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Dairy crossbreeding alternatives to improve New Zealand beef production

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Abstract

Beef production in New Zealand could be increased by developing farming systems that profitably utilised heifer and bull calves which would otherwise be slaughtered soon after birth. Evaluation of a once-bred heifer cattle policy over 3 years at Massey University showed that target weights to achieve acceptable calving percentages and final carcass weights can be achieved under pasture feeding. Piedmontese and Belgian Blue sires used over Friesian cows produced bull calves that did not grow significantly faster than straight Friesian animals, but had higher dressing out (57.8 v 56.7 v 54.0, P<0.05) and meat yield percentages (76.0 v 75.7 v 73.2 for Piedmontese, Belgian Blue and Friesian, respectively). Both the once-bred heifer and the exotic x bull beef production systems earned greater returns than traditional beef cattle policies at 1992 costs and prices, and could be easily implemented by New Zealand beef producers.

Keywords dairy beef, exotic sires, once-bred heifer

Introduction

Cattle originating from the dairy herd currently contribute approximately 350,000 cull cows, 500,000 bulls and a small number of beef x dairy heifers to New Zealand beef production. In addition around 800.000 calves are slaughtered annually as 'bobby' veal. The latter industry, which is unique to New Zealand, contributes to 25% of the annual cattle kill but to less than 3% of the total beef and veal produced. Beef production could be increased by developing profitable production systems to utilise "non-replacement" heifercalves and by encouraging dairy farmers to increase the use of selected beef breed sires. This paper reports on two research projects that aimed to increase beef production through the retention of surplus dairy calves.

Experimental

Once-bred heifer systems

The once-bred heifer (OBH) system involves the purchase of heifers (dairy or beef type at4 days to 15 months of age) for heifer beef production (Morris et al. 1991). The heifers are mated at 15 months of age to a beef breed sire. They are sold prior to the eruption of their fourth pair of permanent incisor teeth (which typically occurs at 37 months but may be as early as 30 months of age) so that carcasses are classified as 'heifer,' which normally provides a higher return than cow beef. The progeny of the heifer can either be sold as weaners or retained for finishing.

Evaluation of the OBH system for New Zealand pastoral conditions commenced at Massey University's Ruminant Research Unit in 1989 with the purchase of 50 Hereford x Friesian (HxF) heifers at 14 months of age (255 kg liveweight (LW)) and the same number of 4 month old HxF calves (120 kg LW). The following year 25 HxF and 25 Simmental x Friesian (SxF) 4 month old calves were purchased at 103 kg and 111 kg average LW, respectively. The programme continued in 1991 with the purchase of 25 Hereford x Jersey (HxJ) and 25 HxF calves at 4 days of age. The objectives of the research programme are to develop the management system required to achieve specified target liveweights under pasture feeding (Figure 1) and to evaluate the suitability of different dairy heifer crosses for OBH beef production.

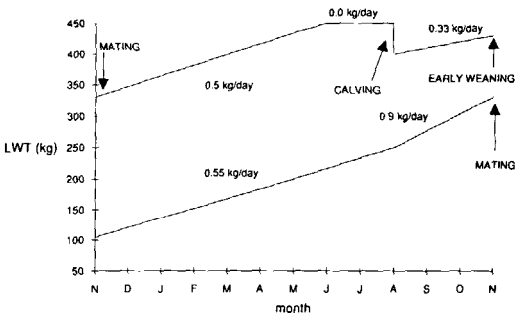

Figure 1 Liveweight gain profile to achieve target weights in a once-bred heifer beef production system.

Liveweights of all animals wererecorded at monthly intervals and, at slaughter, carcass weight information, including *meat* composition data, were obtained. At 15 months of age heifers randomly selected for the OBH system were inseminated to terminal sires selected for ease of calving and meat production using the New Zealand Dairy Board "Genomate" synchronisation programme to terminal sires selected for ease of calving and meat production (Jellie 1991). Breeds of sires used include Charolais and Limousin, and Angus in 1988, and 1989 and 1990 respectively. In 1988 a comparison was made between mated and non-mated heifers for liveweight gain, carcass weight and financial returns, while in 1989 the comparison was made between early weaned (day 90 of lactation) and late weaned (150 days) heifers in a once-bred systen.

Heavily muscled exotic cross bull beef production

The introduction into New Zealand of the double-muscled or heavily muscled breeds (Piedmontese and Belgian Blue) has increased the choice of beef terminal sires available to farmers. However, little is known about how these breeds perform under New Zealand pastoral conditions. Traditionally, farmers have used Friesians for the production of lean manufacturing beef but the heavily-muscled breeds may also be well-suited to this role.

The liveweight gains of Friesian (F), Piedmontese x Friesian (PxF) and Belgian Blue x Friesian (BBxF) (n=30/group) bulls were recorded from arrival at the Massey University Tuapaka Bull Beef Unit at 4 months of age *(November* 1990) until their slaughter at 15-20 months. The bulls were farmed under the management system described by McRae (1987). except for a 6 week period when a sub-sample of 10 bulls from each breed/cross were grazed separately to record grazing behaviour and herbage intake as reported by Morris et al. (1992). The bulls were weighed at approximately monthly intervals until the time of slaughter. Liveweights were recorded off pasture prior to trucking the day before slaughter. Groups of 30 animals (n = 10 per breed/cross) were slaughtered on three separate occasions (corresponding to 17.18 and 20 *months* of age). Individual hot carcass weights, from which the dressing outpercentage of the bulls was calculated, were recorded at the export abattoir of Weddel-Feildiig Ltd. The total weight of

Table 1 Performance of dairy beef heifer in a mce-bred heifers beef production system.

	Year of trial commencement					
	1966		1989		1990	
	Mated	Non-mated	Early weaned	Normal weaned		
Breed cross	HxF[1]	HxF	HxF	HxF	HxF	SXF
Liveweight (kg)						
-weaner calf (4 mo)			120	120	103	111
• mating (15 mo)	267	267	330	330	326	342
• two year (24 ma)	427		450	450		
• pre-slaughter (c.30 mo)	435	466	408	459		
Carcass weight (kg)	211	240	244	220		
• dressing out	51.1	48.9	50.1	47.9		
Caking %	60		69	69		
Calf weaning weight (kg)	207		175	208		
Financial ($)						
• purchase price	420	420	270	270	270	330
• heifer meat value	542	561	634	572		
-weaner calf	405		350	416		

[1]HxF = Hereford x Friesian, S x F = Simmental x Friesian.

trimmed boneless meat from each sub-group of 10 bulls was recorded, and from this value the average meat yield was estimated for each breed/cross.

Results and discussion

Once-bred heifer beef production

Liveweights from weaning to slaughter, and the productivity of the dairy cross heifers used in the OBH experiments are summarised in Table 1.

The liveweights achieved over the three years of the trial with the different groups of heifers indicate that the target mating weight of 330 kg can be realised under pasture conditions (Fig.1). To achieve this heifers need to average 0.55 kg/day from December to August and 0.9 kg/day from August until mating in November. Feeding to achieve 0.5 kg liveweight gain per day has been continued until the eighth month of gestation when allowances have been reduced to a maintenance level until calving. Carcass weights of the heifers haveranged from 21 l-244 kg at 32 months of age, with dressing out percentages being lower in once-calved than never-calved heifers, and higher in early weaned than late weaned heifers.

The low calving percentage from the 1988-born heifers reflects the use of only one cycle of artificial insemination, and in the 1989-born heifers there was a relatively high calf mortality rate of 20% due primarily to dystocia. Only two heifers have died from problems associated with dystocia since the research programme commenced. Calf birth weights averaged 37-42 kg across years and sire breeds. The incidence of dystocia was not influenced by the breed of sire. The levels of dystocia are unacceptable and investigations are currently being undertaken to minimise the problem viamanipulation of early- and mid-pregnancy feeding. Dystocia problems in OBH's were also recorded under UK conditions by Lowman (1987). who subsequently adopted induction of calving to alleviate calving difficulties. Induction cost about $25/cow in 1992. This added expense is unlikely to be acceptable to most New Zealand beef cattle farmers.

Early weaning has improved heifer growth rates and hence carcass weight, but at the expense of calf liveweight gain (Khadem *et* al. 1993). However, this practice offers increased flexibility for selling both the heifer and the weaned calf if pasture supplies diminish over the summer months.

Exotic cross bull beef production

Liveweights, average rates of liveweight gain, carcass weights and meat yields of the three bull breed/cross are presented in Table 2.

Table 2 Liveweight, average daily gain (ADG), and carcass data for Friesian (F), Belgian Blue x Friesian (BB x F) and Piedmontese x Friesian (P x F) bulls

Parameter	Breed F	BBxF	PXF
Liveweight (kg)			
• at arrival (4 mo)	127	130	125
-yearling (12 mo)	334	333	323
- 15 mo	458	457	449
Slaughter			
Group1 -17mo	504	521	489
Group 2 • 18 mo	488	477	493
Group 3 • 20 mo	803	800	585
ADG (kg/d)	0.971	0.960	0.943
Carcass weight (kg)	285	303	298
• dressing-out (%)	54.0'	56.7[b]	57.8[b]
• carcass meat yield (%)	73.2	75.7	78.0

[a,b]Different superscript letters in the same row are significantly different at P<0.05.
'Mean data for 10 animals/breed cross.

There were no differences in liveweight gain between F, PxF or BBxF bulls from purchase to slaughter. The liveweight gain of 0.97 kg/day for Friesian bulls from 4 months • 17 months is high by New Zealand pastoral standards (Nicol 1990) and equates to 621 kg net carcass weight gain/ha for the Tuapaka stocking rate of 2.8 bulls/ha. Mean carcass weights (296 kg) did not differ significantly between the breed/cross groups, but the mean weight-adjusted dressing-out percentage was significantly (P<0.05) higher for the PxF (57.8%) and BBxF (56.7%) bulls than for the F bulls (54.0%). Total trimmed meat yield as a percentage of carcass weight was also higher for the PxF and BBxF than the F group. The F bulls also had longer carcasses, lower muscularity scores and meat to bone ratios of the proximal hind leg, slightly more fat cover and more kidney fat. Meat colour and ultimate meat pH wereunaffected by breed (Purchas *et* al. 1992).

Financial evaluation

The respective gross margins (GM) for OBH, exotic x bull cross and traditional heifer and bull beef cattle policies at 1992 costs and prices are shown in Table 3. The GMs are shown after deducting the opportunity cost of capital • this expense accounts for differences between policies in the amount of capital invested in livestock. Highest returns were easily achieved by bull beef policies and. in the case of exotic x bulls, these would have been improved (by $17/bull in the example) if their 2.65% higher meat yield had been fully rewarded in the beef schedule (McRae 1992). This indicates that

Table3 Gross margins (1992 costs and prices) for alternative beef cattle production systems. Each stock policy is based on a status quo stock reconciliation, and interest on livestock capital is charged at 12% p.a.

Beef cattle policy	Carcass weight (kg)	Sale less purchase ($/hd)	Gross Margin ($/su)
Once-bred heifer[1]	220	233 + 0.6 calf [3]	9
Traditional beef heifer[2]	200	220	94
Breeding cows[3]	250	•	31
Exotic x bull.+[4]	250	362	73
Friesian bulls[4]	250	345	69

[1]Purchase of 4 mo calves at $300/hd, 60% calf survival to sale.
[2]Angus weaner purchased at 8 mo for $300/hd. Calving at 27 mo. 65% calf survival to weaning, sale surplus weaners.
[3]Purchase 4 mo calves at $300/hd (100 kg LW), sale at 18-24 mo, $2.56 schedule.
[5]Includes adjustment In schedule value for 2.65% Improvement in meat yield.

only a small premium can be paid on exotic sired dairy bull calves if they can only be grown as rapidly as straight Friesians. Once-bred heifer returns are sensitive to the calving percentage and final slaughter weights achieved (Parker 1991). but, even at 60% calf survival to sale, returns exceed those of the traditional heifer beef policy. In addition, the OBH option provides farmers with more alternatives including the sale of proven heifers for use in beef cow breeding herds.

Conclusion

The reported research with dairy-type cattle at Massey University has demonstrated the potential of these animals for beef production, and adds toreportsofprevious work on the use of dairy-type cattle as beef cows (Hight 1969; Baker *et* al. 1981) and for bull beef production (McRae 1987). McRae (1992) suggested that the profitability of straight Friesian bull beef policies is likely to decrease in the future as the demand for replacements exceeds the dairy industry supply. The availability of dairy calves to sheep and cattle farmers can be increased by using beef sires, such as the heavily muscled breeds, over a larger proportion of non-Friesian dairy cows or, as is more likely, adopting new cattle policies (e.g. OBH) which utilise calves previously slaughtered at four days of age.

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