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Bull beef production on hill country

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ABSTRACT

The viability of a number of bull beef production systems integrated with sheep, within summer dry and summer wet hill country enironments were examined using a spreadsheet feed budget simulation model. A survey of commercial hill country farmers was also undertaken to identify on-farm problems and opportunities. The study demonstrated that bull beef systems can be profitably integrated with sheep on hill country, and that farming bulls for beef on hill country is likely to increase.

Survey farmers had few problems with bull misbehaviour and had achieved liveweight gains similar to or higher than those used for modelling purposes throughout the year, although not consistently during the autumn and winter. These farmers could improve profitability by setting up a separate wintering area for bulls or integrating their grazing with ewe hoggets rather than older sheep.

Keywords Bull beef systems; hill country; feed budget modelling.

INTRODUCTION

The recent downturn in the New Zealand sheepmeat industry, coupled with rapidly escalating input costs, has placed pressure on hill country farmers to increase profitability by either producing a higher value finished product or diversifying into more profitable farming enterprises. Bull beef fits both these categories, and farmer interest in bull beef has increased markedly in recent years (New Zealand Meat and Wool Board Economic Service, 1984).

However, there has been little formal research into how different systems of bull beef production, mainly developed on flat to rolling land classes of medium to high natural fertility (Everitt and Ward, 1974; Clark and Brougham, 1979; McRae and Morris, 1984) can be adapted to a less favourable hill country environment. This paper describes a modelling-farmer survey study of alternative bull beef production systems for southern North Island hill country.

METHODS

The relative effects of different bull beef production systems on feed demand and supply, and resulting average pasture covers were estimated with a spreadsheet budgeting model (Journeaux, 1987).

The feed supply segment of the model was based on average pasture growth rates (kg DM/ha/d) from Wairarapa trial sites, divided into 26 fortnightly periods and adjusted for variations in nutritive value (MJ ME/kg DM) according to Ulyatt *et al.*, (1980). Pasture growth profiles for 2 contrasting climatic environments, typical of the lower North Island were derived from these data. These were a summer dry area growing 8639 kg DM/ha/yr (17, 48, 15 and 20% of annual production respectively in winter (W), spring (SP) summer (S) and autumn (A)), and a summer wet area producing 10031 kg DM/ha/yr (12W: 43SP: 27S: 18A). New pasture growth not consumed within a period could be transferred forward for up to 3 fortnightly periods after being reduced in each period by specified seasonal senescene and decay rates. Pasture energy available in any period therefore included new growth plus the net energy value of pasture transferred from previous periods. Changes in pasture cover reflected the difference between the total amount of pasture energy available less animal feed requirements in each period. Initial pasture cover on 1 June (typically assumed to be 1200 kg DM/ha) comprised a specified proportion of green and dead material (85% and 15% respectively) which was affected by senescence and decay rates respectively as pasture production was simulated through the year.

The feed demand component of the model included segments for 2 sheep breeding policies and a range of bull beef systems. The sheep policies were based on regional (Wairarapa) performance data for the summer wet and summer dry environments and differed in terms of stocking rate, lambing performance, lambing date, carcass weight of lambs sold and timing of sheep sales. Lamb and older sheep energy requirements were based on the data of Rattray (1979), and Sykes and Geenty (1983). The bull component allowed for bulls to be purchased at any weight and age, and to be farmed for a maximum of 3 years. Bull feed requirements (Minish and Fox, 1982) were simplified into a single equation to provide a continuous estimate of energy requirements for any pattern of liveweight gain. Seven different bull policies were examined (Table 1).

For policies 5 and 6, bulls were purchased in August, rather than wintered, to increase total feed demand as a means of controlling the late spring early summer pasture flush.

TABLE 1 Summary of modelled bull systems. The month of purchase and sale respectively are shown in brackets.

Policy	Bull purchase Age (months)	Live wt (kg)	Bull sale Age (months)	Carcass wt (kg)
1	3 (November)	100	16 (November)	220
2	3 (November)	100	18 (January)	220
3	3 (November)	100	29 (December)	330
4	7 (February)	140	17 (December)	220
5	12 (July)	220	18 (January)	220
6	14 (July)	380	30 (January)	300
7	19 (February)	365	29 (December)	300

To run the model, data inputs describing winter stocking rate (su/ha), sheep:bull ratio (sheep stock units:cattle stock units wintered), lambing performance, pasture cover (kg DM/ha) at the start of winter, and the initial live weight and liveweight gain (LWG) profile for bulls were required. The model output showed total feed grown per period, energy carryover between periods, net energy balance within a period, average pasture cover at the end of each period, and sheep and bull requirements per period in kg DM. Suitable production systems for each region were identified by adjusting rates of bull LWG, and hence feed intake, to match feed supply with feed demand. This was contained by the requirement for average pasture cover not to move beyond bounds set for each season. These bounds were related to the levels of bull performance assumed (e.g. a minimum of 1000 kg DM/ha at lambing and through the summer for policies with medium to high LWG). The systems designed were therefore a reasonable fit and not necessarily optimal. The profitability of each production system was assessed by gross margin per stock unit wintered and per 500 kg DM consumed.

The second part of the study involved an interview survey of 15 Wairarapa sheep and bull beef farmers. This served 2 purposes. First, it provided farm physical and performance data which could be compared with the parameters used in model construction and the alternative bull beef production systems studied. Secondly, an interactive discussion with the farmer about the model results relative to his own experience provided a means of identifying on-farm problems and new opportunities (Sands, 1986).

RESULTS AND DISCUSSION

Required seasonal LWG, (kg/d) for bulls in the summer dry and summer wet regions to achieve the target sale weight are shown in Table 2. Lower winter LWG in the summer wet region because of poorer winter pasture growth rates and a later spring flush are compensated for by improved summer and autumn LWG. Higher LWG than those shown in Table 2 can be achieved, particularly during the spring. For example McRae (1985) measured an average LWG of 1.5 kg/d in 16-month-old bulls from October through to December. Bull LWG and hence feed demand can therefore be altered substantially, (±30-40% of LWG in Table 2) according to seasonal pasture growth. This flexibility

TABLE 2 Average seasonal liveweight gains (kg/d) for summer dry (SD) and summer wet (SW) bull policies to reach target sale carcass weights.

Policy	Bull age	Summer Dec-Feb SD	SW	Autumn Mar-May SD	SW	Winter Jun-Aug SD	SW	Spring Sep-Nov SD	SW	Purchase to sale SD	SW
1	r1 yr	0.57	0.71	0.68	0.79	0.83	0.48	1.34	1.40	0.85	0.85
2	r1 yr	0.43	0.51	0.57	0.59	0.60	0.33	1.21	1.16	0.72	0.72
	r2 yr	1.08	1.08	—	—	—	—	—	—		
3	r1 yr	0.37	0.43	0.44	0.49	0.33	0.30	1.01	0.97	0.68	0.68
	r2 yr	0.58	0.62	0.54	0.60	0.69	0.51	1.33	1.33		
	r3 yr	1.10	1.20	—	—	—	—	—	—		
4	r1 yr	—	—	0.69	0.69	0.70	0.40	1.36	1.24	0.95	0.87
	r2 yr	1.20	1.25	—	—	—	—	—	—		
5	r1 yr	1.20	1.18	—	—	—	—	—	—		
6	r2 yr	—	—	—	—	0.90	0.88	1.36	1.33	1.11	1.21
	r3 yr	1.13	1.17	—	—	—	—	—	—		
7	r2 yr	—	—	0.47	0.43	0.55	0.28	1.19	1.05	0.76	0.68
	r3 yr	1.00	1.23	—	—	—	—	—	—		

is further enhanced by the bull beef grading system, which is based solely on carcass weight (Everitt and Ward, 1974). Thus bulls can be sold in lean condition at lighter weights (eg. 400 kg live weight) to maintain the feed supply for other stock classes if pasture growth rates are reduced by drought or very cold wet conditions.

Survey farmers had little difficulty in achieving these levels of LWG for the spring and summer months, but were unable to realise the autumn and winter levels consistently. As a result, the suggested ages at slaughter were rarely achieved. This reflected both an inadequate feed allocation to bulls and the incompatibility of residual grazing levels of ewes and bulls when grazed together during these seasons (Milligan, 1981). Farmers could therefore improve bull management during these periods by either setting aside more feed reserves, using nitrogen in autumn, grazing the bulls in front of the ewe rotation or grazing the bulls with the ewe hogget mob. Ewe hoggets and bulls have a similar recommended minimum winter residual grazing level of 800 to 1000 kg DM/ha.

Initial analyses were for an 80:20 sheep to bull ratio, the regional average. Increasing the proportion of bulls progressively to 100% improved the fit of feed demand to feed supply, indicating the physical possibility of farming all bulls. Farmers however were reluctant to adopt such a system because of both a dependence on 1 enterprise with a heavy reliance on a single major market and a perceived difficulty in maintaining pasture quality. The latter problem could be overcome by farming a proportion of older bulls grown at lower growth rates (for example, 30% of winter carrying capacity for slaughter at 30 months of age) for grazing low quality pastures resulting from the lax grazing of bulls less than 12 months of age.

Generally, rotational grazing was adopted for bulls for most of the year on the survey farms. Set stocking of bulls was used if pasture covers were high, as a means of overcoming fighting and riding problems, particularly with bulls over 18 months of age. Bull behaviour was not considered a major problem, with the main remedial actions taken by farmers being electrification of fences and avoidance of feed stress by above maintenance feeding. A lack of confidence in grazing bulls on steep hill country resulted in bulls being restricted to the flattest areas of most farms. This seemed to be mainly due to a fear of physical injury to bulls through riding or fighting and restricted the use to which bulls could be put for controlling spring pasture growth and integrated grazing with sheep, especially lambs.

The model profitability of bulls was on average 4 times that of sheep per 500 kg DM consumed (Table 3). Thus, even if schedule prices or the cost of replacements were to alter substantially, the returns would still exceed those of farming sheep alone and those of traditional beef cattle policies (Ministry of Agriculture and Fisheries, 1986). Differences in profitability between bull policies mainly reflected the cost of capital and for this reason policies with bulls purchased at a low capital outlay (such as weaner calves) and grown at high growth rates showed an advantage.

TABLE 3 Summary of gross margins (GM) per stock unit (su) wintered and per 500 kg DM consumed for bull beef and sheep only policies (based on meat schedule for 15/9/86, and an annual interest rate of 20% on capital invested in livestock).

Policy		GM/su ($)	GM/500 kg DM consumed ($)
Bulls	1	49.27	46.68
	2	47.60	41.08
	3	41.61	37.83
	4	37.64	41.36
	5	29.49	40.35
	6	33.18	42.54
	7	42.12	42.54
Sheep	Summer dry	14.35	9.07
	Summer wet	15.14	9.64

The conclusion from this study is that the farming of bull beef on hill country offers considerable opportunity to improve overall farm profitability and has added advantages of increasing the flexibility of feed demand to accommodate seasonal variation in pasture production. For these reasons the numbers of bulls on hill country will continue to increase.

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