BRIEF COMMUNICATION: Relative cost of producing carcasses from dairy-origin steers slaughtered at 8 – 12 months of age in New Zealand

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Abstract

The New Zealand dairy industry produces approximately 2 million surplus calves annually. These under-utilised animals have a potential value that is estimated to exceed NZD$1 billion per annum. Growing surplus dairy calves in an accelerated beef enterprise for slaughter prior to one year of age is being investigated for potential positive financial implications. This study quantifies the physical and financial performance of Hereford x Friesian-Jersey steers (slaughtered at less than one year of age), compared to traditional bull-beef production. The steers achieved slaughter live-weights of 251, 303 and 349 kg/head at 8, 10 and 12 months of age respectively (118, 146 and 175 kg/head carcass weight). The meat schedule price required for the proposed enterprise to break even with traditional 24-month bull-beef was $6.84, $6.55 and $5.99/kg for steers slaughtered at 8, 10 and 12 months of age respectively.

Keywords: break-even; beef; dairy; economics; steers; slaughter age

Introduction

The national dairy herd produces approximately 4.2 million calves annually, of which about 50% are currently surplus to the requirements of either the beef or dairy industries (Archer et al. 2014; Hickson et al. 2015). Under current practices, the majority of these animals are processed as bobby calves, aged 4-8 days (Thomas & Jordaan 2013). This represents an opportunity to improve the utilisation of a potentially valuable resource, where the opportunity cost has been estimated to exceed NZD$1 billion annually (Jolly 2016). Furthermore, there are a number of welfare issues pertaining to the treatment of surplus dairy calves (Mellor 2013), and the public's attitude towards potential welfare compromises is compounded by the age of calves at slaughter (Mellor et al. 2000).

Traditional prime beef production has cattle slaughtered at 18-24 months of age (Coleman et al. 2016), and generally dairy origin cattle are avoided because of their perceived inferior growth and meat characteristics compared to traditional beef breeds (Barton & Pleasants 1997). Other production options for surplus dairy cattle include bull finishing where bulls are processed at 16-36 months of age, once-bred-heifer systems (30-month slaughter) or crossing dairy-beef heifers with a traditional beef sire to produce steers and heifers for prime beef (Morris & Kenyon 2014).

Growing surplus dairy calves in an accelerated-cycle (8-12 month slaughter) enterprise may have positive financial implications, whilst mitigating welfare issues. The potential of accelerated-cycle beef production has been demonstrated in Argentina, the United Kingdom, Poland, Belgium and Spain where production systems regularly slaughter cattle at less than one year of age (Domaradzki et al. 2017) . The aim of this modelling exercise was to quantify the physical and financial performance of dairy-origin steers when slaughtered at 8, 10 and 12 months of age relative to a traditional 24-month bull-beef enterprise.

Materials and methods

In order to generate realistic values for the modelling exercise, sixty Hereford x Friesian-Jersey castrated male (steer) calves were procured from a commercial rearer in the Taranaki region at approximately three months of age (averaging 103 kg/head live weight) in November 2017 (Pike et al. 2019). The steers were managed as a single mob and assigned to groups (balanced for live weight at 8 months of age) to go for slaughter at 8, 10 and 12 months of age. Between December and January, the steers' diet consisted of plantain, chicory, white clover and red clover (supplemented with meal at approximately 0.5 kg/head/day), and in February the steers were grazed on a forage crop of 'Hunter' brassica. For the remainder of the experiment the diet consisted of ryegrass and white clover pasture, and feeding levels were managed to ensure a minimum steer average daily growth rate (ADG) of 0.8 kg/head/day. All steers were weighed fortnightly and hot carcass weights (HCWT) were obtained at slaughter.

Feed-budgets developed in Microsoft EXCEL (using data from the live-animal experiment) were used to determine the number of cattle that could be carried under each slaughter scenario (8, 10 and 12 months), and gross margin analysis was used to quantify financial performance. These parameters were compared to a traditional bull-beef enterprise growing Friesian-type bulls at 0.84 kg/head/day for slaughter at 22-24 months of age under the same set of model constraints. This enabled the break-even beef price relative to the bull enterprise, to be determined for each slaughter option. The B+LNZ (2018a) benchmark data were used to estimate working expenses, and the opportunity cost of capital was 6% (NZ Treasury 2018). Three-year monthly-average bull and prime steer schedule prices were obtained from AgBrief (2016-18) data, and used for financial analysis. Currently there is no classification system for yearling beef, therefore, it was provisionally assumed the accelerated-cycle beef carcasses would attain prime prices. A three-year average of 100 kg weaner Friesian bull ($472/head) and beef-cross steer ($511/head) prices from the Feilding (Manawatu) weaner fair were used to estimate purchase costs (AgriHQ 2016-18). The hypothetical model farm was set on Class-4 (Beef + Lamb NZ classification) land located in the Manawatu region, comprising 425 hectares (ha) with a sheep-to-cattle ratio of 63:37 similar to B+LNZ (2018b) farm survey data, and an annual pasture yield of 7.2 tDM/ha/yr.

Results and discussion

Table 1 presents the results from the 2017/18 live-animal trial, and this data formed the basis for the modeling exercise summarised in Table 2.

Statistical analysis showed that the steer weaner weights did not differ among treatments, as expected given the specification of calves coming onto the farm at +100 kg. Feeding levels allowed a steer growth rate above 0.80 kg/head/day to be maintained from weaning to slaughter, enabling slaughter live weights of 251, 303 and 349 kg/head at 8, 10 and 12 months of age (118, 146 and 175 kg/head carcass weight). The 8 and 10 month treatments dressing out rate (DO%) did not differ (P>0.05), whilst the 12 month treatment achieved a greater DO% (P<0.001, Table 1).

Table 1 Mean (±SEM) physical performance levels of dairy-origin steers run in the 2017/18 experiment in the Manawatu and slaughtered at 8, 10 and 12 months of age.

	Age (Months)		
	8	10	12
Weaner weight (kg)	102±2.50	105±2.46	104±2.53
ADG (kg/head/day)[1]	0.88±0.02	0.86±0.02	0.88±0.02
Slaughter weight (kg)	251±4.90[a]	303±4.9[b]	349±4.96[c]
Days to slaughter	169±1.22[a]	232±1.19[b]	280±1.23[c]
Hot carcass weight (kg)	118±2.74[a]	146±2.69[b]	175±2.77[c]
Dressing out %	47.3%±0.3[a]	47.5%±0.3[a]	50.0%±0.3[b]

Differing superscripts within a row represent significant differences between treatments (P<0.05).

[1] For period from start of experiment until slaughter

As slaughter age increased, the number of cattle in the model decreased (Table 2). This reflects the positive relationship between age (a proxy for live weight) and energy requirements. For the steer finishing scenarios the meat price had a significant impact on model outputs, as the schedule price increased from May through to September (coinciding with the slaughter period). In terms of financial viability, the 12 month slaughter scenario generated a small profit, while the 8 and 10 month scenarios both generated a loss (Table 2).

The meat price necessary for the proposed accelerated-cycle steer enterprise to break even with the 22-24 month Friesian bull enterprise decreased with slaughter age (Table 2). A premium of $1.85 (27%), $1.34 (20%) and $0.67 (11%) per kilogram above the current steer schedule price was required for the 8, 10 and 12 month scenarios to be comparable with the 22-24 month Friesian bull enterprise. It is too soon to determine whether these pricing requirements are realistic, and they would likely vary under different farm physical conditions (i.e, land classes). Further analysis is required to determine the break-even price with an 18 month bull enterprise.

Overall, the provisional findings suggest an 11-27% (depending on slaughter age) price premium ($/kg carcass) would be required for accelerated-cycle beef production to be financially competitive with traditional 22-24 month Friesian bull-beef production. Of particular interest is the quality of meat derived from animals slaughtered at these comparatively young ages (Pike et al. 2019), along with the impact early slaughter potentially has on environmental efficiency. Both of these currently unquantified variables could have a significant impact on the value proposition of accelerated-cycle beef production, and, therefore, warrant further research.

Table 2 Model assumptions and select outputs for the traditional bull-beef enterprise and 8-12 month slaughter accelerated-cycle beef enterprises. The beef price required for each of the accelerated-cycle beef enterprises to break even with the traditional bull beef enterprise is also shown.

	System type (months at slaughter)			
	Bulls (24)	Steers (8)	Steers (10)	Steers (12)
Model Inputs				
Area closed for silage (ha)[1]	0	16	4	60
Cattle purchased (head)	213	742	572	441
Cattle sold (head)	206	719	555	428
Meat price ($/kg Cwt)[2]	4.93	4.99	5.21	5.32
Slaughter month	June[3]	May	July	Sept
Model Outputs				
Return per stock unit ($)	50.7	(37.2)	(9.1)	24.5
Return per hectare ($)	575	(421)	(104)	271
Return per kg DM eaten ($)	0.08	(0.06)	(0.01)	0.04
Beef price required to break even with bull enterprise ($/kg Cwt)		6.84	6.55	5.99

[1] Area required to maintain average pasture cover levels between 1200-3000 kgDM/ha.

[2] Sourced from (AgBrief 2016-18).

[3] Average month, sales staggered equally from May until July.

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