

Nixon, Chris

Working Paper

Innovation and trade liberalisation: A case study of the New Zealand deer industry

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Innovation and trade liberalisation

A case study of the New Zealand deer industry

NZ Trade Consortium working paper no 31

June 2004

The New Zealand Trade Consortium

in association with the

New Zealand Institute of Economic Research (Inc)

Preface

The New Zealand Institute of Economic Research (NZIER), based in Wellington, was founded in 1958 as a non-profit making trust to provide economic research and consultancy services. Best known for its long-established *Quarterly Survey of Business Opinion* and *Quarterly Predictions*, the Institute also undertakes a wide range of consultancy activities for government and private organisations. It obtains most of its income from research contracts obtained in a competitive market and trades on its reputation for delivering quality analysis in the right form, and at the right time, for its clients. Quality assurance is provided on the Institute's work:

- by the interaction of team members on individual projects;
- by exposure of the team's work to the critical review of a broader range of Institute staff members at internal seminars;
- by providing for peer review at various stages through a project by a senior staff member otherwise disinterested in the project;
- and sometimes by external peer reviewers at the request of a client, although this usually entails additional cost.

Authorship

This report has been prepared at NZIER by Chris Nixon and reviewed by Ian Duncan. The assistance of Sarah Spring is gratefully acknowledged. We would also like to thank Collier Issacs, Mike Paterson, Dr Ralph Lattimore, and Elaine Pearse for their time for their time and input. Of course, all errors are entirely those of the author.

EXECUTIVE SUMMARY

Introduction

The deer industry in New Zealand is remarkable for two reasons. Firstly, deer are the only significant new animal to be farmed here in the last hundred years and secondly, this has occurred in a relatively subsidy free environment.

From sport to pest

Deer were introduced to New Zealand for sport in the mid 19th Century. At first individuals were responsible for importing and organising hunting parties; however these activities were soon taken over by Acclimatisation Societies with the willing support of the government, particularly through the Department of Tourism and Health Resorts.

Like many introduced flora and fauna, deer thrived in the New Zealand forests. Not only did they thrive, but they grew faster and achieved higher weights than deer in the Northern Hemisphere. So-much-so that deer became pests, destroying the natural forest and creating erosion problems.

Between 1920 and 1960 both the Department of Internal Affairs and the Forest Service tried to control the 'deer menace'. Unfortunately, neither had the resources or the equipment to do the job properly.

From wild animal to farm animal

The export market for venison, velvet, and co-products began in the 1950s and became a fully fledged industry by the late 1960s.¹ At the height of the hunting phase of the industry, in 1973, 145,000 deer carcasses were removed from New Zealand forests. At this rate of deer culling the wild deer industry was unsustainable. So in 1969, the industry persuaded government to draw up regulations for the farming of deer.

During its evolution from a fledgling industry to its maturity today, the deer industry has under gone several classic boom – bust cycles. Aspects of the evolution of this industry have been the:

- supply side innovations that allowed deer to become a farm animal.
- role of entrepreneurs in making this happen. In particular, the role of pioneers such as Sir Tim Wallis, Sir Peter Elworthy, and Rex Giles.
- well established export markets for venison (Germany) and velvet (Republic of Korea).
- relative lack of protectionists policies that discriminated against venison imports in Germany and Korea.
- changing supply side market structure as bigger New Zealand based processors moved into the venison market.

¹ Although hides were being exported as early as the 1930s.

Production innovations

A number of 'first in the world' supply side innovations allowed for the development of the deer industry. Foremost amongst them were the:

- use of helicopters as a shooting platform and later as the primary source of deer recovery. The helicopter offered unparalleled access to the steep South Island back country where deer thrived.
- adoption of management practices based on studies carried out by Professor Coop (at Lincoln) and carried on by Dr Ken Drew (Invermay). These looked at all aspects of deer management such as animal behaviour, reproduction, yard building, feed requirements, and best practice deer handling techniques.

Marketing chain innovations

Key to demand are the long-established markets in the Republic of Korea (velvet) and Germany (venison). Two issues are important:

- the control of the market by Korean and German wholesalers. These companies are typically large and have a long history in the venison and velvet markets. They have been able to successfully control the market and determined prices to New Zealand processors and farmers. The control over the market demonstrates why backward integration from the market is much easier to achieve than forward integration (Buzzel & Gale, 1987).
- the changing structure of the exporting business in New Zealand. The large scale move by PPCS and other big processors into the deer processing industry has changed the structure of the processing industry. It follows a well worn successful business strategy of large scale second mover advantage (Chandler, 1990). Furthermore, it has also allowed those large scale processing companies to begin to challenge the importing wholesalers, by increasing the bargaining power they have through increased scale (more venison) and scope (sale of venison along with much larger volumes of lamb) and also through by-passing the wholesalers and linking up with supermarket chains.

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1. INTRODUCTION

This paper examines the development of the deer industry as a case study of innovation in a deregulated agricultural environment. The story of deer in New Zealand is remarkable, from an animal released to be hunted for sport, then a pest marked for eradication, to its role as a domesticated farm animal that has contributed significantly to New Zealand economic activity, all within the space of 150 years.

We will demonstrate the connection between innovation and commercial success in the deer industry and show how liberal trading regimes (both in the exporting and importing countries) spurred the industry's development. This is particularly relevant for 'new' agricultural products (such as venison) because the protectionist infrastructure that is endemic in world agricultural trade does not exist or is not as well-developed in the venison industry.¹

The deer story in New Zealand is unique because:

- while reindeer may have been domesticated as early as 18,000 BC and captivity of deer has been common, it has only been in New Zealand that full scale commercial deer farming has occurred. This makes deer unique since they are one of the few animals to be domesticated and farmed in the past 100 years.
- New Zealand agriculture takes place in an environment relatively free from subsidies. We have set out to show how a new agricultural industry can react to the opportunities and constraints of a liberalised international market. From this, we have drawn some generalised and specific lessons about the process of innovation, and successful and not so successful methods of capitalising on the liberalisation process.

The object is to demonstrate that new agricultural export industries can emerge in an environment with little or no government help. To do this we:

- review the history of the deer industry in NZ.
- examine the innovation drivers of the industry.
- demonstrate what innovations were required for deer farming to happen and how those innovations were applied , and
- examine the impact of the deer industry on New Zealand agriculture.

¹ However, protectionist infrastructure is well-developed in the Korean velvet and co-products industry.

2. THE EARLY DEER INDUSTRY

2.1 From sport to pest

2.1.1 The introduction of deer into New Zealand

New Zealand has no native mammals except for two species of bat, therefore farming livestock in New Zealand means farming introduced animals. Precisely, when deer were first introduced in New Zealand is unclear – estimates vary from 1851 to 1871.² What is certain is that it was settlers wanting to hunt deer for sport who introduced deer, Johns & MacGibbon (1986).

Seven types of deer are present in New Zealand: red deer, wapiti, sambar, rusa, Virginia, sika, and fallow deer (see Table 1).³ By far the most common are red deer, as Table 1 shows.

Table 1: Origins of wild deer in New Zealand

Species	Place of origin	Approximate no. of animals liberated	When established
Red deer	England and Scotland	1000	Various 1861 – 1923
Fallow deer	England	130	Various 1864 – c. 1910, 1905
Wapiti	Wyoming USA	18	1905
Sambar deer	Sri Lanka	26	1875 and various times after that. Also 1914 – 21
Sika deer	Via England; probably of mixed origin	6	1905
White-tailed deer	New Hampshire	18	1905
Rusa deer	Java via New Caledonia	8	1908

Adapted from Challies (1985)

According to MAF (1999) and Yerex (2001) the first deer herd to become established was in the Mati Valley in 1861. Other significant introductions were in the Wairarapa (1863-1923) Rakaia (1887, 1902), Central North Island (1897-1922), Pomahaka (1902-20), and Waikaia (1919-21). It was noted (in tourist guides of the time⁴) that they thrived “...uncommonly well...”.

² Giles (1975) claims that the first red deer yearlings were brought from Scotland in 1871, while Johns and MacGibbon (1986) maintain that the first liberation of red deer was in the Maitai Valley near Nelson in 1851. However Yerex (2001) suggests, quoting W.C.R. Sowman, who wrote a history of the Nelson Acclimatisation Society, that the supposed deer release in 1851 was a myth. Sowman claims that the first deer to arrive in New Zealand came to the Nelson province in the Eagle in 1854. Unfortunately, the hind sent with the stag died shortly before reaching Nelson.

³ While Moose were released, a debate rages about whether any have survived.

⁴ A Lands and Survey guide for tourists in 1901 quoted in Yerex 2001 p13-14.

New Zealand's temperate climate proved to be ideal for deer and they thrived (not unlike other introduced flora and fauna). Deer in their new habitat grew to a size that was well beyond what was known in Britain. The main reasons for this were the:

- abundant food supply (in the form of a luxuriant, varied, evergreen vegetation), especially winter browse.
- ability of deer to adapt to a range of habitats.
- moist and temperate climate with mild winters.
- protection from hunting in the early days.
- early maturity, specifically, a younger breeding age in females.
- absence of predators, pests, and diseases.
- areas into which deer could escape and remain hidden were too vast and heavily forested for them to be easily controlled, and
- large number of herds established.

The first deer were imported by individuals. However, in the 1860s Acclimatisation Societies were established to provide the impetus for significant numbers of deer to be imported. Acclimatisation Societies were seeking to "*promote and organise the introduction of desirable animal and plant species*". The importation of deer was an important part of their activities and symptomatic of the more general belief (in the population and in government) that New Zealand should be made more like Britain.

Governments were firmly behind these moves and provided funds to support Acclimatisation Societies activities. This was done under the auspices of the Department of Tourist and Health Resorts.⁵

2.1.2 The need to control deer numbers

As early as 1892 the Rev Phillip Walsh warned of the dangers that deer posed for New Zealand forests. The first attempts to control deer were in the Lake Hawea region in 1906, Johns & MacGibbon (1986). Government efforts to manage deer numbers failed because they were not intensive enough to control the dramatic increase in numbers.

Between 1900-1920 half-hearted gestures were made to cull deer. It was only after 1920 when the deer population explosion and its consequent impact on the environment became apparent that deer were seen as a pest.⁶ Many publications began to focus on the "deer problem". Conway (1949), Hart (1957), and Logan (1956) documented the problems that deer were causing in New Zealand's parks and forests. In some places wild deer were displacing domestic stock causing damage to crops, pine plantations, and pastures.

Under the Animals Protection Game Act 1921-22 (later to become the Wildlife Act 1953) hunting of deer was encouraged by government through the use of wages and bounties. Two shillings for the first tail and one shilling and six pence for each further tail was the going rate. This was discontinued in 1933 and replaced by a bonus on skins.⁷

⁵ Yerex (2001) p 17 points to the role of T.E. Donne noted hunter and General Manager of the Department of Tourist and Health Resorts, as an ardent supporter of the introduction of deer into New Zealand.

⁶ Clouston (1973) estimates that between 1910 and 1930 deer numbers grew by an average of 25% per year in the wild.

⁷ The Government had developed an export market for skins and were seeking to recoup some of the costs of controlling deer.

By 1927 the Department of Internal Affairs (DIA) was concerned enough to start its own hunting operations, Howell (1978) and Yerex (2001)⁸. With deer numbers estimated at 300,000 head, all remaining protections for deer were lifted at the Deer Menace conference of 1930. At first, the DIA tended to focus on more accessible hill country. However, it was soon realised that the damage to the forest cover and the consequent erosion deer caused needed more attention. Hence, the focus was put on areas of state forests where exotics had been planted, and high country catchment areas.

As time went on the Deer Control Section of the Wildlife Division of DIA began to perfect techniques, train hunters, and develop systematic eradication programmes. However, with the advent of war, much of the progress in controlling deer was lost, as hunters were required to join the war effort.

During the late 1940s, large numbers of deer were being culled in accessible areas, however the sheer numbers of deer meant that efforts to eradicate them were stepped up. At first, New Zealand's rugged terrain made things very difficult. According to MAF (1999) new measures were introduced:

- fixed wing aircraft were used to move hunters and their supplies into the more remote areas.
- the deer skin recovery policy was dispensed with. Having shot the animal, hunters did not have to spend time skinning the carcass, and
- incentives were changed so that hunters could concentrate on eradication.

The responsibility for deer eradication came under the Forest Service with the passing of the Noxious Animals Act in 1956 (later replaced by the Wild Animals Controls Act of 1977). By giving responsibility to the Forest Service whose forests the deer were destroying, it was hoped a more focused approach would be taken to the "deer problem". According to Riney (1956), it resulted in the Forest Service intensifying its culling on the basis of the downstream values at risk. Hunters with rifles carried out the bulk of the work. However, the scale of the deer infestation and the limited resources applied to the problem meant that control methods were relatively ineffectual.

2.2 Wild deer commercial operations

Up until the early 1960s, commercial operations were focused on deer skins. The government, through the DIA, developed a market in 1931 as an outlet for skins taken in culling operations.

Initially, the DIA bought skins from private hunters and sold them to overseas buyers, despite returns being relatively weak. However, as the market firmed, the private traders entered the trade to market their own skins. The impact of culling was felt most in accessible parts of the ranges, hill country runs, and in marginal farmland. According to Challies (1986) p32, commercial hunters culled twice as many animals as the government control programmes.

Table 1 shows how the trade developed over time, reaching a peak in the 1970s. Moreover, the numbers of wild deer were reduced sharply as deer farming became established.

⁸ Yerex (2001) pp 35-48, documents the role of the 'government cullers' and their role in the attempted eradication of deer.

The export trade in venison and co-products started in the 1950s. Three factors were important:

- the existence of well-established and liberalised markets for venison in Europe and a well-established but much more restricted market for velvet and co-products in the Republic of Korea, and.
- the abundance of deer in relatively open valleys, vast tussock areas, and open tops in the Otago-Westland area (Yerex 2001).
- a pool of expertise available to develop the industry (Yerex 2001).

Table 2: Annual number of skins taken 1930 – 1960

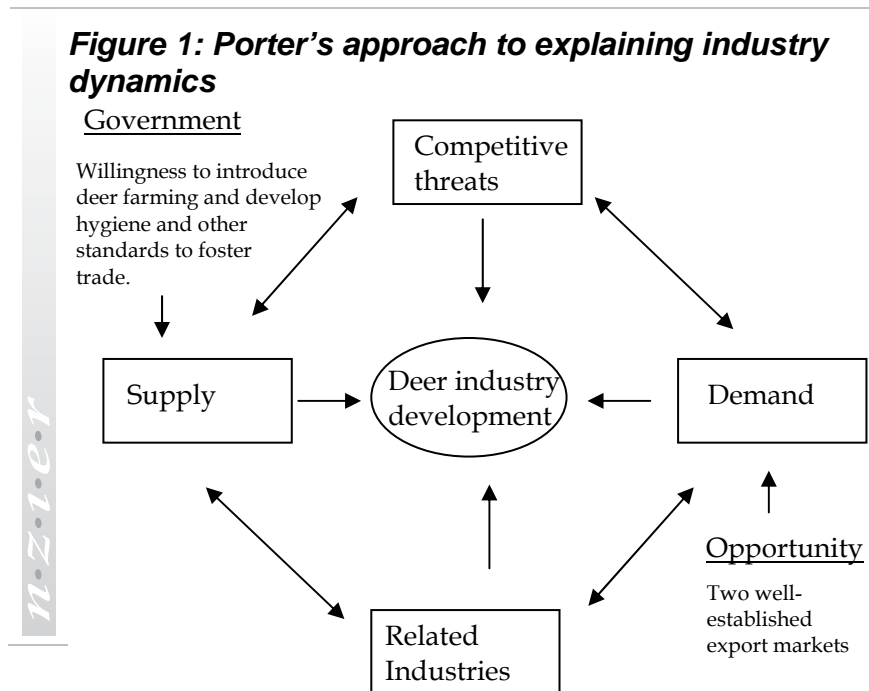
Year	Approximate number of Skins taken
1931	6,800
1942	50,000
1944	97,000
1950	60,000
1951	103,000
1960 – 1970	Up to 60,000
1973	145,000
1980 – 2000	10,000 – 30,000

Adapted from Challies (1986), Yerex (2001), & MAF statistics.

3. INNOVATION DRIVERS

As a way of organising the material and to explain what drove innovation we have used the headings developed by Porter (1980) to illustrate the base conditions for the development of the deer industry.

Figure 1 gives a graphical display of the approach used. Impacting on the development of the deer industry in New Zealand are the demand and supply conditions, competitive threats, the opportunity presented, role of government, and related industries.



Source: Adapted from Porter ME (1980)

3.1 Supply

In 2003, by far the most numerous species of deer are red deer. The balance of the deer population is mainly Wapiti (imported from Canada) and small numbers of Fallow deer are also farmed in New Zealand. Genetic improvements for the New Zealand deer herd have come from Eastern Europe, UK, and North America.

3.1.1 Venison

The supply of venison for export occurred in two distinct phases. Firstly, the hunting phase and secondly, the farming stage.

Hunting

In the early 1960s, the New Zealand venison supplied to the export market came from wild deer shot by hunters. Yerex (2001) points to entrepreneurs such as Robert Wilson (Wilson - Neill) and Sir Tim Wallis as being pivotal in creating the opportunity for

hunters and pilots to develop a wild venison industry in New Zealand. Others involved included:

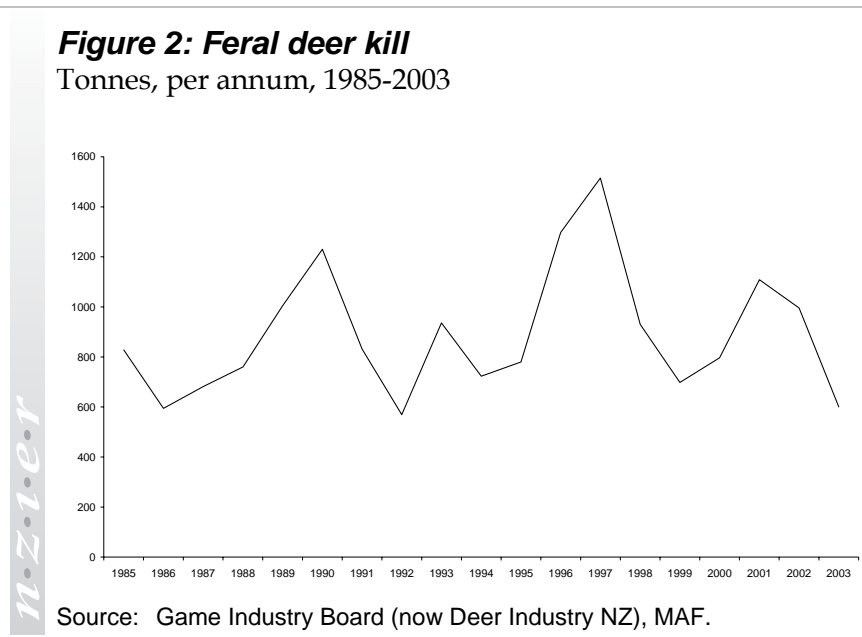
“...Evan Meredith on the West Coast, Doug Jones at Haast, Ivan Taylor at Wanaka, and Paddy Kilgariff at Mossburn. Firms that had an established trade in deer skins also got in on the act, notably Consolidated Traders and Bergs in the North Island, and Graham Stewart & Co. in the South Island. They began to compete for supply by paying better prices to shooters, who in turn competed more fiercely with one another to shoot more.” Yerex (2001) p75

Deer were intensively hunted over all of their habitats. As the game meat industry developed and the easy country was cleared of deer, a variety of methods were used to transport animals out of the rugged terrain. Animals that had been shot were hauled out on packhorses, by truck, or even jet boat. One early innovation involved pilots of fixed wing airplanes teaming up with hunters to transport deer carcasses out of the rugged hill country. Hunters would cut an airstrip out of the river flats and then once that area was cleaned out of deer they would move to the next suitable location.

Processing and packing plants were built and small amounts of venison were exported. According to Challies (1986), so effective and sustained was the hunting that it negated the need for deer control in some areas.

Helicopters were first used to support the activities of hunters, ferrying hunters and their kill in and out of rugged terrain. According to Yerex (2001), in 1963, Wallis and Wilson with another keen hunter Wattie Cameron were one of the first to trial helicopters. The advantages of helicopters were obvious, they could go where fixed winged aircraft could not and they could penetrate country that had previously been inaccessible. By 1964, the helicopter had become a shooting platform and the numbers of feral deer killed grew exponentially.

While the hunting phase of the deer industry is past its heyday, there is still a substantial tonnage taken from forests around New Zealand. Figure 2 shows that wild deer tonnes taken, varies between 500 and 1600 tonnes per annum.

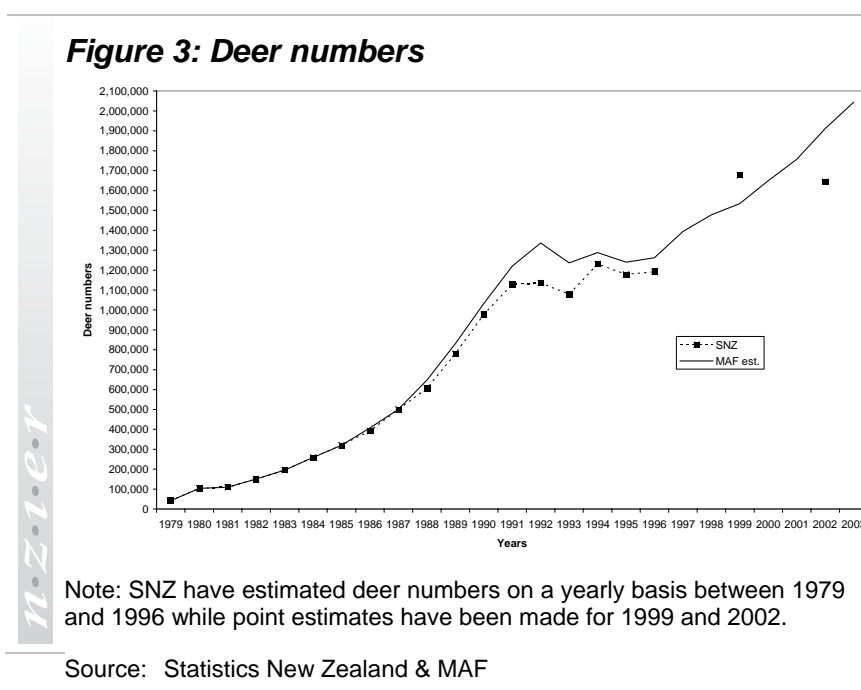


Farming

The switch between the hunting phase and the farming phase occurred in the early 1970s. By 1972, 4,380 tonnes of wild venison was exported, which was equivalent to 145,000 carcasses. At that rate, the culling of wild deer was unsustainable. Farming was the only way to sustain and grow the deer population. By the late 1970s wild deer numbers had dropped dramatically and most deer products were being supplied by deer farms.

Legislation was passed in 1969 that permitted the farming of deer. MAF (1999), state that the first licence to farm deer was given to Mr M R Giles of Taupo in early 1970.⁹ At the same time research programmes were initiated to understand the best way to handle deer in a farming situation. These innovations are the subject of Section 4.

Figure 3 shows that the numbers of farmed deer grew rapidly, after a slow start in the 1970s. By 2002, deer numbers had grown to such an extent that they had reached 1.6 million head.



Note there is some divergence in the numbers quoted by MAF and those quoted by Statistics NZ. There is some suggestion that estimates by the Statistics NZ underestimate the deer population. Reasons for this include:

- farmers have traditionally run small deer mobs along with other livestock. These scattered herds are not reflected in the sampling techniques used by Statistics NZ which consistently under-report deer numbers. This issue is compounded by the approximately 4,000 farms that have varying degrees of involvement in deer farming from small hobby farms, and those that run a variety of livestock, to extensive commercial operations; and
- the value of the animals, the scattered nature of the deer mobs, and the difficulty in monitoring who owns what stock means there is an incentive for farmers to under-report, to reduce individual tax bills.

⁹ The farm, Rahana Station, was owned by Consolidated Traders.

Table 3 shows the north – south shift that has occurred. The industry has seen a gradual migration of large deer farms from the North Island rolling country to the South Island hill country.

Table 3: Shift in deer farming operations 1983 & 2002

Total deer numbers as at June 30 th				
	1983 (%)		2002 ¹ (%)	
North Island	112,471	(58)	597, 579	(36)
South Island	83,182	(42)	1,046,359	(64)
Total	195,653		1,643,958	

Notes: (1) provisional

Source: MWBES, MAF, Statistics NZ

Three reasons the South Island has become more important for deer production include:

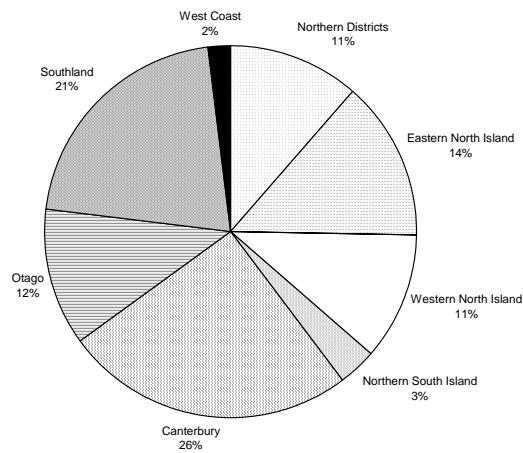
- the value of competing livestock has gone up. The impact of trade liberalisation through the Uruguay Round of GATT has overtime raised prices for dairy products. In the North Island, deer and sheep have been displaced by dairy cattle on the gentle rolling country.
- it has been discovered that deer perform just as well on the cheaper South Island high country land as they do on prime North Island land. Furthermore, the lighter soils of the North Island farm land are not as well suited to deer farming relative to the heavier South Island country soils.¹⁰
- speculators in the North Island have exited the industry. With the closing of the loopholes allowing for tax write-offs, mainly North Island investors have left the industry.

Despite this, Table 3 shows that the numbers of deer in the North Island dramatically increased over the period.

Figure 4 shows the location of deer in New Zealand. Deer are mainly located in Southland, Otago, Bay of Plenty, and Canterbury. Typically, the deer farms in these regions are larger than deer farms in other regions. This allows for economies of scale in production that improves deer farming profitability. In the North Island, smaller scale operations are prevalent, with farmers raising other livestock as well as deer.

¹⁰ Deer also tend to tread the property boundaries heavily, relative to other livestock, creating pugging problems on lighter North Island soils.

Figure 4: Location of deer in 2002

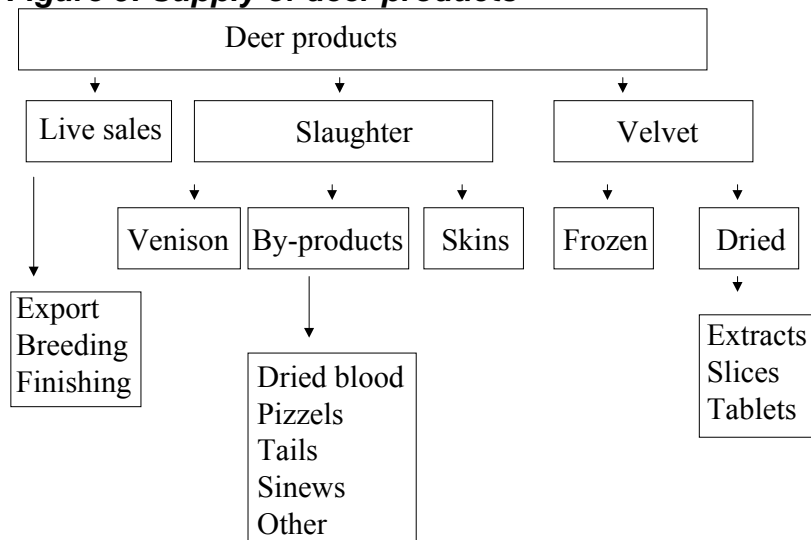


Source: MAF, Statistics NZ

When considering the supply of venison a number of other issues are important. These include:

- venison is a joint product.¹¹ Figure 5 illustrates the types of deer products produced. Velvet and venison are by far the most important of these products, however other by-products can be relatively profitable.

Figure 5: Supply of deer products



Source: Pearse et al (1994)

- timing slaughter to coincide with demand. The seasonality of production means that traditionally deer have been slaughtered after the main demand period.

¹¹ Like sheep, deer has a number of different markets for different parts of the animal. These are considered joint products because economic value can be derived from different markets that can have different economic drivers.

- venison is highly regarded for its nutritional value. Venison is rich in protein, iron, copper, zinc, and low in fat, cholesterol, sodium, and saturated fatty acids.
- red deer are the mainstay of the New Zealand deer herds. At first, farmers selected red deer because they were the most numerous. Now they are also seen as well-adapted to the New Zealand environment and more manageable than other breeds of deer.¹²

3.1.2 Velvet

Velvet production began in earnest in New Zealand with deer farming. While the motivations of entrepreneurs are sometimes difficult to decipher, particularly in hindsight, an argument can be made that deer farming started more with the intention of harvesting velvet than farming for meat (venison).

This is because collecting the highest quality velvet product requires harvesting at the right time. In the hunting phase of the deer industry, this was almost impossible to achieve on a consistent basis. It was only by luck that good quality antlers were acquired through hunting the animals.

The joint nature of deer products means that farmers are required to make decisions on the type of products they wish to supply the market with. The choices include either specialising in velvet, or a joint velvet-venison farming operation. On specialist velvet farms, where stag only mobs have been established, deer have been expressly bred for the genetic traits required to develop consistently good velvet production. However, most deer farming involves production of venison, velvet, and by-products.

Harvesting velvet involves tranquillising the stag and removing the antlers. Care needs to be taken to remove the antlers at the correct time because the difference in quality can have a large impact on profitability. Removing antlers is a highly sensitive animal welfare issue and strict codes of practice are in force in the industry.

Quality is judged on size (circumference when dried and sliced) and blood retention. Circumference of the sliced product relates to the size and health of the stag – this is perceived to be important by the consumer. Blood retention relates to the amount of cartilage relative to bone (calcification) in the velvet. The more cartilage in the velvet, the more blood is retained, and the less calcification.

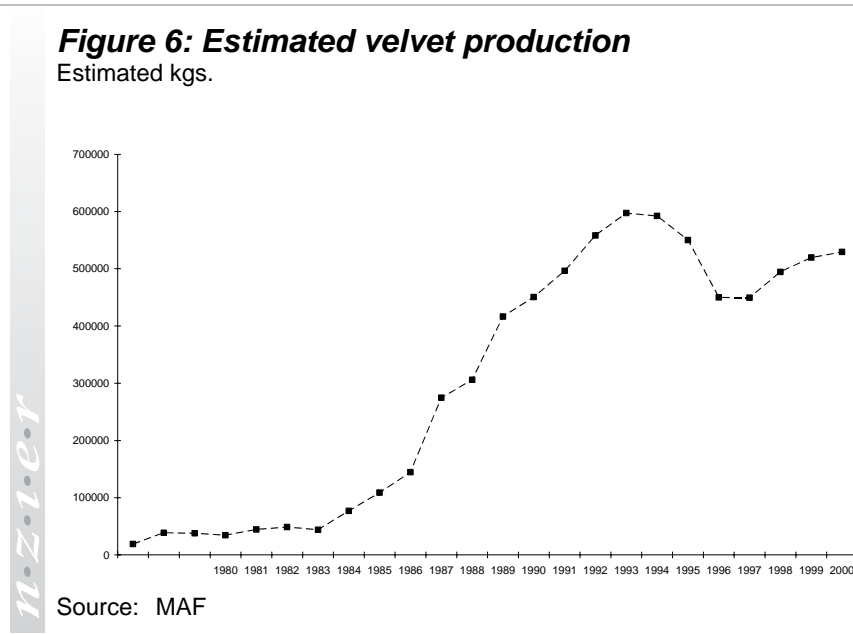
Little was known about the development and production of good quality velvet in New Zealand prior to the commencement of deer farming. R&D, therefore, was more difficult since New Zealand had no history in the velvet industry. R&D in the industry started from scratch in the 1970s. Government funded research has been used to understand the genetics of velvet, traceability testing, humane methods of velveting, and research into the health benefits of velvet.

Figure 6 shows the steady build up in the volume of velvet produced until the mid 1980s, when a dramatic increase in volume occurred. This was partly due to farmers moving out of other livestock (mainly sheep and dairy) as subsidies were reduced.¹³ The resurgence of dairy in the mid 90s stalled deer numbers. However this was minor compared with the Asian crisis, which almost stopped the deer velvet trade with the

¹² Other breeds are seen as difficult to manage or not having the suitable market characteristics, although some such as Wapiti have been successfully crossbred to improve the marketability of venison (see section 4).

¹³ This was particularly so for sheep when in 1984 Supplementary Minimum Prices (SMP) were withdrawn.

Republic of Korea (causing a dramatic dip in velvet production, see Figure 6). Following the Asian crisis deer numbers increased, boosting velvet export volumes.



3.1.3 Co-products

The by-products are derived from deer slaughterings. The three main groupings are:

- deer leather has been a staple production since the early culling years. It was only in the 1960s that leather products became less important than venison. Skin supply is highly dependent on venison production.
- live deer sales to replenish and provide new genetics to overseas herds.
- other co-products. These include:
 - edible offal production is a function of venison production. Unlike leather however, it has only been consistently developed with deer farming since certification is required from MAF guaranteeing that the product is disease free.
 - jewellery is processed from deer tusks. This is a small part of the by-products trade.
 - oriental medicines use special mixtures of various deer products such as antlers, tails, pizzles, and other parts of a deer's anatomy.
 - powdered products which are sold to tourists and in health food shops.

3.1.4 Breeding

Breeding deer is also a well established part of the deer industry in New Zealand focusing on breeding for venison or velvet production. Typically, a breeder can either be involved in breeding and selling livestock, or venison and velvet production. Some of the options open to breeders have include:

- selecting hinds (young females) for replacement breeding stock or finished for venison sales.

- purchasing weaners for finishing and selling as finished stock specifically for the chilled venison trade between October and January.
- purchasing breeding stock for velvetting. Stags not selected for the velvet trade are finished, however this would not normally meet the timing requirements of the chilled venison trade.

3.1.5 Genetic improvement

Recently the Livestock Improvement Corporation (LIC) has signalled that they are going to enter the deer genetic improvement business. They intend to leverage their knowledge in dairy genetics across to the deer industry (Springall L, 2004). The intention is to provide an artificial insemination service that provides significantly improved genetic stock. This will be backed up by the development of a comprehensive sire referencing scheme. While we do not know whether or not this venture will be successful, it does follow a well-worn business strategy of leveraging expertise in one area (dairy genetics) into another industry (deer genetics) where it can be readily adopted (see Winston, 1996, for example).

3.2 Demand

The development of an export market for velvet and venison is a recent phenomenon, with little trade until the mid – late 1960s. The demand is essentially an export demand with approximately 90% of venison exported and 98% of velvet.¹⁴ Therefore demand is determined and almost totally reliant on the main individual export markets. Germany is the main market for venison, while velvet and co-products are sold mainly to the Republic of Korea. The demand has been primarily driven by the traditional consumption in these two regions and underpinned by growing consumer affluence in these markets.

In 2003, venison accounted for the major portion of export revenue (76%) from deer products. Other products such as velvet (18%) and co-products (6%) provide the remainder.¹⁵

3.2.1 Venison

The first shipment of venison from New Zealand was shipped to the United States in 1953, Anderson (1978). However, it was from Germany (then West Germany) that the main demand for venison has come.¹⁶ According to Yerex (1982) p73, in the beginning, the trade was small and mainly consisted of wild venison of all cuts. Over time, export demand has been strong and the market has expanded considerably. In 2003, Germany accounted for approximately 50% of the market for New Zealand venison, with another 30% being consumed by other European states. The other main market for venison is the United States.

Trade development

In the 1970s, New Zealand venison was not differentiated from other sources of supply. Venison has followed the classic production push pattern. Undifferentiated

¹⁴ This varies depending on the number of Korean tourists buying velvet when they come to New Zealand on holiday.

¹⁵ MAF estimates.

¹⁶ Game meat in Germany has had a strong traditional demand, particularly in the run up to Christmas when game meat is traditionally eaten as a special treat.

bulk commodity product shipped into the market that was prepared to pay the highest price, by small venison-only processors. With the meat usually destined for the wholesale or catering markets, there was no need to spend money on marketing or brand development. Moreover, New Zealand product was mixed with other venison from Eastern Europe and other parts of the world.

As farming became established, competition emerged from velvet. Herds of stags were a common sight as the price of velvet boomed in the mid-to-late 1970s. However, oversupply and the closing of tax loopholes caused a sharp correction in prices and venison re-established itself as the most important deer product in the 1980s.

Since the early 1980s venison has been on a rollercoaster ride. The price of venison began to increase during the 1980s, that is, until the Chernobyl incident (see differentiation). Two other events also caused fluctuations in venison prices. They were the:

- collapse of the Fortex meat company. Fortex was a relatively new meat company that had developed some innovative marketing and processing ideas. While primarily focused on sheep, Fortex also had a large deer operation.¹⁷ The collapse of Fortex in 1994 sent a flood of venison on to the market at low prices, and
- discovery of Creutzfeldt-Jakob disease in Europe sent venison prices skyrocketing as consumers stopped eating beef and switched to other meats. Unfortunately, wholesalers miscalculated the amount of venison that would be required for the market. The large overhang of game meat on European markets meant that prices tumbled. Furthermore, the slow growth in European economies has continued to depress prices to such an extent that they are less than half what they were at their peak in 2001.

Currently, venison prices are below their long term 10 yearly moving average (see Straight Furrow, 2004). Part of the reason for this is low growth in the German economy.

Differentiation

Originally, New Zealand venison was not differentiated from other game meat sold principally to German wholesalers. The structure of the marketing chain meant that small New Zealand firms dealt with very large food wholesalers in the importing country. As the trade started, the structure of the industry did not have much impact since demand outstripped supply and export sales grew strongly.

The Chernobyl incident was a practical demonstration that while commodity selling saves on marketing costs, differentiation has its advantages. After the Chernobyl nuclear accident, game meat met considerable consumer resistance. This was because of the propensity of game meat and other livestock to concentrate high levels of caesium after eating contaminated pasture. With no way of differentiating New Zealand venison from potentially tainted Eastern European game meat, demand for New Zealand venison was just as badly affected. In 1987, 600-700 tonnes of New Zealand venison were held in stock because of the slowdown in demand, Jarvis (1988).

¹⁷ They had what was called a back-to-back operation where a sheep and lamb slaughtering facility was side-by-side with a deer slaughtering facility. Both of these facilities shared a sorting and packaging room. This was important for a low throughput product such as venison because it could be packed by the same staff who were primarily packing lamb, improving economies of scale and scope.

The newly created New Zealand Game Industry Board (GIB) did a number of things to alleviate the problem:

- introduced a quality mark ensuring the processors complied with the ISO 9002.¹⁸
- renaming New Zealand venison.¹⁹ To differentiate its product the New Zealand industry launched venison as an appellation (Cervena).²⁰ By giving venison a distinctly New Zealand brand the aim was to ensure that consumer concerns about where the meat had been raised were met. According to Jarvis (1988) p4, game meat consumption dropped in Germany by 40% and New Zealand's share of the market rose by 24% in 1986.

Currently, a debate is going on within the deer industry (also a major review) about whether or not the Cervena appellation should be continued. According to Deer Industry New Zealand (www.deerindustry.org):

"Initially the programme was administered through a separate company; the Cervana Company, then the Cervena Council. In 1999 the Game Industry Board established the Cervena Trust as a short-term mechanism to take the Cervena programme to a point where it was no longer dependent on levy funding, as levies had been funding a programme which was not supported by 100% of the industry. The Cervena Trust was charged with finding the best solution to bring about 'Cervena' capable of operating without dependence on levy funding. A number of options were put to the industry in early 2001, but the Trust was unable to find a workable solution acceptable to all sectors."

The industry dynamics are important in understanding why a review is going on. In the beginning, the Cervena appellation was a way of binding a large number of small companies together to achieve consistent quality in designated markets. As the number of firms decline, the industry dynamics change. For Cervena to survive it will have to reflect current industry structure and be flexible enough to adapt to further change.

For example, some are questioning the worth (and fairness) of the programme given that not all producers are providing monetary support for the Cervena programmes and may be getting benefit from them (free riding). Furthermore, PPCS, now a large player in the deer processing industry, have bluntly told deer farmers that Cervena is less useful as a brand than "New Zealand" (as a brand or appellation) and that Cervena should be dropped as the product name. Others believe that it is vital that Cervena remains so that customers and consumers can distinguish between New Zealand venison and venison from other sources.

A related issue are German wholesalers' perceptions of New Zealand venison. German wholesalers have always maintained that they were doing the New Zealand industry a

¹⁸ This emphasis on quality control has become more important as time has gone on. Food safety, animal welfare, bio-terrorism, and environmental sustainability are all key concerns of the industry and are constantly being refined and updated. Deer Industry New Zealand (the successor organisation to the GIB) runs DeerQA, which aims to have deer management, processing, and marketing systems proven, transparent, and auditable (Deer Industry News, June 2003, p10).

¹⁹ The product was renamed because no processing company would commit to one brand-name. By renaming the product the industry was able to get around the claims by each company that their product was superior to any other competing New Zealand company's product.

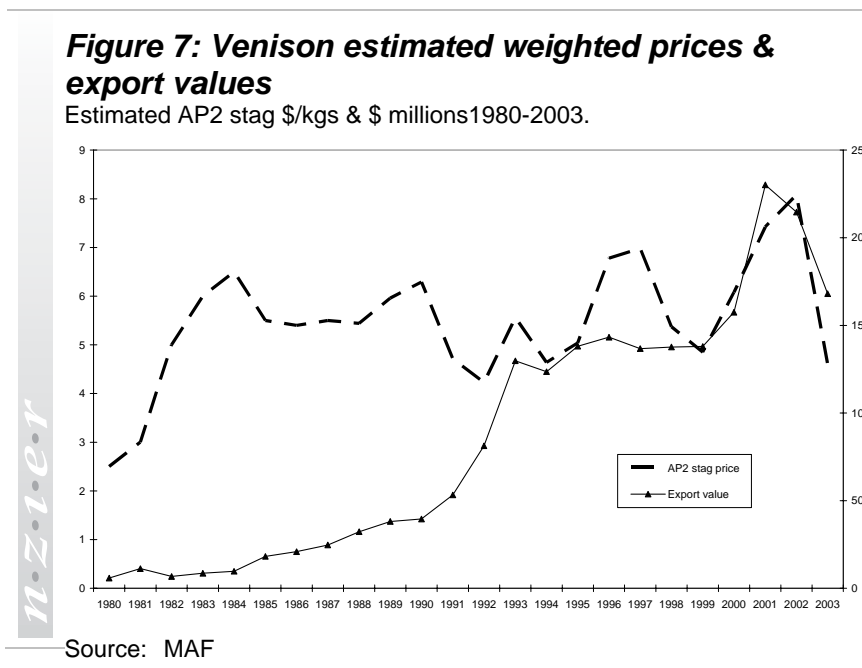
²⁰ An appellation is a generic term for an industry brand (e.g. it is similar to champagne). According to Deer Industry New Zealand (www.deerindustry.org) "an appellation is not, in marketing terms, a brand, as licensees own their own brands. Cervena is an umbrella strategy, encapsulating quality standards, positioning values and providing support and protection – with licensees operating their own brands of Cervena."

favour by mixing other game meats with New Zealand venison. They imply that deer shot in the Black Forest (and in other European forests) is superior to New Zealand venison. This proposition could never be tested and there is a suspicion amongst New Zealand processors that this has been used to keep New Zealand venison prices down.

To counteract the grip of the German wholesalers on the market, New Zealand processors have been looking for ways of bypassing the wholesale market. Processors, for approximately the past 5 years, have been developing marketing channels that bring them closer to the consumer through supermarkets.²¹ This is now changing as processing companies seek to limit the influence of the German wholesalers and develop retail packs in pre-cooked products that combine venison with pasta, noodles, and vegetables (Deer Industry News, 2003, p10).

Figure 7 shows that despite attempts at branding, prices received by producers and value of venison exports have been extremely volatile. This has introduced uncertainty into the deer industry. It may be why many farmers who farm deer also farm other livestock in order to counter some of the adverse effects of venison price volatility.

The price volatility does raise some issues about the branding strategy and its effectiveness, particularly when Deer Industry New Zealand estimates that only 25% of export venison sold in 2004 occurs where the end consumer can identify that the venison comes from New Zealand with a clear country of origin brand.



²¹ There were a number of reasons for this. When exposed to oxygen venison changes to a blackish colour, not the redish meat consumers are use to with beef and lamb. Also the industry did not have enough money to embark on a campaign to educate and inform consumers in Germany about the product.

3.2.2 Velvet

The demand for velvet comes mainly from the Republic of Korea, where the use of deer products, particularly velvet, has been long established. Velvet is prized for its:

- perceived value as a medicine (stimulating the heart and healing wounds), and
- use as a tonic.

Velvet is favoured by the older consumers who rely more on traditional healing methods than on modern medicines. The most highly prized antlers, in the Korean market, are sourced in Russia, with New Zealand product falling into the mid price range.²²

The long-established demand for velvet means that it is sold in a traditional way in shops that specially cater for the oriental medicine market. This has meant that gaining access to the customers and interpreting their needs has been very difficult for relatively new producers, such as New Zealand, wanting to establish links with consumers. Furthermore, Korean wholesalers exert tight control over the market offering easy credit terms to retailers and “persuading” other retailing outlets not to stock deer products.

How New Zealand producers of velvet became aware of the Korean market is illustrative of the issues confronting those wanting to forward integrate into the market. New Zealand producers only became aware that the Republic of Korea was the final destination for velvet by accident. They assumed that because Hong Kong based companies were buying product that the velvet was being consumed in Hong Kong. In actual fact Hong Kong based companies were drying the product and on-shipping it to the Republic of Korea.

The source of supply was also a surprise to the Koreans, who then attempted to backward integrate into the New Zealand market. The Koreans had no knowledge of how to dry product, but knew what they were looking for in a finished product. Through trial and error they were able to replicate the drying process so they could compete directly against Hong Kong based processors.

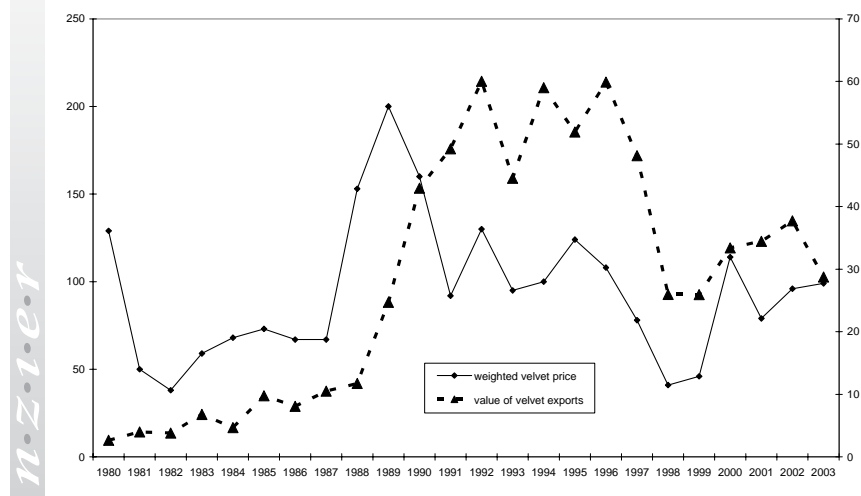
With very few links with retailers and little chance to brand product, velvet producers in New Zealand experience relatively high price volatility (see Figure 8). Furthermore, changes in government regulations and sudden increases (or decreases in supply) from other sources, for example, all have a major impact on prices and value of exports.

With little control over the marketing chain New Zealand producers have little control over how their product is presented or even what happens to it e.g. in the past New Zealand antlers were injected with blood then on-sold to the Republic of Korea from Hong Kong and Japan. These kinds of practices can destabilise prices and portray the product in an unfavourable light.

²² New Zealand product is smaller and lighter than Russian and Chinese velvet and does not retain as much blood – therefore it is sold at a discount.

Figure 8: Velvet: estimated weighted prices & export values

Estimated weighted velvet price & export value \$M 1980-2003.



Source: MAF & GIB

Two major issues dominate the Korean market:

- trade restrictions implemented by the Korean government. The more processed the product is, the higher the duty that it incurs. There is a 50% duty on dried product. However, the structure of the tariff means that frozen product, which is untraceable, slips through the tariff net or incurs only part of the 50% tariff.
- smuggling of frozen product makes up 50% of the supply on the Korean market.

There are huge incentives to smuggle product into the Republic of Korea (because of the high tariff) and sheer volume of product being smuggled suggests that it is highly organised. Some of this product is sourced from Canadian reindeer, which has no history of use in Korean traditional medicine.

Furthermore, traceability is starting to become an issue in the Korean market. This is particularly so with the discovery of Chronic Wasting Disease (CWD) in deer herds in the North America.²³ While there have been no cases of humans contracting CWD, there is nervousness in the Korean market because of the large amount of North American smuggled product on the market.

New Zealand researchers, funded by the Foundation for Research, Science, & Technology (FRST) have provided Korean authorities with a test to establish the origin of any particular antler. However, this has yet to be put into practice in the Republic of Korea.

²³ CWD is a transmissible neurological disease of deer and elk that produces small lesions in brains of infected animals. Its symptoms are loss of body condition, behavioural abnormalities, and death. CWD is similar to mad cow disease in cattle and scrapie in sheep.

3.2.3 Co-products

Co-products are exported to a variety of markets. New Zealand has a long history of exporting deer products. Since the 1930s, co-products in the form of hides and skins have been exported to mainly European destinations (see Table 4).

The use of internal organs started with the wild venison trade. As Yerex 2001 p74, points out:

“Many of those who first made a living from skins knew local Chinese would pay well for deer organs and parts such as velvet antlers, tails and sinews. Local Chinese firms such as South Seas Trading and Hop Yick Cheong in Christchurch, and George Ting in Ashburton, developed more efficient supply lines to Asian markets”

The early wild venison trade was extremely haphazard because it depended upon getting the meat out of the forest and to the trader in good condition. It was not until deer farming started in earnest that infrastructure began to be built-up that would deliver a consistent high quality supply of co-products.

It was recognised early on that there was a market for co-products in, particularly in Asia. Along with velvet, the sinews/tendons, tails, pizzles, and latterly, dried blood products have been sold in Asia (particularly in the Hong Kong and China). Traditionally, Asian buyers want to see the product before it is processed. Price is determined by size, shape, and weight. Depending on the product they are either boiled (pizzles, sinews and tendons) and used in soups or alternatively consumed with alcohol. Glands such as tails are consumed for medicinal purposes.

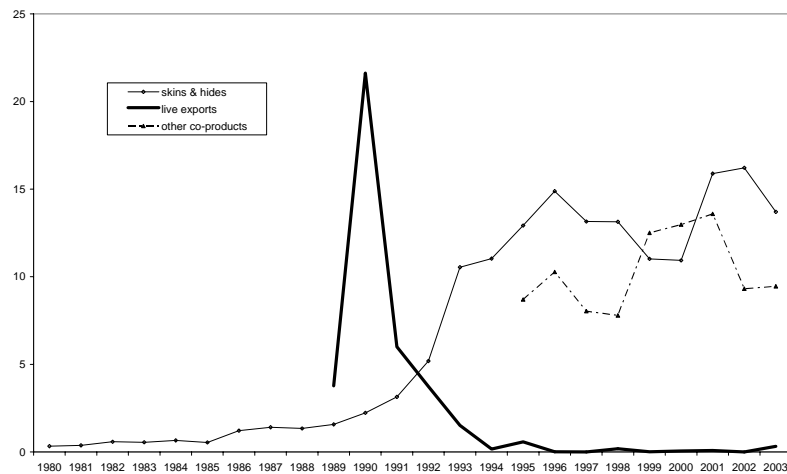
Table 4: Co-product groupings and their major markets

Hides and skins	Germany, New Zealand, USA, & Japan
Edible offals	Europe & Scandinavia
Jewellery	Austria & Germany
Oriental medicines (including sinews/tendons, tails, pizzles, and dried blood products)	Hong Kong, China, Thailand, and Malaysia.

Source: Anderson (1978)

Co-products, like velvet and venison, are treated as commodity products with little attempt at promotion. Also, prices have been relatively low and subject to commodity fluctuations. Figure 9 shows the returns from co-products. Skins and hides and other co-products have shown steady returns overtime. Apart from one year, the returns from the sale of live deer have been small.

Figure 9: Estimated co-products export return
Estimated \$ Millions.



Source: MAF estimates

3.3 Industry structure, strategy, and rivalry

3.3.1 Structure of trade

Traditionally, New Zealand venison and velvet are price takers on the international market. Both venison and velvet are highly dependent on the German and Korean market respectively, for the majority of sales. When those markets stop buying, the market demand is seriously undermined. In the past, economic conditions, uncertainty of government action, and nuclear accidents, have all caused major disruption to the venison and velvet markets, increasing volatility.

Venison

Figure 10 sets out the structural characteristics of both the venison and velvet trade. The venison trade, in Germany has relied solely on the wholesalers trade.²⁴ Effectively, the market power of the large German wholesalers dictated prices to processors and producers in New Zealand. The unequal power relationship between New Zealand producers/suppliers and German wholesalers puts New Zealand suppliers in a strategically weak pricing position, despite them having a branded product.

In other markets, such as the US and Europe (other than Germany), more effective links have been established with the retail sector because smaller companies have been able to manage the (smaller) market size. In the US, contact is mainly with the restaurant trade, while in Europe links have been established with supermarkets. Having said that, the US is a relatively small market and it remains to be seen whether this trade is sustainable overtime.

Velvet

For velvet, the marketing channels in the Republic of Korea are difficult for New Zealand producers to penetrate and it has not been possible to keep control of the

²⁴ This has not been true in other European markets and United States where the smaller scale has allowed for sales to supermarkets and restaurants.

product sold to the final consumer. Therefore the large Korean wholesalers have been able to control the market for velvet.

Figure 10: Structural characteristics of the venison and velvet trade

Producers	Processors	Wholesalers	Retailers
		<i>Venison</i>	
Small	Initially small – second movers are much larger.	Wholesalers are large, particularly in Germany.	Large
		<i>Velvet</i>	
Small	Small – with some backward integration	Large	Small

Source: NZIER

3.3.2 Strategy

Venison

The structure and behaviour of participants in the New Zealand venison industry has given producers little room or resources to allow for the development of a marketing strategy that differentiates between New Zealand venison and other game products. The small size of New Zealand firms has meant that the strategies followed have been severely limited. Traditionally, small New Zealand companies moved product as quickly and cheaply as possible into the most profitable Northern Hemisphere markets.

This is slowly changing with the movement of bigger meat companies into processing venison. The strategy being followed by companies such as PPCS is to move product out of the German wholesale sector and develop relationships with retailers. While this has been known for some time as being a way to generate better returns, smaller processing companies have been unable collaborate to the degree needed to supply the bigger German retail market in the quantities demanded or guarantee year round supply demand by supermarkets. Bigger processors such as PPCS have been able to provide venison products on a year round basis and in a consumer acceptable format.²⁵

Bigger companies have also been able to exploit economies of scope, since they are also marketing lamb to European retailers. They have more bargaining power with retailers because of the volumes they can supply and can reduce costs associated with transport since they can co-ordinate venison shipments with much larger volumes of lamb being sold in the same market.

While there will always be room for the small innovative player, the economies of scale and scope in marketing and transport will give bigger players cost and bargaining power advantages in negotiations with both producers and wholesalers/retailers.

Velvet

While there have been on-going initiatives to link producers with retailers in the Korean market place, as yet, little significant progress has been made. The Korean

²⁵ Remembering that venison turns black with exposure to air, making it less appealing to consumers.

wholesalers and government have made it extremely difficult for this to occur. Some of the impediments include:

- velvet is viewed as a luxury good by the Korean government and as such attracts a substantial tariff (for dried product 50%).
- the easy credit terms given to small retailers by bigger wholesalers
- “persuasion” used by the wholesalers to block potential alternative retail outlets (such as pharmacies) for velvet products.

Despite this, there has been some progress in the development of velvet products. Velvet powders and pills have been developed and research has been done on the health benefits of velvet products.²⁶

Firm rivalry

In the 1960s and 1970s the deer industry was a new industry. Like most new industries, it attracted a number of colourful entrepreneurial types who enjoyed the free wheeling nature of the industry.²⁷ The deer industry not only attracted people from other agricultural industries but also attracted “new blood” from cities and towns all over New Zealand. While some were only in the industry for a short time, others have made a continuing contribution to the deer industry overtime.

While there were many individual operators, three companies made a significant contribution to the development of the venison industry. These were Wilson Neill, TJ Edmonds, and Consolidated Traders. Between them, these companies dominated the nascent deer industry during the 1970s and into the 1980s.²⁸

These companies carved out venison commodity markets in Europe, particularly the German wholesale market, and other European, Japanese, and US markets. The markets were growing rapidly so companies could still make good profits on relatively small volumes.

The entry into the market of Fortex brought new processing innovations. Fortex developed a back-to-back facility so that they could slaughter deer and sheep in two side-by-side slaughtering facilities and then process both meats in a cool store located behind both slaughtering facilities. Use of common cool store facilities reduced handling lamb and venison costs for Fortex (economies of scope).

It was well understood by the industry that to achieve better returns in the market they would require critical mass in the market. The industry attempted to do this by setting up Venison New Zealand. This was an attempt to bring producers of venison together in a co-operative and co-ordinated fashion. Unfortunately, this approach coincided with large increases in the venison kill and a lack of appreciation of the costs associated with forward integration, or of the financial effort required to sustain a collaborative approach to marketing venison.

After the collapse of Venison New Zealand and Fortex (for reasons other than venison processing) the bigger meat companies gradually made their presence felt in the

²⁶ With velvet there are animal welfare issues to be considered concerning the removal antlers. Competing plant-based products do not have same issues. This is particularly important for markets being developed outside Republic of Korea.

²⁷ The timeline in Appendix A sets out the significant events that shaped the deer industry and those who made contributions to the development of the deer industry.

²⁸ According to Yerex (2001) p82, Graham Stewart & Co who were pioneers in the deer hunting game were bought out by TJ Edmonds.

industry. As venison volumes increased, the bigger meat processing companies such as PPCS, Richmond, and AFFCO began moving into the venison market. They were able to pick up the assets of the smaller companies at bargain basement prices and use their own processing and marketing channels to develop venison markets.

Second movers with scale have many advantages over smaller firms in a commodity market. This includes the use of economies of scale and scope by combining the much bigger lamb processing volumes with venison to reduce transport and marketing costs. Furthermore, with larger volumes of venison processors are in a better position to bargain with large wholesalers/retailers.

Not surprisingly these larger processing companies are lukewarm about using Cervena (see various industry Newsletters e.g. Deer Industry News, June 2003) as an appellation. Issues associated with who funds Cervena and the current lack of success in the market means that pressure for change has increased.

Since the early 1980s, a large number of firms have entered and exited the deer industry. Those that remain are either very large or very small. While large companies rely on scale and scope, smaller companies have survived because they have been able to be more innovative and flexible in the market and establish lasting relationships with selected customers.

3.4 Related support organisations

3.4.1 NZ Deer Farmers' Association

Formation of the New Zealand Deer Farmers' Association in 1975 marked the first attempt by the industry to organise itself. Its aims were to promote, encourage, and ensure that information on the deer farming was widely distributed. It was set up at time when there were only a few deer farmers in New Zealand.

In the early years, the slaughter of stock was determined by the farmer. Stock were either shot on farm or sent to a separate deer processing facility. This unregulated approach to processing become less and less acceptable to New Zealand and foreign meat inspection officials.²⁹ The Government put pressure on industry to either organise processing facilities in a transparent manner or they would open up slaughtering to meat companies.

This led to the establishment of the Game Industry Board (GIB) in 1985. The GIB was set up as a statutory producer board with representatives from producers (Deer Farming Association), processors (Deer Industry Association), and one representative appointed by the Minister of Agriculture to represent consumers. Its function was to co-ordinate industry marketing and market access, quality, and research.

In 2002, the GIB was renamed as Deer Industry New Zealand. Deer Industry New Zealand also took over some of the functions of the Deer Farmers' Association as part of an industry rationalisation programme, (newzealandfarmers.com (2002)).

²⁹ "Farmers" were known to bring in headless deer for processing facilities, claiming that they had been shot in the wild. Meat inspectors were suspicious that the heads had been cut off to disguise the ear tag marks - which would have shown that they were farmed animals (or poached farm animals) not wild as claimed by the "hunter". This led to the "head on" rule by MAF Meat Division which stated that no animal would be accepted for processing unless it had its head attached to the carcass.

3.5 Opportunity

3.5.1 Supply side advantages

Like a lot of introduced species, deer thrived in the New Zealand environment. They grew bigger and at faster rates, than the same deer species in Europe, adapting well to the temperate climatic conditions. The competitive advantage that the natural environment provided for deer, which could not be replicated elsewhere, meant that the potential existed for deer farming if the animal could be domesticated.

The market opportunity was grasped by a group of innovative entrepreneurs and scientists. Not only did they develop the means to capture deer but also established farming methods that have sustained the industry over the long run.

3.5.2 Demand side advantages

Two traditionally strong markets were already well established for deer products. The German market for venison was well developed before New Zealand exports were thought possible. Similarly, for velvet and by-products, markets were well developed in the Republic of Korea. Furthermore, the German venison tariff barriers were relatively light (e.g. tariffs on venison in the lucrative West Germany were 6.2% in 1973).

3.6 Government involvement

The Government has had a major impact (both positive and negative) on the development of the deer industry.

From the outset, government:

- encouraged deer to be introduced into New Zealand. Along with acclimatisation societies, government encouraged the transport and release of deer in New Zealand.
- has been at the forefront of attempts to control deer. At first through the DIA, then the Forest Service, government organised hunting, bounty payments, and export markets for skins.
- declared deer a noxious animal, under the Noxious Animals Act (1956) declared deer to be a noxious animal. This meant that farming deer was prohibited.
- allowed, through amendments to the Noxious Animals Act in 1969 the development of deer farming. The Deer Farming Regulations were introduced providing for licensing of deer farms, subject to certain conditions.
- attempted to control poaching deer through the Wild Animal Control Act (1977). It made the provision that all deer carcasses must have their “head on” when they went to the game packing house. This enabled stock to be earmarked and allowed for registration of deer. This had an enormously positive impact on the confidence of overseas buyers. As Yerex (2001) p99, points out, quoting an unnamed British game exporter: *‘New Zealand, the country whose game exports are expanding rapidly, is also the only country with regulations controlling the processing of game’*.
- encouraged speculation in deer farming (leading to a boom bust cycle). The introduction of tax incentives in 1970s destabilised the industry. Entrepreneurs

flooded into the industry pushing up the price of live animals. According to Yerex (1982), the Inland Revenue Department (IRD) permitted those buying deer to adopt “standard values” equivalent to sheep and cattle. This meant that along with other livestock farmers they were able to write off initial high capital costs of livestock and farm development against their income. In effect, allowing tax write downs of up to 50%. (Note that deer farming has significantly higher capital requirements than sheep farming).

As a result, live deer prices increased dramatically – more than could ever be recouped from the production of velvet or venison. The numbers of people involved in live captures in 1979 quadrupled. The boom generated demand for new helicopters, the leasing of large cargo planes to move deer from one end of New Zealand to another, and deer for sale of any quality. When IRD signalled that the write down would be withdrawn in late 1979, coupled with the disappearance of Republic of Korean velvet buyers, prices tumbled.

- integrated the deer industry into the New Zealand agricultural industry. Once the initial establishment period was completed, the government (in particular MAF) ensured that deer farming was treated in a similar fashion to other farming activities.

4. INNOVATION

Apart from some Scottish research, there was very little understanding of how to go about turning deer into a farm animal. Most of the research had to start from scratch using captured wild deer.

Despite this, New Zealand researchers had a number of advantages in their quest to domesticate deer. Important, was the ability to apply the knowledge and skills already learnt from the management of sheep and dairy farming. Techniques adapted from sheep farming such as mating management, weaning, and grazing control were adopted readily in deer farming.

Agriculture research stations³⁰ also had the infrastructure and skills to develop world's best practice. This meant that the capacity and infrastructure was in place to deal with deer farming problems as they arose. The ability to leverage existing skills from other livestock industries was a significant advantage for the New Zealand industry and pivotal in the development phase of deer farming.

There were also a number of other advantages:

- red deer were the most numerous breed in the wild. Fortunately, they had characteristics that were most suited to venison, velvet, and co-products markets.
- the herding instincts of red, wapiti, fallow, and sika deer are relatively strong. The need to manage deer in 'mob' situations is crucial to the success of farming livestock economically.
- deer were comparatively disease free, relative to other livestock.

4.1 Use of helicopters for retrieval

The 'breakthrough' innovation that had a major impact on the deer industry was the introduction of the helicopter. In the early 1960s the helicopter enabled more efficient use of a hunter's time, increasing kill rates dramatically. At first, they were sparingly, to ferry hunters and equipment into the remote areas and to retrieve deer carcasses. By 1964 however, they had been used to shoot deer, as venison prices increased.

As time went on helicopters were also used in deer recovery. Prior to the use of helicopters, deer had to be enticed out of the hills with feed. While this was partially successful, it was the introduction of helicopters that allowed large scale retrieval to occur. The helicopter was so successful that it has been estimated that 85% of all deer recovered can be directly attributed to the use of helicopters (Wallis and Hunn, 1982 p84).

As venison prices continued to climb, culling rates became so great that hunting of wild deer in such large numbers became unsustainable.³¹ Deer were also becoming familiar with helicopters; instead of running up hill as their natural instincts normally dictated, they retreated into the bush. Clouston (1973) p8, suggests that in some places, where helicopter hunting was greatest: "*...they even changed their feeding habits. They would advance on the 'tops' and feed before daybreak – then retreat into bush until dusk.*"

³⁰ These included Invermay, Lincoln College, Massey University, and Ruakura.

³¹ At its peak, in the early 1970s, over 100,000 deer carcasses were taken out New Zealand forests.

The major problem was how to catch the deer once it had been spotted by the helicopter. Over the years a number of methods were trialled with varying degrees of success:

- an early method consisted of chasing one or a small group of deer up above the snow line, so that eventually the deer would get bogged down in the snow. At that point, a catcher would jump from the helicopter, “bulldogging”³² the deer and hauling it up in a sling under the helicopter.
- herding deer into capture paddocks was another successful method when deer were relatively numerous. A farmer would first pick a suitable mountain valley where they would construct a paddock. A helicopter would then round-up and herd as many deer as possible into a capture paddock, where they would be secured. This method depended on suitable country and on substantial numbers of deer being herded into the paddock.
- a common method in the 1970s was the use of tranquillisers or darts to capture deer. The helicopter hovered over the moving deer while a dart was fired into the hindquarters of the selected animal. The helicopter then followed the deer until it collapsed. Through a variety of methods, all involving the deer being blindfolded and winched out under the helicopter, the deer was flown a few kilometres to a transport box. Losses were initially very high, however as operators became more experienced and as techniques improved, the loss ratio reduced markedly.

However this system had its limitations, it took 15-20 minutes for the tranquilliser to work and the helicopter had to try and herd the deer out of bush areas. While this was overcome by the use of a radio transmitter fired at the same time as the tranquilliser, it still required skilful handling by the operator who needed a licence before a veterinarian would supply the operator with the necessary drugs.

- the most widely used system was the “gotcha gun” developed in 1978/79. This consisted of a modified .303 or .308 rifle or a helicopter mounted gun that fired a net over the deer. This was a great advance over other capture techniques. According to Hunn and Wallis (1982) p88, the advantages of this method were:
 - the operator did not require a complicated drug licence.
 - the operator did not have to wait twenty minutes for the drug to take effect.
 - even if the animal was injured, it could still be sold as wild venison, whereas anything shot with a tranquilliser could not.
 - there were opportunities for multiple shots since the gun could be reloaded with another net.

Hunn and Wallis (1982) also point to the team approach to capture. The team was closely integrated, usually comprising a pilot, a shooter, and sometimes a third person. The pilot had to perform dangerous manoeuvres to put the machine in the best possible position to retrieve the deer. Unfortunately, as deer grew scarce and the economic pressure was at its most intense, pilots tended to go to the limit of safety. This led to many serious accidents. The shooter and third person also had difficult jobs, since after the net gun had been fired it was their job to jump from the helicopter and

³² Bulldogging consisted of throwing a net over the deer and tying up its legs ready for transportation. The first documented successful attempt at bulldogging is attributed to Goodwin McNutt in 1966.

secure the deer. This involved sedating the deer with valium or stresnil, strapping the legs, freeing the deer from the net, and placing the deer in a carrying bag for the short trip back to a strategically located darkened holding pen. At that point, the object was to get the deer back on its feet to ensure survival.

4.2 Deer handling

Deer are nervous, flighty, easily scared, given to panic, and can easily injure or kill themselves. In the wild, this was their only protection against predators. For researchers, this behavioural trait was a major challenge.

According to Drew (1976), Lincoln College under Prof Coop, acquired 14 red deer for study under intensive farming conditions in 1968. In this work on deer, Coop established that deer were in fact able to be farmed.

Building on Coop's work in 1973, Invermay Agricultural Research Centre was able to establish a herd of 90 breeding hinds on both hill country and prime agricultural flat land. Problems occurred immediately, the animals were nervous, damaged fences, and refused to be herded into the central raceway running through the farm, Drew (1976). However, in six months, once the animals became familiar with their surroundings, coupled with the skill of those working with the animals, the deer gradually became more amenable to shifting.

4.3 Reproduction

Drew (1976) demonstrated how the hybridisation between red deer and other members of the deer family can improve the genetic potential of progeny. This had two practical results for the farmer:

- it allowed the young red/wapiti stags to reach market weights by November, in time for traditionally strong German Christmas demand, and
- it boosted the weights of the progeny, which improved stocking rates.

Drew's work was a major advance for the deer industry demonstrates how R&D can be critical in underpinning processing and marketing in agricultural industries.

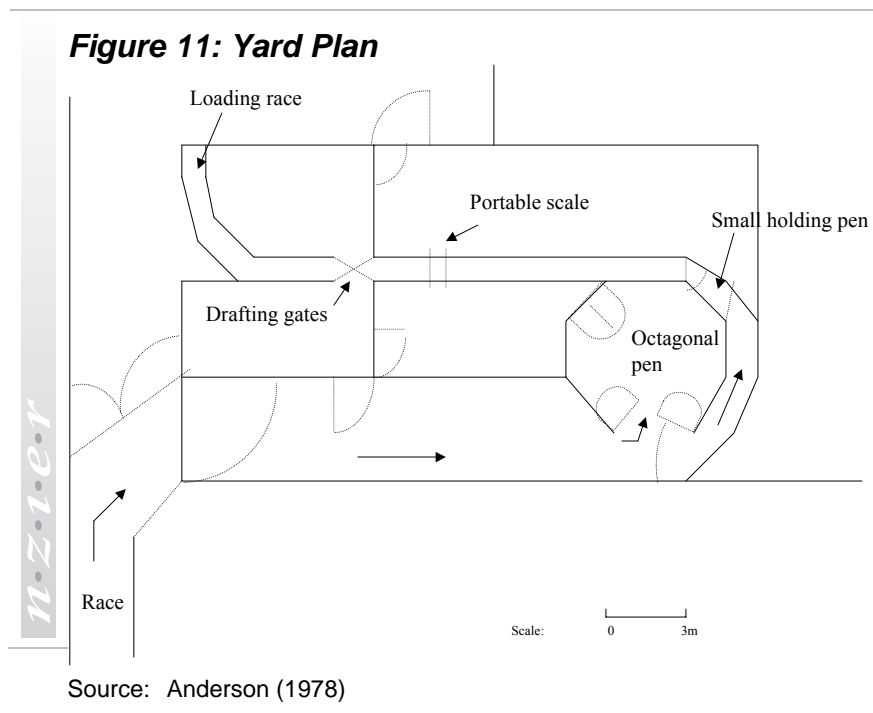
4.4 Yard plans

Deer behaviour has a big impact on yard design (see Figure 11). Good design can have a major impact on stock management and general running of a deer farm. Research and experience of working deer showed that:

- a covered facility to provide a dark interior was essential. Deer are more relaxed in a darkened environment when confined. The required stud height was approximately 2.4 metres.
- a round or octagonal drafting yard (at least 3.5 metres in diameter) is required to prevent deer bunching in corners and to provide a free flow around the circle before being moved to the appropriate drafting gate.
- next to the circular pen at least one or two smaller pens to hold each mob drafted off is necessary for easy handling.
- an adjustable loading race for transporting animals. This should be near the drenching pen (with a weighing system in between the loading race and drenching pen).

- a central farm race enables deer to be moved from yard to paddock easily. Any angles in the race should be screened with trees or a sight board.
- boundary fences should be at least 2 metres high.
- ideally paddocks should be square (not always possible) with fresh water in each paddock.
- surrounding pens open into a the central yard at various points
- two centre-pivoting doors in the central yard are required to direct deer out of the central yard into various pens.
- a drafting or loading out race with adjustable height ramp
- a system of lanes or races capable of bringing the deer to and through the yards from any part of the farm.

Also important when deer first arrive at a farm is to allow them to move through the yards from paddock to paddock so that they grow accustomed to the structures.



4.5 Feed requirements in intensive agriculture

Important to efficient farming of deer has been the ability of researchers to provide information on nutritional requirements. According to Fennessy (1982) pp105-114, crucial to the growth and nutrition of red deer are:

- intrauterine growth determines size and weight at birth. Most of the growth occurs in the last $\frac{1}{3}$ of pregnancy, consequently nutrition of the hind is very important.³³
- the milk feeding period in a calf's life is a critical. Early research at Invermay showed that 90% of the variation between female calves in growth rate from birth to 9 weeks was accounted for by milk intake.

³³ Other factors such as calf sex, weight of hind, and placental size also have a bearing on birthweights.

- the pattern of growth between the 6 month – 2 year period is highly seasonal. Little or no growth occurs during the winter and rapid growth occurs in spring. At time of the rut (March – April) feed intake declines and stags lose condition. The following spring – summer the stag reaches a new higher weight.
- adult stags go through a similar cycle to the under two year old stags. High spring-summer growth followed by loss of condition during the rut and no growth over winter.

The highly seasonal pattern in the growth of deer is linked to hormones. At the rut, the high concentration of testosterone depresses feed intake. Castrated stags do not lose as much condition at the time of the rut and also do not put as much on during the spring – summer months.

Fennessy (1985) demonstrated that understanding the relationship between nutrition, liveweight, age, and performance, are of crucial importance in managing an efficient deer farm. For yearling hinds to produce as 2 year olds they must be well grown. As an illustration of the seasonal nature of those requirements Table 5 sets out red deer requirements and compares them with those for ewes.

Table 5: Metabolisable energy (ME)¹ requirements and stock unit equivalents for red deer

MJ ME/day	Autumn	Winter	Spring	Summer	Annual stock units
Stags					
3-15 months	16	19	27	26	1.4
15-27months	24	28	31	30	1.8
Older	19	35	42	38	2.2
Hinds					
3-15 months	15	18	22	21	1.2
Older	23	22	24	47	1.9
Ewe					
Rearing 1.1 lambs during spring	13	10	28	11	1.0 ²

Note: 1) ME requirements are expressed in terms of megajoules of metabolisable energy per day. 2) One SU requires about 540kg pasture dry matter per year (e.g. pasture – 10.8 MJ ME/kg DM; barley – 12.5 MJ ME/kg DM)

Source: Fennessy (1985)

5. OUTCOMES

From its beginnings in the early 1970s the deer industry has grown rapidly. Venison and velvet production are now a well established part of New Zealand's livestock industry.

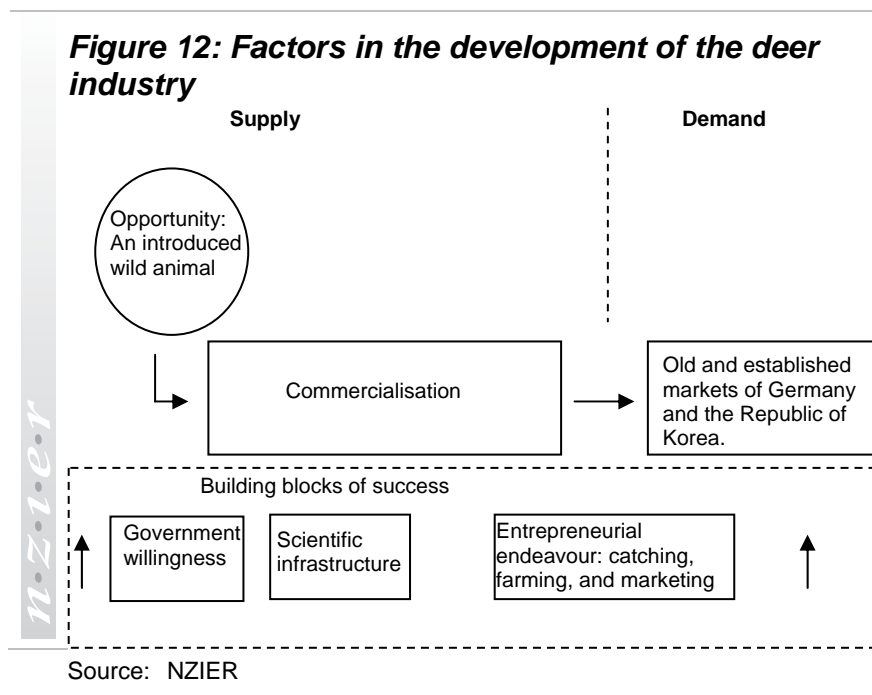
5.1 Development

The deer industry has followed the classic boom – bust cycles that other agricultural and horticulture products have in New Zealand (see Figure 13 as an example). However the demand has been driven by two markets which have had a long history in venison and velvet consumption. The skill and innovation has been in meeting the market demand from wild deer and sustaining the supply by farming deer.

5.1.1 Supply issues

The most significant innovations have been on the supply side. This included: helicopter capture, deer handling, reproduction, yarding, and feed requirements. Most of these were 'first in the world' innovations specifically geared for farming deer in New Zealand.

Supporting this process was the scientific, commercial, and government infrastructure that underpinned the deer industry's development (see Figure 12). Crucial to the success was the knowledge and expertise scientists had gained from other farmed animals, motivated entrepreneurs who overcame difficult logistical problems, and willingness of farmers to diversify their livestock portfolios.



5.1.2 Demand issues

The demand for deer products has mainly been driven by venison (except for a short period in the late 1970s). Currently, venison prices impact on the supply of velvet but velvet prices have little impact on venison prices.

The well established export markets were of major significance. This has been a positive and a negative for deer producers in New Zealand. It is positive because markets have readily accepted New Zealand deer products without large expenditure on advertising or education programmes.

The main drawback has been the difficulty in getting close to the consumer. This is because the distribution channels have been 'locked up' by wholesalers, which have traditionally supplied deer products to supermarkets and the final consumer. The wholesalers are typically large and exert considerable bargaining power in the venison and velvet marketing chain.

Two underlying issues dominate the demand for venison (and to a lesser extent velvet.) They are:

- the attempts by the deer industry to forward integrate into the market.

In a US 1980s study, Buzzel and Gale (1987) demonstrated that in the 2,500 to 3,000 businesses surveyed that there was no correlation between forward integration and returns on investment (ROI). However, there was a correlation between backward integration and ROI.³⁴ The conclusion is that forward integration, while not impossible, is difficult to achieve in practice. The experience in the deer industry with its attempts to forward integrate through Venison New Zealand underlines this result where forward integration failed for a variety of reasons. Furthermore, backward integration by Korean buyers into the velvet market and the domination of the wholesalers in both the German and Korean markets has been highly successful.

- the importance of second mover advantage.

Chandler (1990) shows in his study of Germany, British, and United States businesses that second mover advantage with scale is a key business strategy. This has been clearly demonstrated by PPCS, one of two large meat processing cooperative in the South Island. It has bought up the failed processing facilities of others (notably the Fortex plant in South Canterbury) and entered the mature venison trade on a large scale. PPCS has used its underlying core competencies (scale in meat processing and scale in transportation) to be extremely competitive in the venison processing industry. The structure of the venison processing industry has changed – so-much-so that there are only big and very small players left in the processing industry.

Not only has scale been important but also scope. PPCS and other major processors have shipped venison to Northern Hemisphere markets with much higher tonnages of sheepmeat. This means they can co-ordinate shipments to reduce transport costs and have greater bargaining power with large wholesalers that buy both products. It is also significant that it has been only in the last five years that venison has been slowly diverted away from the German wholesalers to supermarkets.³⁵ This reduces the

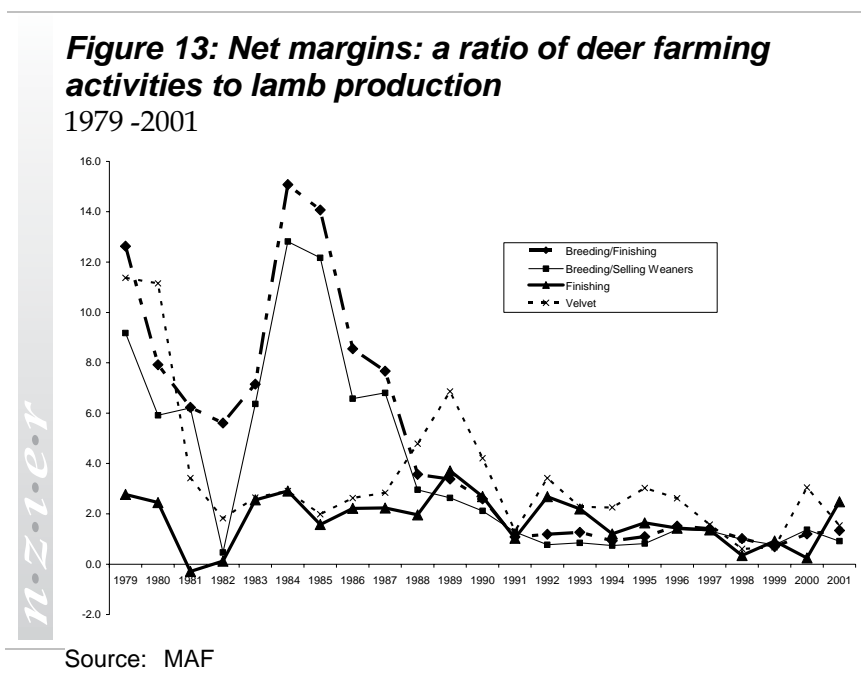
³⁴ Forward integration occurs when producers/processors seek to control the marketing of their product to consumers by controlling retailing/wholesaling. Backward integration occurs when those that control the retail/wholesale trade seek also to control the processing/producer part of the marketing chain

³⁵ A direct result of the entry of large processors, which can supply product at the times the supermarkets demand it.

influence of the wholesalers on prices received, introduces the processors to the more lucrative consumer market, and puts processors more in touch with consumer trends.

5.2 Comparisons

The most logical comparison is to examine the likely alternative land use for deer farming activities (see Figure 13), in this case, lamb production. Unfortunately, we do not have data pre 1979. However the data presented does show how profitability relative to sheep farming has declined overtime. The wild fluctuations pre-1990 are typical of new agricultural industries as supply is continually outstripped by demand. In particular, the volatility of velvet prices has continued, albeit at lower levels.



Other sources report a slide in returns per hectare relative to the next best alternative land use. In data reported by Straight Furrow (2004) the economic farm surplus for deer had declined further in 2004. Deer returns per hectare were \$26/ha. This compared with sheep (\$577/ha) and dairy (\$694/ha).

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APPENDIX A: TIMELINE

1854	First deer introduced into New Zealand. This attempt failed to establish a herd.
1861	A stag and two hinds imported from England.
1863	First significant introduction of deer into New Zealand (Wairarapa 1863).
1860-70	Acclimatisation Societies supported by government are at the forefront of introducing deer into New Zealand. T.E. Donne was a keen hunter and head of the Tourism Department that supported financially the efforts of the Acclimatisation Societies to bring deer to New Zealand.
1871	Deer introduced to Otago.
1871 – 1920	Explosion in deer numbers.
1892	Rev Phillip Walsh warns of the impact of deer on the New Zealand forests.
1906	First attempts to control deer in the Lake Hawea district.
1913 – 1925	Deer become a problem in New Zealand parks and forests.
1921-22	The Animals Protection Act removes protection on deer.
1927	Department of Internal Affairs starts its own deer hunting operations.
1930	Deer Menace Conference where all remaining protection for deer was lifted.
1931	DIA develop a deer skin trade.
1939-1945	War curtails culling operations.
1953	First export of venison (to the United States).
1956	Forest Service takes control of deer eradication from the DIA.
1958/59	Entrepreneurs start to develop businesses based on shooting and recovering wild deer.
1963	Tim Wallis, Robert Wilson, and Wattie Cameron trial the helicopter.
1964	The helicopter becomes a shooting platform and the number of wild deer shot and recovered grows dramatically.
1966	First successful attempt at bulldogging a deer was made by Goodwin McNutt.
1968	J.R. Maddren financed farming trials at Lincoln College under Prof Coop.
1969	First deer farming licence given to Rex Giles, Managing Director of Consolidated Traders.
1973	A special deer research unit headed by Dr Ken Drew at Invermay Agricultural Research Station was established.
1975	Deer Farmers Association had its first AGM with Peter Elworthy as President.
1978	Development of the 'Gotcha Gun' by Ivan Wilson and Graham Jacobs.
1979	Korean buyers set up velvet processing operations in Canterbury.
1980	Velvet prices collapse as prices fall in Republic of Korea and IRD remove tax incentives.
1983	Korean traders caught injecting blood into imported antlers to improve weight and colour – demand drops dramatically.
1986	Chernobyl crisis taints Eastern European game meat.
1993	Venison New Zealand collapses.
1994	Fortex collapses.

1995	PPCS and other processors start to develop venison operations.
1996	CJD is linked to consumption of meat in Britain.
1997	CWD (similar to CJD) is discovered in wild North American deer herds.
1998	Companies begin to diversify away from wholesale market in Germany. Asian crisis hit velvet exports to Korea.
2001	Prices peak in Europe for venison and start a prolonged downward spiral.
2002	Formation of Deer Industry New Zealand.
2004	Deer New Zealand release a draft Global Venison Strategy for discussion.