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New Zealand beef industry structure and opportunities to improve income

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ABSTRACT

As a product, beef can be classified as suiting table or processing requirements. The aim of this study is to quantify the volume and value of table and processing beef arising from herds of beef or dairy origin to identify opportunities for increasing industry revenue from improving table beef harvest relative to processing products. A deterministic model was developed to calculate product flows and income from processing and table beef derived from beef and dairy herds over a 20 year horizon. The dairy herd contributed 52% of beef, 60% of processing grade beef and 45% of total beef income. Processing grade beef comprised 58% of total product by weight. Beef-breed steers and Holstein-Friesian (F) bulls were the largest contributors of any cattle class to table and processing grade beef and total industry revenue. Improving the harvest of table beef by 1% from F bulls would increase beef industry revenue by 0.7%, a similar increase in revenue that could be achieved from beef-breed steers. The relative contribution of beef and dairy origin cattle to beef revenue is insensitive to table beef premiums over processing beef. Any improvement strategy within the beef industry should be considered with dairy-origin beef animals in mind.

Keywords: Beef cattle; dairy cattle; product flows; income

INTRODUCTION

Beef industry profitability is determined by both the quantity of products marketed annually and the returns relative to cost for each of these products. Real beef cattle prices (as $/kg carcass weight) have shown a gradual decline at the rate of four cents per annum from the period 1970 to 1996. An index of farm gate prices indicates that beef returns in 1996-97 were 68% of 1990-91 values (New Zealand Meat and Wool Boards' Economic Service, NZMWBES, 1997a). A similar 33% decline in Free On Board (FOB) income from export beef despite a 17% increase in volume over the same period suggests the New Zealand beef industry is selling more product at a lower value (West, 1997).

Beef is marketed as suiting either table or processing purposes the distinction between these classifications is usually made on the basis of product role, its mode of transport and the specific cuts. There is a paucity of data comparing the relative financial worth of beef within either table and processing beef classifications. Differences in FOB returns from chilled ($6579) and frozen ($1800) export beef products in the 1995-96 season were in the order $4,800 per tonne. Assuming all chilled product was destined for table beef purposes and all processing beef was transported in frozen form, price differentials between table and processing classes of beef cannot exceed those between chilled and frozen products.

Approximately half of beef produced arises from the dairy herd (Webby and Thompson, 1994), however, no previous studies have quantified the volume or value of table or processing product arising from this source. The purpose of this study was to determine the proportions of table and processing beef arising from beef and dairy herds and to identify opportunities for improving industry income by redirecting product from processing to table beef markets.

METHODOLOGY

A deterministic computer model was developed to simulate the numbers of beef and dairy cattle harvested annually over a twenty year time horizon. The relative contribution of the beef and dairy herds to table and processing beef product flows and subsequent beef industry income was determined.

Beef and dairy cattle population

National beef breeding cow and dairy cow numbers were obtained from literature sources (NZMWBES, 1997a,b; Livestock Improvement, 1997a). The number of beef, beef x dairy and dairy cattle harvested annually were derived from numbers of beef-breeding cows and the number of lactating dairy cows respectively, together with assumed calving percentages, heifer retention rates, adult and juvenile mortality rates (Table 1). The number of beef and dairy cows harvested per age group were calculated from a knowledge of proportion of cows present within each age group (Harris, 1989; New Zealand Hereford Society, 1997 unpublished data) minus mortality rates.

Origin of beef and dairy cattle harvested

Beef cattle available for harvest comprised cull cows, cull breeding bulls, steers and surplus heifers. Number of heifers required for re-breeding (nH) was calculated as:

$$nH = \frac{f.bcB}{wean.\ (1\text{-}post)}$$

Total number of beef steer and heifer calves for harvest (nS) was calculated as:

$$nS = bcB\ .\ wean\ .\ post\ \text{-}nH$$

TABLE 1: Cattle numbers, fertility and mortality parameters for beef and dairy cattle simulation, suffixes B and D refer to the beef and dairy herd respectively.

Parameters	Abbreviation	Beef cattle	Dairy cattle
Number of lactating cows[a,b]	bc (B,D)	1,596,000	3,065,000
Heifer replacement rate (%)	f (B,D)	19.8	22.5
Cow mortality rate (%)[c]	de (B,D)	2.1	1.1
Preweaning calf mortality (%)[c,d]	pre (B,D)	1.6	9.0
Postweaning calf mortality (%)[d]	post (B,D)	2.1	2.0
Cows preg. to AB (%)[b]	%AI	nil	84.0
Calving percentage (%)	calv (B,D)	85.4	90.0
Weaning percentage (%)[d]	wean (B,D)	83.8	81.0

Age at calving (years)	2	3	4	5	6	7	8	9	10
Dairy cows[c]	21.1	18.8	15.6	12.5	10.2	7.8	6.2	4.7	3.1
Beef cows[e]	25.1	20.2	14.9	12.9	10.0	7.1	4.7	3.2	2.0

Source: [a] New Zealand Meat and Wool Board's Economic Service, 1997a
[b] Livestock Improvement, 1997
[c] Harris, 1989
[d] New Zealand Meat and Wool Board's Economic Service, 1997b
[e] Zealand Hereford Society, 1996 unpublished data

Dairy cattle harvested comprise cull cows, bobby calves (4-day old calves), Holstein-Friesian (F) bulls retained for beef production, surplus F heifers and beef x dairy cattle. Beef cattle producers using dairy-sourced cattle prefer animals with a minimum 50% F genes for beef production, thus the majority of dairy-origin cattle entering the beef industry are either F bulls or beef-bred x F steers or heifers. Animals of F and other non-F breeds are primarily harvested as bobby calves. To account for breed preferences in purchasing dairy-origin cattle, the number of cattle harvested from dairy herds were calculated separately for each dairy breed. Holstein-Friesian cows were assumed to comprise 57% of all lactating dairy cows (Livestock Improvement, 1997a).

Bobby calf harvest was assumed at a constant 1.1 million animals comprising all non-F bull and surplus non-F heifer calves. Approximately 80% of F heifer calves not required as replacements were assumed harvested as bobby calves. Pure-breed dairy cattle transferred to the beef industry comprised surplus F heifers not harvested as bobby calves and F bulls. The number of beef x dairy cattle available for transfer to the beef herd were calculated from known beef inseminations within dairy herds and the number of bulls sold from beef bull-breeding herds to dairy producers (Charteris and Garrick, 1996). Unrecorded natural matings within dairy herds were assumed evenly divided between beef and dairy-breed bulls.

Beef and dairy cattle harvest parameters

The weight of saleable beef and the proportion of beef marketed as either table or processing beef was calculated for all classes of cattle harvested (Table 2). Average carcass weights were derived from industry sources (NZMWBES, 1997a). Saleable beef yield percentage were based on data from 162 prime carcasses processed under commercial conditions (Kirton, 1994, unpublished). Saleable beef distribution into processing or table classifications were reported for a North Island beef processing facility (Ogg, 1996).

TABLE 2: Beef and dairy cattle harvest parameters for the simulation model

Class of cattle	Carcass weight (kg)	Saleable Yield %[a]	% of Saleable Meat as processing Beef	% of Saleable Meat as table Beef
Beef origin				
Cull cows	220	62	80	20
Steers	295	66	46	54
Heifers	240	66	46	54
Breeding bulls	350	70	68	32
Dairy origin				
Cull cows	235	60	90	10
bobby calves	18	50	0	100
F heifers	230	66	50	50
F bulls	270	75	68	32
Beef x F steers	280	66	50	50
Beef x F cull cows	200	62	85	15

[a] Saleable meat yield % (SMY%) = (saleable meat weight/carcass weight) x 100

Economic Parameters

Due to the variability of beef classified as suiting table or processing purposes, a range of table:processing beef FOB returns were examined $6,000:$2,000; $4,000:$2,000 and $2,000:$2,000. Future accumulated returns for beef marketed over a 20 year time horizon were discounted to net present values ($NPV) using a discount rate of 7%. Expected future incomes from table and processing beef for each major class of cattle were calculated. The relative sizes of the beef and dairy herd and breed composition within herds were assumed constant. The financial effect of increasing meat quality by adjusting the percentage of table beef upward by 1% was calculated for cattle harvested from dairy and beef herds and separately for F bulls and beef-breed steers.

RESULTS

Two-thirds of all cattle harvested in New Zealand (including bobby calves) arise from the dairy herd. The dairy herd contributes a little over half (52%) of annual saleable beef produced in New Zealand from 49% of adult cattle harvested (Table 3). The largest single classes of cattle contributing to table and processing beef are beef steers and F bulls respectively. The beef herd contributes 60% of annual table beef production whilst the dairy herd contributed an estimates 60% of processing beef.

At each ratio of table:processing beef receipts, beef-breed steers contribute one-third of total beef revenue followed by F bulls contributing one-quarter of total beef revenue (Table 4). The relative contribution of beef and dairy-origin cattle to beef industry revenue was similar across the range of table:processing beef returns analysed. As expected, income from cull dairy cows was least sensitive to changes in table and processing beef returns whilst revenues from bobby calves were most sensitive. The dairy herd plays a double role in New Zealand's livestock industry providing income from milk and con-

TABLE 3: Annual number of animals harvested and weight of processing and table beef from cattle of beef or dairy origin.

Class of cattle	Number of cattle harvested	Tonnes of Saleable beef	Tonnes of processing beef	Tonnes of table beef
Beef origin				
Cull cows	121,800	16,610	13,290	3,320
Steers	654,700	127,500	58,630	68,830
Heifers	343,500	54,410	25,030	29,380
Breeding bulls	11,160	2,734	1,859	874
Dairy origin				
Cull cows	237,000	33,420	30,080	3,342
bobby calves	1,098,000	9,935	0	9,935
F bulls	582,400	117,960	80,190	37,774
F heifers	29,700	4,508	2,254	2,254
Beef x F steers	124,300	22,297	11,148	11,148
Beef x F cull cows	121,700	15,090	12,820	2,263
Total	3,254,060	393,372	230,283	163,093
% from beef herds	33	48	41	59
% from dairy herds	67	52	59	41

tributing almost half of beef industry income. At the level of individual dairy producers however, income from beef sales comprise only 7% of farm income (Livestock Improvement, 1997b).

Twenty year industry income was expected to increase by $87.7 million or $43.9 million if the proportion of table beef harvested from all dairy-origin cattle was increased by 1% at returns for table to processing beef of $6,000:$2,000 or $4,000:$2,000 respectively. Similarly, a 1% increase in table beef from harvested beef cattle increased industry revenue by $94.9 million, or $49.3 million when table beef was worth three times and twice as much as processing beef respectively. Increasing the proportion of table beef by 1% in beef-breed steers or F bulls earned an extra $57.7 or $53.3 million respectively when table beef was worth $6,000 per tonne.

TABLE 4: Accumulated returns ($NPV) over a 20-year time horizon from table and processing beef derived from beef and dairy herds at three ratios of table:processing beef returns ($ x 10^6).

	Ratio of returns between from table: processing beef		
Class of cattle	$6,000: $2,000	$4,000: $2,000	$2,000: $2,000
Beef origin			
Cull cows	527.3	452.0	376.6
Steers	6,010.9	4,450.3	2,889.8
Heifers	2,565.7	1,899.4	1,233.4
Breeding bulls	101.7	81.8	61.9
Total	9,205.5	6,883.5	4,561.9
Dairy origin			
Cull cows	909.2	833.4	719.7
bobby calves	675.7	450.5	112.6
F bulls	4,384.8	3,529.3	2,246.0
F heifers	204.4	153.3	76.6
Beef x F steers	1,041.4	781.0	390.5
Beef x F cull cows	444.7	393.4	316.4
Total	7,660.1	6,140.9	3,861.9
Grand Total	16,865.7	13,024.5	8,423.9
% from beef	55	53	54
% from dairy	45	47	46

DISCUSSION

The dairy herd contributed 52% of beef, 59% of processing grade beef and 45% of total income confirming the importance of dairy-origin animals to New Zealand's beef industry (Webby and Thompson, 1994). Processing grade beef comprised 59% of total product (Table 2), yet has limited marketing options except as a commodity product is traded in larger quantity units at lower value than table beef. Due to the importance of product flows from the dairy herd, any beef industry initiatives aimed at increasing industry revenue should assess their impact on both the volume and classification of beef arising from the dairy herd.

The relative costs of production, processing and marketing of beef from both beef and dairy origin animals were not examined, this study should therefore be interpreted within its context of predicting industry revenues rather than industry profitability.

CONCLUSIONS

The dairy herd is an equal contributor to the beef sector product flow and revenue. Any improvement strategy within the beef industry should be considered with beef from dairy-origin cattle in mind.

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