Predicting animal production from pasture

K.E. MILLIGAN

Advisory Services Division
Ministry of Agriculture and Fisheries, Te Kuiti*

ABSTRACT

Stocking rates and target live weights to optimise profit on a small bull beef unit were determined from the New Zealand Exporters Schedule for bull beef and liveweight gain information.

The targets were to purchase bulls during October or November at 85 to 100 kg live weight and to grow them to between 420 and 440 kg live weight by 1 December the following year.

Using average pasture growth rate data, a simple feed budget model predicted mean pasture cover targets from April to December required to achieve the live weight targets.

Grazing plans were designed and regularly reviewed to test the validity of using mean pasture cover as an indicator of successful management.

Keywords Bull beef; liveweight gain; pasture cover.

INTRODUCTION

Simulation models have been used to predict animal production given pasture mass, patterns of pasture growth and stocking rates (Bircham, 1984; McCall, 1984). These models have been valuable in defining critical mean pasture cover levels required to achieve maximum animal production per ha. From the producers point of view however maximum profit rather than production per ha is the driving force for the development of flexible production systems that reflect an ability to capitalise on favourable market conditions.

Some marketing situations are relatively simple to interpret. For example the New Zealand Exporters Schedule for bull beef usually pays 5 to 7 cents more for bulls over 245 kg carcass weight than for those below 245 kg carcass weight. The marginal value of 1 kg carcass from 244 to 245 kg is therefore around $14 per hd. Other marketing situations are much more complex and involve predictions on the movement of foreign exchange values, the payment or otherwise of premiums (which often reflect use of killing capacities) and external factors such as the Chicago beef futures market. Some marketing decisions may well mean that production opportunities will be wasted. For example in the 1985 and 1986 seasons liveweight gains of 0.88 and 2.03 kg/d respectively were required over 90 days from 1 February to maintain meat value per hd (Table 1). Liveweight gains of 2 kg/d on pasture in late summer early autumn are not normally possible and that coupled with high interest on the capital invested in trading stock meant that although bulls would continue to gain live weight, profitability would fall.

This paper describes an attempt to set production targets for a bull beef system that provides flexibility to react to market opportunities, to define simple pasture characteristics that will enable those levels of production to be obtained and to test those assumptions on a small bull beef unit.

TABLE 1 Effect of bull beef schedule price on the value of meat from a 230 kg carcass.

	1985		1986	
	February	May	February	May
Meat schedule (c/kg)	260	220	223	158
Meat value ($/hd)	598	506	513	363
Extra carcass weight to equate to meat value	—	+42	—	+95
Liveweight gain/d to break even (90 days, 52% dressing)	—	0.88	—	2.03

METHODS

The production system was a small commercial bull beef unit near Te Kuiti. A live weight target of 420 to 440 kg on 1 December was considered to provide earliest market flexibility. This target required a purchase live weight of 85 to 100 kg some 12 to 13 months previously. Based on monitored live weights during 1984 a pattern of liveweight gain for the critical months between April and December was determined (Fig. 1).

A simple feed budget model (Milligan and Blyth, 1982) was used on a month by month basis to determine the mean pasture cover required to provide the feed intakes needed to achieve the target liveweight gain pattern (Fig. 2). During 1985 and 1986 pasture dry matter for individual paddocks was assessed either by eye or pasture probe at least every 6 weeks. The feed budget model was also used to allocate areas to different mobs of bulls based on

* Present address: Canterbury Agriculture and Science Centre, Ministry of Agriculture and Fisheries, Lincoln.

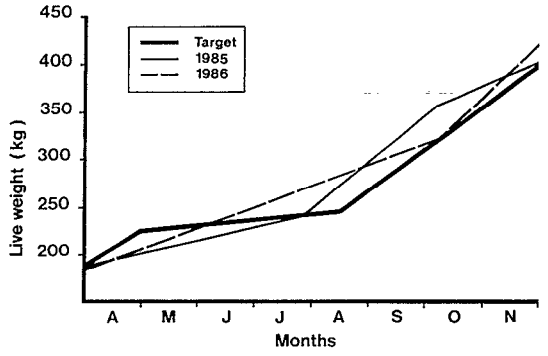

FIG. 1 Target and actual patterns of liveweight gain between April and November.

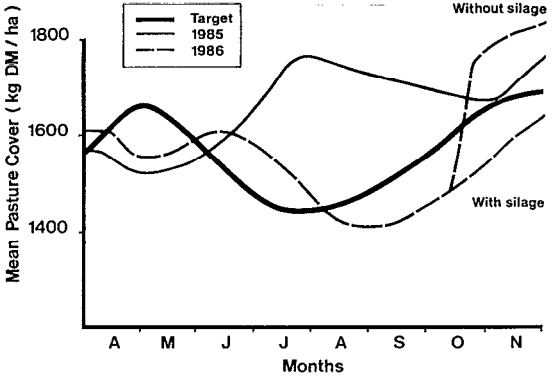

FIG. 2 Predicted mean pasture cover to attain target liveweight and actual mean pasture cover between April and November.

their feed requirements and to prepare detailed grazing plans on a paddock by paddock basis.

RESULTS AND DISCUSSION

Bull beef production results for 1984 to 1986 are shown in Table 2.

The feed budget model predicted that mean pasture cover targets should be in the range of 1400 kg dry matter (DM)/ha to 1800 kg DM/ha (Fig. 2). If mean pasture cover fell below 1400 kg DM/ha in winter high spring liveweight gains were not possible. Conversely mean pasture covers above 1800 kg DM/ha in the early spring compromised high late spring and early summer liveweight gains because of a fall in feed quality.

Fig. 1 shows the relationship between target and actual live weights and Fig. 2 the relationship between target and actual mean pasture yields, from April to November in 1985 and 1986.

Actual live weight on 1 December exceeded targets in both years although the pattern of liveweight change from April to December was different. This reflected variations in apparent

TABLE 2 Bull beef production from the commercial unit.

	1984	1985	1986
Area (ha)	52.4	54.8	62.4
No. bulls			
1 April-1 December	164	185	200
1 August-1 December	—	30	—
Mean live weight			
1 April (kg)	160	174	168
1 August (kg)	—	248	—
1 December (kg)	404	418	427
Liveweight gain/ha (kg in 244d)	764	917	830

TABLE 3 Apparent monthly pasture growth rate (kg DM/ha/d) on the commercial unit.

Year	April	May	June	July	Aug	Sept	Oct	Nov
1985	18	16	17	21	24	40	44	57
1986	22	15	11	9	18	36	52	58

pasture growth rates (Table 3) which gave rise to marked differences in mean pasture cover levels (Fig. 2)

In July 1985 mean pasture cover increased rapidly to 1850 kg DM/ha (range 1100-2600 kg DM/ha). To control the additional pasture the speed of rotation was increased thereby increasing the pasture residual DM following grazing. This resulted in increased feed intake and liveweight gain. An additional 30 bulls were also introduced on July 30. Prices of store rising yearling bulls were approximately $35 lower in July than in September each year representing an additional profit margin.

In 1986 low June to August pasture growth rates were reflected in falling mean pasture cover which reached a minimum 1170 kg DM/ha (range 900-1500 kg DM/ha) in the third week of August. There was thus no flexibility at this time to buy additional bulls although prices were again favourable. A management decision was made to keep pasture residual DM, and therefore feed intakes, low over the month of September in an attempt to build-up pasture cover. Although this meant low liveweight gains in September (0.5 kg/d compared with 1.25 kg/d in September 1985) mean pasture cover did increase. High apparent pasture growth rates in October and November 1986 resulted in a very rapid increase in mean pasture cover. Rotation speed was increased through a combination of increasing the number of mobs of bulls and lifting residual DM. Average liveweight gain exceeded 2.2 kg/d during October and November. In an attempt to maintain pasture quality 16.5 ha (26% of the area) was progressively shut for silage in October. Fig. 2 shows the change in mean pasture cover with the silage paddocks included and excluded. Had the silage not been harvested it was predicted that mean pasture cover in January would have been greater than 2700 kg DM/ha (range 1600-3800 kg DM/ha). At these

TABLE 4 Relationship between predicted and actual liveweight gain and mean pasture cover for 3 area allocations between 30 July and 15 September.

Measurement		Mob 1	Mob 2	Mob 3
Stocking rate (bulls/ha)		3.52	4.11	5.88
Liveweight gain (kg/d)				
Predicted		1.25	1.25	1.50
Actual		1.16	1.18	1.38
Mean pasture cover (kg DM/ha)				
Actual	July 30	1775	1864	2493
Predicted	Sept 15	1852	1764	2728
Actual	Sept 15	1554	1769	2041

levels poor pasture quality would have inhibited liveweight gain even though pasture quantity was high.

The success in exceeding live weight targets was due largely to revision of the feed budget model every 6 weeks. At each revision decisions on area allocation, rotation length, residual DM and prediction of liveweight gain, and start and end mean pasture cover, were made. The relationship between predicted and actual liveweight gain and pasture cover (Table 4) indicate that management systems for contract meat production from pasture can be designed with confidence.

REFERENCES

Bircham J.S. 1984. Pattern of herbage growth during lactation and level of herbage mass at lambing: their significance to animal production. *Proceedings of the New Zealand Grasslands Association* **45**: 177-183.

McCall D.G. 1984. Relative priorities for feed between ewes and ewe hoggets in winter and spring: a modelling analysis. *Proceedings of the New Zealand Society of Animal Production* **44**: 121-124.

Milligan K.E.; Blyth R. 1982. *Feed budget users' manual* Ministry of Agriculture and Fisheries, Advisory Services Division, Hastings.