genotypes were, 1.0, 2.0 and 3.0 percent respectively. For dry, growing cattle annual mortality rates were 1.0 and 0.5% for temperate and tropically adapted genotypes respectively;

. pregnancy rates for fertile tropically adapted and temperate genotypes were 85, 90, 86, 89, 93, 94, 98 percent for 1 yr, 2 yr maiden, 2 yr lactating, 3 yr, 4 yr, 5 to 9 yr, 10+ yr respectively. Comparable values for the sub-fertile tropically adapted genotype were 71, 85, 67, 82, 90, 94, 87;

sales of tropically adapted steers were assumed to be 25, 65, 10 percent by'30 mo, 42 or 54 mo respectively. Cull heifers were sold at the rate of 50 percent by 30 mo and the remainder by 42 mo. Temperate genotype steers and cull heifers were assumed to be sold at 6 mo older than comparable tropically adapted cattle;

cow weights. The relative importance of these effects in the additional live weight available for sale is mortality (26.0 percent), cull cow weight (12.4 percent), and larger numbers for sale due to reduced age required to reach sale weight (61.6 percent).

In terms of net income the differences in favour of the fertile adapted genotypes were 23.8, 31.0 and 89.9 percent when steer prices were 90¢, 65¢ and 40¢ kg live weight. The relative differences were highest at low prices but absolute differences were markedly higher at high prices ($38,665, $28,136 and $17,606).

These data support the contention that use of cattle well adapted to prevailing environmental hazards is an important factor contributing to beef herd productivity. Change from the use of cattle that are not well adapted to the environment does not necessarily require large capital infusion. Over time the extra revenue produced can be used for property development that will increase productivity to a higher level, e.g. pasture improvement, sub-division, water facilities. There is some evidence to show that these effects compound profitability in favour of tropically adapted herds in central Queensland (Lankono 1979).

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REFERENCES

ANON. (1976). Notes on the research programme, CSIRO Division of Animal Production, Rockhampton.

LANKONO, ZINENUBA (1979). Masters dissertation, Faculty of Economic Studies, University of New England, Armidale.

RUDDER, T.H., SEIFERT, G.W., and MAYNARD, P.J. (1976). Aust. J. Exp. Agric. Anim. Husb. 16: 623.

RUDDER, T.H. and SEIFERT, G.W. (1977). 3rd International Congress of the Society of Advancement of Breeding Research in Asia and Oceania (SABRAO), Canberra, February, 1977. p. 10.

RUDDER, T.H. (1978). Beef Cattle Husbandry Branch Tech. Bull. No. 11, QDPI, February, 1978. p. 14.