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STRUCTURE AND PRICE FORMATION IN THE  
STORE CATTLE INDUSTRY

A thesis  
presented in partial fulfilment  
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## ABSTRACT

Substantial increases in overseas beef prices in recent years have made the farming of beef cattle increasingly important to the New Zealand economy. This study describes the place of the store cattle sector within the cattle industry and investigates price formation in the store cattle market.

The specific aims of the study were :

1. To identify and describe the various channels and institutions involved in store cattle marketing.
2. To investigate the process of price formation for store cattle on an annual basis.
3. To study the relationship of the prices of various classes of store cattle to each other and to the meat exporters' beef schedule.
4. To investigate the inter-regional price differences for classes of store cattle in relation to the transport cost differentials between regions.

Over the period 1965 - 1971 there was a 41% increase in total cattle (beef) numbers in the North Island. Also there was an increase in the proportion of younger steers in the herd at the expense of breeding cows and older steers. Over the same period the number of dairy calves bred and retained for beef purposes increased from approximately 180,000 to 460,000. The rearing of calves from the dairy herd suitable for beef production has made possible a far greater expansion of beef production than would have been possible from the traditional beef herd alone.

The structural changes in the traditional beef herd may be disguised by the presence of dairy beef animals suitable for beef purposes that are classified as beef cattle in the agricultural production statistics.

Present data limitations made it impossible to investigate the spatial nature of the North Island store cattle industry in the spatial equilibrium framework used by Judge and Wallace. However a statistical model was formulated to analyse store market prices for different classes of stock within a regional framework on a per head and per lb liveweight basis.

The factors influencing the price of store cattle included in the analysis were beef schedule price (OxGAQ), seasonal conditions, class of store cattle, and region of origin.

Although the model did indicate regional differences, no systematic or identifiable regional pattern of store cattle prices was apparent for individual classes of stock. However the results obtained for the per lb liveweight model were consistent with the conclusions of recent theoretical beef investment models, namely :

1. The store value of an animal on a per lb basis is greater than its slaughter value at any age prior to slaughter, and equal to it at slaughter. The per lb store value of a steer is larger for younger classes of steers and declines with age.
2. Changes in seasonal conditions have a greater impact on the price of younger classes of store cattle.
3. The beef schedule price coefficients for individual classes of steers on a per lb basis indicate that a unit change in the beef schedule price has a greater effect on the store cattle prices of younger classes of cattle. This is in direct contrast with the beef schedule price coefficients for the per head model where, as the age of the store animal increases changes in the beef schedule are reflected in greater increases in store prices.
4. The elasticity of store cattle prices with respect to the beef schedule price, is greater than unity for all cattle in the herd below the optimum slaughter age and declines monotonically towards unity as the animal approaches this slaughter age. The elasticities suggest that the optimum slaughter age for store cattle in the North Island is approximately  $2\frac{1}{2}$  years.

The investigation of the regional differences of store cattle prices for selected pairs of regions indicated that regional price differences in excess of the transport costs between pairs of regions exist. This suggests that it would be profitable for traders to transfer additional store cattle from the surplus store cattle breeding regions to the growing and finishing regions.

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## CHAPTER ONE

INTRODUCTION

Beef cattle have long been important in New Zealand's livestock based economy. Initially beef cattle were used, especially before the introduction of aerial top-dressing, to break in large areas of hill country and to maintain them for sheep farming. On farms where roughage control is important and on some hill country runs where cattle graze the swampy valleys, sheep and cattle grazing are still often complementary. However, over recent years substantial increases in overseas beef prices have resulted in cattle becoming recognised as meat producers in their own right.

These substantial increases in overseas beef prices as reflected in the beef schedule to New Zealand beef producers (see Table 1.7.3) have made the farming of beef increasingly important to the New Zealand economy, and the cattle industry is now an important area for research.

In particular this study describes the place of the store cattle sector within the cattle industry and investigates the process of price formation within this sector. The study is confined to the cattle industry in the North Island.

### 1.1 STRATIFICATION OF THE BEEF CATTLE INDUSTRY

Beef cattle are distributed fairly evenly over the occupied areas of the North Island apart from the predominantly non-sheep farming areas of Taranaki and parts of South Auckland. The proportion of total cattle to total sheep is higher on hill country and the proportion of breeding cows to total cattle is higher on the rougher, less fertile country.

In fact a pattern of stratification similar to that for sheep farming exists. The fattening/finishing process is usually restricted to the more fertile and improved pastures whereas the breeding of store animals is relatively more flexible with respect to pasture type. Free market economic forces work to reserve the better areas for fattening and entice the breeder onto the poorer country where he has a comparative advantage. With the exception of many farms which have areas of both classes of land

and on which both breeding and fattening may take place the majority of farms fall into the category of being either store or fattening units, with the regular transfer of store cattle occurring from the former to the latter. In areas where farms are predominantly of one class or the other this shifting of store cattle may occur over long distances. The best known example of this is the annual draft of store cattle from the East Cape region to the South Auckland fattening areas. (Predominantly 'store' producing beef cattle areas tend to be also predominantly 'store' with respect to the type of sheep run).

The beef cattle industry therefore is a two tiered structure with the movement of store cattle occurring from the breeding or store producing farms in response to a derived demand from the fattening/finishing farms. This movement of store cattle implies regional movements of cattle - 'inter-regional flows' - with the supply of store cattle of an area determined by the history of production of that area.

Buyers, from regions where production of store cattle does not satisfy local demand for finishing purposes, purchase store cattle from surrounding regions where excess supply exists above their requirements. In any year the supply is predetermined by production decisions in the previous year, or years, while the demand for store cattle shifts according to farmers' expectations of the future level of the beef schedule and the amount of feed available in any area. The aggregate demand curve for an area is the sum of the demand curves for that area and all other areas where cattle may be shipped.

The term "fattening" as used here is traditional but perhaps rather unfortunate in the light of the present discrimination against excess fat by the market as evidenced in the beef schedule. It should, therefore, be interpreted as synonymous with the growing and finishing to the desired size of non-breeding animals for slaughter. The store producing or breeding function on the other hand is essentially the biological production of such animals to be finished.



## 1.2 THE AIMS OF THIS STUDY

The specific aims of this study are as follows :

1. To identify and describe the various channels and institutions involved in store cattle marketing.
2. To investigate the process of price formation for store cattle on an annual basis.
3. To study the relationship of the prices of various classes of store cattle to each other and to the meat exporters' beef schedule.
4. To investigate the inter-regional price differences for classes of store cattle compared with the transport cost differentials between regions.

## 1.3 CHAPTER OUTLINE

The remainder of Chapter 1 is a brief resume of the importance of beef to the New Zealand economy, a statistical review of the New Zealand beef industry as it exists at present, and a summary of the recent changes of significance that have occurred within the New Zealand beef industry.

Chapter 2 describes the North Island cattle industry, the store cattle sector, and the institutions and channels involved in the marketing of store and finished cattle.

Chapter 3 discusses the factors affecting the supply of, and demand for store cattle, and the theoretical framework for inter-regional models. A spatial model is formulated to measure significant differences in observed store cattle prices in the North Island store cattle market and the data used outlined.

Chapter 4 discusses the results for the model formulated on a per head basis.

Chapter 5 investigates the store cattle market on a cents/lb unit liveweight basis to isolate (if possible) the problem of the varying description of classes of store cattle that may occur between regions.

Chapter 6 investigates the spatial distribution of store cattle

prices in relation to the transport cost differentials between selected pairs of regions.

Chapter 7 presents the summary and conclusions of the study.

#### 1.4 IMPORTANCE OF BEEF TO THE NEW ZEALAND ECONOMY

Overseas trade in primary products is an important feature of the New Zealand economy - in fact New Zealand has always been heavily dependent on overseas trade for its development and progress. Approximately one quarter of this country's gross national product is exported and a similar proportion of gross domestic expenditure is in payment for imports.

In recent years pastoral products processed to various degrees have contributed the major proportion of export receipts [ 3]. This proportion has been slowly declining, but such products still account for roughly 90% of total visible exports. Meat exports earned a record \$613.6 million in the year ended 30 September 1973, an increase of \$158.7 million or 34.9% on the 1971-72 season's record. [11]

Together meat and meat by-products returned \$742.8 million, or 40.7% of New Zealand's total export receipts of \$1,823.2 million. [11] The dramatic rise in New Zealand's meat export earnings is attributable largely to the increasing world demand for meat and to lower domestic production in some major markets caused by a shortage of grains and other animal feed stuffs. Meat shipments to all destinations for the season totalled 652 459 tons which was a drop of more than 15,000 tons, or 2.2% on those for the 1971-72 season. [6 ]

Despite the decline in shipments, estimated receipts for each type of meat were up on the previous season's figures. Beef and veal remain the principal earners of New Zealand's meat export income. Beef and veal accounted for an estimated \$266 million, or 35.8% of the total export earnings for meat and meat by-products, with lamb and mutton accounting for 33.3% and 8.1% respectively. [11]

The relative importance of beef and veal exports, in quantity rather than value terms, remained rather static in the early 1960's

but since 1967 the volume of beef and veal exports have risen in response to higher overseas beef prices.

In the long run, different types of pastoral production may be substituted one for another. At some time in the future, much more of New Zealand's pasture land could be devoted to beef production if changes in relative market prices for the various alternative final products were to warrant such a change in output proportions.

#### 1.5 ECONOMIC IMPORTANCE OF BEEF CATTLE TO THE INDIVIDUAL FARMER

The economic importance of beef cattle to a sample of sheep farmers surveyed by the New Zealand Meat and Wool Boards' Economic Service for the years ended 30 June 1961, 1966 and 1972 are shown below in Table 1.5.

TABLE 1.5      CATTLE INCOME AS A PERCENTAGE OF GROSS FARM  
INCOME ON NEW ZEALAND SHEEP FARMS  
(AVERAGE FOR EACH FARM CATEGORY)

	<u>1961</u>	<u>1966</u>	<u>1972</u>
	<u>Year Ended June 30</u>		
<u>Farm Class</u>			
High country (S. Is.)	7.6	4.9	20.0
Hill country (S. Is.)	9.2	12.6	26.0
Fattening/breeding (S. Is.)	4.7	7.0	10.6
Intensive fattening (S. Is.)	3.1	5.0	8.3
Mixed fattening (S. Is.)	3.8	2.7	0.3
Hard hill country (N. Is.)	29.4	28.5	38.7
Hill country (N. Is.)	19.6	21.4	32.1
Fattening country (N. Is.)	18.0	16.5	26.3

Source: New Zealand Meat and Wool Boards' Economic  
Service Bulletins and Sheep Farm Survey 1971/72 [ 8]

This Table highlights the increasing importance of cattle on all the major farm types and in particular the more important role of cattle on North Island sheep farms, though their use in the South Island is increasing.

#### 1.6 CURRENT PRODUCTION, CONSUMPTION AND EXPORTS

In January 31 1973 there were some 9.09 million cattle in New

Zealand. Approximately 37% (3.36 million) of these were classified as dairy animals and 63% (5.73 million) as 'beef' animals. [ 5] (The word 'beef' is placed in inverted commas here because of an inconsistency which occurs between common usage of the word and the usage in the national statistics. Note that the product beef, is derived not only from 'beef' animals but also from 'dairy' animals, in both usages.)

The proportion of breeding stock to dry stock in the two national categories is quite different; at January 1973 there were 65% (2.19 million) dairy cows in milk as opposed to only 35% (2.00 million) beef cows used for breeding. Approximately half of New Zealand's current annual calf crop comes from dairy cows. Of these dairy-cows, about 60% are now Jersey and over 80% of the remainder predominantly Friesian. The increasing importance of calves of dairy origin suitable for beef production will be discussed in Chapter 2.

Each year about one third of the total cattle population is slaughtered. In the 1972/73 season, for the year ended 30 September 1973, total slaughterings amounted to 3.10 million head [10] comprised as follows :

Calves (under 60lb)	0.97 million
Vealers (61 - 350lb)	0.09
Heifers	0.22
Steers	0.74
Cows	0.82
Bulls	0.26
	<hr/>
	3.10 million

There is no known data available to show the break up of each of these age/sex classes slaughtered into the main dairy and beef breeds. Nevertheless indications are :

- (i) Virtually all the bobby calves are from the dairy herd.
- (ii) The cow slaughterings of dairy and beef herd origin are roughly in the same proportion as their respective breeding cow populations.
- (iii) The majority of the steers and heifers will be 'beef' breed animals.

Calder [15] estimated that the dairy herds contribution to export beef and veal production for the years ended 30 September 1969, 1970 and 1971 was 40%, 43% and 45% respectively.

Total slaughterings yielded for the year ended 30 September 1973, an estimated total weight of carcass (bone-in) beef of 420 thousand tons, and 22 thousand tons of veal (Ministry of Agriculture and Fisheries estimate).

New Zealand's domestic consumption of beef took 121,000 tons (27%) of this total bone-in beef production, leaving 321,000 tons for further processing and export in the year ended 30 September 1973 (Ministry of Agriculture and Fisheries estimate)

No data is available, but it is apparent that consumption in New Zealand is mainly of the better quality beef derived from prime steer, prime heifer and heavy vealer animals.

Table 1.6 gives an indication of the various types of beef exported in 1972/73 season (i.e. September year) on a bone-out or shipping weight basis.

TABLE 1.6      NEW ZEALAND'S BEEF AND VEAL EXPORTS (SHIPPING  
WEIGHT) BY MAIN CATEGORIES FOR THE YEAR ENDED  
30 SEPTEMBER 1973

Chilled Beef Quarters and Cuts	1,327
Frozen Beef Quarters	4,426
Frozen Beef Cuts	29,642
Frozen Beef and Vealer Manufacturing	156,458
Vealer Quarters and Cuts	541
Bobby Veal	6,592
<b>TOTAL BEEF EXPORTED</b>	<b>198,986 tons</b>

Source: New Zealand Meat Producers' Board Annual Report

Therefore, in the 1972/73 season 79% of our exports of beef were boned-out frozen manufacturing beef and veal suggesting that the majority of prime beef is consumed within New Zealand.

## 1.7 RECENT CHANGES OF SIGNIFICANCE

### 1.7.1 Cattle Numbers

Table 1.7.1 indicates that over the thirteen years from 1960 to 1973, dairy cattle numbers increased by 12.8%, beef cattle numbers by 89.9% and total cattle by 51.7%  
[ 5]

TABLE 1.7.1      RECENT INCREASES IN THE NATIONAL BEEF AND  
DAIRY HERDS

	000 head as at January 31			
	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1973</u>
Dairy Cows in Milk	1887	2032	2321	2190
Total Dairy Cattle	2973	3174	3729	3355
Dairy Cows as a % total dairy cattle	63.5	64.0	62.0	65.3
Beef Cows and Heifers over 2 yrs used for breeding	1144	1320	1519	1996 <sup>1</sup>
Total Beef Cattle	3019	3628	5048	5733
Beef Cows as a % total beef cattle	38.0	36.4	30.0	34.8
Total Cattle	5992	6801	8777	9088

1. Includes cows and heifers of all ages used for breeding

Source: Department of Statistics

Over the same period total sheep numbers increased from 47.1 million in 1960 to 60.9 million in 1972, an increase of 29%.

### 1.7.2 Slaughterings and Meat Production

Over the same period annual slaughterings of 'beef' and dairy animals and therefore total beef production show year to year fluctuations. Short run fluctuations aside, there has been a long run increase in annual cattle slaughterings, while calf slaughtering has shown a decline over recent years.

TABLE 1.7.2

## ANNUAL CATTLE AND CALF SLAUGHTERINGS

Year ended 30 September	Cattle Slaughter (000 head)	Calf Slaughter (000 head)
1960	956	1,234
1965	1,138	1,231
1970	1,836	1,311
1971	1,828	1,077
1972	1,784	1,061
1973	2,044	1,063

Source: Ministry of Agriculture and Fisheries Slaughtering Statistics.

Therefore, over the past 13 years adult cattle slaughter has increased by 114% and calf slaughter has declined 14%.

Figure 1.7.1 shows graphically the changes in total beef cattle and beef breeding cow numbers since 1960. When Figure 1.7.1 is compared with Figure 1.7.2, it will be noticed that increases in beef production tend to follow increases in breeding stock. Also it is to be expected that when the national beef herd in general, or the breeding herd in particular, are being built up faster than normal by the retention of a greater proportion of young females as replacements, increases in beef production will be lower than normal.

The percentage of total beef and veal production consumed domestically declined from 44% in 1960 to 27% in 1973 (on a September year basis). However, the absolute consumption of beef and veal in New Zealand rose steadily until about 1967, but since then has declined suggesting that the consumption of beef shows some response to price and the general economic climate.

Residual beef and veal production (bone-in) left available for export is also shown graphically in Figure 1.7.2. Again short run fluctuations aside it appears that beef exports rose gradually till about 1967, but since then have increased dramatically.



Figure 1.7.1. Annual Beef Cattle Numbers 1960-1973  
(At January 31)

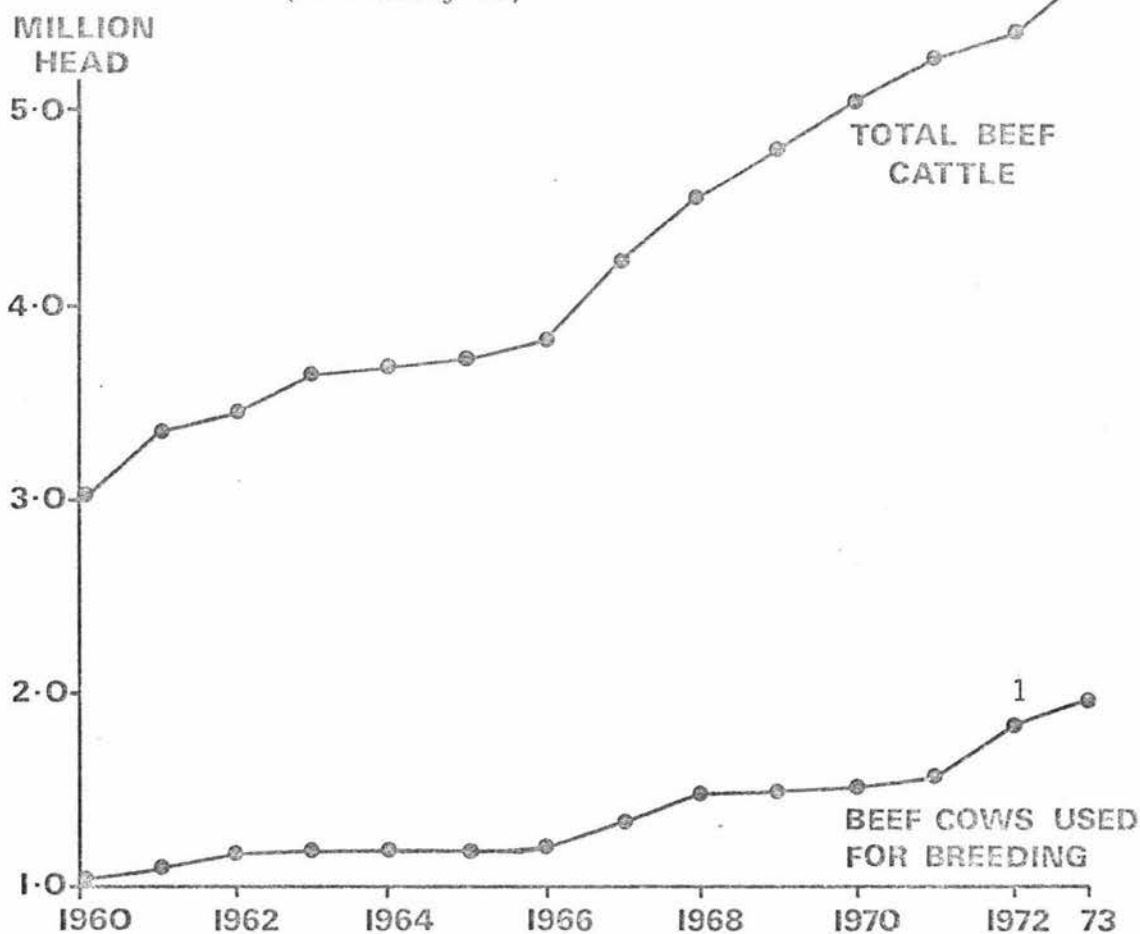
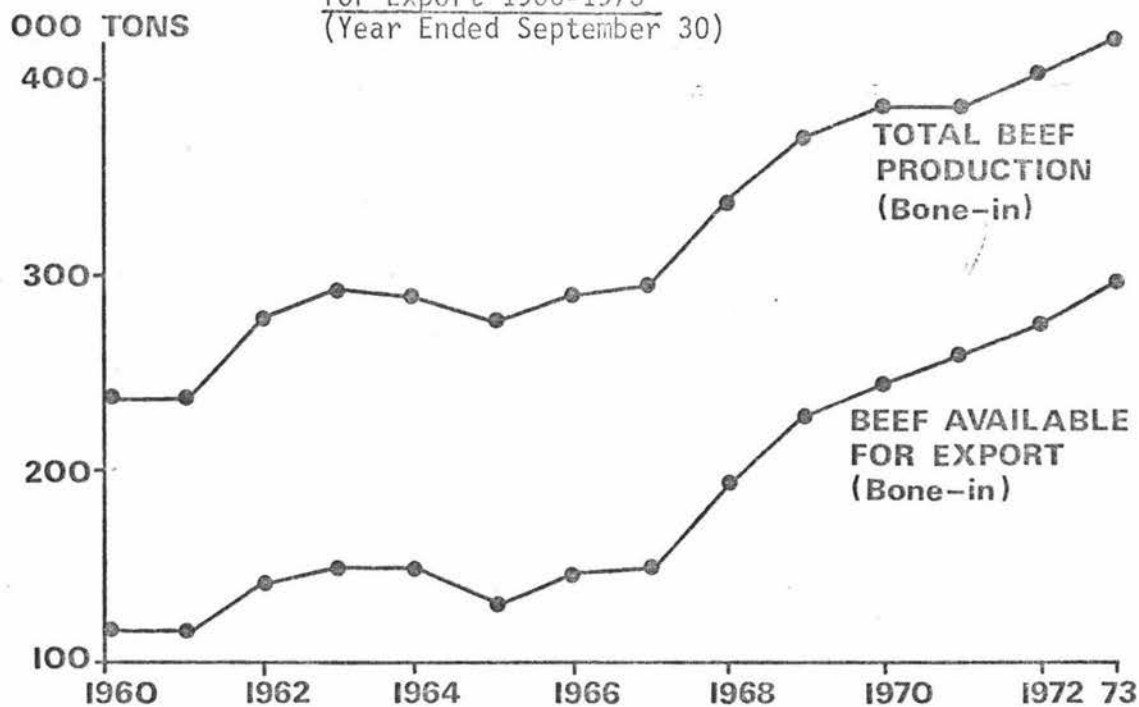


Figure 1.7.2. Annual Beef Production and Beef Available for Export 1960-1973  
(Year Ended September 30)



Source: Department of Statistics - New Zealand Year Books

1 Prior to 31 January 1972 heifers under 2 years old which were used for breeding were not included.



### 1.7.3 Export Beef Schedule Prices to Producers

General beef prices have shown a marked rise since World War II. Economic trends favoured the expansion of beef production in the 1960's and moderated growth in dairy and sheep production. Prices to producers for beef increased at a faster rate than for other livestock products reflecting the rise in world demand for beef. While meat prices showed sizeable increases there were only slight increases in dairy prices and a decline in wool prices. Taking opening beef export schedule prices as indicators of seasonal levels, the price (undeflated) for top grade steer carcass beef rose from 4.5 cents per pound in 1946 to 29.0 cents per pound in 1972. In particular Table 1.7.3 indicates the movement of selected North Island opening beef export schedule prices over the period 1960 to 1972. The top grade steer schedule rose 207 percent over this period from 14.0 cents per pound in 1960 to 29.0 cents per pound in 1972. Opening boner cow and boner bull prices have shown an even greater rise over the same period. Boner cow and boner bull schedules rose by 230 percent over the same period. The large increase in boner cow and boner bull schedules occurred due to the development of the United States market for New Zealand manufacturing grade beef and its continued growth since the late 1950's.

TABLE 1.7.3

SELECTED NORTH ISLAND BEEF EXPORT SCHEDULE PRICES  
(CENTS/LB CARCASE WEIGHT)

<u>OPENING SCHEDULE FOR THE SEASON BEGINNING OCTOBER 1</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
1. PRIME STEER, GAQ ( TOP WEIGHT GRADE)	14.0	11.5	13.5	12.5	15.0	15.0	15.5	14.0	18.0	21.5	22.5	25.0	29.0
2. BONER COW (TOP WEIGHT GRADE)	11.0	10.0	10.0	10.5	10.5	11.3	14.0	12.5	17.0	19.5	20.0	21.0	25.5
3. BONER BULL (TOP WEIGHT GRADE)	12.8	12.0	13.0	13.3	13.5	14.0	17.3	17.3	22.0	24.5	24.0	26.0	30.0

SOURCE : NEW ZEALAND MEAT PRODUCERS' BOARD ANNUAL REPORTS