Deer farming in Oceania

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Abstract

Deer farming in Oceania is confined largely to New Zealand and Australia. Deer were introduced to both countries in the 19th century, so successfully in New Zealand that control operations were required to protect vegetation and watersheds. Marketing venison from control operations led to the farming of deer as feral populations declined. In 1985, there were approximately 374,000 farmed deer on 4000 farms in New Zealand. Deer respond to intensive management and husbandry similar to that applied to cattle and sheep. Strong demands and speciality prices for venison create a favourable economic picture and confidence in the industry remains high. In Australia, about 43,000 deer are supported on 400 farms and the infrastructure is less developed. Growth of the industry is restricted mainly by the availability of breeding stock.

Introduction

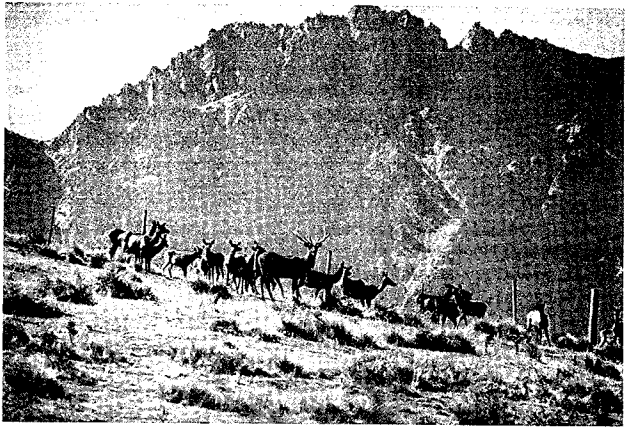
Oceania includes Papua New Guinea, Australia, New Zealand, and neighbouring Pacific islands. Deer are not endemic but were introduced by European settlers mainly during the 19th century. Various species are now found in New Zealand (mainly red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) but also North American wapiti (*C. e. nelsoni*), white-tailed deer (*Odocoileus virginianus*), sika (*Cervus nippon*), sambar (*Cervus unicolor*), and rusa (*Cervus timorensis*)). In Australia, the main species farmed are fallow deer and red deer but also sambar, rusa, chital (*Axis axis*), and hog deer (*Axis porcinus*). Papua New Guinea and New Caledonia have rusa. Currently, deer farming is virtually confined to New Zealand and Australia but there is considerable interest in Papua New Guinea (Fraser-Stewart, 1985) and New Caledonia. Consequently, this chapter is concerned only with deer farming in New Zealand and Australia.

New Zealand

Deer were first introduced to New Zealand in 1851 with several more liberations following over the next 60 years. Favoured by plentiful food supplies, mild climate, and absence of predators, populations grew rapidly. By early this century, damage to native forests and grasslands was such that they were regarded as pests (Wodzicki, 1950). Of the several species introduced, only red deer (Fig. 16.1) and to a lesser extent fallow deer prospered although there are small local populations of wapiti, sika, rusa, sambar, and white-tailed deer.

Because of damage to vegetation and concern about erosion, there have been several attempts at population control. In initial attempts, bounties were paid to private hunters. Then, in the 1930s, the government employed their own hunters to shoot deer. A substantial proportion of the skins were recovered for export (Challies, 1985). Although Challies (1974, 1985) considers it unlikely that early control operations in forested areas significantly reduced deer numbers, commercial hunting for skins undoubtedly did have a significant impact in more accessible areas in the 1940s and 1950s. From the late 1950s, the greater hunting pressure applied in priority areas (i.e., those selected on the

Fig. 16.1. Red deer, which comprise about 85% of farmed deer in New Zealand. (Photograph by Audio-Visual Unit, MAFTech, Invermay Agricultural Centre.)



basis of downstream values at risk (Riney, 1956)) appears to have been effective in reducing browsing on preferred plant species (Challies, 1974).

Subsequently, the recovery of deer carcases proved economic and by the early 1960s venison was being exported to Europe and by-products such as antlers, tails, pizzles, and sinews to Asia for traditional medicines and health products. Following the success of the first commercial helicopter venison operation in 1963, it became apparent that pressure on feral populations could become so great that the resource would soon become limiting. Venison exports increased from 480 tonnes in 1962/63 to 4400 tonnes only 10 years later, but by 1979/80 exports had declined to about 1000 tonnes. It was this pressure on wild stocks which led to the development of deer farming and new markets for breeding stock.

The first serious attempts to capture live deer were made in 1967 but it was not until 1969 that deer farming was legalised, with the first licence issued in March 1970. Initially, growth was slow and by 1975 there were only about 25 farms with a total of 5000 deer. However, the high prices received at the first deer auctions in 1977 encouraged helicopter operators to seize the opportunity for live capture. For example, in the 1979/80 season 20,000–25,000 feral deer were captured (Wallis & Hunn, 1982; Fennessy & Drew, 1983). Although live capture is now much less important, a number of deer are still captured each year.

Deer farming initially developed to provide venison for export. However, lucrative prices for velvet antler on the Korean market in the late 1970s temporarily diverted the industry from this main course. With the promise of a lucrative velvet antler market, prices for stags and breeding hinds increased substantially. Other factors stimulating development of deer farming include the ready availability of feral deer, adaptability of red deer to farm conditions, development of efficient capture techniques, and relatively low prices for other livestock products, especially sheep meat and wool. The last factor was particularly important in the 1960s and 1970s when New Zealand farmers were looking to diversify their operations, a situation which has persisted. Another important stimulus was the infusion of capital by urban investors formerly encouraged by favourable taxation policies. However, even without tax advantages, there is considerable interest in a variety of arrangements. For example, deer farmers often manage animals owned by investors, charging a grazing fee or by taking a share of the progeny and products.

Structure and size of the industry

In New Zealand, farm animals are pastured throughout the year. In times of pasture shortage, such as during winter or summer drought, they are

fed supplements such as hay, silage, or grain. Thus, the same husbandry systems are used for deer as for sheep and cattle and in fact most deer are run on mixed farms where the predominant animals are likely to be sheep or dairy cows.

Currently, the New Zealand deer industry is expanding maximally and virtually all young females are retained for breeding. According to a survey by the New Zealand Deer Farmers' Association, there were about 374,000 farmed deer in mid 1985, of which 188,000 females were mated. About 8% were fallow and 84% were red deer; most of the remainder were wapiti or red x wapiti hybrids. Also, about 47,000 older males were farmed for velvet antler production (mainly red deer as fallow deer are not used for velvet production to any extent) and breeding. Slaughter animals are mainly young stags, with the balance being older stags which are usually killed following the rut when they are very low in carcase fat. In the absence of female culling, the number of breeding females can be expected to double about every 3 years. The deer are run on about 4000 farms with about 64% of all deer in the North Island and the remainder in the South Island.

The industry is well organised nationally. The New Zealand Deer Farmers' Association (NZDFA), through its national body (established in 1975) and local branches, represents a majority of those farming deer. The NZDFA keeps its members well informed through a newsletter and an annual conference, while it also has the major interest in the publication of the monthly magazine, *The Deer Farmer*. The NZDFA's role has been primarily political in representing the industry to government. The Game Industry Board, established by government statute in 1985, has equal representation from producers and from the processing industry together with a government representative. It therefore draws together all sectors of the deer farming industry with the stated function of promoting the orderly development of this new industry, particularly its overseas markets.

Technology

Most New Zealand deer farmers have considerable experience with pastoral production systems and have developed appropriate husbandry methods for deer. Although there is a wide range in climate and hence the annual pattern and total amount of pasture production, much of New Zealand is well suited to animal production from pasture (see Nicol, 1987) and deer are raised on all types of country from the intensive dairying areas of the North Island to the extensive high country of the South Island. Compared with farming sheep, deer farming has a relatively low labour requirement, with the most intensive periods being weaning, mating, and during supplementary feeding.

Regulations require 2-m perimeter fencing which is usually a purpose-built deer netting. Internal fencing may be the same or may be an extended sheep fence, whereas temporary electric fencing is often used to ration pasture. Many farms have a laneway system so that the animals can be shifted simply. Good yarding facilities are essential for effective management (e.g., for anthelmintic treatment, ear-tagging, testing for tuberculosis, velvet antler removal, etc.). Frequently, these yards will include a body crush, weigh scales, and often a small handling pen which will hold five to eight hinds. Deer became easy to handle and are apparently very amenable to the systems developed in New Zealand. For example, deer are safely trucked all over New Zealand by specialist deer transport operators (Trask, 1986), and many farms also have their own deer transport trailers.

Strong research and extension programmes coupled with the enthusiasm of deer farmers and infusions of off-farm capital have had a major collective impact on the development of deer farming. Major research contributions include the following:

1. Guidelines have been established on management procedures (including animal health) to achieve high levels of production (Fennessy, 1982; Mason, 1984; Macintosh & Beatson, 1985; Moore, Cowie & Bray, 1985; Macintosh, 1986; Pearse, 1987a,b).
2. Research on the control of tuberculosis has been vital (Beatson & Hutton, 1981; Carter *et al.*, 1986; Griffin & Cross, 1986).
3. An understanding of some of the factors which influence antler growth and development has assisted farmers involved in velvet antler production (Fennessy & Suttie, 1985).
4. Comparative data on different species of deer and on hybridisation (e.g., wapiti and red deer; Moore, 1985) is expected to increase interest in wapiti hybrids greatly over the next few years.
5. Guidelines for the selection of genetically superior deer are being developed along with a recording and genetic improvement system (Cowie, 1985; Fennessy, 1986). Bloodtyping also may have a place in improving assessments of genetic value (Dratch, 1986).
6. Reproductive technologies, such as advancement of the breeding season and artificial insemination, have been developed (Moore & Cowie, 1985; Fennessy *et al.*, 1986; van Reenen, 1986).
7. New meat processing technologies are being adopted (Drew & Fennessy, 1986).

Management of farmed deer is a skilled operation. This is well illustrated on intensive farms where it is essential to regularly treat young deer through

their first autumn and winter with anthelmintics to ensure that performance does not suffer from lungworm (*Dictyocaulus viviparus*) infestation (Mason, 1985). With young deer in their first winter, adequate nutrition minimises the risk of the stress-related diseases such as yersiniosis (Macintosh, 1986) and malignant catarrhal fever (Oliver *et al.*, 1986). Similarly, an appreciation of seasonal feed requirements is essential (Fennessy, 1982). For example, adult stags have very low fat reserves following the rut. Consequently, high quality diets are required to ensure that they do not succumb under difficult climatic conditions and to improve velvet antler production the following spring (Fennessy & Suttie, 1985). Adequate quantities of high quality feed should be supplied to lactating hinds so their calves thrive (Fennessy & Milligan, 1987). Although with proper management there are few problems with animal health, malignant catarrhal fever, yersiniosis, and bovine tuberculosis do cause problems on some farms. A scheme for tuberculosis control run by the NZDFA and with cooperation of the Deer Branch of the NZ Veterinary Association is in operation (Hunter, 1986).

Farmed deer are slaughtered at specialised deer slaughter premises (DSP) of which there are four in the South Island and five in the North Island. At the DSPs, deer are subject to both *ante-* and *post-mortem* examination by a veterinarian. Since deer are not classified as domestic stock, they cannot be slaughtered at abattoirs along with sheep, cattle, goats, and pigs. The venison is processed and packaged for export at Game Packing Houses, a number of which are attached to the DSPs. Feral (wild-shot) venison is also processed through the Game Packing Houses, with the separation of farmed from feral venison being rigidly controlled by government inspectors.

Productivity

Deer are efficient converters of grass to meat on good grazing land; the use of such high-class land contrasts with the traditional habitat of the deer in New Zealand. Body growth is strongly seasonal. Basic information on feed requirements has enabled more efficient use of feed and improved production from pasture (Fennessy, Moore & Corson, 1981; Harbord, 1982; Fennessy & Milligan, 1987). The meat is very lean compared with traditional livestock (Drew, 1985; Drew & Fennessy, 1986) and the eating qualities of farmed and feral deer are similar (Forss *et al.*, 1979).

The principal factors determining herd productivity are reproductive and growth rates (and hence slaughter weight) of the progeny and the amount of feed consumed by the herd. As well as being farmed for meat production, some red deer (and wapiti) are kept specifically for velvet antler production and to a lesser, but increasing extent for trophy hunting.

Red deer and fallow deer normally breed for the first time at 16 months of age, thus calving at two years. For red deer, there is a threshold bodyweight of about 70 kg (about 70% of mature weight) below which hinds are less likely to become pregnant (Fennessy *et al.*, 1986). A corresponding threshold weight for the onset of puberty has not been defined for fallow does (Asher, 1986). As both red and fallow deer have low natural twinning rates (probably less than 0.5%), high conception rates are essential (>90%). Therefore, it is important to have adult hinds in good condition for mating. Consequently, pre-rut weaning may help in ensuring high herd fertility (Fennessy & Milligan, 1987). Although pre-rut weaning is general on intensive farms, weaning after the rut is not uncommon on the more extensive properties (Yerex & Spiers, 1987). Single sire mating in red deer is commonly practised with the recommendations being one stag per 50 hinds (Moore *et al.*, 1985).

Good growth rates in female deer are vital in terms of yearling fertility. They also are very important for slaughter stags as the NZ venison price system is based on carcase weight and leanness. The premium carcase weighs 50–70 kg with less than 10% fat (Drew & Fennessy, 1986). Most red deer stags fulfil these criteria at 12–18 months of age although this is currently too late to enjoy the seasonal premiums which prevail in the spring, when these animals are about 9–10 months old. Consequently, many older stags are slaughtered in the early spring. From a productivity point of view, this is not the optimum time for the farmer as the stags do not grow over winter but must be fed well to maintain weight (Fennessy *et al.*, 1981). Overall, the objective is to maximise growth rates at times of the year when high quality grazing feed is available and the animals have the propensity to grow. Spring pasture in most parts of New Zealand is adequate but summer pastures are limiting in some regions so irrigation or costly supplements may be necessary.

The use of such expensive procedures ultimately depends on the market return for venison and by-products such as skins, testes, pizzles, and tails (Kong & But, 1985). The international market for velvet antler is relatively small and well-supplied (Hughes, 1986). Since it is a buyer's market, many New Zealand deer farmers have little if any interest in velvet production. However, for some it is very profitable, with highly selected groups of red x wapiti hybrids and wapiti being retained for this purpose.

There is considerable interest among deer farmers in widening the genetic base of farmed deer. Consequently, since 1981 there have been several importations of wapiti from Canada and red deer from Europe (particularly Germany and the United Kingdom). Small numbers of fallow deer and Pere David's deer (*Elaphurus davidianus*) also have been imported. Much of the

initial interest was stimulated by the possibilities for both wapiti-type velvet in the velvet antler trade and larger carcases in the venison trade.

Economics

The economics of deer farming in New Zealand are difficult to assess in the long term without several assumptions, mainly relating to the longterm relativity between the price for weaner hinds destined for breeding and weaner stags for slaughter (currently for red deer weaners of 3–6 months of age, the relativity is about 6:1 in favour of hinds). Most commentators recognise that the price relativity will eventually settle to about 1:1, but the question for investors is when.

With the high price for animals and facilities (fencing at about NZ$ 8000/km and a set of yards for about NZ$ 20,000), the cost of establishment is high. However, currently returns on investment are good, especially when compared with traditional farming enterprises such as sheep and cattle (Harbord, 1986; Pearse, 1986).

Prospects

The New Zealand deer industry is generally optimistic about the future for venison internationally. Currently deer farming is expanding at the maximum possible rate (no females are being slaughtered) while deer, particularly red deer from Europe, are being imported to broaden the genetic base of the local herd. However, the long-term future depends absolutely on the ability to develop new markets for venison. The future for velvet antler must be seen as limited unless there is a major breakthrough in sales to Western consumers.

Australia

Australia lacks indigenous deer and early settlers imported many species for aesthetic and sporting purposes, attempting to establish wild populations of about 14 species (Bentley, 1978) of which only six remain: fallow, red, rusa, sambar, hog deer, and chital.

Recreational hunting of deer is popular and, despite its illegality, wild-shot venison has long supplied the restaurant trade. Recognition of potential markets for farmed venison, and of similar interest in New Zealand, led to the establishment of two commercial deer farms in Victoria in 1971/72. By 1980, commercial herds were established in all eastern states and the industry received much publicity. Rapid escalation of stock prices accompanied the expansion (Anderson, 1982).

Whereas export and some local markets for antler were developed, high

prices received in New Zealand were rarely attained in Australia. Difficulties associated with marketing small amounts of venison, an influx of lower priced venison from New Zealand, and the failure of velvet antler to provide anticipated returns, led to reduced investment in the early 1980s and a marked decline in livestock values.

However, since about 1984, there has been increasing acceptance of venison by the local market as a low-fat, high quality meat although its use is largely confined to the better restaurants. Renewal investment has resulted from farmers wishing to diversify away from traditional enterprises which are experiencing a period of low profitability.

Currently, production is oriented to local markets although it is likely that as the industry grows, increasing attention will be given to higher-priced export opportunities.

Structure and size of industry

Accurate data regarding size and composition of the Australian deer industry are unavailable. However, Woodford (1986) estimates that there are about 43,000 head on 400 farms (Table 16.1), with a capacity for growth of some 25% per annum. In contrast to New Zealand, about 65% are fallow and 18% are red deer. A significant proportion of the total herd is made up of a small number of large units, there being many extremely small herds. Hybridisation between rusa and sambar has been practised at least since 1976, and more recently between red and wapiti. Some importations of wapiti have been made from New Zealand.

Owners of most of the large and many of the small herds belong to state industry organisations established to represent deer farmers in discussions with government and to provide information to members. These state bodies

Table 16.1. *Estimates of farmed deer in Australia, 1986.*[a]

	Queensland	New South Wales	Victoria	South Australia	Western Australia	Tasmania	Total
Fallow	300	11,000	7,000	2,500	2,500	4,400	27,600
Red	5,000	800	1,000	500	500	—	7,800
Rusa	1,000	1,500	2,000	200	100	—	4,800
Chital	300	1,500	300	20	50	—	2,170
Other	—	200	110	—	—	—	310
Total	6,600	15,000	10,410	3,220	3,150	3,400	42,680

[a]Woodford (1986).

are in turn represented nationally by the Australian Deer Breeders Federation formed in 1979.

Technology

Many Australian deer farmers are newcomers and some even have little experience with conventional livestock. There is wide variation in standards of management and use of available knowledge and technology, but active dissemination of such information by industry leaders is rapidly raising standards.

The industry is based on several species, each with particular requirements. It also is practised in a wide range of environments in which rainfall and other climatic factors influence pasture growth. Traditional livestock production in Australia characteristically involves sale or purchase of breeding stock in keeping with feed availability, an option difficult to exploit with deer. In only a few areas does seasonal variation in pasture production coincide with nutritional requirements of any given deer species and supplementary feeding and/or irrigation of pastures are essential on most fully stocked enterprises.

Most deer farms are still being developed and labour input is thus generally high but will decrease substantially relative to herd size as farms become fully fenced, equipped, and stocked. Labour requirements vary substantially with needs to conserve fodder or manage irrigation programmes.

Deer on most farms require infrequent yarding and handling; routine administration of anthelmintics is not widely practised since internal parasitism generally has remained low (Presidente, 1984). However, deer in much of Queensland need regular treatment for infestation of cattle tick (*Boophilus microplus*) (MacKenzie, 1984). Although a variety of viral and bacterial diseases have been reported (English, 1984), their incidence is sporadic and of little significance on most farms.

Legislation in most Australian states requires minimum fence standards; usually about 2.1 m in height and constructed of mesh or netting specifically designed for deer (Taylor, 1984). Farm layout typically involves small paddocks connected by laneways to handling yards, the design of which often permits no more than basic confinement of deer. However, the use of scales and crushes for tagging and veterinary attention is becoming more widespread.

While many deer are still transported in makeshift or poor quality containers, standards are improving rapidly and there are several deer transport contractors in operation (see Stevens, 1986). Losses and injuries during transport are infrequent.

Only one abattoir, at Muswellbrook in New South Wales, has been constructed specifically for deer with other venison being processed in conventional abattoirs (Scarf, 1986). Sale of farm-killed venison is generally illegal. Deer brought to the Muswellbrook works are held before slaughter but elsewhere are killed upon arrival, usually in the transport crate. With industry expansion, it is likely that some abattoirs will construct permanent facilities for deer although relevant authorities generally regard present techniques as adequate for meeting humane and quality standards.

Productivity

Reproductive performance and growth rates vary widely among farms and between successive years. Few quantitative data are available but nutrition is a major factor determining reproductive success. Shortage of breeding stock and retention of aged and poor quality females depresses overall herd performance and rate of genetic improvement. Only recently have breeding males been subjected to much selection and proven sires are generally not available. Artificial breeding techniques are used on a limited scale; the long-term interest arises mainly with importation of semen or embryos from outside Australia.

Before 1984, high proportions of non-breeding males were retained for antler production but most are now slaughtered. Some farms with established venison markets buy young or unfinished stock for slaughter after further growth, which may involve lot-feeding. Seasonal fluctuations in male body-weight and aggressive behaviour in the breeding season interrupt continuity of supply of venison, alleviated to a small degree by use of species whose seasonal patterns differ from fallow and red deer. Castration is not widely practised because growth is slowed (Drew, Fennessy & Greer, 1978; Mulley & English, 1985) although there is interest in the strategic use of castration so that fallow deer are available for slaughter during the rut and winter. Woodford (1986) estimated about 2300 deer were slaughtered in 1985/86, representing only 5% of the estimated total herd, suggesting a capacity to markedly increase production in the short term.

Antler production has declined markedly since 1984. Commercial drying facilities do not exist and the previous major outlet for frozen antler, Taiwan, does not now permit imports in unprocessed form. With increased slaughtering of males for venison it is unlikely that any processing venture could obtain sufficient quantities for viability at present values. A market still exists in the local Chinese community supplied by some individual farmers, but many farms no longer harvest antler for sale, removing it, if at all, only for stock management reasons.

Economics

Deer prices currently represent several times a female's worth as venison. Consequently, acquisition of a herd requires substantial investment and confidence that females produced can be sold for comparable returns. On such a basis, profitability can be superior to many other livestock but there is general recognition (Woodford, 1986) that eventually returns will more closely reflect venison prices.

Prospects

Growth of the Australian industry and its markets is severely restricted by lack of breeding stock, but its long-term future depends largely upon achievement and maintenance of high standards of venison quality whether for local or export consumption. Antler production will probably continue to decline, although hides and other slaughter by-products may be marketed more profitably as quantities increase. However, deer are most unlikely ever to usurp the position of any of the more traditional livestock species in Australia.

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