

## **PASTURE-BASED BEEF PRODUCTION IN NEW ZEALAND**

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### **Introduction**

New Zealand lies in the Southern Pacific Ocean, 1,600 km east of Australia. It is made up of the North and South Islands and a number of smaller islands, with a total land area of 266,171 sq. km, which is 3% of that of the United States. Mountain ranges and hill country dominate New Zealand's landscape. The Southern Alps along with the fjords, glaciers and lakes, and the coastal plains of Canterbury and Southland, add to the variety of South Island scenery. In the North Island, the volcanic interior contains New Zealand's largest lake, Lake Taupo, and most of the country's active volcanoes - Ruapehu, Ngauruhoe and Tongariro - all usually quiet, although Ruapehu has been active since September 1995. Hot springs, geysers and mud pools also form part of the volcanic system in the central North Island. Of New Zealand's population of 3.8 million, two-thirds live in the northern region of the North Island. The distribution of the population is 85% urban and 15% rural. The largest city is Auckland with a population of one million, while the capital city, Wellington has 350,000 residents.

The climate is temperate - the mean daily range from 44°F (8°C) in July to 63°F (17°C) in January - but summer temperatures reach over 86°F (30°C) in many places. The average rainfall varies widely - from less than 16" in Central Otago (central South Island) to over 250" in the Southern Alps. For most of the North Island and northern South Island the driest season is summer (December-February). However in the West Coast of the South Island and much of inland Canterbury, Otago and Southland, winter (June-August) is the driest season. The wide variation in climate and scenery makes for an attractive tourist destination, despite its isolation in the South Pacific.

New Zealand stretches through more than 12 degrees of latitude, from 34-47° south, this is equivalent to Albuquerque NM through Missoula MT in the north. The range of latitude provides a climate ranging from sub-tropical north to the colder southern regions, the climate generally favors pasture growth all year round, and it is upon this that the livestock industries, and the economy, is largely based.

### **Agriculture And The New Zealand Economy**

Today New Zealand farmers operate in an almost completely unsubsidized economy with subsidies accounting for less than one percent of producer income. Agricultural production in New Zealand is already the least subsidized of any major agricultural producing nation with the aim of becoming completely unsubsidized (across all industries) by 2006. New Zealand will become the first country that will have no protection from imports from any part of the world. As an exporting nation that is exposed to international trade patterns New Zealand businesses realize that if they

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cannot keep up with world's best practice they will not be financially viable. This is as true for beef cattle production as for any industry - agricultural or otherwise.

New Zealand's economy is heavily dependent on overseas trade. Traditionally, a large proportion of New Zealand's exports, mainly agricultural products, went to the United Kingdom. In the past 20 years, however, New Zealand has adapted to a changing world so that Asia is now more dominant. Our largest export markets are Australia, which takes 20% of all exports, second is Japan at 16%, followed by the United States with 10%. In recent years New Zealand has attempted to develop its agriculture and manufacturing industries to suit the needs of niche markets. This has meant a move away from its dependence on bulk dairy, meat and wool exports to further processed dairy, meat and wool products of higher value.

It is the livestock sector's contribution to export earnings that drives the New Zealand economy (Table 1). New Zealand exports around 22% of gross domestic product compared with 8.1% for the United States. Of the \$ NZ 20.4 billion (NZ \$1 = US \$ 0.52) earned from exports in 1997, 44% was from pasture-based livestock products. In total, agriculture contributed 49.6% of New Zealand's export earnings in 1996-97.

*Table 1: F.O.B<sup>1</sup> Value of New Zealand's Exports - year ended June 1997 (NZ \$ million) (Source: NZMWBES, 1999). (\$1 N.Z. = \$ US .52 approx.)*

Wool	906.1	
Lamb and mutton	1,482.3	
Beef	1,167.7	
Venison (from deer)	1,33.2	
Edible offal	79.6	
Other	63.1	
<b>TOTAL MEAT</b>		<b>3,832</b>
Dairy	4,364.1	
Other animal products <sup>2</sup>	969.3	
Livestock	134.8	
<i>Pastoral products</i>		<b>9,309.6</b>
Fruits & Cereals	1,390.9	
<i>Total Agriculture</i>		<b>10,700.5</b>
Fish	1,105.7	
Forest Products	2,280.6	
Aluminum	959.1	
Other Exports	6,443.6	
<i>Total Exports</i>		<b>21,489.5</b>

<sup>1</sup>F.O.B. - Free on Board. <sup>2</sup>Edible offals, hides and skins, tallow, live animal exports.

## **Beef Exports**

The beef cattle industry in New Zealand is based on a national herd of around 5 million cattle. The beef industry accounts for only about 1.1% of total world beef production (Figure 1). In terms of beef that enters the international trade, however, it is somewhat more significant with about 10%

coming from New Zealand (Figure 2). Beef export returns in 1998/99 are 22% lower than at the same time in the previous 12 months due to lower cattle numbers and harvest weights combined with increased domestic consumption and problems with Asian economic woes. In addition to making an important contribution to export income, the beef industry is also important as a supplier of high quality foodstuffs for consumption within New Zealand (about 20% of total beef production), and as a provider of employment.

Figure 1: Beef production from selected countries in 1996. Source: NZ Meat & Wool Boards Economic Service - Annual Review of the Sheep & Beef Industry 1996-97

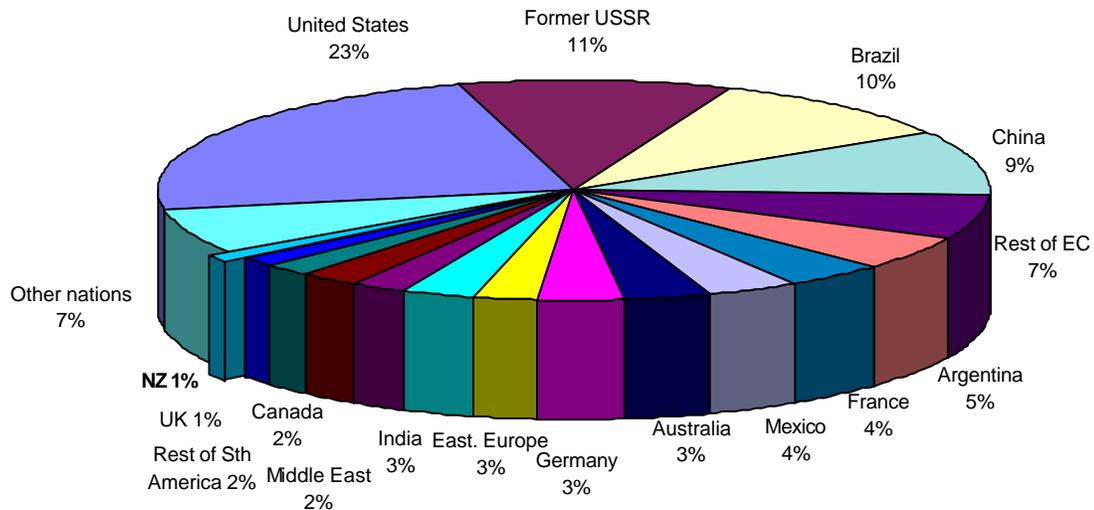
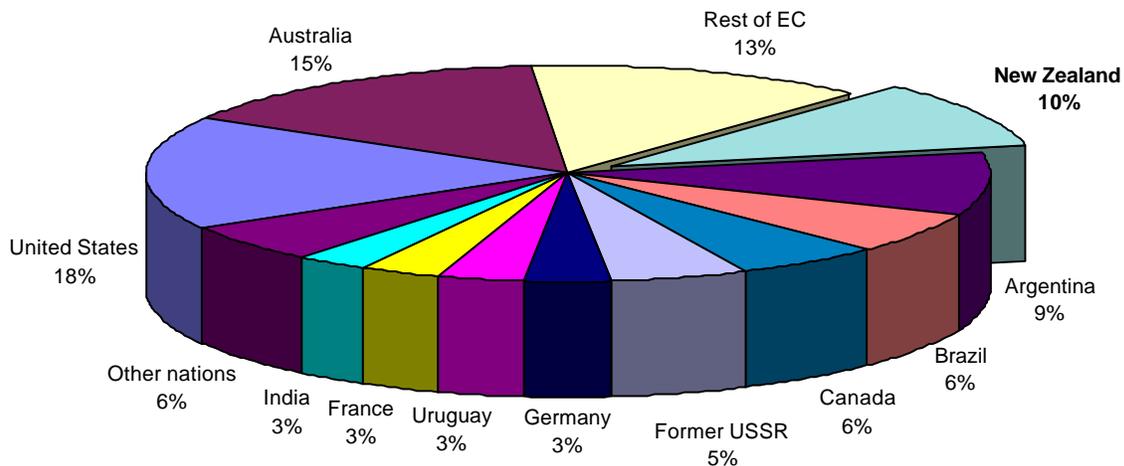


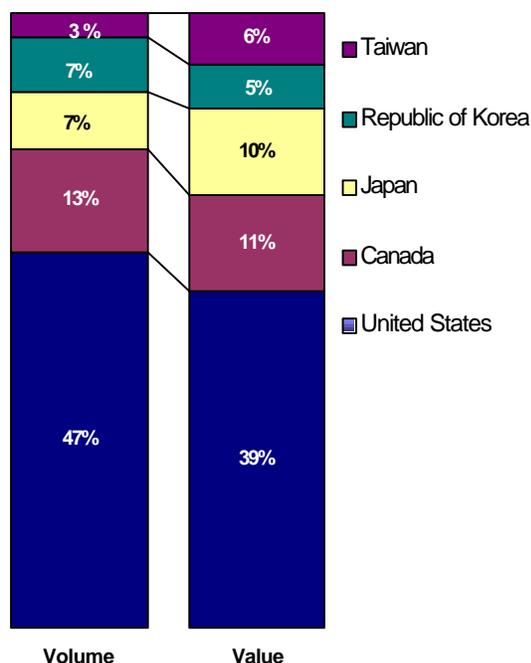
Figure 2: Beef exports from Selected Countries in 1996 Source: NZ Meat and Wool Boards Economic Service - Ann. Review of the Sheep and Beef Industry 1996-1997.



Beef is New Zealand's least diversified meat export with the majority of exports going to North America in 1999 (63% to USA and 13% to Canada). There has been an increased effort in recent

years to diversify to other markets, notably Mexico, South Korea, Taiwan, Japan, Singapore, Indonesia and Malaysia. This diversification will presumably continue but these new markets require table beef as opposed to the processing grade beef. The increased requirements of table beef will require farmers to focus on meat quality and appearance traits such as muscle and fat color, degree of marbling (indication of tenderness and juiciness of meat) and yield of red meat. This will be the challenge over the next 5-10 years. The need for greater diversity of export markets can be determined by comparing the percentage of beef we export to major markets with the percentage of export earnings from these markets. Of the five major beef export destinations for New Zealand only the Japanese and Taiwanese markets had a value : volume ratio of greater than one (Figure 3).

Figure 3: Percentage of beef exports by volume and value in 1996 for the five major export markets.



One reason for differences between value and volume of exports can be explained by the composition of exports. In 1996, approximately 4% of beef by volume and 9% by value was exported in chilled form. Nearly half of this chilled product was exported to Japan with the remainder to predominantly Asian and Pacific countries. In contrast, North America consumed the large majority of New Zealand's frozen beef exports. Some industry commentators suggest these Asian markets should be targeted to further diminish reliance on the North American processing grade beef markets.

Despite increased diversification of exports into North and South Asian countries in the last seven years, beef exporting remains a relatively straightforward commodity business aimed at supplying frozen, lean beef of consistent specification to manufacturers. New Zealand helps fuel America's enormous appetite for ground beef, which makes up 42% of total beef consumption in the United States. Unlike New Zealand, Australia has steadily diversified its beef trade away from North America to North Asia and is now exporting around 44% of its total beef exports of 707,000 metric tons to North Asia. A large proportion of these exports are grainfed feedlot cattle, an area where Australian has an advantage over New Zealand because of its vast and cheap grain resources.

## Land Use and Livestock Numbers

### *Landuse*

Of New Zealand's 67.5 million acres of land slightly over half is in grassland, and of this 23.5 million is improved grassland and 14 million is native tussock land, mostly found in the South Island hill and mountain areas. There are 2.5 million acres in exotic forest, primarily *Pinus radiata*. The area devoted to crops and horticulture is one million acres of which half is in cereal

crops. This relatively small area in cereals results from New Zealand not having any natural advantage, climatically or in terms of scale of operation enabling it to compete in the world grain markets. Since the pork and poultry industries are based very heavily on grain, these two industries are restricted to supplying the domestic market only.

### ***Livestock numbers***

The New Zealand climate favors pasture growth, and it is the key to the livestock production sector. Pasture provides up to 95% of the diet of dairy cows and virtually the whole diet of sheep and beef cattle. The 35 million acres of grassland in New Zealand carries a large number of ruminant livestock (Table 2).

Table 2 - *Livestock numbers (millions) in New Zealand 1998: (Source NZMWBES 1999).*

Livestock class	Number (millions)
Sheep	46.15
Beef Cattle	4.23
Dairy Cattle	4.34
Deer	1.27
Goats	.21
Pigs	.39
Poultry	50.00
Horses	.09

Current estimates are that there are 23,958 commercial sheep and beef cattle farmers, 16,466 dairy farmers and 2,179 deer farmers (with 3,000 of the sheep and beef farmers also running deer) in New Zealand. There has been an increasing trend to rural lifestyle subdivision leading to a significant number of smaller part-time farmers (approximately 36,000) who derive a large part of their income from off-farm activities. In total there are 66,045 farmers in New Zealand. In the year ended 30 September 1997, 2.4 million adult cattle were harvested in addition to some 1.4 million four day old calves.

### ***Range of production environments***

Livestock production systems range from intensive sheep, beef or dairy cattle farms, on the highly productive lowlands, through to extensive high country farms involving just sheep and cattle. New Zealand grasslands can be conveniently divided on the basis of topography and elevation into three broad farming groups: high, hill, and flat to rolling country (Bryant and Sheath, 1987). While the area of each is similar (Table 3), they vary in the quantity of pasture produced, and the number and type of animals carried. High country is characterized by hilly terrain and low pasture production especially during cold winter months and is used for predominantly sheep farming based on wool production. Flat to rolling country usually has good all year round pasture production and supports almost all of New Zealand's dairy cattle in addition to large numbers of sheep and beef cattle.

Table 3: Area, pasture production and number of livestock carried on the three grassland regions.

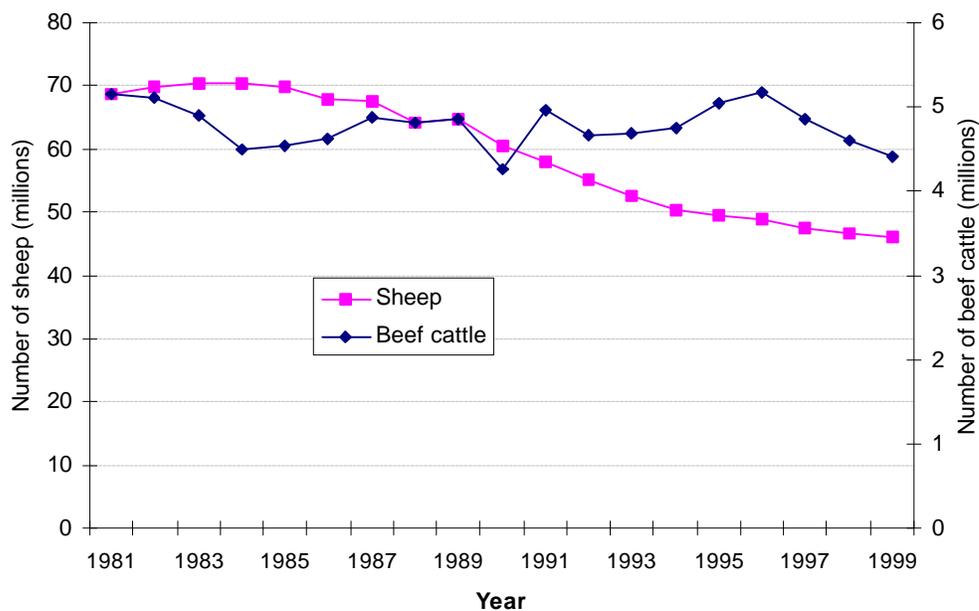
Region	Area (m/acre)	Pasture Production (tonnes/DM <sup>1</sup> /acre)	Livestock (m)			su <sup>2</sup> /acre
			Sheep	Beef	Dairy	
High country	11.25	.8	2.5	.1	-	.28
Hill country	12.5	2.7	20.3	1.9	.2	3.0
Flat to rolling	11.25	4.4	26.7	2.9	3.4	5.6

<sup>1</sup>DM = Dry matter. <sup>2</sup>su = stock units. Since most farmers have both sheep and cattle, the stock unit (su) is the common unit used to express stocking rate where 1 su = one breeding ewe.

### The Beef Cattle Industry

In New Zealand beef cattle and sheep are usually farmed together and are considered complementary to one another especially under hill country conditions. Over the last 20 or so years there has been an emergence of the specialist all cattle farm based primarily on the Holstein-Friesian bull to supply the manufacturing beef trade. It is relatively easy for producers to alter their mix of sheep and cattle to suit current economic conditions and preferences. Figure 4 shows the trend in beef cattle and sheep numbers over the period 1981-97 and the substitution which has taken place between those two livestock types.

Figure 4: Change in beef cattle and sheep numbers from 1981 to 1997 (Source: NZMWBE, 1998)



The main driving force behind this substitution is relative profitability between cattle and sheep. The expansion of the sheep flock and the decline in cattle numbers through the late 1970's was driven by market prices favoring sheep. Growth in beef cattle numbers has occurred since 1983 but there was a significant set back in 1989 and again in early-mid 1998 due to severe droughts and the forced harvest of capital stock (beef breeding cows) at that time. Despite a 0.6% decrease in beef cattle numbers from 1986, beef production has increased by 23% (NZMWBE, 1998).

Traditionally, New Zealand beef production has been based upon the breeding herd. Bull calves are castrated and raised as steers for harvest either on the beef breeding herd farms or on finishing farms usually located on the better class of country. Heifer calves replace the cows within the breeding herd. While this management system is still practiced around the country another system relying on the dairy herd relies on purchases 4-day old calves from the dairy herd and raises these as bulls for harvest or heifers for replacements in the breeding herd or as once-bred heifers. The latter system involves heifers at 2-years with their calves being sold at weaning and their heifer herself being harvested some three months following weaning. The advantage of this is that no capital overhead tied up in a beef breeding herd, so more capital can be used for direct income generation.

The increasingly higher percentage of the New Zealand beef herd being derived from the dairy herd has resulted in the ratio of beef breeding cows and heifers in the national herd declining from 36% in 1972-73 to 30% in 1992-93 with a resultant increase in “trading “ or finishing stock. In fact unless retention of female stock numbers increases, future growth and annual fluctuations in beef cattle numbers are primarily due to the number of dairy calves originating from the dairy industry that are reared for beef production. In terms of product flows, the dairy herd contributed 52% of total beef produced in, 59% of processing grade beef and 45% of total income from beef (Charteris et al. 1998). This confirms the importance of animals of dairy origin to New Zealand's beef industry. The dairy herd plays a double role in the livestock industry providing income from milk and contributing almost half of beef industry income.

#### **Breeds and genetic change - *Breed composition***

Total numbers and predominant breeds of cattle reported from a 1987 census and from an unpublished study in 1992/93 are shown in Table Four.

*Table 4: Breeds of cattle and breeding cows (Statistics NZ 1987; NZMWBES, unpublished)*

<u>Beef cattle breed</u>	<u>Percentage of beef cattle by breed</u>		
	<u>Statistics New Zealand (1987)</u>		<u>1992/93 unpublished</u>
	<u>Cows and heifers bred</u>	<u>All cattle</u>	<u>All cattle</u>
	<u>from</u>		
Angus	28.7	22.7	21.9
Angus x Hereford	18.5	17.7	13.5
Hereford	17.8	13.3	12.5
Friesian	2.7	10.7	10.9
Friesian x Hereford	1.9	3.3	0
Murray Grey	1.3	1.0	1.0
Shorthorn	1.0	1.2	1.0
Simmental	0.4	0.3	1.0
Mixed	18.2 <sup>1</sup>	18.2 <sup>1</sup>	35.4
Other	9.3	11.6	2.8
Total cattle	1,586,247	4,804,178	N/A

<sup>1</sup> Unspecified cattle, no breed reported on the census form or incomplete census form submitted

In 1987, Angus, Angus x Hereford and Hereford cattle comprised 65% of the national beef cow herd and 54% of total beef cattle (Statistics New Zealand, 1987). Based on the NZMWBES farm survey undertaken some five years later, the estimated proportion of Angus, Hereford and crosses was slightly lower at 48%. This lower proportion may have reflected sampling errors or a greater use of non-traditional beef breeds. Furthermore, a large proportion of beef cattle (35%) from the 1992/1993 survey were classified as mixed. Due to New Zealand's temperate climate and lack of tick problems, *Bos indicus* cattle account for less than 1% of all cattle and comprise breeds such as Sahiwal x Friesian for export to Indonesia, Santa Gertrudis, Australian Brahman and Brangus.

### ***Breeding bull sales***

Some 18,000 to 20,000 beef breeding bulls are sold in New Zealand annually (Charteris and Garrick, 1996). Sale destination for yearling and two year old bulls to dairy and beef cattle farmers are shown by breed in Table 5. The majority of Hereford bulls sold (56%) and to a lesser extent Angus bulls (41%) are sold to dairy farmers. Simmental breeders sold only a small proportion (11%) of their bulls to dairy farmers. Sales of yearling bulls accounted for 34% (Angus), 47% (Hereford) and 16% (Simmental) sales. Breeders comment that these bull sales (especially to dairy farmers) tend to be at lower prices than 2 year old bull sales and include bulls that are not considered worthy of retention through to sale at 2 years of age. In contrast, beef cattle farmers primarily bought two-year old bulls. Hereford and Angus bulls are preferred by dairy farmers for their ease of calving attributes and ability to sell progeny for premium prices. Two year old bulls sold to beef farmers are sold between May and July, with average prices per bull around \$NZ 2,000.

Table 5: Sale destination by breed and bull age for Angus, Hereford and Simmental bulls (Charteris and Garrick, 1996)

Bull breed		<u>Yearling bulls</u>		<u>2 Year old bulls</u>		<u>Older bulls</u>
		To beef farmers	To dairy farmers	To beef farmers	To dairy farmers	To all farmers
% of bulls sold	Angus	6.3	27.9	51.4	12.8	1.6
	Hereford	2.0	45.4	41.5	10.8	0.3
	Simmental	7.9	7.6	78.3	3.4	2.8

### ***Genetic improvement***

Approximately 70% of the 65,000 recorded beef cattle within registered herds are evaluated using the Breedplan evaluation (Graser *et al.* 1995). Breedplan, developed at the University of New England, Armidale, Australia provides a series of Estimated Breeding Values (EBVs) for a number of selection criteria including live weight, fertility, maternal, and carcass traits. EBVs are conceptually similar to Expected Progeny Differences (EPDs) used in North America. To date, with the exception of Landcorp Farming Ltd. (Enns and Nicoll, 1997) bull-buyers have not been able to evaluate the relative economic importance of these EBVs. In a recent study, breeding objectives were developed for a range of New Zealand beef cattle breeding, production and marketing circumstances. Estimated Breeding Values (EBVs) were weighted by their effect on farm profit to derive an index value for each bull. A sire selector on the World Wide Web

([www.beef.org.nz](http://www.beef.org.nz)) was developed which ranks bulls on their expected contribution to farm profit as well as providing a search for bulls within specific EBV ranges (Charteris et al. 1998).

### **Systems of Beef Production**

Many different systems of beef cattle production exist in New Zealand, but these can be conveniently divided into those involving beef breeding cows and those that are concerned with the growing and finishing of beef cattle. Both systems are operated on the same farm in some cases. An alternative division of the industry is into prime beef production, primarily from steers and heifers of beef breeds, and dairy beef production, which involves the raising of dairy-bred bulls for the processing or manufacturing beef trade. In recent years, as the price for prime beef has increased relative to manufacturing beef from bulls, an increasing number of cattle from the dairy industry have been used for prime beef production.

Most beef breeding cow herds are found on hill country farms in the North Island, usually in conjunction with other livestock such as sheep and deer. The growing and finishing farms for beef production, in contrast, are mainly on lowland farms where the cattle can be finished on high quality pastures. For almost all beef cattle raised in New Zealand pasture contributes over 95% of their total diet. Forage crops other than pasture are not used widely, but supplementary feed of various types (hay, silage, concentrates, forage crops) may be used during times of feed shortage during winter or during particularly dry summers.

Only a very small proportion of cattle in New Zealand are finished in feedlots, mainly because of the high price of local grain relative to pasture. There is, however, one large feedlot (10,000 head capacity) in the South Island which is part owned by a Japanese company that markets all the product in Japan. Beef production in New Zealand is well served by an efficient, technologically advanced, and innovative processing industry, and both the production and processing sectors have access to a range of strong research groups.

There are several reasons for cattle numbers to vary on different farms and often profit is not the motivation for keeping cattle. Other reasons include:

- pasture control - especially where there is a lack of subdivision
- pasture development - control of scrub, fern and rushes
- labor - spread labor requirements, variety of work, cattle often require less work per stock unit than sheep
- cash flow
- risk management
- animal health reasons
- farmers may like cattle rather than sheep

Under all of the above conditions we can consider cattle as complementary to sheep but when subdivision and stocking rate increases on an individual farm, it is true to say that the role of cattle changes from complementary to a competitive one. There is another type of beef cattle farm, that of the specialist bull breeding unit. Most of the comments that pertain to commercial breeding cows

units would apply to bull breeding units since the commercial cattle farmer is client of bull breeding units.

### Beef Breeding Cow Herds

In New Zealand the beef breeding cow has developed a complementary role to sheep in mixed livestock farming systems. However, her traditional position as a complement to sheep farming has been challenged by many farmers over the last decade as efforts are made to improve breeding cow profitability (Webby and Thompson, 1994). The beef breeding cow of the future acts in both a complementary role and as a direct competitor to sheep on the basis of financial performance.

The beef breeding cow contributes to financial performance of the farm directly, through sale of offspring and through her own sale value and indirectly through maintaining pasture quality—especially during autumn. It was noted by Webby and Thompson (1994) that from a survey of North Island beef farmers, the indirect benefits of the beef breeding cow were listed by farmers in order of importance as being:

1. complementary grazing,
2. self-replacing
3. maintaining pasture quality
4. low risk, flexible enterprise with a diversity of income and
5. easy to manage in relation to other stock classes

The objectives of a commercial beef breeding cow herd are to:

- rear to weaning a large number of calves (95 per 100 cows mated each year)
- wean calves with a heavy liveweight (220 kg or better)
- maintain a low death rate in the herd (2 to 3% per annum)
- make use of the breeding cow in promoting and maintaining improved pastures

Table 6 outlines some physical production data for three different classes of farms carrying beef cattle in the North Island. Note the calving percentages and that the national calving percentage (the number of calves weaned as a percentage of cows mated) ranges between 80-85%.

*Table 6 Physical data from North Island beef cow herds 1995-1996 (Source: NZMWBES, 1997b.)*

		Type of farm <sup>1</sup>		
		Hard hill country	Hill country	Intensive Finishing
Total cattle		432	370	269
Cows to bull		128	84	34
Calving %		79.9	84.5	85.7
Mating Date		18 November	16 November	3 November
Losses (%)	Calves	2.0	2.0	2.4
	Others	2.8	2.2	1.5
Sales as % of cattle		38.0	48.6	64.5
Purchases as % of cattle		8.3	21.7	44.3

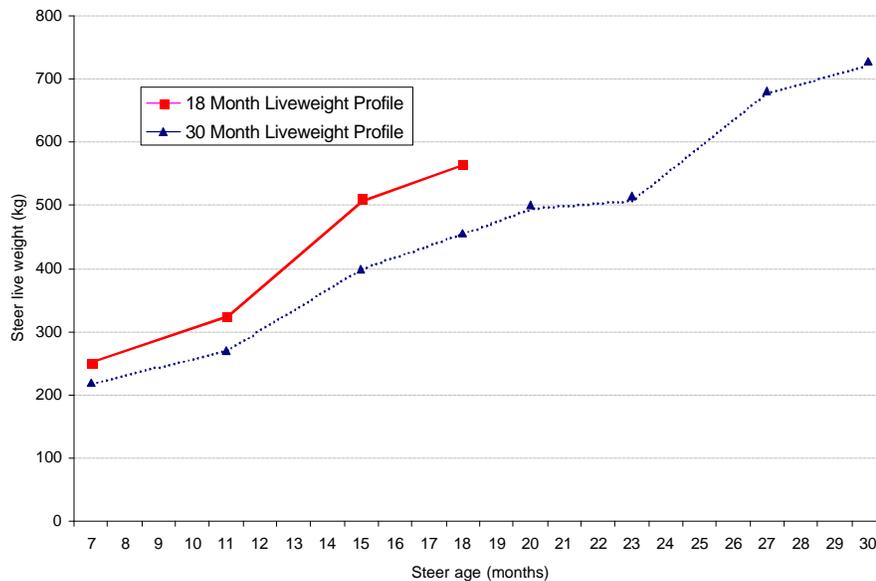
## Beef Finishing Herds

Beef cattle finishing herds are usually located on lowland farms and the objective is to maximise the margin between buy and sell price within any one year. Replacement cattle are usually brought at the same time (or the same market) as finished cattle are sold for harvest. This margin is largely influenced by two factors:

1. the skill of the farmer in obtaining the best price for their market cattle and then their skill in replacing these cattle at below the ruling market price, and
2. the farmer's ability to put liveweight gain on their cattle so as to reach the specified market carcass weight and quality requirements as quickly as possible. A fast turnover of cattle will also increase annual profits.

Cattle are usually finished before their second winter (18 month system), however on poor country steers may be finished at 27-30 months of age (Figure 5).

Figure 5: 18 and 30 month steer live weight profiles (from Parker, 1994)



There are many different classes, ages, and condition of cattle that can be purchased for finishing. The particular market a farmer aims for will determine the type of cattle purchased. For example a farmer wishing to supply the local trade may choose early maturing cattle such as Angus heifers with typical carcass weights of 210 -220 kg. In comparison a farm wanting to supply the North American manufacturing trade will choose Holstein-Friesian bulls and finish to carcass weights of 250 - 300 kg. Another major determinant of the type of beef finishing system used is the schedule price ruling at the proposed time of sale.

## Beef carcass grading and classification

Beef carcass classification was developed by Meat New Zealand to provide a standard for describing beef products to our customers and for providing a terms of reference for payment for

New Zealand beef producers. The carcass grading and classification system classifies carcasses according to maturity, sex, fat content and muscling. Weight is relevant for payment purposes. Types of carcass are steer, heifer, cow, bull and 4-day old calf.

Table 7: Definitions of beef carcasses in New Zealand (New Zealand Meat Board, 1996)

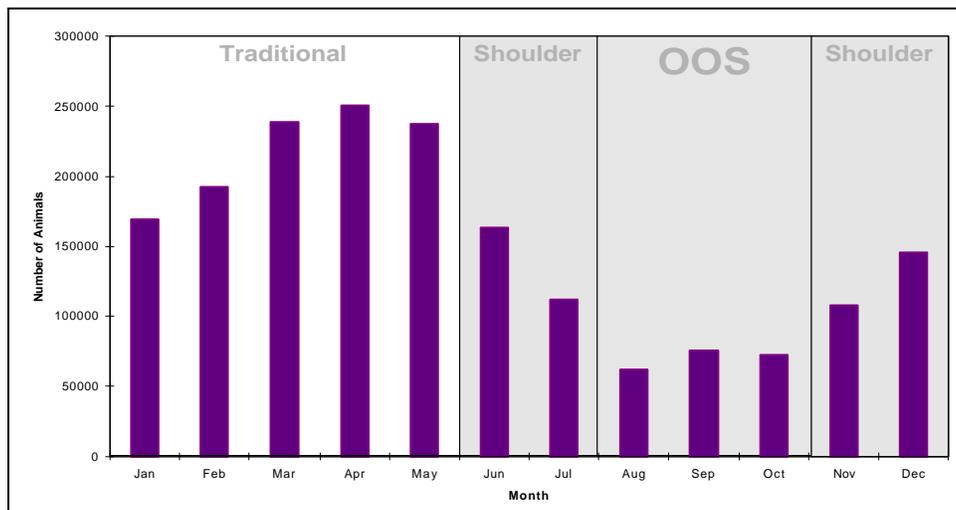
Steer -	Male cattle castrated when young.
Heifer	Female cattle having no more than six permanent incisors.
Cow	Female cattle having more than six permanent incisors.
Bull	Entire cattle with masculine characteristics.
4-day-old calf	Milk-fed, generally under two weeks old. They are not classified into either classes or weight ranges.

- *Young Lean Beef:* This is a voluntary carcass category for cattle with no more than two permanent incisors.
- *Fat Classes:* All carcasses, except bobby calves, are classified into seven fat classes.
- *Muscling:* All adult cattle, other than M cow are classified into three muscling classes, 1, 2 and 3. Each is based on the degree of muscling of the hindquarter

### Seasonality of Pasture and Beef Production

Beef production is highly seasonal with peak slaughter production from January to May (mid-summer to late Fall). This slaughter pattern follows the period of annual pasture production. This demonstrates an important aspect of beef production in New Zealand, firstly, beef production is sensitive to variation in pasture production and secondly, processing plants are under-utilized as export flows are seasonal.

Figure 6: Definition of Out of Season (OOS), Shoulder and Traditional Beef production periods relative to the average number of beef cattle harvested between 1991-1994 (Sherlock and Parker, 1998).



## **Grazing Management**

Sheep and beef cattle farms in New Zealand are far more diverse than dairy farms. Beef cattle are mainly located in the North Island (73%) with breeding herds mainly found in the hill country areas and finishing cattle on the higher producing flat land. The following land classes account for the majority of beef cattle farmed in New Zealand (NZMWBES 1997a).

### 1. North Island Hard Hill Country

These are large hill country farms (1600 acres), with a high proportion of steep land (77%), an annual rainfall of >58". Pastures consist of lower fertility grasses and there is a continuing erosion and reversion problem. Pastoral production on this land class is increasingly considered to be unsustainable. Annual pasture production is low (12-2.4 ton DM/acre/year) with very low productivity in the autumn and winter. These farms carry 3-4 stock units/acre with a ratio of sheep to cattle of 60:40 on a stock unit basis. Sheep provide around 65% of the revenue, with most of the balance derived from the harvest of cattle with most stock sold unfinished to finishing farms. Mainly located on the east and west coasts and North Island central plateau.

### 2. North Island Hill Country

This is easier hill country with smaller holdings (1000 ha) and running a higher proportion of cattle (43% of total su) than the previous class. Annual rainfall is slightly lower at 54" but is more likely to be associated with summer dry conditions. Annual pasture production will be 2-3.2 ton DM/acre with higher quality pasture and an increased proportion of high fertility pasture species (ryegrass and white clover). Average stocking rate is 4.2 su/acre. North Island hill country farms account for 23% of all sheep and 35 % of all beef cattle farmed in New Zealand. A higher proportion of cattle sold in a finished state. These farms are located throughout the North Island.

### 3. North Island Finishing/Breeding Farms

These are high producing grassland farms (5-6.5 ton DM/acre/year) carrying 4-5 su/ha with the lowest sheep to cattle ratio of all farm classes in New Zealand (46% su as cattle). Average farm size is 600 acres. There is a high proportion of sheep and cattle sales relative to opening stock numbers reflecting the increased emphasis on stock finishing rather than breeding. Mainly located in South Auckland, West Coast North Island and Hawkes Bay.

Sheep and beef cattle farms therefore have marked differences in annual and seasonal pasture production (Figure 8), and sward composition. In the wet North Island hill country the challenge is to winter sufficient stock to then be able to utilize the high levels of pasture production over the spring and summer. This means that a high proportion of the stocked farmed need to be breeding ewes and cows which can be fed at maintenance in the winter, while lactation demand and the development of grazing activity in lambs and calves will lift spring and summer pasture demand. Increasing the proportion of finishing stock on the farm will lead to increased pasture demand in the winter and decreased demand in the summer. The key to success is to adjust stock numbers in the autumn to achieve pasture cover and animal liveweight targets at the start of winter. This then enables feed to be rationed throughout the winter to transfer pasture into the more productive period after lambing and calving. Rationing will be best achieved under a rotational grazing regime. The aim is to fully feed ewes and cows during lactation. For ewes and lambs target sward conditions and animal intakes at lambing and during lactation are best obtained under set stocking.

On hill country farms it is important that cattle and/or ewes after weaning are used to control surplus pasture growth, maintain pasture quality and prevent sward deterioration.

In the drier areas of the East Coast the requirement is to achieve maximum production through the spring and early summer and then to significantly reduce demand over the summer when drought reduces pasture production. This pasture production pattern suits lamb production providing lambing can take place early enough in the spring to enable lambs to be marketed before the onset of the summer dry. Lambs can be sold in prime or store condition. Cattle breeding is less suitable in these areas due to lactation demand over the summer, but cattle finishing systems can be successfully operated provided supplementary feed is available over the winter and finishing stock are sold early in the summer.

There are few specialized sheep or cattle farms in New Zealand. Having sheep and cattle on the same farm increases management flexibility as it increases the number of stock classes and the ability to preferentially feed some stock while maintaining high levels of grazing pressure with other classes. The role of the breeding cow has been, and continues to be, important in the sustainability of hill country farms where the contour requires that pasture control, the maintenance of species within the sward and the prevention of pasture deterioration. The higher herbage allowances required by cattle than by sheep means that they are likely to be wintered separately, but that cattle are likely to suffer from the low herbage covers operating in early spring on sheep breeding farms.

One of the major landmarks in the development of sheep and beef cattle farms was the introduction of aerial oversowing of legumes together with fertiliser application in the 1950s. In 1996 North Island hill country farms on average applied 66 tons of fertiliser with 85% of this spread by air. This equates to an average application rate of 90 lb./acre on the steep land and 143 lb./acre on the easier hills. In 1996 fertiliser was the largest single farm working expense in all classes of sheep and beef cattle farms (NZMWBES 1997a).

In recent year's carcass weights for lambs, cull ewes, and beef cattle as well as wool production per sheep are all increasing. They are however only returning to levels achieved in 1950, and with improved grazing management they are now being obtained at higher stocking rates. An analysis of North Island hill country (NZMWBES 1997a) showed that the main differences between low and high profit farms was a consistent improvement in stock performance, stock death rates, and prices received. It was concluded that in general the higher stock performance was brought about through better feeding of livestock. In the initial stages this better feeding was being achieved with fewer inputs suggesting higher levels of management skill are being applied in the higher profitable groups. Because of the low returns from sheep and cattle and the limited labor it is important that any grazing systems used should be both low cost and easy to apply.

### **Beef Branding Initiatives**

On September 29th 1997 the new Beef and Lamb Quality mark was launched. The scheme, which sets standards for eating quality, tenderness, animal welfare and processing hygiene, has to date the support of all the major retail groups and the majority of independent meat retailers, as well as over 80 per cent of processors. A key objective of the Quality Mark programme is to increase retail

expenditure on beef and lamb by 6 per cent over three years. If the quality mark programme proves successful, it will deliver in excess of \$NZ 20 million per annum to producers.

Two further Breed Society-based initiatives Hereford Prime and Angus Classic have been developed to deliver a premium quality beef product to New Zealand beef customers. Both of these initiatives are involved in selling small quantities at this stage, through either restaurants, and mail order (Hereford Prime) or through selected supermarkets (Angus Classic). Both branding schemes (in addition to the Quality Mark) have strict guidelines in terms of breed, animal age, meat pH requirements, and post-harvest treatment of meat.

### **Future Trends in Livestock Production in New Zealand**

Competition for land in New Zealand has begun in earnest in the 1990's. The pastoral sector has lost about 820,000 hectares in just the last decade, mainly to plantation forestry and horticulture. It will lose at least another 500,000 hectares this decade to the same sectors. Meanwhile, even within the shrinking pastoral sector, there is a steady redistribution of traditional sheep, cattle, goat and crop usage of land into dairying, deer, and other holdings such as "lifestyle blocks". This has taken a further 470,000 hectares away from sheep and cattle farming in the past 10 years and will claim at least another 260,000 ha this decade. Dairy gross margins have been approximately double that of sheep and beef on a per unit land area basis in recent years.

Even with the use of more intensive farming methods; increased application of fertilizers; new and better pasture types and improved management techniques; any increased production of red meat will, more than likely, only just keep pace within increasing local demand. New Zealand's population is expected to keep growing at a faster pace than in recent years, which, together with tourism is adding steadily to local meat consumption, particularly beef. Intensive farming methods can impose environmental problems and associated cost disadvantages. New Zealand has some distinct natural advantages with its current low cost, grass-fed sheep, dairy and cattle raising techniques, and relatively abundant supplies of high quality water.

In the future New Zealand will promote and market its livestock products on the basis of quality and position itself at the top end of the market. The clean, green and natural production images, seen by the 1 million or so tourists that visit New Zealand each year will almost certainly be an advantage for our food exports as they compete in the high-priced "niche" markets of the world. The industry will think more in terms of quality not quantity and value not volume. Europe, Japan and emerging Asian tiger economies with their high demands for wholesome and environmentally friendly products are likely to be growing markets for New Zealand's agricultural products over the next decade.

In the face of increasing international competition, the New Zealand beef industry will draw on the following strengths in the production and marketing of beef:

- natural production and good livestock health
- efficient low cost farm production systems
- internationally competitive meat processing systems and widespread adoption of processing technology

- reputation for industry-wide commitment to high standards of quality and food safety management
- reputation for strong customer service

In summary, the main features of the New Zealand beef industry are:

- Profits and production are driven by world prices.
- The majority of beef production is exported.
- Beef and sheep production are closely integrated.
- Beef cattle graze pasture year round.
- North America dominates our exports.
- Processing beef is the major form of beef export.
- The dairy industry is an integral part of the beef industry.

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