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# COMPARATIVE GROWTH PERFORMANCE OF JERSEY, FRIESIAN AND AYRSHIRE BULLS ON PASTURE

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## SUMMARY

Records of liveweight growth from 12 to 20 months of age of 249 Jersey, 31 Ayrshire and 53 Friesian bulls running on pasture at an A.B. Centre, over four successive years, are summarized.

Differences between years were small. Average daily gains were 0.75 kg (1.7 lb) for Jerseys, 0.90 kg (2.0 lb) for Ayrshires and 1.05 kg (2.3 lb) for Friesians, with greatest gains recorded during the spring. On average, the Ayrshires were 18%, the Friesians 33%, heavier than Jerseys. Coefficients of variation in liveweight were comparable for the three breeds and declined from 10.5% at entry to 7.5% at 20 months.

Mature liveweights (56 months) and A.B. proofs were available for one year only. The Ayrshires were now 24%, the Friesians 40%, heavier than the Jerseys, with coefficient of variation round 9.5% within breeds. Mature weights were closely correlated with final weights at the A.B. Centre (23 months). A small but positive association was observed between A.B. proofs and mature liveweight, significant only for the Friesian breed.

The findings are compared with other results and the implications discussed.

AS PART of a general proposal to study variation in growth rate, its inheritance and its relationship with dairy production efficiency, the young bulls under proof at the Newstead A.B. Centre have been weight-recorded since 1964.

Bulls for proving, all registered animals selected on performance pedigree, are brought to the Centre as yearlings. Arrival dates for the main intake vary from year to year (May 27 to July 6); all animals have been assembled by early October. The bulls remain at Newstead — for semen collection — until the following autumn (April to June) when they are transferred to a run-off area pending their dairy progeny test assessment. At Newstead the bulls are normally run in four mobs of 20 to 25 head. An endeavour is made to provide adequate pasture, but some hay and a limited quantity (up to 1 kg/head/day) of meal are fed over the winter months, June to August. Animals are weighed at 6- to 8-week intervals.

A.B. proofs on the first weight-recorded bulls, born 1963 and purchased 1964, became available in 1968. In March of that year, this group was again weighed prior to selec-

tion or disposal, providing a measure of "mature liveweight".

This interim report summarizes liveweight data from Newstead for the four intake years 1964-7, based on an average of 62 Jerseys, 13 Friesian and 8 Ayrshire bulls per year. Mature liveweight and progeny test information for the 1964 intake is also discussed. This project is in co-operation with the N.Z. Dairy Board.

## RESULTS

### VARIATION BETWEEN YEARS

Figure 1 shows the average growth curves at Newstead, for the Jersey bulls only, for successive intake years 1964-8 inclusive. Annual mean birth dates showed a range of 14 days; weights have therefore been adjusted to the mean overall birth date, July 25, using the within-year regressions of initial weight on age.

Variation between years is apparent and largely follows seasonal differences in pasture production. The poor growth performance of the most recent intake (born 1967) — apparent also with the Ayrshire and Friesian bulls — is particularly noteworthy and reflects the generally poor feeding conditions in 1968. For the remaining four groups, however, on which the subsequent analyses are based, the growth patterns are sufficiently consistent to warrant pooling data for the four complete years.

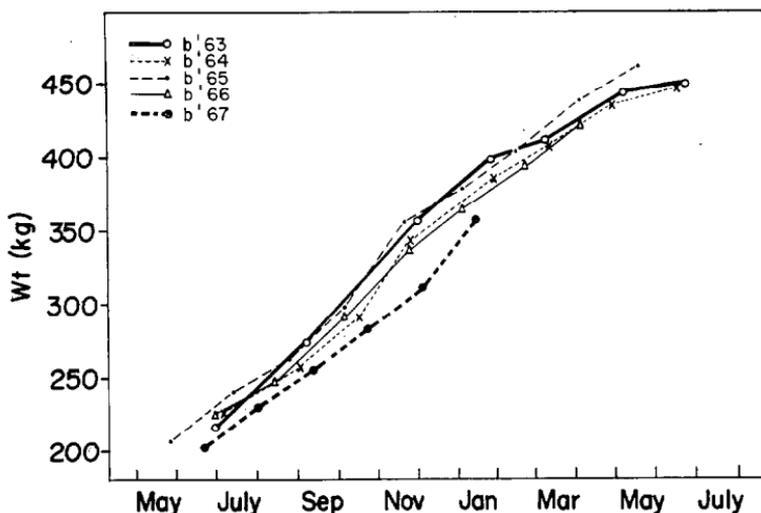


FIG. 1: Average liveweight growth curves, by years, of Jersey bulls born 1963-7.

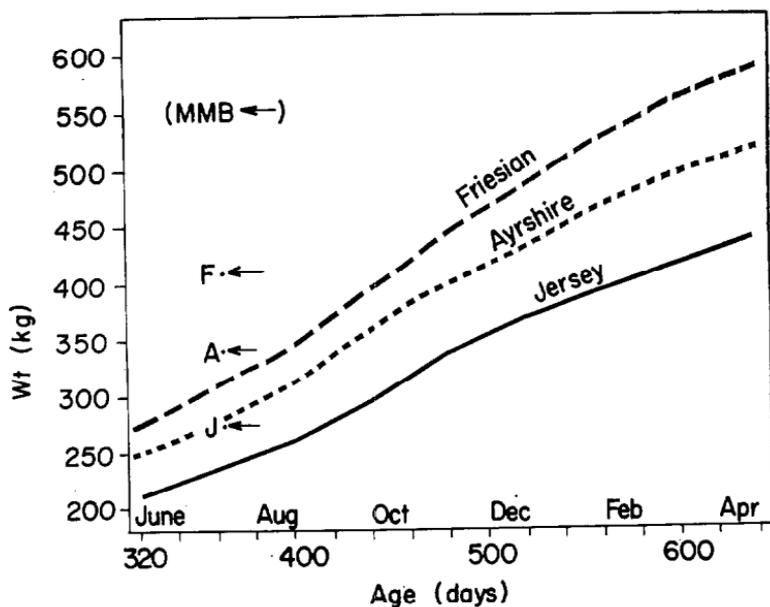


FIG. 2: Average liveweight growth curves, by breeds, of bulls from 1963-6.

#### VARIATION BETWEEN BREEDS

In deriving mean growth curves for each breed, weights at assigned age intervals have been interpolated for the individual seasons and then averaged over the four years. The results are depicted in Fig. 2. Also indicated are the British Milk Marketing Board results (Anon., 1966) for average liveweights at one year of age of bulls reared at the Chippenham Centre and including 15 Jersey, 66 Ayrshire and 280 Friesian bulls. Apparent from both Figs. 1 and 2 is the high rate of liveweight gain during the spring (September-November) and the marked falling off in the autumn (April-June).

Daily gains are summarized in Table 1, based on four years' data.

In calculating gains from birth, birth weights for Jersey, Ayrshire and Friesian bulls have been estimated (from published figures and unpublished Ruakura data) at 27.2 kg (60 lb), 36.3 kg (80 lb) and 40.8 kg (90 lb), respectively. Since daily gains from birth to arrival at the Centre and from arrival to the end of August were generally similar, and since arrival weights were expected to be largely influenced by previous rearing, the overall gains

TABLE 1: AVERAGE DAILY GAINS (kg)  
(Range in parentheses)

<i>Period</i>	<i>Jersey</i>	<i>Ayrshire</i>	<i>Friesian</i>
MMB*: 3 mon- 12 mon	0.74 (0.68-0.91)	0.92 (0.73-1.17)	1.10 (0.60-1.41)
Birth — 13 mon (Aug. 31)	0.59 (0.45-0.78)	0.67 (0.45-0.82)	0.75 (0.57-1.04)
13 mon-16 mon (Nov. 30)	0.98	1.11	1.24
16 mon-20 mon (Mar. 31)	0.61	0.78	0.95
Whole period, Aug.-Apr.	0.75 (0.48-0.95)	0.90 (0.65-1.15)	1.05 (0.80-1.34)

\*British Milk Marketing Board data (Anon., 1966).

(birth to end of August) only are presented. For comparison, the MMB results (Anon., 1966) for 3- to 12-month gain are shown. The table clearly illustrates the high gains achieved during the spring months, September to November. It is worthy of note that the relative decline in growth rate from this period to the ensuing four-month summer period was greatest for the Jersey bulls (38%), least for the Friesian bulls (23%).

The effects of differential growth rates in terms of live-weight at 13 months and 20 months are indicated in Table 2.

From Fig. 2, Table 1 and Table 2, the marked difference in average growth performance of bulls of the three breeds is apparent. Friesians averaged 30 to 35% heavier, Ayrshires 16 to 19% heavier, than Jerseys in their second year of life.

#### VARIATION WITHIN BREEDS

Differences between animals within a breed are equally as important as differences between breed averages. Ranges are shown (on a pooled within-breed and year basis) for daily gains in Table 1 and for liveweights in Table 2. Wide variation within breeds is evident; the Ayrshires show considerable overlap with the other two breeds, while the heaviest or fastest-growing Jerseys actually exceed

TABLE 2: MEAN LIVEWEIGHTS AND RANGES (kg) AND COEFFICIENTS OF VARIATION (CV)

Age (date)	Jersey	Ayrshire*	Friesian*
13 mon (Aug. 31) †			
Mean ....	262	304 (116%)	343 (131%)
Range ..	204-345	243-397	274-458
CV ....	10.5%	10.5%	9.9%
20 mon (Mar. 31) †			
Mean ....	424	499 (118%)	570 (134%)
Range ..	306-494	417-612	463-694
CV ....	7.2%	8.2%	8.4%
56 mon (Mar. 26) ‡			
Mean ....	559	695 (124%)	783 (140%)
Range ..	442-658	606-821	640-876
CV ....	9.1%	11.9%	9.7%

\*Figures in parentheses denote percentage of corresponding Jersey mean liveweight.

†Four years' data, comprising 249 Jersey, 31 Ayrshire and 53 Friesian bulls.

‡One year's data, comprising 51 Jersey, 7 Ayrshire and 13 Friesian bulls.

the lightest or slowest-growing Friesians. Ranges tend to increase with age, and at any age are greatest for the Friesians, intermediate for the Ayrshires, and least for the Jerseys.

A more useful measure in practice is the coefficient of variation, shown in Table 2 for liveweights after adjusting for age differences. The results suggest a decline in this coefficient with age (approximately 10% at 13 months, 8% at 20 months), possibly reflecting the reducing influence of pre-entry rearing environments. Reasonable consistency is apparent between breeds, bearing in mind the relatively small number of Ayrshire and Friesian bulls. It may be noted that the coefficient of variation for total gain at the Centre (August to April) approximates 12%.

#### EFFECTS OF AGE AND PREVIOUS WEIGHTS

The regression coefficients of early weights at the Centre on age differed markedly from year to year and between breeds. For the numerically large Jersey groups, the coefficients were significant each year but ranged from 0.43 to 0.79, whereas average daily gain from birth varied only between 0.56 and 0.60 kg. This suggests that the common practice of standardization for age on the basis of average daily gain (since birth) can be seriously in error relative to the more accurate regression adjustment method. As

expected, the influence of birth date on liveweight declined with age, the average correlation being of the order of 0.5 at 13 months and 0.3 (usually non-significant) at 20 months.

In all cases, liveweights at any age were strongly correlated with earlier weights at the Centre, although the observed relationships differed between breeds and between years. Pooling all the data, the regression coefficient of final weight on initial weight was 0.87 ( $r = 0.74$ ). In other words, gain over the period was negatively (and significantly) associated with initial weight, implying some form of compensatory growth; for example, better-reared (heavier) animals may tend to gain less than those less well reared.

#### MATURE LIVWEIGHT

Means and ranges of liveweights in March 1968 at approximately 56 months of age (based on one year's data only) are included in Table 2. Relative to earlier weights, the variation within breeds and the differences between breeds have continued to increase. The Friesians and Ayr-

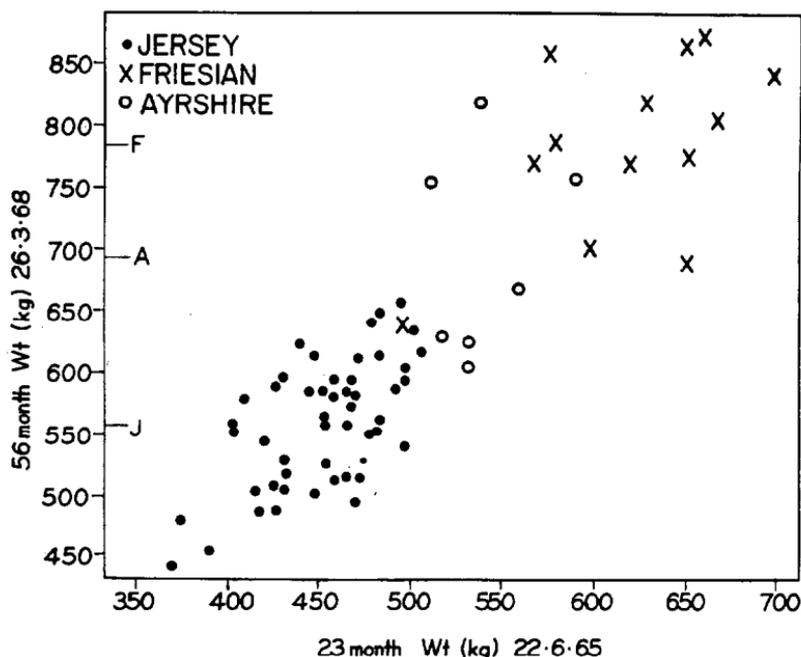


FIG. 3: Relationship between 56 month (26/3/68) and 23 month (22/6/65) weight of bulls born 1963.

shires were respectively 41% and 24% heavier on average than the Jerseys. Coefficients of variations were comparable for the three breeds at approximately 9.5%, rather greater than at 20 months.

Liveweights at 56 months are plotted against final weights at the Centre in Fig. 3. Close association between the two weights is manifest, both between and within breeds. The overall regression coefficient, similar for each breed, is 0.80 ( $r = 0.55$ ).

### GENETIC MERIT

Available A.B. proof ratings (expressed as superiority in butterfat yield of a bull's daughters compared with progeny of an "average" bull) for the 1964 bull intake are plotted against mature liveweight in Fig. 4.

The mean ratings were 5.1 kg (11 lb), 6.9 kg (15 lb) and 5.9 kg (13 lb) for the Jerseys (46 bulls), Ayrshires (5) and Friesians (10), respectively. Only for the Friesians was the relationship between rating and liveweight significant ( $b = 0.06$ ,  $r = 0.85$ ). Pooling results for all breeds, however, revealed a significant overall relationship ( $b = 0.038$ ,  $r = 0.35$ ). This implies that a difference of 100 kg in live-

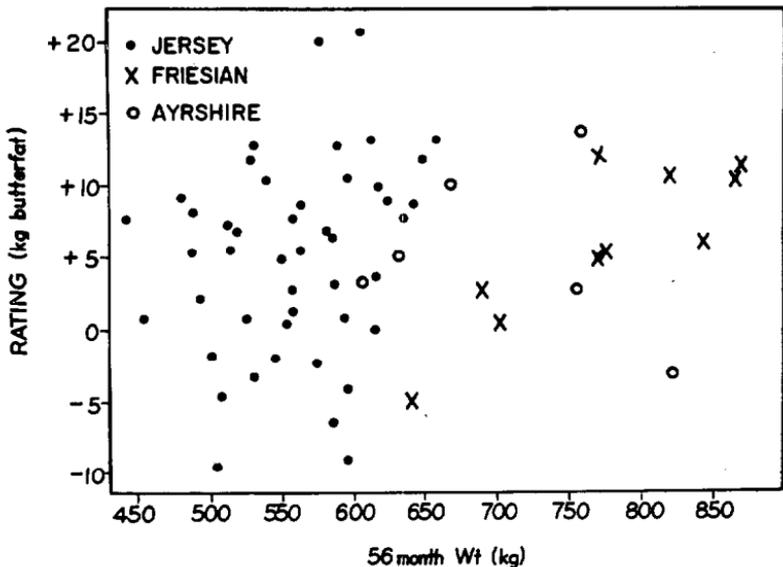


FIG. 4: Relationship between A.B. proof rating and 56 month liveweight (26/3/68) of bulls born 1963.

weight tends to be associated with a difference of 3.8 kg in daughters' butterfat yield.

#### DISCUSSION

In the present study, the proportionate weight superiority of the Friesian (Ayrshire) over the Jersey bulls increased from 30% (16%) at 12 months to 34% (18%) at 20 months and 40% (24%) at 4½ years. In the only comparable published study (Anon., 1966) greater proportionate differences were found, Friesian bulls being 49%, Ayrshire 24%, heavier than Jerseys at 12 months. However, the intensive rearing of these animals makes comparison with the New Zealand results difficult. Campbell and Flux (1952), reporting growth rates of Jersey and Friesian females on pasture, showed a relative weight difference of 37% at one year, 30% at two years and 38% at older ages, in fair agreement with the present findings for pasture-fed bulls.

The established variation in growth rate, both within and between breeds, has obvious significance for dairy beef production. The findings appear to be no less important in terms of the efficiency of dairy production from pasture. With a heritability of 0.35 and coefficient of variation 9.5%, progeny of the heaviest 5% and lightest 5% of bulls within a breed may be expected to differ in weight by 7%. Allowing for rearing and maintenance costs under pasture feeding, it can be estimated that, for equal feed conversion efficiency, the former progeny would require to produce of the order of 5% more milk or butterfat. Put another way, a 400 kg (882 lb) bull with a rating + 13 kg (+ 29 lb) will, on average, be as "efficient" as a 560 kg (1,235 lb) bull with a rating + 22 kg (+ 49 lb)! Similar considerations apply to comparison between breeds, particularly Jersey versus Friesian.

These findings suggest strongly that present selection emphasis on yield *per cow* may need to be modified to allow for variation in growth rate and liveweight, in the interests of overall productive efficiency. The extent of such allowance will, of course, depend on the relative economic importance of milk and meat production. It will depend also on the heritability of growth rate and its genetic association with dairy merit. The present findings, albeit provisional, seem to confirm overseas evidence of a small but positive genetic correlation between the two traits, but further information is clearly needed.

## ACKNOWLEDGEMENT

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