GROWTH RATES OF FRIESIAN × FRIESIAN, HEREFORD × FRIESIAN AND SIMMENTAL × FRIESIAN STEERS IN SEVERAL ENVIRONMENTS

G. C. EVERITT, K. E. JURY AND J. D. B. WARD
Ruakura Animal Research Station, Hamilton

SUMMARY

The growth performance of Friesian × Friesian (F × F), Hereford × Friesian (H × F) and Simmental × Friesian (S × F) steers up to 70 weeks of age is reported. The steers were bred and reared to 16 weeks of age on 21 dairy farms and then transferred in balanced groups to 9 grazing farms.

H × F steers were lighter at birth and grew slower than S × F and F × F steers. At 70 weeks of age mean liveweights were 337.1, 316.3 and 339.5 kg for F × F, H × F and S × F steers, respectively.

Sires within breeds differed significantly in the live weight-for-age of their progeny, indicating considerable opportunity for selection.

Dairy farm environment exerted a highly significant effect on subsequent liveweights of the steers. Compensatory growth did not occur in steers which had been poorly reared.

Attention is drawn to the implications of these results on performance testing of beef cattle and on breed and sire progeny comparisons.

INTRODUCTION

Semen from the Charolais breed was first introduced into New Zealand in 1965, initiating considerable research activity in assessing the comparative performance of exotic and established breeds and crosses for beef production (Everitt, 1972a; Carter, 1974).

Each year now sees at least one new exotic breed of cattle becoming available to New Zealand farmers. A research framework is required in which the major productive characteristics of these new breeds, and established ones, can be recorded under a range of commercial farming conditions. Reproductive merit, including ease of calving, growth rate, and carcass characters are three vital areas for enquiry.

Operational guidelines for development of on-farm progeny testing of beef sires, as an alternative to centralized testing, are also needed.

This paper outlines a long-term series of trials in which the performance of progeny of sire breeds mated to Friesian cows is being compared. Each spring mating season, commencing in 1972, Friesian sires have been used as a standard, and sires of two

additional breeds included in the comparisons. Co-operating farmers play a major role in the trials, giving opportunity to isolate "environmental" effects. A progress report is offered on the comparative growth rates of Friesian × Friesian (F × F), Hereford × Friesian (H × F) and Simmental × Friesian (S × F) steer progeny reared in several farm environments. Some aspects of reproductive performance and growth rates of the heifer progeny of these breeds and crosses are reported by Dalton *et al.* (1975).

EXPERIMENTAL

The organization of the trials was similar to that reported by Everitt *et al.*, (1969), with the Farm Production Division of the New Zealand Dairy Board, the Livestock Improvement Association (Auckland) Inc., and the Auckland Farmers Freezing Co-operative Ltd. collaborating at different stages.

Sire Breeds

Friesian, Hereford and Simmental sire breeds used in the 1972 mating season were represented by 10 sires each—Table 1.

All sires were available for commercial artificial breeding. The Hereford breed may not be adequately represented by the sires used, but these were the only sires available through the New Zealand Dairy Board at that time.

Dam Breed

Dairy cows of at least three-quarter Friesian parentage were offered by co-operating dairy farmers. Only cows which were 2 years old and older at mating, and which had calved at least once, were used.

Dairy Farms

Twenty-one dairy farmers widely distributed in the South Auckland region assisted in the trials. Each farmer offered a minimum number of cows for insemination in the experimental programme.

Identification and calving details were recorded by each farmer, who reared his experimental calves as one group according to his customary methods. Male calves were castrated at about 4 weeks of age. Liveweights of calves were recorded at birth and thereafter fortnightly up to the time of transfer to grazing farms at approximately 16 weeks of age, in December 1973.

TABLE 1: INDIVIDUAL SIRES WITHIN BREEDS

N.Z. Dairy Board Code No.	*Name of Sire*
Friesian:	
8232	Taunton T.S. Prince
9207	Athol Vic Byron
9211	Carnowen Reginald
9230	Ngaio Sovereign Julian
9235	Shamrock Graham's Bimbo
9247	Kelsie Treasure Philip
71249	Mutu Kahauri A.B. Bruno
71259	Poplarino Socrates Darien
71263	Seaway Victory
71233	Kingsmill M.M. Zulu
Hereford:	
926	Lonsdale Domino 33rd
936	Lonsdale Domino 86th
939	Lonsdale Domino 102nd
940	Lonsdale Prince 95th
941	Lonsdale Domino 97th
942	Lonsdale Prince 94th
943	Lonsdale Domino 114th
66295	Lonsdale Domino 193rd
66112	Ffostil Brigadier
66196	Freetown Vindicator
Simmental:	
66321	M.M.B. Klaus
66317	M.M.B. Casar
66312	M.M.B. Adrian
66320	M.M.B. Harald
66319	Hampshire Robinson
66213	M.M.B. Seeger
66212	M.M.B. Thierauch
66308	M.M.B. Schock
66271	M.M.B. Rebholz
66215	Scottish Neff

Grazing Farms

All heifer calves were purchased by the Department of Lands and Survey and grazed together at Tahae, near Mangakino (Dalton *et al.*, 1975).

Steer calves were either retained by the dairy farmer breeder or purchased by co-operating graziers spread throughout the South Auckland region.

Each grazier was provided with a group of cattle balanced, as far as possible, for breeds and with animals originating from two dairy farms on each grazing property. One grazing farm received

cattle from 7 dairy farms and these were grazed in two groups — one (A) originated from 3 dairy farms and the other (B) from 4 dairy farms. Thus, in total there were, in effect, 9 grazing farms involved.

Each grazier managed his experimental cattle as he wished, carrying out his own control of internal and external parasites.

Liveweights were recorded approximately quarterly.

Biometrical Methods

Least squares analysis of liveweights and weight changes prior to transfer included effects of breed, sire within breed, rearing (dairy) farm and sex, with age adjustment of weights. For data obtained after transfer of the steers to graziers, effects of grazing farm, and of rearing farm within grazier, were included in the analysis. Statistical significance of variation between breeds was assessed by comparison with that between sires within breeds. The fortnightly weights recorded pre-transfer were used to obtain 2-, 4-, 6-, 8-, 12-, and 16-week weights by interpolation.

RESULTS

Performance on Dairy Farms

Figure 1 records mean liveweights of steers and heifers up to the time of transfer to grazing farms, at approximately 16 weeks of age.

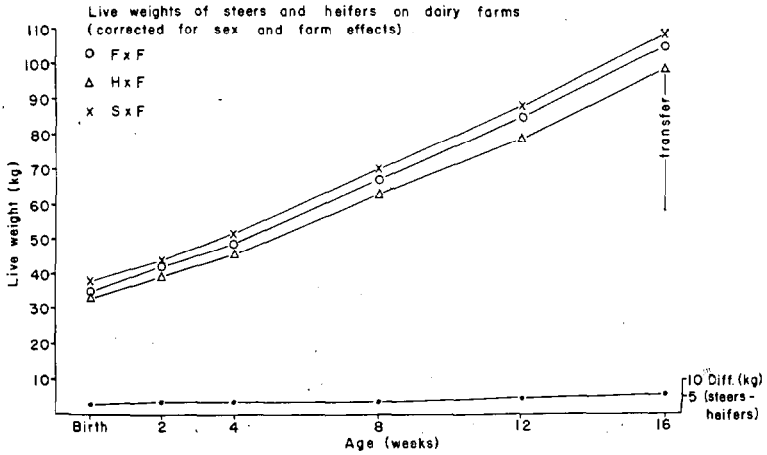

FIG. 1: *Mean liveweights of steers and heifers on dairy farms from birth to transfer (corrected for sex and farm effects).*

Friesians were heavier than Hereford crosses, but lighter than Simmental crosses, at birth ($P < 0.01$). The S × F cattle grew at a similar rate (0.62 kg/day liveweight gain) to the F× F (0.61) up to the time of transfer; and these animals grew faster than the H × F (0.57) crosses ($P < 0.01$). At transfer, S × F crosses were heaviest, followed by the F × F with the H × F lightest ($P < 0.01$).

Steers were heavier than heifers at all weighing times ($P<0.001$).

Dairy farms accounted for approximately 52% of the variation in transfer liveweight, mean liveweights ranging from 73.6 to 153.8 kg. Multiple suckled calves, on 11 farms, averaged 57.5 kg liveweight at transfer compared with 41.1 kg for artificially reared calves on 10 farms.

Performance of Grazing Farms

The numbers of steers weighed at transfer and at subsequent weighings are recorded in Table 2.

TABLE 2: NUMBERS OF STEERS WEIGHED

Time of Weighing	*Sire Breed*		
	F	*H*	*S*
Transfer Dec. 1973	125	122	120
March 1974	120	120	116
May/June 1974	122	120	116
September 1974	120	119	114
December 1974	117	116	113

Mean liveweights of steers at transfer time and on later weighing occasions are recorded in Table 3.

At transfer H × F steers were significantly lighter than S × F and F × F cattle, which did not differ significantly in liveweight. This pattern continued through to the last recorded weighing in December 1974. Between transfer, in December 1973, and December 1974 F × F and S × F steers grew at 0.61 kg/day liveweight gain compared with 0.57 kg/day for H × F crosses ($P < 0.01$).

Differences between grazing farms in the liveweights of steers were highly significant on all occasions (Table 3). A high proportion (42%) of the variation in liveweight at 70 weeks of age

TABLE 3: MEAN LIVEWEIGHTS (kg) AND DIFFERENCES OF STEERS ON GRAZING FARMS

								Significance of Variation due to		
	Means			*Sire Breed Differences*					*"Dairy" Farms within Grazing Farms*	*Sires within Breeds*
Age	*F*	*H*	*S*	*F-H*	*F-S*	*S-H*	*S.E.*[1]	*Grazing Farms*		
Transfer (115 days)	109.6	101.7	112.0	7.9**	−2.4	10.3***	2.7	***	***	*
215 days	148.6	141.2	151.7	7.4**	−3.1	10.5***	2.5	***	***	n.s.
299 days	187.5	176.5	187.0	11.0**	0.5	10.5**	3.5	***	***	n.s.
396 days	234.0	217.9	233.5	16.1**	0.5	15.6**	4.8	***	***	**
489 days	337.1	316.3	339.5	20.8***	−2.4	23.2***	5.2	***	***	*

[1] S.E. = approximate standard error of difference calculated from sire mean square.

was accounted for by grazing farm environments, the steers ranging in liveweight from 277 to 371 kg.

Importantly, Table 3 shows that the pre-transfer environments provided by dairy farms exerted highly significant effects on all weighing occasions. Growth rates between transfer and December 1974 did not vary significantly between dairy farms within grazing farms. Figure 2 illustrates the relationship between the differences in mean liveweights of steers from different dairy farms within a grazing farm recorded in December 1974 with the mean differences at transfer, a year previously.

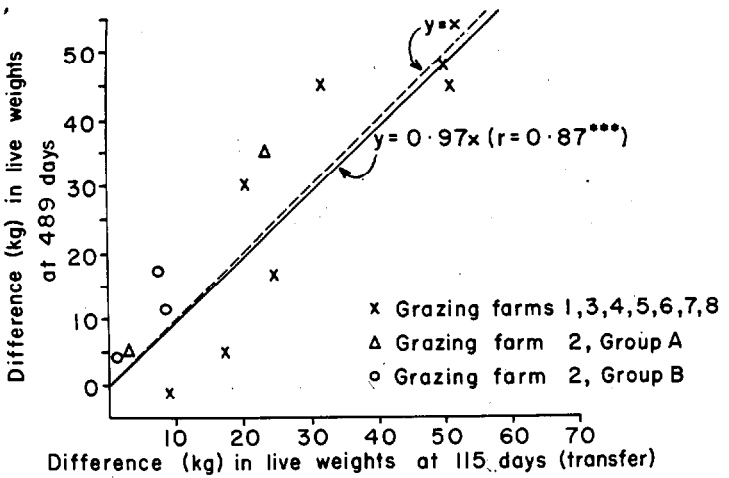

FIG. 2: *Mean liveweight differences (corrected for breed and age) between steers from different dairy farms within a grazing farm in December 1974 (489 days of age, on average) related to the mean differences in December 1973, at transfer (115 days of age, on average).*

On average, 97% of the difference in liveweight recorded at transfer time persisted a year later, in December 1974. This clearly illustrates a lack of compensatory growth in steers poorly reared up to 16 weeks of age.

SIRE EFFECTS

Table 3 shows that sires within breeds differed significantly in liveweights of steer progeny on grazing farms at 3 of the 5 weighings. Deviations from the breed mean liveweight in December 1974 of steer progeny of individual sires are recorded in Table 4.

TABLE 4: NUMBER OF STEER PROGENY AND DEVIATION FROM BREED MEAN LIVEWEIGHT (kg) IN DECEMBER 1974 OF INDIVIDUAL SIRES

Sire Breed								
Friesian			*Hereford*			*Simmental*		
Code No.	*No. of Progeny*	*Deviation*	*Code No.*	*No. of Progeny*	*Deviation*	*Code No.*	*No. of Progeny*	*Deviation*
9247	10	+22	66295	16	+22	66271	8	+22
9235	11	+ 5	943	5	+12	66213	10	+16
8232	15	+ 2	66112	15	+11	66319	13	+ 7
71263	17	+ 1	926	15	+ 4	66212	10	+ 4
71233	7	0	936	8	− 4	66320	12	− 2
71259	11	0	940	11	− 4	66312	15	− 6
9207	13	− 4	66196	14	− 4	66308	10	− 7
9211	13	− 7	939	9	− 8	66215	11	− 9
71249	12	− 8	941	11	− 9	66317	10	− 9
9230	11	−11	942	16	−20	66321	15	−15
Breed mean		337			316			339

Average S.E. of difference = 12

The progeny mean liveweights of each sire breed overlapped considerably. Each sire breed was characterized by a wide range of deviations between sires, with a relatively high average standard error of difference. The top sire of each breed recorded a deviation of + 22 from the breed mean.

DISCUSSION

These results indicate that the Friesian breed has yet to meet its peer, in terms of growth rate, under a wide range of New Zealand farming conditions. Both the Friesian and the Simmental sire breeds proved superior to the Hereford in terms of weight-for-age of steer progeny. Further results and analyses of other important characteristics of these sire breeds—such as reproductive performance, including calving ease, and carcass characters—must be awaited with interest. Derivation of a comprehensive Value Index for each sire, incorporating measurements of reproduction, growth and carcass characters of progeny, should perhaps be considered.

Variation between sires within each of the three breeds was quite substantial and emphasizes the selection opportunities available. A sound case can be advanced for selection of high growth

rate sires within the Hereford and other beef breeds. For the Friesian, however, although the selection potential is sizeable (Dalton and Everitt, 1972; Hight *et al.*, 1973), the case for undertaking growth rate selection in an industry artificial breeding programme is more arguable because of the possibly restricted progress resulting in selection for dairying characters. Selection within the Simmental breed may be faced with similar problems if this breed is to be promoted in New Zealand as a dual purpose animal.

Although these trials were designed primarily for purposes of comparing performance of breeds and crosses for beef production, the data presented also offer a base for development of on-farm progeny testing of beef sires. The variation recorded (Table 4) suggests that the number of steer progeny per sire needs to be considerably greater for precise progeny test purposes than those recorded for the sires in these trials. The relatively small number of progeny per sire may explain, in part, the conflict in sire ranking based on the steer progeny recorded in several environments, compared with the ranking recorded by Dalton *et al.* (1975) with the heifer progeny held at a single location. Liveweights of heifers may also be affected by oestrous activity. Certainly, the progeny test results reported here cannot be regarded as anything more than operational guidelines.

The marked effects of dairy and grazing farm environments on the growth of the steers is in agreement with previous observations (Everitt *et al.*, 1969). Isolation of the residual effects of the pre-transfer rearing period on subsequent liveweights of the steer and heifer (Dalton *et al.*, 1975) progeny, with lack of compensatory growth, lends further support to earlier work (Everitt *et al.*, 1969; Everitt, 1972b, 1973; Reardon and Everitt, 1972). Unless such early growth effects can be isolated in performance testing of bulls and in breed and sire progeny comparisons, then it appears imperative that the animals to be compared should be reared together from as soon after birth as possible.

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