

3. Deer Farming

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Deer farming is generally located on the Southland Plains or the high country areas in northern and western Southland, as shown in Figure B17. There is a concentration of large farms in the Te Anau Basin and a large number of specialist deer properties occur in and around the Invercargill area. As deer farming is based on the annual production of meat and other animal products it shares many similarities with sheep and beef farming. A deer farm is usually run as either a specialised deer farm or as a part of a mixed drystock farm. Deer have different seasonal feed requirements to sheep and beef and the three stock types are often seen as complementary, despite the investment needed for deer fencing.

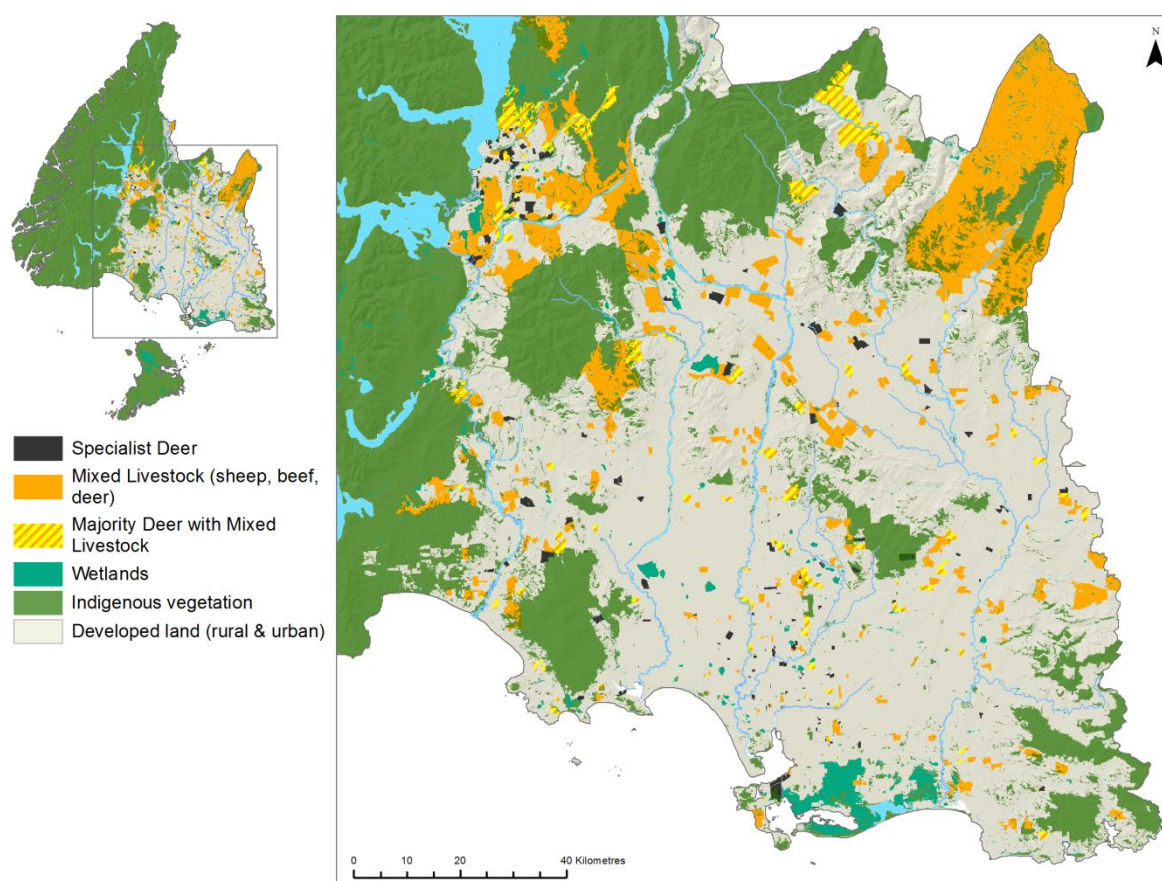


Figure B17: Deer farming in Southland 2015

Source: Pearson and Couldrey (2016)

In total, deer farming covers around 270,000 hectares of land over 456 properties. Following advice from Deer Industry New Zealand (DINZ), deer properties were categorised for the Southland Land Use Map as: specialist deer (100% deer), mixed deer (>45% deer), mixed sheep, beef and deer (<45% deer). Table B7 shows the distribution of deer properties in Southland by freshwater management unit (FMU) using these categories (for more information on FMUs refer to Part A: Section 1.4).

Table B7: Distribution of deer properties in Southland

FMU	Total area (ha)	Number of Properties	Average area (ha)
Specialist Deer Total	15,311	170	90
Matāura	3,928	32	123
Ōreti	5,359	71	75
Aparima	1,637	15	109
Waiau	4,365	50	87
Fiordland & Islands	22	2	11
Mixed Deer Total	31,385	38	826
Matāura	10,890	9	1,210
Ōreti	8,695	14	621
Aparima	1,098	4	275
Waiau	10,702	11	973
Mixed Sheep, Beef & Deer Total	223,277	248	900
Matāura	115,145	71	1622
Ōreti	28,789	86	335
Aparima	20,905	28	747
Waiau	58,437	63	928
Total for Southland	269,973	456	592

Source: Pearson and Couldrey (2016)

Over recent years, an increasing number of large sheep and beef farms in Southland have included deer in their farming mix. Most deer farms (estimated to be over 70%) are now mixed drystock operations – typically with sheep and/or beef cattle, but dairy grazing and cropping are also seen. Mixed drystock operations have expanded farmers’ options for sustained profitability in red meat supply and are an alternative to traditional drystock farming. Deer farms previously tended to be focused on either breeding or finishing, but more recently there has been a shift towards both operations on the same farm.

3.1. History of Deer Farming in Southland

Deer farming is a relatively new industry, compared to other pastoral land uses⁴¹. Internationally, Southland is the pioneer region for large-scale commercial deer farming. Southland’s deer industry currently has the second largest herd in New Zealand, and it is considered the most advanced, through the supply of high quality genetics, animal specialist support services, stock transportation and processing. Overall, the New Zealand deer industry is the largest and most advanced of its kind in the world.

⁴¹ Before the 1970s deer were raised on aristocratic estates in Europe for hunting, or housed in small enclosures in Asia for velvet production.

The first deer farming licence was issued in Southland in 1970, and the New Zealand Deer Farmers Association was set up in 1975. The initial interest in deer farming was accentuated by an abundant supply of available stock, through wild deer capture, and an established wild venison recovery and processing industry.



Image B4: Velvet stags in the Matāura FMU

Source: Southland Deer Farmers Association

Since the New Zealand deer industry's peak in 2002, with 5,200 farmers and 2.1 million deer, it had contracted nationally by 2015 to 2,100 farmers and 950,000 deer. In Southland, the deer industry is more entrenched than in other regions, and is influenced by Landcorp Farming Ltd.'s large deer holdings in the Te Anau Basin. Beyond these corporate holdings, the farmers that remain in the industry are often from the pioneering deer farming families.

With its history, Southland quickly became the centre of New Zealand's commercial deer transportation and specialist venison processing plants. The deer industry's growth in the region continued with the entry of the large meat processing co-operatives, Alliance Group Ltd. and Silver Fern Farms. These two co-operatives concentrated the venison processing capacity for the lower half of the South Island in Southland. Southland's processing capacity is estimated to be roughly 40-45 percent of New Zealand venison, although current levels are around 35 percent.

The main deer species farmed in New Zealand are red deer, but over time other varieties and other species (e.g. wapiti and Eastern red deer) have been crossbred and are also farmed⁴². In Southland, access to nearby wapiti in Fiordland, has led to their crossbreeding with red deer.

The Southland deer industry is second only to Canterbury as the most important region for velvet production, both for volume and quality.

3.2. Farm Classes

Deer farms are usually classified in terms of production and they are a mix of venison, velvet, and/or trophy antler production systems. Although most farms are self-contained breeding and finishing units, there are also specialist operations concentrating on either breeding or finishing. The different mix of age classes in each production system presents different environmental risks on-farm because of the size and seasonal, sex or age-related behaviours of the deer (refer to Part B: Section 3.9). The main characteristics of these production systems are as follows:

Venison: Animals are typically slaughtered at 12-18 months of age. There will be a capital stock breeding herd of hinds, and a smaller group of selected breeding stags (older animals), which are used to provide animals for either slaughter or replacement.

Velvet: The focus is on stags that produce heavy antlers with a good configuration – stags are retained for many years as the antler weight grown each year increases with age⁴³. There will be a selected breeding herd of hinds. Young female deer not needed for breeding and young males not being kept for velvet production, are either on-sold to other farms or processed for venison. Older breeding hinds and velvet stags are also culled for venison.

Stud: The focus is on establishing breeding lines of high genetic value for velvet (predominantly), venison or trophy antler markets. The progeny (offspring) of stags is sold to production farms or breeders, usually at 2-3 years of age for elite males, or at 12-20 months of age for elite females. Velvet and venison production also occur on the same farm.

Across the country, the deer industry's main focus is on venison production (roughly 80-85% of deer farms), and it is likely that a similar distribution is found in Southland. Table B8 outlines a deer production calendar that describes the main deer stock class activities and production systems throughout a year. It highlights the peak season for chilled venison from September to November (red on the calendar). The production calendar gives an indication of the complexity and diversity of deer farming. The traditional variation between peak and trough in venison prices is becoming less pronounced, possible because of increased exports to the United States, where there is not the same seasonal demand for game meat as Europe. The calendar just covers the activities of a deer production system – many deer farms also include sheep and/or beef enterprises, which introduce extra layers of complexity into the farming activities.

⁴² Wapiti freely interbreed with red deer and produce viable offspring. Wapiti and red deer have been considered as the same species (both with 68 chromosomes) until analysis of mitochondrial DNA resulted in classification to two different species. There are quite distinct morphological and physiological differences but are genetically compatible and only naturally separated by geography (Atlantic Ocean). For all practical purposes they are considered as the same species.

⁴³ Some farmers prefer not to keep stags in a herd for too long because aggression issues can arise between younger and older ones. It can be reduced by keeping stags within similar age ranges.

Table B8: Deer Production Calendar (peak venison price is from September to November)

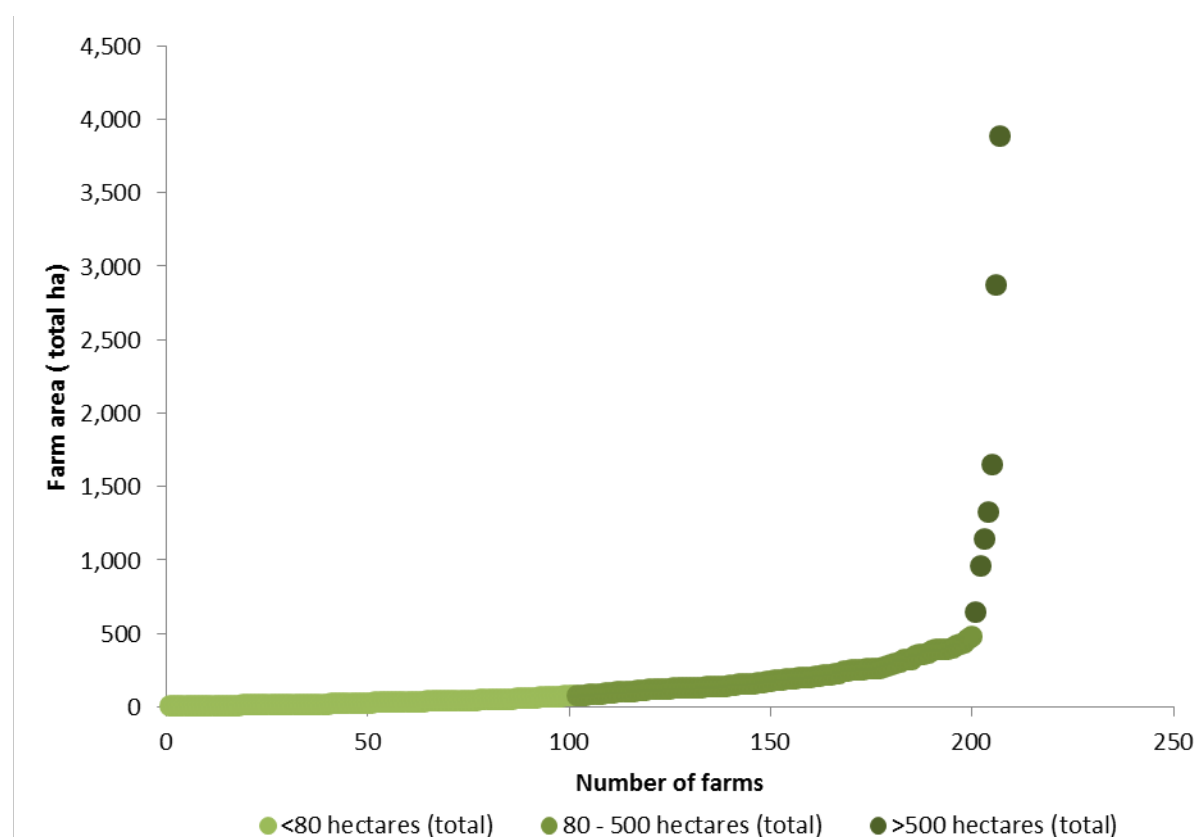
Month	Adult breeding stags	Adult velvet stags	Yearling stags	Weaned adult hinds	Un-weaned adult hinds	Elite hinds (all ages)	Yearling hinds (first calvers)	Weaner stags	Weaner hinds
Apr	Mating activity (rut or roar)	On farm, separated from other stock	Last of up to weight stags to slaughter	In mating groups. Majority weaned		Artificial insemination and embryo transfer programs	Mating programme using spikers or selected single sires	Pre-rut weaned. First live sales	
May	Stags removed from mobs							Weaner sales to finishers	
Jun	On farm wintering	Cull stock sent for slaughter	Rising two-year-olds sent to slaughter	Non pregnant hinds sent to slaughter	Weaning. Cull hinds to works	Elite stud stock female sales	Non-pregnant hinds sent to slaughter	Weaner sales to finishers. Post rut weaning	
Jul								Last weaner sales	
Aug									
Sep	Velvet commences growing	Velvet commences growing			Cull at peak prices			Sent for slaughter, chilled venison	
Oct	Velvet growth & harvest	Cull stock sent for slaughter	Velvet growth			Calving & lactating			
Nov			Velvet harvest	Calving & lactating				Sent for slaughter, chilled/frozen venison	
Dec			Velvet harvest and cull						
Jan				Lactating	Aged dry or wet dry (lost fawns) culled	Lactating		Sent for slaughter, frozen venison	
Feb	Breeding duties								
Mar				Early weaning		Early weaning			Replacements to mating programme

3.3. Main Features Specific to Southland

Deer farming in Southland has particular features that distinguish it from how it occurs in other regions. Southland's winters create challenges for managing environmental effects over longer periods than the rest of the country, but the pasture production cycle matches hind demand during peak lactation. The seasonal day lengths (photoperiod) are well suited to breeding patterns in deer, and both red deer and wapiti are often referred to as 'short-day breeders' (where decreasing day length triggers hinds to become fertile in autumn).

Deer farming is practiced in all land use capability classes (refer to Part A: Section 2.3) although increasingly breeding and velvet production is concentrating in the hill and high country because of competition for flat, productive land. The headwaters and upper reaches of the main river catchments are home to extensive deer breeding operations as part of extensive mixed livestock holdings.

Using Environment Southland's Land Use Map (2015), there are an estimated 210 deer properties in Southland (a farm business may consist of more than one property). The vast majority of these properties are less than 500 hectares, and almost half are less than 80 hectares. A handful of deer properties are extremely large, with the largest in the region being almost 7,000 hectares. Figure B18 shows the number of deer properties by size (total hectares) (the largest property is excluded because it skews the "farm area" scale): 100 farms are less than 80 hectares, just over 100 farms are between 80 and 500 hectares, eight farms are more than 500 hectares.



Winter is a challenging time with conditions being wetter and cooler than the rest of the country, and lasting longer (100-130 days of tough climate conditions are reasonably common). Deer are wintered on brassica crops (swedes or kale), and increasingly fodder beet, generally by break or block feeding. The use of support blocks is reasonably rare in deer farming, with the exception of Landcorp Farming in the Te Anau Basin. Most deer farms are self-contained units, although there may be some owners that have more than one property. Modern deer farms are generally situated where the landscape provides a mix of flats and hill country, and farm management classes (e.g. breeding and finishing) can be achieved on the one property.

Red deer farmers in Southland use dual purpose stag sires for capital (breeding) stock hinds to produce offspring with good antler and growth end points. The region's deer stud breeders also supply favourable deer genetics, particularly in velvet antler, trophy antler and high quality capital stock hinds.

In addition to red deer, Southland is the main region in New Zealand for wapiti farming and has a strong base of wapiti genetics. These multi-purpose large deer interbreed with European red deer, producing fast growing crossbred venison progeny (offspring) that are slaughtered at 9-12 months of age for the lucrative European chilled venison market, fetching the same venison prices as red deer. In comparison to red deer, wapiti are bigger and grow faster, but are less disease resistant. Wapiti are suited to gentler land use capability classes, and red deer perform better in hill country. Southland leads the country in meeting the strong demand for wapiti terminal sires and well-bred wapiti males are also used for a niche velvet antler market.

3.4. Importance of the Deer Industry in Southland

While deer farming is a smaller pastoral industry, it provides an additional source of revenue for farmers and the region, while diversifying the agricultural sector. Southland's farmed deer herd is estimated to sit at around 200,000 head⁴⁴, which is roughly 23 percent of the national deer herd (second only to Canterbury with 28%). The region accounts for about 22 percent of New Zealand's venison production, 35% of the venison processing, and 20 percent of velvet antler production. The deer industry's presence in Southland is disproportionately larger than in most other regions, and reflects a number of favourable features for deer farming in Southland (some of which are described above, and others are listed below).

The deer farming livestock system covers most of the mid to upper catchment land use capability classes and uses in Southland. Once widespread, specialist venison finishing farms are now rare; as deer farming's relative profitability to other land uses has diminished on the gentler and more productive land. Competition for land from dairy grazing, some milking platform conversions, and high performance sheep breeding and finishing, have out-performed deer breeding and finishing on these land-classes. The decline of the once thriving Lorneville weaner deer sales market is a symptom of the reduction in specialist venison finishing farms. Finishing is now occurs on the breeding farm.

⁴⁴ StatsNZ – Livestock Numbers by Regional Council

As at the end of September 2016, the deer industry generated \$246 million revenue nationally⁴⁵. Around 67 percent of this revenue was earned from venison, 17 percent from velvet, and 16 percent from co-products and hides / leather. For Southland, export based revenue is estimated at \$65-\$70 million for venison and velvet antler, with an additional \$12-\$15 million in livestock sales for both store stock (deer sold to another farm for finishing) and the stud deer industry.

Although regional figures are not available, Southland's share of revenue is likely to be greater than its 23 percent share of the national herd. With two specialist venison processing facilities and one multi-species processing facility⁴⁶, more venison is processed in the region than elsewhere (Lindsay Fung, pers. comm., 2016). As these operations process deer from outside of the region, Southland has proportionally more downstream employment and added value compared with other regions in New Zealand.

The presence of Landcorp Farming Ltd. and other large corporate farmers in the region means Southland also recruits, trains and employs the bulk of the country's deer farm staff and managers. Silver Fern Farms and Alliance Group both employ a large number of venison slaughter plant staff (estimated at about 100 jobs over the peak time) skilled in processing both farmed and wild, high quality, high specification export venison⁴⁷.

The deer industry's founders have strong Southland connections and the region makes a large contribution to the national deer industry through leadership and development via both the New Zealand Deer Farmers Association and Deer Industry New Zealand. Two examples are Southland deer farmers' proactive response to the bovine tuberculosis (Tb) issue, which was a particular challenge for the emerging industry, and their active involvement with the AgResearch Invermay Deer Research Centre, and the University of Otago Disease Research Laboratory.

Southland also leads the country in deer sector servicing, through livestock company representation and large, specialised veterinarian practices. A deer specialist veterinary network is based around the original practitioner in Vet South. The network is recognised internationally for their skills and services in deer embryo transfer and artificial insemination, as well as providing veterinary supervision of the velvet antler removal programmes. More generally, the region is a major contributor to the national high quality deer genetics pool and the January sales period attracts buyers from throughout New Zealand for elite young sires and capital stock breeding hinds.

Southland is also home to the largest deer specialist transport companies and is the national hub for wild venison recovery via helicopters. There are several major trophy park operations and other links to international hunting clientele who also engage in adventure tourism, fishing and specialised tourism interests.

⁴⁵ This figure includes the processing of venison and some processing of velvet (but most is exported as frozen raw product).

⁴⁶ In New Zealand there are a total of eight specialist venison processing facilities and four multi-species processing facilities approved to process venison.

⁴⁷ Although total national kill figures are available, kill figures by plant or region are not because of commercial sensitivities.

3.5. Farm Ownership Types

The deer industry, now established for over 40 years, is well advanced into its succession phase. The next generation of deer farmers is assuming farm ownership, and continuing well-established deer farming enterprises.

Family owned and operated farms remain the dominant business ownership model in Southland. Since the 1980s there has been a trend throughout New Zealand of exiting drystock enterprises, and in particular deer farming, and turning to other pastoral land uses. While this trend has also been a recent feature in Southland, the industry is more entrenched in this region than elsewhere.

Southland has more specialist deer farms (operations where at least 80% of income is derived from deer activity) than other parts of the country, although larger holdings are most likely to be mixed livestock operations. Corporate farming is typical on larger holdings, as is seen with Landcorp's interests in Te Anau. A number of large farms are held within families, but have corporate structures, and are run by advisory boards with farm managers and staff.

The deer industry appears to be in a stabilising period as farms retain hinds for breeding. In the near future it is expected that the regional herd will increase with a change back to increased velvet antler production and a reversal of five years of decline in herd size.



Image B5: Weaners in the Autumn, Catlins

Source: Southland Deer Farmers Association

3.6. Integration of Other Farming Systems

Modern deer farming is a drystock enterprise that can be integrated into sheep and/or cattle over a variety of land use capability classes. While farming different types of livestock on the same property is more challenging, the balance of differing seasonality and feeding, and behavioural demands can maximise outputs from good quality pasture management, and is better achieved using more than one stock class.

The widespread use of sheep, and/or cattle and cropping, or combinations of all of these activities introduces more layers of complexity beyond the three deer production systems (venison, velvet, and stud). As a result, it is difficult to characterise a 'typical' deer farm and the variability was problematic for the modelling of the deer case study farms in **Part C**.

For deer farms that specialise predominantly in deer (i.e. have limited other farming systems), maximising pasture quality and meeting seasonal variations can be achieved by using larger mobs of velvet antler stags as 'cattle by proxy' to clear and control poorer pasture.

Forage crops grown as a supplement for late summer lactation, or as a full or partial winter ration, are suitable for the three major livestock classes (deer, sheep, and beef). These crops may need slightly different feeding management systems than pasture, but they have proven effective in Southland. However, winter feeding systems based on crops have important environmental management issues for heavier stock such as some deer (and cattle) on poorly drained soils.

3.7. Processing and Markets

The NZ deer industry exports 95 percent of its venison, velvet antler, and co-products including: skins and leather, edible offal and the tails, pizzles and tendons favoured in traditional oriental medicine. Venison is mainly exported to Europe and the USA, while velvet is mainly exported to Asia, with Korea and China dominating the market. While the export focus gives deer farmers an economic return under current prices, there is little evidence to date to suggest that current export customers and end consumers will pay additional premiums for sustainably produced products. This constraint requires deer farmers to undertake mitigations outlined in **Part C** 'at cost' – in other words, the cost is borne by the farmer without it generating additional revenue.

The deer industry is engaged in a new market development initiative, supported by all five venison processing companies. It is now combined with an on farm productivity improvement programme *Passion2Profit*. This productivity push is similar to improvements in the sheep and beef industry in better feed, animal genetics for growth, improved animal health, better birth rates and survival to slaughter. With development of new high priced markets, the push seeks to improve on-farm performance and to continue to diversify high value markets. The seven year \$16 million investment is underwritten by a Primary Growth Partnership bid with the Ministry for Primary Industries. Conservative estimates suggest that an additional \$3.70 per kilogram of venison is available for capture from productivity growth, and premium returns from traditional and new markets.

There is a small high-end demand for chilled venison in the export retail and restaurant trade in traditional European markets, but the industry's future focus is to extend its market reach into new venison markets (USA, north-western Europe and Chinese markets). The bulk of venison is still

exported as frozen product, but increasingly markets are demanding a high-end chilled product range produced from August to November. Production in later months of the season is frozen to meet the existing northern hemisphere venison market demand in the following season.

3.8. Future Outlook

Deer farming has many opportunities for the future. They range from the development of export markets for velvet and free trade agreements with South Korea and China to the reversion from deer-fenced dairy support and dairy winter grazing back to deer weaner finishing, and/or breeding and finishing. Many Southland farms have existing deer infrastructure and lower nitrogen loss from deer farming may lead to land use change back to deer in some areas.

The deer industry's strength lies in successful farm succession, new skills and interest from 'Next Generation' farmers, and skilled and trained staff. The major venison processors, Alliance Group Ltd. and Silver Fern Farms, have consolidated their own processing capacities and made a commitment to the industry, particularly through their involvement in the Primary Growth Partnership *Passion to Profit* programme for the production and marketing of venison. The programme's is shown through on-farm initiatives, such as "Advance Parties", which are well-supported groups of motivated deer farmers who find innovative methods or technologies for increased profit and inspire change.

As well as continuing to supply of established markets for velvet antler, the industry anticipates controlled, steady increase in production for new products in the rapidly expanding healthy food market, in both current and new export markets. Further expansion of the industry will add more critical mass and output from the safer summer climate and pasture/crop production potential of Southland and Otago (with less effects from El Nino on breeding hinds and lactation demands).



Image B6: Mature velvet stags

Source: Southland Deer Farmers Association

Indications for the 2016-17 season suggest that venison price expectations will be similar to the previous season, with slaughter numbers remaining the same or potentially reduced by 5-8 percent, because of a slowing in capital stock hind slaughter numbers and some stag retention for velvet production. The velvet antler market is predicted to be stable as markets open up in China and new opportunities in Korea continue to seek velvet antler for the health food market. Preferred product supply is supported by Quality Assurance of food safety, a strong provenance, country of origin verification and a known high animal health status.

The challenge in Southland is competition with other agricultural industries for the gentler, highly productive land (i.e. LUC Classes 1 to 3), which has seen a decline in large venison finishing properties.

3.9. Environmental Issues Linked to Water Quality

Environmental risks on deer farms are different from those faced by dairy, sheep and cattle farmers. Deer behave differently, and are strongly social but competitive in their natural behaviour. Deer behaviour can have specific effects on the farm environment, including to soil and water, the risk of indigenous vegetation damage in the hill and high country, or damage created through overstocking (even on mixed livestock farms). While these behaviours are well understood by deer farmers, on-farm management for these behaviours is not captured well in nutrient management models, such as OVERSEER. The results presented for the case study deer farms in **Part C** of this report need to be viewed with this important limitation in mind.

The key to avoiding environmental damage is in understanding deer behaviour – what activities occur, where, when and why. The social conditions on-farm can differ markedly from the wild, which can conflict with management needs at times, particularly during mating, calving and weaning. Thoughtful management, combining good management practices, genetic selection for good temperament, and environmental knowledge, reduces unwanted deer behaviours and controls environmental risks. When such a management approach occurs it leads to positive outcomes for deer, farmers and natural resources.

The major environmental issue identified by farmers, and confirmed by research (McDowell & Stevens, 2008), is soil erosion along fence lines. This issue is caused by deer walking up and down fence lines in response to behavioural stress (e.g. weaning, or changing mob age and social structures) or disturbance. This behaviour is known in the context of this research as ‘fence pacing’. In combination with adverse weather, it can quickly become a management issue on parts of a farm, with increased soil erosion (and phosphorus loss attached to the sediment), pasture damage, and declining water quality.

Natural deer behaviour includes playing on banks and loose soil, wallowing and camping in areas that can become bare, and they can pug soils in wet weather. On any property, large numbers of young deer indulge in natural play, sparring and greater behavioural competitive activity. When this natural play occurs on erodible hillocks, bare ground or damp/wet areas, it can then lead to unintended erosion or pasture soil damage if not actively managed.

Some deer varieties (English and European reds) readily wallow. If wallows are connected to water bodies they effectively create point source discharges for faecal matter, nitrogen, phosphorus and sediment. Other varieties (wapiti, their crossbred progeny, and Eastern reds) wallow less frequently. Fallow deer do not wallow at all.

The two main nutrients leaving deer farms that create water quality issues are nitrogen and phosphorus; and typically these nutrients take different pathways. Phosphorus tends to escape the farm in runoff events when it is attached to soil particles (such as in dirty water during rainstorms) and washed into water bodies. Nitrogen escapes mainly by passing through the soil and leaching into the water table in the form of nitrate.

In general, nitrogen loss from deer farms occurs at similar rates to sheep and beef farms. Deer excrete small but concentrated urine deposits so, like sheep, they have relatively low nitrogen loss rates. Those deer farms with higher nitrogen losses tend to have specific characteristics, such as irrigation, cropping and / or dairy grazing, the presence of cattle, and certain soil types.

Phosphorus and sediment losses are closely connected and occur mainly through soil erosion, typically on hill country farms. Deer have particular behaviours that increase the risk of soil erosion, and can result in considerable amounts of sediment and phosphorus entering water if not well managed. Deer farms can have 'critical source areas', which are locations or activities prone to a higher rate of phosphorus loss than the rest of the farm. Fence pacing, stock camping, competitive behaviour, and wallowing all create critical source areas for phosphorus loss (Deer Industry New Zealand, n.d.).

In addition to nutrients and sediment, bacteria from deer faecal matter (as indicated by *E. coli*) also affect water quality. The issue will typically result from dung deposited directly into water bodies, and from dung being washed into water bodies – either as run off or from wallows that are connected to water.

More information on environmental issues linked to water quality is available in ***The New Zealand Deer Farmers' Landcare Manual (2012)***.