Venison production – nutritional requirements

Feeding management to achieve profitable venison production depends on understanding and manipulating the natural seasonal growth cycle of deer from weaning to 27 months of age.

Animal growth patterns

Red deer stags and hinds both have weight peaks at around 15 and 26 months of age. Weight gains to reach these peaks are a function of the seasonal pattern of voluntary feed intake – a mild version of the pattern which becomes more pronounced in adult stags (*see AgFACT no. 10 Velvet production – nutritional requirements).*

Key features of this pattern are low *ad lib.* intake and growth rates during winter, followed by potentially high intake and very rapid growth in spring and summer. Potential for growth in the first autumn is determined more by seasonal fluctuations in the quantity and quality of available feed than by natural biological rhythms.

Weaning stress (particularly with post-rut weaning), worm burdens and severe exposure and cold may all reduce potential growth rate in the first autumn–winter. These factors can also make young stock vulnerable to stress-related conditions such as yersiniosis.

Around puberty (15 months), stags show a marked loss of appetite, even when not actively involved in the rut. This may not cause actual weight loss, but weight gains will be much harder to achieve. Young hinds have a similar annual pattern of feed intake, but do not experience the same check during and after the rut.

Target liveweight

Target liveweights and feeding management to achieve these are shown in Tables 1 and 2. The aim is to exploit to the utmost the periods of natural growth potential, and minimise the impact of low growth periods.

This can be done by providing the quantity and quality of feed needed to meet the animals' energy requirements. *(See AgFACT no. 11 Feeding and nutrition tables)*

Feeding management

The first priority is to minimise any growth check due to weaning stress. Calves can then make significant growth during the first autumn and (to some extent) winter if given access to good feed.

Autumn

The few weeks of autumn provide an opportunity to increase young calves' weight before their first winter. Growth rates of 150 to 200 g/day can be achieved if they are fed preferentially on good quality ryegrass–white clover pasture. Pastures based on red clover and chicory can be a successful alternative for late summer and autumn grazing. To achieve the highest growth rates pasture allowances of about three times the daily dry matter requirement for maintenance must be offered.

Given the choice, deer graze more selectively than sheep or cattle, preferring to nip off the most succulent and nutritive parts of pasture plants. They will also stop eating soiled feed before sheep or cattle do. So feed left uneaten should not always be regarded as deer well fed. A post-grazing pasture mass of 1400 kg DM/ha is recommended (Table 2).

Table 1: Target weights (kg) for venison production

Age:	*15 months*	*26 months*
NZ Red deer		
Liveweight	107	133
Carcass weight	59	75
Dressing %	55	56
NZ Wapiti		
Liveweight	156	189
Carcass weight	80	98
Dressing %	51	52
¼Wapiti/¾red hybrids		
Liveweight	135	166
Carcass weight	73	91
Dressing %	54	55

ISSN 1172-2088

Great attention to animal health, especially internal parasites, is also very important at this time.

Table 2: Recommended post-grazing pasture mass for young red deer stags grazing good quality ryegrass–white clover pastures. (Hind growth rates are around two-thirds of these)

	Post-grazing pasture mass (kg DM/ha)	***Liveweight change (g/day)***
Autumn (weaners)	1400	150-200
Winter	1000	70-130
Spring (yearlings)	1500	250-350
Summer	1500	150-250

Winter

Energy requirements increase in colder winter conditions, and ability to continue growth declines. But winter growth rate can have a major effect on subsequent carcass weight, particularly in young stags. Winter depression in *ad lib.* feed intake means liveweight gains of 100 to 150 g/day are about the upper limit with high quality diets (e.g., good pasture plus grain or silage). To achieve maintenance intake outdoors in winter, young deer must be offered a diet containing 9.0 to 9.5 MJ ME/kg DM. Excellent meadow hay or very good lucerne hay will achieve this but, in practice, hay would usually be fed along with higher quality feeds such as grain or good pasture. High quality wilted silage can provide as much as 10 MJ ME/kg DM. Feed grains are very palatable to deer and can provide a significant part of the ration in winter. However, grains must be introduced slowly.

The economics of venison production means young stags must gain weight during winter, as compensatory growth during spring usually fails to fully make up weight deficits at the end of winter. Good feeding also protects against stresses, and consequent risk of disease, due to adverse weather. Control of parasites, especially lungworm, is critical if good growth rates are to be achieved.

Spring–summer

The spring–summer period, when young deer are 9 to 14 months old, provides the greatest opportunity for rapid liveweight gain. It is a period of rapid pasture growth and of maximum potential feed intake. To take full advantage of this, the animals should be offered high allowances of high quality pasture. Under rotational grazing, allowances of 7 to 10 kg DM/head/day should be offered, and a post-grazing pasture mass of 1500 kg DM/ha aimed for, if growth rates of 250-350 g/day are to be achieved. As summer progresses, there is often less high quality pasture available. What there is must be allocated preferentially to hinds and calves. But yearlings cannot be neglected, since this is the last opportunity for yearling stags due for slaughter in autumn to gain weight. All yearling hinds need to reach 70 kg liveweight at 15 months if they are to mate and calve successfully as 2-year-olds. However, the target weight for New Zealand red hinds at 15 months is 80 to 85 kg.

For further information, contact:

Dr Ken Drew
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034
Mosgiel
Phone: (03) 489 3809 Fax: (03) 489 3739

AgFACT no. 9, November 1995
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Velvet production – breeding and nutritional requirements

Only heavy, high grade velvet is likely to be profitable compared with venison. Deer fed to achieve excellent levels of venison production are also likely to achieve their genetic potential for velvet production.

A stag's maximum potential velvet antler growth is genetically pre-determined, but achieving that potential can be helped or hindered by nutrition. Adequate nutrition will result in close to maximum velvet production. "Super" nutrition may achieve only marginal, and probably uneconomic, gains. Poor nutrition will significantly limit antler growth.

Breeding and selection

Selecting stags for the velveting herd is the most important part of the operation. Strains or sub-species differ in antler size. Therefore choosing a breeding stag is very important. There is a general relationship between antler weight and body weight across strains (see Table 1).

Table 1: Example of the general relationship between liveweight and antler weight

Liveweight (kg)	*Hard antler weight (kg)*
400	14.9
300	9.4
200	4.9
100	1.6

Constant poor nutrition will result in a disproportionately large reduction in antler size relative to liveweight reduction.

Some idea of the relative velveting potential of a group of spikers can be gained by studying their yearling liveweight. The lighter stags within a mob tend to become the poorer velvet producers (Table 2), so culling on the basis of yearling liveweight is a good option.

Table 2: Total velvet production from 2 to 5 years of age for a group of 90 red stags ranked by yearling liveweight

Rank	*Liveweight (kg)*	*Total velvet (kg/head)*
Top 1/6	120	10.06
Next 1/3	108	9.14
Next 1/3	102	8.88
Bottom 1/6	94	8.57
Overall average	105	9.11

In contrast, we can **select** positively for superior animals among 2-year-olds. The yield and grade of velvet from 2-year-olds is an excellent indicator of their subsequent lifetime velvet potential. The top velveters at this time are likely to be among the best at a later age (Table 3). Thus, selecting on 2-year-old velvet is better than selecting on yearling liveweight. But if you are selecting stags as 2-year-olds, we recommend that you record casting date (within 2 to 3 days) and harvesting date so that all stags can be evaluated at the same stage of growth.

Table 3: Total velvet production from 2 to 5 years of age for a group of 90 red stags ranked for 2-year-old velvet antler production

Rank	*2-year-old velvet (kg/head)*	*Total velvet (kg/head)*
Top 1/6	2.18	11.37
Next 1/3	1.55	9.35
Next 1/3	1.29	8.47
Bottom 1/6	1.02	7.69
Overall average	1.48	9.11

Undernutrition

It is more productive to avoid undernutrition of velveting stags than to feed luxury amounts in an attempt to gain a bit more velvet growth. There is no evidence of a single critical or limiting nutrient for antler growth. Deficiency of a single

ISSN 1172-2088

nutrient, such as copper, will reduce antler size, but supplementation over the basic requirement will not increase antler size.

Seasonal undernutrition will always reduce velvet size, but the effect is most severe after the rut and during velvet growth. The post-rut (one month) and winter (especially the six weeks prior to casting) periods are critical for good velvet production. The aim is to ensure that stags can eat as much as they want over these periods. The problem with getting stags to eat well in the post-rut period is often behavioural. They need space to avoid fighting, but providing it is often not practicable. Later in winter stags are quieter and ensuring good nutrition is less of a problem. Restricting food intake in spring – the growing period for velvet and a time when voluntary intake is increasing naturally – can greatly reduce antler growth and velvet yield.

When stags are otherwise well fed, acute underfeeding during the antler growth period will reduce antler size.

Adequate nutrition

Adequately fed stags will grow antlers to their genetic potential. Adequate nutrition is a balance between the genetic potential of the stag, the quantity and quality of feed, the costs of feed and the value of the end product.

The key elements in achieving an adequately nourished stag for velvet production are:

- Feed *ad libitum* after the rut and during winter.
- Provide appropriate supplements to meet any shortfall in energy requirements; stags on hay alone probably cannot get enough energy over winter to maintain their liveweight.
- Give unrestricted access to high quality pasture during antler growth.
- Give appropriate mineral supplements if deficiencies are known to occur.

(See also AgFACT no. 9: Venison production – nutritional requirements; and AgFACT no. 11: Feeding and nutrition tables for deer.)

For further information, contact:

Dr Ken Drew
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034
Mosgiel
Phone: (03) 489 3809
Fax: (03) 489 3739

AgFACT no. 10, November 1995
ISSN 1172-2088

99991

9 418835 000019

AgFACT

This document is for internal use by AgResearch only

Feeding and nutrition tables for deer

This AgFACT presents basic information about the feeding values of various diets and the energy requirements of deer. Refer to these tables when reading the other AgFACTs (nos 9 and 10) on feeding and nutrition of deer.

The seasonal information presented in Tables 1 to 4 is based on an autumn of 65 days' duration and winter, spring and summer each of 100 days.

The energy requirements for maintenance of grazing deer in autumn, winter, spring and summer (Table 2) have been estimated at 30, 50, 20 and 10% respectively above those of animals held indoors.

Table 3 shows the expected growth of deer following "average" and "excellent" liveweight gain paths from weaning to 15 months of age – the critical period for venison production. Feed requirements in subsequent seasons are shown relative to that in the first autumn (100). In the second autumn and winter stags are likely to show little net liveweight gain, but in the second spring average gains of 250 g/day can be expected and growth rates as much as 320 g/day can be achieved, resulting in liveweights of 116 and 144 kg for "average" and "excellent" performance respectively at 2 years of age. Carcass weights can be calculated on the basis of 55% of liveweight

The nutritive value of conserved feeds such as hay and silage will vary according to the quality of the original material and the conservation process. For example, fine-chopped wilted silage made from high quality leafy pastures in spring will be more palatable to stock (if the pH is correct) and have a higher metabolisable energy value than silage made from over-mature material or silage in which the pH is too high or too low.

Table 1: Daily metabolisable energy (MJ ME/day) requirements of red deer to achieve target liveweights

Age (years)	*Target liveweight (kg)*	*Autumn*	*Winter*	*Spring*	*Summer*	*Year total (MJ ME)*	*Annual stock units*
Stags							
0.25-1.25	48-107	16	21	27	26	8300	1.5
1.25-2.25	107-133	24	28	31	30	10 500	1.8
2.25-3.25	133-180	24	33	38	36	12 200	2.1
>3.25	180+	19	36	42	38	12 900	2.2
Hinds							
0.25-1.25	44-83	15	17	22	21	7000	1.2
1.25-2.25	83-100	20	23	23	45	10 500	1.8
>2.25	100+	23	22	24	47	10 900	1.9
Ewes	55	13	10	28	11	5 800	1.0

Table 2: Daily ME and pasture DM requirements of red deer for maintenance

Liveweight (kg)	*90*		*150*	
	MJ ME	kg DM	MJ ME	kg DM
Autumn	22	2.0	32	2.9
Winter	25	2.3	37	3.3
Spring	20	1.8	29	2.6
Summer	18	1.7	27	2.6

ISSN 1172-2088

Table 3: Seasonal growth pattern and relative seasonal feed energy requirements of red deer from weaning to 15 months (stags starting at 48 kg, hinds at 44 kg liveweight)

	Autumn	*Winter*	*Spring*	*Summer*
Stags – average growth				
Liveweight gain (g/day)	150	50	200	180
Target liveweight (kg)	58	63	83	101
Relative energy required	100	104	119	125
Stags – excellent growth				
Liveweight gain (g/day)	200	100	300	240
Target liveweight (kg)	61	71	101	125
Relative energy required	100	107	133	138
Hinds – average growth				
Liveweight gain (g/day)	106	35	141	130
Target liveweight (kg)	51	54	68	82
Relative energy required	100	106	114	119
Hinds – excellent growth				
Liveweight gain (g/day)	140	70	211	180
Target liveweight (kg)	53	60	80	98
Relative energy required	100	109	126	131

Table 4: Dry matter (DM) and metabolisable energy (ME) content of feeds

	DM (%)	*ME (MJ/kg DM)*
Ryegrass–white clover pasture		
Autum	15	10.8
Winter	15	11.2
Spring – short	15	12.0
– mixed length	15	11.2
Summer – leafy	18	10.3
Meadow hay		
Young leafy	85	9.0
Mature	85	8.0
Weathered	85	7.0
Lucerne hay		
pre-bloom	85	10.5
mid-bloom	85	9.0
weathered	85	8.0
Silage		
rank pasture – high moisture	20	10.0
lucerne – high moisture	23	10.5
maize – mature	35	10.5
Grains		
barley	85	12.5
wheat	85	12.5
oats	85	11.5
Deer nuts	85	10.8

For further information, contact:

Dr Ken Drew
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034
Mosgiel
Phone (03) 489 3809
Fax (03) 489 3739

AgFACT no. 11, November 1995
ISSN 1172-2088

99991

AgFACT

This document is for internal use by AgResearch only

Yersiniosis in deer

Yersiniosis is one of the most common causes of death in young, farmed red deer in New Zealand, but its impact can be minimised by vaccination and good management.

Yersiniosis is a bacterial disease which affects young red deer and wapiti x red hybrids in their first winter, when they are 5 to 9 months old. Cases are most commonly reported in June, July and August. Sporadic cases may occur throughout the year, but these usually involve recently captured or debilitated animals. Other deer species are rarely, if ever, affected.

Outbreaks of the disease can affect up to 40% of a group, although more usually 5 to 20% are affected. In a serious outbreak, up to 40% of affected animals may die. Virtually all red deer are exposed to the bacterium responsible for the disease, *Yersinia pseudotuberculosis,* in the farming environment but, if fed and managed well, they will experience only a subclinical infection and will develop some immunity.

Clinical signs

Although "sudden death" is often the first obvious sign that a problem exists in a group of weaners, animals are typically acutely ill with anorexia, and green or brown watery diarrhoea which often contains blood. Close inspection reveals staining around the anus or on the tail, perineum or hocks. Affected animals have raised temperatures and rapidly become dehydrated. If not treated promptly they lose condition, collapse and die.

Detecting affected animals in the early stages of the disease is often difficult. It requires careful observation of the mob from a distance, especially when feeding supplements. Alternatively, the animals can be yarded, whereupon affected weaners can be spotted because they tend to lag behind, towards the back of the mob. Close inspection under good lighting is often required to detect faecal staining around the tail and hocks, especially if the faeces are liquid.

Disease outbreaks

Subclinical infections can quickly become clinical disease when animals suffer simultaneous stresses such as heavy stocking in cold wet weather, particularly if they are already in poor condition. Other forms of stress that can contribute to precipitating disease outbreaks include underfeeding, sudden changes of diet, overcrowding and social stresses, other disease conditions, capture from the wild, transport, and rough handling.

Prevention

Good management practices, adequate feeding, shelter from bad weather, and minimising stress will help to prevent yersiniosis. These measures can be augmented by vaccination of weaners with Yersiniavax™. This vaccine will provide significant protection against yersiniosis and many farmers routinely vaccinate their weaners.

Weaning is a stressful time for deer, particularly when animals are weaned, sold and transported to new properties all at once. Weaning after the rut, in May and June, is especially stressful. At this time weaners have no time to adjust to their new environment before winter conditions set in, and they are extremely susceptible to disease.

The stress of weaning can be minimised by weaning before the rut, when feed is more plentiful, the weather is warmer and severe storms are less likely. Once weaned, calves can be yarded regularly for drenching in autumn and given preferential grazing in winter. Indoor wintering of weaners is becoming popular in colder southern parts of the country. This practice can reduce the risk of yersiniosis if feeding is adequate and the accommodation warm, dry and clean.

Vaccination timing

Two doses of Yersiniavax™ 3 to 6 weeks apart are needed to give adequate protection, and full protection will be attained 7 to 10 days after the second (booster) injection. The first dose should therefore be given at least 4 to 7 weeks before a yersioniosis field challenge is likely.

ISSN 1172-2088

Farmers planning to vaccinate face the dilemma of fitting vaccination into the management programme without exposing their animals to additional handling stress, while also gaining maximum benefit from the vaccination programme. If vaccination is too early (before weaning) you risk disturbing hind–calf groups. It may also set up an interference between maternally derived antibodies and the calf's own antibody response to the vaccine, thus compromising the vaccine's effectiveness. If started too late, protection may not develop before the time of greatest disease challenge.

Within the two main options of weaning before or after the rut are several sub-options for timing vaccination.

Weaning before the rut (March)

1. **First injection late February (early born fawns) or early March; second 3 to 6 weeks later**: gives some protection over weaning, but incomplete until 7 to 10 days after second injection; especially beneficial if weaners sold and transported soon after weaning; gives maximum protection for late autumn–early winter high risk period.
2. **First injection at or soon after weaning; second 3 to 6 weeks later**: does not protect weaners sold and transported at weaning but gives maximum protection for late autumn–early winter high risk period.

Weaning after the rut (May)

1. **Two injections before weaning, the second 3 to 6 weeks after the first:** gives maximum protection over weaning, and through late autumn–early winter high risk period; difficult to implement owing to handling problems with weaners in mating groups, but achievable if both injections done in March before putting stags to hinds or second injection is done when a mating group is yarded to change the stag midway through the rut.
2. **First injection before weaning, either immediately before the rut in late March, or at stag changeover in mid-rut; second injection at weaning:** gives some protection against yersiniosis triggered by weaning stresses, but incomplete until 7 to 10 days after second injection; takes weaners closer to period of bad weather and disease risk.
3. **First injection at weaning in mid to late May; second injection 3 to 6 weeks later**: least favourable option; protection is poor until 7 to 10 days after second injection, giving inadequate protection until late June; weaners unprotected when stress and weather-related yersiniosis is likely; no protection against yersiniosis triggered by weaning stress.

Treatment

Individual cases or outbreaks of yersiniosis can occur in spite of all precautions and preventive measures. Treatment with antibiotics, proprietary scour medicines and fluid therapy for 3 or 4 days is usually successful if started as soon as the first signs of disease are noted. Recommended antibiotics are oxytetracycline or combinations of trimethoprim and sulphonamide.

To contain an outbreak, deer in contact with affected animals may be treated en masse with long-acting tetracyclines or neomycin or they may be fed concentrate pellets medicated with tetracyclines. This may prevent further cases from developing, but great care must be taken to minimise the stresses of gathering and handling the animals in order to treat them.

For further information, contact:

Colin Mackintosh
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034
Phone: (03) 489 3809
Fax: (03) 489 3739

AgFACT no. 14, November 1995
ISSN 1172-2088

99991

9 418835 000019

Malignant catarrhal fever in deer

Malignant catarrhal fever (MCF) is the single greatest infectious cause of mortality in adult deer in New Zealand.

The problem

MCF is a viral disease carried by sheep and transmitted to deer. It is almost invariably fatal to deer. There appears to be little or no deer-to-deer transmission under normal pasture conditions. Deer are therefore literally a "dead-end" host. The equivalent disease in cattle is called bovine malignant catarrh (BMC).

Some species and breeds of deer are much more susceptible than others. Père David's deer, sika and rusa are the most susceptible, red and wapiti deer are relatively resistant, while hybrid Père David's and sika/red deer are intermediate. Fallow deer appear to be completely resistant.

The disease occurs mostly in adult animals especially over the winter–spring period. Stags are at higher risk than hinds. Overall losses in areas prone to MCF can be around 1% of adult hinds and stags.

The virus

The virus has not yet been cultured in the laboratory but it has been detected in infected tissues and characterised by special molecular biological techniques. It appears to be closely related to the herpes virus carried by wildebeeste which causes a disease similar to BMC in cattle in Africa.

Sheep excrete the virus during lambing and newborn lambs are infected at birth. Sheep are perfectly adapted to the virus and do not develop any signs of disease. Although the virus does not appear to be very robust outside a natural host, it can infect deer after travelling some distance from carrier sheep. It is probably transmitted via saliva, mucus, dust or contaminated objects such as vehicles, equipment, food, clothing, or human hands.

It is not known to what extent the virus can remain latent in deer. However, disease appears to be precipitated by stresses such as transport, low levels of feeding, exposure to bad storms, fighting, bullying and low body condition entering the winter.

Clinical signs

MCF most commonly displays signs of an acute gastro-intestinal disease. Typical signs include bloodstained scour, depression and loss of appetite. Affected animals tend to separate from the herd and stand "tucked up", with ears flattened and have little inclination to move. Initially their body temperature may be above normal (i.e., over 39.5°C) and their respiratory rate and heart rate slightly increased. Their condition usually deteriorates rapidly over 12 to 24 hours, they lie down and their temperature falls below the normal range (38 to 39.5°C). The animal dies soon after. Often the disease progresses very quickly and the farmer will simply find the animal dead.

In about 5 to 10% of cases the initial disease is less serious and the animal develops the chronic form which is similar to the "head and eye" form of bovine malignant catarrh in cattle. It is usually characterised by crustiness or ulceration around the nose, muzzle, lips and sometimes under the tail. There are often mucous discharges from eyes and nose and gradual loss of condition. Occasionally the animals may become blind. The animals almost invariably die from 3 weeks to 3 months after they first become ill.

Diagnosis

Any adult animal found in winter or spring with typical clinical signs, or found dead with blood staining around the anus or with ulceration or crusting around the muzzle, is very likely to have had MCF. The disease can be confirmed by necropsy and laboratory examination of tissues, especially the brain, lungs, kidneys, blood and lymph nodes.

A new test called a PCR (polymerase chain reaction) is available at the Wallaceville Animal

ISSN 1172-2088

AgFACT

Copper deficiency in deer

Copper deficiency is the most common mineral deficiency seen in deer in New Zealand. Signs include loss of condition and ill-thrift, dry dull coats, enlarged limb joints and arthritis, brittle bones, and a swayback condition known as enzootic ataxia.

The role of copper

Copper is essential for the effective functioning of several enzymes including those involved in the synthesis of red blood cells, and the linking of proteins in bones, cartilages and tendons. It also affects enzymes involved in the activity of white blood cells, and others involved in the production of melanin, the dark pigment in hair. Copper stores are usually higher at birth, and when copper intake of pregnant hinds is inadequate the levels in newborn deer are lower than normal.

Primary and secondary copper deficiency

- Primary copper deficiency occurs when copper intake is inadequate. Pasture copper levels are lower in winter and spring and higher in summer and autumn.
- Secondary copper deficiency occurs when chemical processes in the gut reduce the absorption of copper. For example, high levels of dietary sulphur, molybdenum, iron and zinc can all reduce absorption.

Symptoms

Enzootic ataxia or swayback is the result of a progressive decay of the insulating layers around nerve fibres in the spinal cord. Affected deer become uncoordinated and unsteady, especially in the hind legs, and severe cases may be unable to stand on their hind legs and assume a "dog sitting" position. Wapiti seem to be more prone to enzootic ataxia than red deer. It occurs most often in yearlings, unlike sheep where the condition is usually seen in young lambs. Occasionally enzootic ataxia is seen in aged hinds.

Osteochondrosis (OCD) is associated with poor bone and joint development in weaners. It affects joint cartilage, particularly in weight-bearing joints such as front knees, fetlocks, hips, stifles and hocks. Osteochondrosis can also affect the growth plates of long bones.

Other signs can include poor condition, a light-coloured coat, anaemia and low growth rates.

Diagnosis

Accurate diagnosis usually requires a post-mortem by a veterinarian. This involves examining the limb joints for signs of OCD, or the microscopic examination of the brain and spinal cord for enzootic ataxia.

The analysis of samples from live deer, as well as pasture and soil analysis, are needed to establish whether the problem is caused by primary or secondary copper deficiency. If soil and plant copper levels are low there is obviously a primary deficiency. If they are high, but the animal's copper levels are low, a secondary deficiency is indicated.

The liver is the main storage organ for copper, and a biopsy technique has been developed. Blood can also be tested for copper levels, but it is a less accurate indicator than liver samples. Blood samples should be collected from at least six animals, and if any show levels below 8 µmol/litre a copper deficiency in the mob is indicated.

Treatment

Unfortunately there is no treatment for either enzootic ataxia or osteochondrosis; instead the emphasis must be on prevention. Bone and nervous system damage cannot be repaired, although copper supplements may improve the condition of affected animals. Severely affected animals should be destroyed, and the rest of the

ISSN 1172-2088

herd should be given a copper supplement, based on the needs of the individual farm.

Putting copper sulphate on the pasture may be enough to deal with primary copper deficiency. Otherwise deer can be given copper through injections or capsules. Deer metabolise copper rapidly, so the latter treatment will be more effective in the longer term. Trials have shown that copper oxide particles (or "needles") can provide adequate liver copper stores for up to 5 months on a marginally deficient property. If your property has a history of copper deficiency problems, it is best to set up a monitoring and prevention programme, rather than waiting until problems arise.

Timing

Treating pregnant hinds will ensure calves are born with adequate copper reserves and should prevent OCD.

Treatment of weaners and yearlings in autmun and winter should prevent enzootic ataxia.

The treatment of stags in winter should prevent brittle bones and will encourage normal antler growth.

Risks

Copper poisoning is a risk, so levels must be checked before you begin using copper supplements, and a monitoring programme should also be used.

For further information, contact your local veterinarian.

AgFACT no. 33, November 1995
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Recognising and controlling tuberculosis in deer

The best advice to give to deer farmers about tuberculosis is to avoid it. This AgFACT helps farmers do so by outlining the problem, clinical signs, diagnosis and the statutory requirements for the control of the disease.

The problem

Prevalence of tuberculosis is very low in farmed animals in New Zealand. Less than one percent of animals are infected. Nevertheless Tb presents a threat to our country's pastoral industry, because Tb may become a non-tariff barrier put up by countries that have spent a considerable amount of money ridding their own country of Tb. New Zealand is therefore putting significant effort into confining the disease in farmed animals, controlling wildlife like possums that transmit Tb, and researching long-term ways of reducing Tb.

The root of the problem is that wildlife in a number of areas of New Zealand are infected with Tb. The possum is the most important vector of Tb for domestic livestock. Other wildlife, including deer, pigs, ferrets, cats and hedgehogs, can also have Tb, although their role as vectors of infection is still unclear. Areas where Tb is known to be entrenched in wildlife are classified as "endemic" or "movement control areas". Zones around these areas are called "fringe" areas. The exact locations of these areas can be obtained from your local MAF office.

Tuberculosis, caused by the bacterium *Mycobacterium bovis,* is found in deer almost everywhere in the world they are farmed. Infection is commonly transmitted through the animal's nose or mouth.

Symptoms

Infected animals can show no clinical signs of the disease for up to five years, only the most severely affected animals showing signs of sickness. A loss of body condition, emaciation, coughing, difficult breathing and diarrhoea may all occur, and the deer may stop feeding. Enlarged lymph nodes and open abscesses may also be seen, especially in the upper neck and chest. Sudden death can occur in seemingly healthy deer. Tb lesions are usually associated with the lungs and lymph nodes, particularly in the upper neck near the base of the head, although they may occur anywhere in the body. These lesions often consist of a pus-filled abscess.

ANY abscess in deer should be regarded as Tb until proven otherwise. A sample of material from the lesions should be collected by a vet and sent to a laboratory for testing for Tb.

Diagnosis

The skin test is the standard diagnostic tool for detecting Tb in New Zealand deer, and is carried out by vets or MAF officers. A protein derived from the Tb organism is injected into the skin on the side of the deer's neck, and the reaction recorded 72 hours later. However, because *M. bovis* is only one member of a family of bacteria present in pasture, water and soil to which deer are exposed, the Tb skin test can produce false readings, and is not completely reliable.

In herds with a low risk of Tb, a secondary comparative skin test (CCT) can be carried out at the discretion of the vet or MAF on animals that are thought to have falsely reacted to the single skin test.

However, in herds with a history of Tb or where there is a risk of Tb having been introduced, the CCT **cannot** be used. In these herds, the Blood Test for Tb (BTB) is a useful secondary test available to deer farmers, and can be used on deer that have reacted positively to the Tb skin test. This will detect if the positive reaction is actually due to *M. bovis* infection, or if the animals are exposed to non-specific Tb reactions. If reaction is due to a bacterium like *M. avium,* the deer will not have to be slaughtered.

Seriously infected animals that do not show a reaction to the standard skin test can be identified using the ELISA test, which, like the BTB, is available from the University of Otago Deer Research Laboratory.

Advice on the most appropriate tests to be used in any given situation should be obtained from your own vet or MAF office.

ISSN 1172-2088

Deer that have been identified as infected by positive skin tests or blood tests, or both, must be identified by a special reactor tag and slaughtered. If it is desirable or necessary to confirm the disease, a post mortem examination can be carried out by a vet or farmer or alternatively the carcass will be inspected for lesions if the animal is slaughtered through a Deer Slaughter Plant (DSP). Any lesions should be sent to the local Animal Health Laboratory for histopathological examination and Tb culture.

An outbreak of Tb can cause considerable financial loss to the individual farmer. Not only are there potential losses with the deaths of seriously affected animals and the decrease in slaughter value of reactor animals, but there are also the increased costs of extra testing required to rid the herd of infection and the virtual embargo on live sales of deer from infected herds. There is also the stigma and increased psychological stress of having an infected herd.

There is no effective treatment for deer with Tb infection.

Statutory requirements for control

There are legal requirements under the Bovine Tb Regulations Act to control Tb infection. The Deer Tb Control Scheme is administered by MAF and all testing is paid for directly by deer farmers. There is no compensation for reactors, in contrast with the cattle scheme in which there is compensation for reactors.

Accreditation is give to herds free from evidence of Tb for at least three consecutive whole herd tests over two years. Previously accredited or free herds that have Tb reactors or suspected Tb lesions detected at slaughter, have their accredited status suspended. Herds with Tb are placed under movement control. Pre-movement Tb testing is compulsory for any animals over one year old being moved from herds in a movement-controlled area, and must be accompanied by a Tb status declaration card.

New Zealand deer must be tested regularly for Tb infection, the frequency depending on location. If you are farming deer in a Tb-endemic or fringe area, the risk of infection in your herd is higher, and testing is required yearly to monitor the farm's Tb status. It is very important to know the regional status and requirements.

If the farm is free of Tb, it is vital that farmers are extremely careful to maintain that position. That means taking care to check the Tb status of stock coming in, maintaining a Tb-testing programme, and regular wildlife trapping.

Deer farmers are strongly advised to purchase only Tb-tested deer or animals from an accredited Tb-free herd.

Possum and wildlife control is recommended, especially in Tb-endemic or fringe areas.

Please contact MAF or the Animal Health Board for more information on Tb regulations.

Conclusions

Preventing stock from coming into contact with the infection is the best way of dealing with the Tb problem.

Key points to remember are:

- Buy only Tb-tested stock.
- Contact MAF before you move deer.
- A skin test is used for finding infected herds.
- Subsequent blood testing can be used to identify the infection and individuals infected with Tb.
- Wildlife control around the farm is recommended.

For further information, contact:

Dr Colin Mackintosh
AgResearch
Invermay Agricultural Centre
PB 50034
Mosgiel
Phone (03) 489 3809 Fax (03) 489 9038

AgFACT no. 34, November 1995
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Deer handling facilities

Well constructed yards are essential to modern deer farming. Yarding and handling animals in appropriately sized groups in well designed facilities is a key to minimising stress in the animal while maximising safety for those handling them.

Layout

Yard designs vary widely and generally reflect proven handling practices, but may need specific features for each type of deer. There are three important elements: the lead-in raceway and receiving area, the holding area where groups are split up, and the work area where individual animals are weighed and handled.

To prevent deer feeling pressured, they should approach the yards via a lead-in race that curves or angles towards the yards. Netting should be reinforced and made more visible with sighter boards. Having shingle underfoot will prevent ground becoming too muddy and dangerous.

Because the biggest single cause of injury to deer is overcrowding in the yards, the yards need to be designed to break down the herd into groups of about 30, then into smaller numbers. One way is to provide a large receiving area with a system of gates to divide the group until you are handling individual animals on weighscales or in the crush. Yards don't need to be large enough to accommodate all deer on the farm, but they should be able to cater for 25 to 30% of your total number.

Yards should be designed to exploit deer's tendency to move in a group. Octagonal pens work well because they use the deer's natural circular movement. If the pens are square, plywood blocks across the corners are advisable. A handling pen for holding five to seven deer should be about 2.4 by 2.4 metres. Gateways in the holding yards need to be wide enough to allow the group through without being crushed together.

Oblique approaches to pressure areas work best, so that the animals turn a corner into a work area. By using a lead-in raceway to weighscales or a chute, you are less likely to have to force them.

The simpler the layout the better. Deer understand routines and will get used to the shed if they use it three or four times a season.

Yards should be positioned away from the farm boundary so that if deer escape they are more easily contained on the property.

Construction

Floors

Modern yards have concrete or cleanable floors in pressure and work areas, an important feature in quality assurance programmes. Smooth concrete can become slippery. Therefore, when laying the concrete, the surface can be raked as it is setting.

Woodchips and sand improve grip and reduce noise, but sawdust dries out and becomes dusty, and therefore chips and sand are preferred.

Walls

Holding areas should have solid walls up to about 1.2 metres, with a 100 mm gap below for ventilation, and some form of open board arrangement above 1.2 metres; one such arrangement uses 150 mm by 25 mm timber with 100 mm spaces between boards. Deer are more comfortable if they can see each other and approaching people. In pressure areas the solid walling should be a minimum 2 metres high and capped by 50 by 100 mm timber to give rigidity, and a useful catwalk.

Deer running in a group put pressure on walls, so use strong, smooth materials. A 12.5 mm ply on a standard building framework works well. An alternative is to use 150 by 25 mm boards. Because rough edges can injure, punch home nails or use countersunk screws.

ISSN 1172-2088

Avoid flat or corrugated iron as these are noisy, can develop sharp edges and require a lot of maintenance.

Gates

Gates need to be strong. Plywood riveted onto a boxed steel frame works well. Experience has shown that the following gate widths generally work well: 3.6 metres wide in the entrance-way to the yards; 2.4 metres wide in the pens; and 1.2 metres wide in the handling areas. (These measurements are for red deer and may need to be modified for other species.) This makes it easier to split the deer progressively into smaller groups. In working areas gates work well when they open into the pen from which the deer are coming, so that they can be used as a visual barrier for better control.

The hinges and gate post should be flush so that deer cannot catch their legs. Latches must be strong, easy to use and retractable, leaving nothing sticking out. Many types of commercially made latches are available.

Lighting

Skylights and plastic panels provide subdued natural light, but vets require a well-lit secure area for Tb testing or velveting.

Ventilation

Ventilation is vital. Several designs include a 100- mm gap between the floor and the bottom of the partition wall plus good roof level ventilation.

Other features

A good clean **workroom** is essential for vets and other deer handlers, and there should be washing facilities to reduce disease risks. If you are involved in velveting, lockable cabinets are also essential. A whiteboard or blackboard can also be useful.

Load-out ramps should be solidly constructed, with overhead covering to avoid a sudden transition from dark to light. For red deer, the recommended width is no narrower than 1 to 1.2 metres, the same width as truck or trailer doors, because deer seldom move in single file.

Weighscales are an essential part of modern deer farming operations. They need to be quiet. If they have a metal floor it is a good idea to cover it with rubber. Some operations make them like a small pen for several animals which they weigh off one by one.

Crushes should be positioned so that the deer walks into it around a curve and can be subdued quickly and easily. When using a drop floor system, the deer should approach at floor level, not up a ramp. There should be a reasonable amount of light and a good working space.

A separate exit system and holding yards away from the entrance often helps with routine procedures such as velveting and weaning.

(Note: Information given conforms with standards developed by the industry, which are checked by independent auditors as part of the New Zealand Deer Farmers' Quality Assurance Programme.)

For further information, contact:

Tony Pearse
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034
Mosgiel
Phone (03) 489 3809
Fax (03) 489 3739

AgFACT no. 44, November 1995
ISSN 1172-2088

99991

Feeding and nutrition of hinds and calves

The objective of feeding management of hinds and calves is to maximise calving percentage and calf growth to weaning.

Calf production

Whether they be male calves destined for velvet and venison production, or female calves which will become part of the breeding herd, they are the key to deer farming profitability and have to grow rapidly to get a head start on a productive adult life.

The starting point (birth and birth weight), and early growth of calves are determined by hind nutrition. Good calving percentages are influenced most by hind liveweight. Within strains, the heavier hinds tend to give birth to heavier calves which have a better chance of survival and subsequent growth. So a nutritional management plan for hinds should start at or before the point at which the outcome of calving is determined.

Pre-mating hind nutrition

Liveweight at 15 months is the critical productive limitation for hinds. Puberty occurs at about 70% of mature body weight (70 to 75 kg for New Zealand red hinds under intensive conditions). For realistic first-calving performance, yearling hinds must therefore weigh over 70 kg at mating. If they are being run in mixed sex groups with yearling stags, they should be separated in December–January to avoid bossing and mounting and to allow them to be fed well before mating. The target group mean weight for New Zealand red hinds at 15 months is 83 kg.

Once threshold mating weights are attained, liveweight has little direct effect on fertility and there is no trigger mating weight with advancing age. Nevertheless, it is important to feed adult hinds well enough to allow body weight to recover before mating. Pre-rut weaning and preferential feeding will help. This advances the onset of oestrus and will concentrate calving patterns. Earlier and more concentrated calving allows better utilisation of spring pasture growth and management of calving groups.

Because of the natural pattern of feed requirements and pasture growth, there is likely to be a pre-rut feed deficit for adult hinds, so preferential or supplementary feeding may be required to achieve optimum mating performance. Pre-rut weaning will help.

Pregnancy nutrition

In early pregnancy the aim is to maintain the liveweight of hinds. (Refer to AgFACT no. 11, "Feeding and nutrition tables for deer", for information on metabolisable energy requirements.)

Feeding management in late pregnancy should maintain a balance between the demands of increasing foetal growth (and therefore birth weight) but restricting fat deposition in the hinds to avoid calving difficulties (dystocia). It is particularly important to restrict feed intake in late pregnancy in hybrid breeding programmes which involve mating Canadian wapiti bulls or other large terminal sires to red hinds.

If calves are very small (under 6 kg birth weight), a higher death rate from starvation or misadventure can be expected. If they are very large (up to 16 kg for wapiti hybrids), an increase in deaths from dystocia can be expected. Around 9 to 10 kg birth weight seems to be the optimum for New Zealand red hinds of around 95 to 110 kg mating weight.

Lactation nutrition

Weaning weights of calves reflect mothering ability, especially milk production. This is determined by the quantity and quality of pasture and how it is managed during lactation.

Up to 90% of the variation in calf growth rates from birth to 80 days of age is attributable to milk intake. Hind milk is high in fat, protein and total energy. By 9 weeks 80% of the hind's lactational efforts have been achieved. Feed requirements in this period are high – double those of winter or spring. They can be sustained

ISSN 1172-2088

only by offering the highest quality vegetative pasture and by supplementary feeding during summer drought.

Allowing paddocks to grow long and rank to provide cover for new-born calves may be counter-productive. The nutritive value of the feed may be lowered so much that calf growth rates and weaning weights are significantly affected. It is better to make surplus feed into silage and control pastures by topping or grazing with cattle. It could mean the difference between 35 kg and 50 kg weaning weights. However, providing cover for calves is still important. Tree branches or patches of long grass (not on fence lines) are a good compromise.

Calves need high quality pasture from about 4 weeks of age, both to develop the ruminant gut and to encourage good growth rates. Rates in excess of 400 g per day from birth to weaning are possible for New Zealand red deer.

For further information, contact:

Dr Ken Drew
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034
Phone (03) 489 3809
Fax (03) 489 3739

AgFACT no. 46, December 1995
ISSN 1172-2088

99991

AgFACT

This document is for internal use by AgResearch only

Parasitism in deer

Farmed deer are susceptible in varying degrees to a wide range of parasites similar to those that infect sheep or cattle, but only lungworm, abomasal parasites and tissue worm are likely to cause problems. Basic principles of good husbandry, and an effective drenching programme for lungworm control, will keep at bay other internal parasite problems.

Lungworm

The lungworm (*Dictyocaulus viviparus*) is the most important nematode parasite of young deer in New Zealand. It is a slender, thread-like nematode up to 8 cm long. All age groups may carry infestations at any time but generally it is severe only in young stock, and in recently captured animals (especially wapiti) during their first six months on the new property. Moderate infestations may cause production losses and heavy infestations may be fatal.

Life cycle

Adult worms are found in the windpipe and larger air passages of the lungs. Eggs laid by the female worm hatch quickly and first-stage larvae are coughed up by the deer, swallowed, and appear in the faeces. These develop through second-stage to infective third-stage larvae, which migrate from the faeces onto grass. Under warm moist conditions this development can take place in as little as 5 days.

When infective larvae are ingested by grazing deer, they pass into the animal's gut, penetrate the intestinal wall and migrate to the lungs within 7 days. During this time they moult to fourth-stage larvae and reach the fifth or adult stage in the lungs a few days later. Mature adult worms begin laying eggs about 20 days after being ingested as infective larvae.

Signs

The signs of lungworm infection are vague and can include loss of condition, reduced growth rate and roughened coat. Coughing is not a common sign. Severely infected animals can die suddenly, apparently from physical blockage of the air passages by large numbers of worms.

Prevention and control

Drench weaners at weaning in early March and thereafter at 3-weekly intervals with white drenches or 4- to 6-weekly with avermectins or moxidectin until June. One or two drenches may be required the following spring and summer to cope with any lungworm build-up in deer that were slow to develop resistance. A veterinarian can check faecal samples to determine if treatment is needed. Move stock onto clean pastures after drenching.

Wapiti develop resistance more slowly than red and fallow deer, so their parasite status should be monitored for longer and further treatments given when necessary.

Recently imported wapiti, which may not previously have been exposed to high levels of lungworm parasites, should receive regular anthelmintic treatment for 6 months after their arrival and have faecal samples examined for a further 6 to 12 months.

Adult deer are relatively resistant to lungworm if they are not subjected to nutritional or environmental stress. Intensively grazed deer may benefit from two strategic drenches: hinds before calving and at weaning; stags at velveting and after the rut. Alternatively, faecal samples can be checked periodically for signs of worm build-up.

Abomasal parasites

Adult red and fallow deer are relatively resistant to abomasal parasites of the *Ostertagia* type. However, wapiti (elk) and wapiti–red hybrids are quite susceptible.

Life cycle

Adult worms live in the abomasum (fourth, or simple stomach) and are small (5 to 10 mm long), brown and slender. Their eggs are passed in the faeces and can develop to the infective third-stage larvae in less than a week in warm moist conditions. Low temperatures delay or prevent development. Infective larvae can survive on the ground for up to 6 months in optimum conditions.

The infective larvae migrate up blades of grass and, when ingested by grazing deer, they penetrate the lining of the abomasum, where they mature. Some larvae mature to adults in 3 to 4 weeks whereas others become retarded, specially in late autumn, overwinter as immature larvae and may not mature until spring.

Diagnosis is difficult because faecal egg counts reflect only adult abomasal worms, and the retarded or inhibited larvae cannot be detected in the living animal.

Signs

The build-up of parasites in the abomasal wall can severely affect digestion. Heavy worm burdens in red deer may cause subclinical weight loss or poor weight gains. Occasionally adult red hinds develop severe weight loss. This condition occurs frequently in wapiti or elk, where it is called "fading elk syndrome", because,

ISSN 1172-2088

unlike red deer, they have not evolved to cope with these parasites. Elk or wapiti bulls are especially vulnerable in late autumn or winter, after the stress of the rut, whereas cows appear more susceptible in late spring and summer, with the stress of late pregnancy and lactation.

Prevention and control

The adult parasites appear sensitive to the avermectins and moxidectin anthelmintics at their normal dose rates, but the inhibited larvae are more resistant and, although moxidectin is apparently effective at the normal dose rate, double the normal dose rate is recommended.

Wapiti bulls should be treated in late autumn or early winter after the rut and again in spring. Wapiti cows should be treated in spring and at weaning in autumn. Other treatments may be necessary according to conditions. Try to avoid intergrazing red and wapiti deer. Grazing wapiti on longer pastures and on clean pastures (e.g., after silage or hay) is preferable if possible.

Tissue worm

The tissue worm (*Elaphostrongylus cervi*) is found in low numbers in red deer throughout New Zealand but wapiti, especially those originating from Fiordland, are more likely to carry this parasite.

Tissue worms are slender nematode worms up to 60 mm long usually found coiled in the connective tissue between muscle blocks or occasionally on the spinal cord or under the brain. While not particularly harmful to the deer at these sites, they may result in carcass rejection due to unsightly lesions or greenish colour tinges in muscle tissue due to host reaction.

Life cycle

Adult female worms lay eggs that are carried to the deer's lungs in the bloodstream. They hatch into larvae which break into the lungs, are passed up the air passages, swallowed and voided in the mucus coating on the faeces. First-stage larvae can survive in the environment for over 2 years. Further development occurs only when the larvae penetrate the foot of a suitable snail or slug intermediate host. Here, the worms develop to the infective third larval stage in 27 to 50 days, depending on temperature. They can survive in snails, and retain their ability to infect deer, for up to 2 years. A deer becomes infected when it inadvertently consumes a snail containing infective larvae. Larvae are released from the snail by digestion in the stomach and then burrow through the host's gut wall. They then travel by an unknown route to their final site and develop into adults.

Adult female tissue worms start laying eggs 80 to 125 days after the infective larvae were consumed by the host deer. They are long-lived in deer and can produce eggs for over 6 years.

Signs

Deer infected with tissue worm usually exhibit no clinical signs of disease. However, the parasite sometimes lodges in the central nervous system (brain or spinal cord) and induces an acute reaction characterised by weakness or paralysis of the hind limbs and sometimes blindness and other nervous disorders. Occasionally a type of pneumonia may be induced by the migration of large numbers of larvae through the lungs.

Prevention and control

Treatment is difficult. Drenching may suppress larval output, but the intermediate hosts would have to be eliminated to achieve effective prevention and control

Other parasites

Lice rarely cause problems in deer. Ticks can be a problem in new-born animals in some parts of the upper North Island and may cause serious anaemia. Contact a vet if either problem occurs.

For further information, contact your local vet, or :

Colin Mackintosh
AgResearch, Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034, Mosgiel
Phone (03) 489 3809 Fax (03) 489 3739

AgFACT no. 47, December 1995
ISSN 1172-2088

9 418835 000019

99991

Artificial insemination in red deer

Artificial insemination (AI) is a powerful tool for increasing rates of genetic improvement in red deer herds. Individual sire stags contribute to the genetic composition of more progeny than individual hinds, so selection at the sire level is the most important means of genetic improvement. AI allows access to stags of high genetic merit from distant sources, and can be used to increase progeny numbers from particular sires beyond what is possible by natural mating.

The success of an AI programme is judged by the pregnancy rate achieved. Achieving a good rate for red deer, between 60 and 70% hinds pregnant to AI, depends on close attention to details and good animal husbandry.

Sire selection

Little information is available on genetic merit or estimated breeding values (BVs) for red deer stags. Promotion of genetic merit is therefore based largely on stag phenotype like body size, antler size or temperament, or origin (e.g., English park or Continental Europe), rather than progeny performance. There are a range of imported genotypes, the merits of which are hotly debated in the deer farming industry. Semen is generally available for most genotypes, although the price varies enormously depending on perceived genetic merit and rarity.

Hind selection

AI focuses on sire selection, but the genetic merit of the hind is still an important consideration. Over and above this, however, is the need to use healthy hinds in an AI programme. Hinds in poor health or on a low plane of nutrition generally give lower pregnancy rates to AI than those in good condition. To get the best results from AI it is recommended to select healthy, well-conditioned hinds, preferably with a record of rearing calves consistently each year. Yearling hinds can be used if well grown (>80 kg), but using elk or wapiti semen in these animals is not recommended.

Oestrous synchronisation

The recipient hinds will need to undergo oestrous (heat) synchronisation to facilitate "fixed-time insemination" so that all hinds can be inseminated at the same time. Synchronisation is achieved very simply by a standardised treatment with intravaginal CIDR (Controlled Internal Drug Releasing) devices containing progesterone.

A single device is inserted into the vagina of each hind for 12 to 14 days. Some operators prefer to replace the device after 8 to 9 days. Devices are withdrawn synchronously from all hinds, and invariably an intramuscular injection of PMSG (Pregnant Mare Serum Gonadotrophin) is given at the same time to ensure ovulation. This injection is especially important early in the breeding season. Hinds will tend to exhibit "heat" 36 to 40 hours after device removal, and will ovulate 52 to 56 hours after device removal. This latter time corresponds to the ideal time of insemination.

There are two major considerations with such treatment:

- The best results are achieved if the entire procedure is conducted during the onset of the natural rut in March–April. Attempts to go too early can sometimes have disastrous consequences owing to hinds failing to ovulate. Despite this being good advice, some people have been very successful with early AI. For example, AgResearch Invermay have had good results from AI at the beginning of March.
- The presence of a vasectomised stag during synchronisation treatment is often recommended, as this may further stimulate hinds to ovulate synchronously. However, the benefits of teasers are uncertain, and many programmes have been successful without them. It is likely that the earlier the AI, the more important is the presence of a stag. If AI is to be carried out before the stags are expected to be roaring, treating vasectomised stags with melatonin to advance the rut is important.

Semen collection

Most farmers opt to purchase frozen semen for use in their AI programmes. However, there is a growing trend to extend the genetic influence of particular sires on the home farm by collecting

ISSN 1172-2088

semen on the day of AI and using it fresh across large numbers of hinds – up to 100 hinds per sire.

Semen is collected by electro-ejaculation while stags are sedated. The procedure is generally performed by veterinarians or trained animal breeding personnel. Further processing of semen into individual inseminates involves cooling and dilution to a predetermined sperm concentration, which requires specialised equipment and expertise to preserve the viability of the fragile sperm. Most companies providing an AI service also offer semen collection and processing.

Insemination

The most reliable method of inseminating red deer hinds is the "laparoscopic intra-uterine" technique. Hinds are individually sedated and placed in a cradle. The reproductive tract (uterus) is viewed with a fibre optic laparoscope inserted through the abdominal wall. The semen is injected directly into the uterus via a pipette, also inserted through the abdominal wall. The insemination procedure, which usually takes only 30 seconds to perform per hind, is timed 52 to 56 hours after removal of CIDR devices. For large AI programmes, hinds are usually synchronised (i.e., CIDR devices pulled) and inseminated in batches of 40 to 50 animals.

The technique requires a skilled laparoscopist and veterinary supervision. However, numerous veterinary practices and animal breeding companies provide a laparoscopic AI service for deer.

Less invasive methods of insemination have been attempted with deer, but generally with poor or inconsistent results. Transvaginal or intra-cervical techniques are relatively simple to perform but are unreliable, especially with frozen semen.

Post-insemination care of hinds

The hinds are returned to pasture after AI. It is advisable to avoid stressful disturbances over the next 1 to 2 weeks. A chaser stag is normally introduced to the AI group after this period, to service hinds that failed to conceive to AI.

Pregnancy diagnosis

Although not critical to the success of the AI programme, an early indication of pregnancy is useful. Diagnosis is best performed by rectal ultrasonography about 35 to 50 days after insemination. Foetal size is the main criterion of pregnancy to AI, a day-45 foetus being 22 to 28 mm in length. Hinds failing to conceive to AI but pregnant to subsequent service 18 days later will not show any appreciable signs of foetal development at scanning.

Cautionary note

The presence of a large number of oestrous hinds after CIDR device removal is quite an inducement for stags to "exchange" paddocks. Ensure that paddocks containing the AI group are secure from amorous wanderers – nothing can spoil an AI programme like an unplanned pregnancy.

For further information, contact your veterinarian, or:
Dr Geoff Asher or Mr Tony Pearse
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
PB 50034
Mosgiel
Phone (03) 489 3809 Fax (03) 489 3739

AgFACT no. 48, November 1995
ISSN 1172-2088
99991

AgFACT

This document is for internal use by AgResearch only

Wapiti hybrids

Wapiti and wapiti hybrids now account for 13% of New Zealand's farmed deer. Wapiti sires can help boost production of both meat and velvet, either as upgrades or in crossbreeding programmes.

Wapiti were introduced to New Zealand from North America early this century. Deer farmers first began using captured Fiordland wapiti. These generally had an average of around 50 to 60% elk genes after natural hybridisation with red deer. Farmers are now upgrading, using imported wapiti or elk genes. Others are using an intermediate animal for velvet production or, in most cases, as a terminal sire mated to commercial red hinds.

Wapiti is the American Indian name for elk. However, in New Zealand the term wapiti is used to describe animals with a significant component of red deer genes, often of Fiordland descent, while elk is the term used to describe descendants of animals from the more recent North American importation of the 1980s.

Wapiti are much larger than red deer. Stags can grow to 500 kg, and cows can be from 220 to 300 kg, depending on their bloodlines. They are generally around twice the size of ordinary New Zealand red deer.

Velvet

The most valuable product from wapiti is their antlers. The wapiti antler commands considerable status in the Korean market, which considers it distinct from red deer antler. Its style, colour and size have been attracting a substantial premium in recent years. Good bulls have been identified, blood-typed and registered, and have been used to build up several herds solely for velvet production.

Wapiti sires and the "efficiency factor"

The wapiti's major role in the wider industry is the productive flexibility given when a wapiti sire is used across a commercial herd based on red deer, generating fast-growing, large progeny.

The "efficiency factor" comes from using the largest possible male mated to the smallest possible female, provided this does not diminish the hind's reproductive performance. For example, a well-grown, mature red deer hind (100 to 110 kg) mated to a half wapiti, half red deer sire is an efficient productive system. It does not increase management requirements at calving, yet a 50 to 60 kg carcass is possible in the peak venison season, or a heavier lean carcass at the same age as pure-bred red deer. Research has shown that at a given age a wapiti hybrid is leaner and faster growing than a red deer.

Table Average liveweight measurements in red and wapiti x breed types of young male deer

Sire **Dam**	NZ red NZ red	Wapiti x NZ red NZ red	Wapiti or elk NZ red
Weight (kg)			
Birth	10	12	14
Weaning	48	58	67
15 months	107	128	150
Growth rates (g/day)			
Birth to weaning	380	400	530
Weaning to 15 months	166	197	233

Using a hybrid sire enables greater management flexibility in venison production, producing an animal that will reach a given target weight sooner, or will be bigger at a given age, thus increasing returns.

Red deer hinds have a number of advantages. Their smaller size makes them easier to handle, and they can be stocked at a higher rate. They

ISSN 1172-2088

also come to sexual maturity earlier and have been heavily selected for positive production traits such as earlier calving and higher weaning weights.

There are drawbacks. This system can be used to its maximum only if the production of red deer hinds is maintained. A terminal sire is most practical when the female progeny are farmed for venison as well. If they are returned to the breeding herd the females continually increase in size and the system becomes an upgrading programme, and not an efficient terminal sire function.

Other factors to consider

- There are mating implications. Because wapiti are slower than red deer to reach sexual maturity, older animals, and more of them, are needed to achieve satisfactory calving numbers and mating management. It is easier to get red deer to sexual maturity by 15 months. Wapiti need to be fed well in the first 15 months to achieve this.
- Gestation takes longer for wapiti hybrids and elk. Red deer gestation takes 234 days, a 50/50 hybrid takes around 8 to 10 days longer, and a pure-bred wapiti or elk takes about 20 days longer than red deer.
- Management of calving patterns and feed demands must be adjusted. Hinds carrying calves from a big sire need to be fed well during summer, to achieve the calf's potential and ensure the hind is able to breed the following year. If she is not able to calve next season, or has calving problems, efficiency is reduced.
- Wapiti sires have some extra management needs compared with red deer. They require more feed to achieve maturity, so they must be well managed and fed appropriately as young stock.
- Wapiti hybrids have the advantage that once they have reached maturity they are about 50% bigger than their red deer equivalents, but require only about 35 to 40% more feed for maintenance.
- Wapiti and their hybrids require more attention to their health programme. A parasite control programme is vital, as wapiti do not have the resistance of red deer. Their metabolic requirement for copper is also higher.
- Hybrids seem to require more space than red deer, so stocking rate per hectare will be less, although they tend to be much quieter in the paddock.
- Red deer and wapiti should be handled separately in yards.
- The extra size and speed of wapiti and waptiti hybrids may mean yard modifications are needed. Their handling is more demanding and if they are particularly big they may need to be handled remotely, and to have modified handling equipment.
- Wapiti grow a lot more velvet than red deer, but it takes a year longer for them to mature and develop big antlers. Premiums and extra weight, however, more than compensate for later maturity.

For further information, contact:
The New Zealand Elk and Wapiti Society
Mrs Janey Hayes
Publicity Officer
"Lochinvine"
Fernside, RD1
Rangiora

AgFACT no. 49, revised November 1997
ISSN 1172-2088

99991

AgFACT

This document is for internal use by AgResearch only

Velvet antler removal: standards of practice

Velvet antler removal is a specialised operation requiring considerable veterinary skill. It must be carried out under anaesthetic with veterinary supervision. Specific legal requirements and safety precautions apply to the procedure.

Antlers must be removed from stags to prevent them injuring other deer or those handling them. If antlers are removed at the velvet stage, stags are not in the rut and are easier to handle, and the velvet is a valuable product on world markets. Antlers in velvet, however, are well supplied with blood vessels and nerves, so special techniques must be used for their removal.

Legal requirements

Velvet can be removed from deer only under anaesthetic and with veterinary supervision. The animal welfare aspects of the operation are covered by the Animal Protection Act (1960), and the use of the required drugs by the Animal Remedies Act (1967, amended 1988). Certificated farmers are able to velvet their own deer, or those under their direct control, under the indirect supervision of a veterinarian.

To become certificated, farmers must undergo training and examinations laid down by the National Velveting Standards Body. They must show that they understand these legal requirements, and have skills in the handling of deer before and after velveting, and in the surgical technique.

Mustering and yarding stags

Laneways and yards should be designed to allow unobstructed and safe movement of stags. Avoid protruding structures and minimise stock pressure areas. Stags should be moved from paddock to yards as quietly as possible to avoid damage to antlers or bodies, or excessive stress.

Once yarded, stags should be drafted into manageable mobs. Take care that stags do not stack or climb on one another, and avoid them fretting by ensuring that they always have companionship. Age, species and strain of deer, and their present and past environment, will affect behaviour in yards. Handling methods should be modified accordingly.

Stags ready for velveting should be drafted from the rest of the mob and held together. They should be allowed a settling period to recover from the stress of mustering and drafting before proceeding with velveting. Stags not required for velveting should be released as soon as possible.

Restraining stags for velveting

Stags can be restrained physically, chemically, or by a combination of both methods.

Physical restraint

Stags should be moved singly from the holding pen to the crush smoothly, to avoid them stopping or turning. The crush should be activated as soon as the stag is in place. Delay may lead to stress and damage to velvet. The stag should be held firmly enough to prevent unnecessary struggling, but not so tightly as to interfere with breathing. Avoid sounds, shafts of light or sudden movements, which will disturb the stag.

Chemical restraint

The stag should be moved into a suitable pen with adequate, uniform lighting, sufficient air flow to prevent high temperatures, and a dry, but not dusty, floor. Walls and gates should be of a solid material, preferably timber, which will reduce noise transmission.

Stags are sedated with the drug xylazine. The dosage required will depend on the species, weight and temperament of the stag. It must be injected intramuscularly into the top half of the neck using a syringe or other methods such as a pole syringe, or possibly a dart pistol. Xylazine must be injected into the muscle, not fat.

Xylazine is dangerous to humans, and can be absorbed through mucous membranes or skin, as well as by accidental injection. It may lead to cessation of breathing and cardiac arrest. Anyone using xylazine must observe the prescribed safety precautions, and be familiar with first-aid treatment for cases of accidental exposure. All drugs used in velveting must be locked in an approved cabinet when not in use.

Observe strict hygiene. Stags should be as clean as possible to prevent contamination of the injection site. Use a new needle for each animal, and avoid contaminating xylazine bottles with blood or debris from needles or syringes. Disposable syringes should be discarded daily, or as soon as they become contaminated. Repeat-use syringes should be sterilised at least once a day.

Xylazine acts as a sedative, muscle relaxant and analgesic. Individual animals vary widely in their response to a given dose. Heart rate, blood pressure and respiration rate are all greatly reduced, and

ISSN 1172-2088

reduction of the swallowing reflex will lead to drooling.

At higher doses the stags will lie down, leading to a risk of bloat, particularly if the stag is lying on its side. Stags may regurgitate stomach contents which may be breathed into the lungs, causing breathing failure or starting lung infections. In crowded pens stags may lie on top of each other, or standing stags may trample lying ones, causing suffocation or injury.

Xylazine reduces the stag's ability to control its body temperature, so temperatures in the pen must be kept low to prevent heat stress.

Any of these effects of xylazine, if sufficiently severe, can be fatal. **After treatment with xylazine, stags must be closely monitored by a person trained to recognise danger signs, and to apply appropriate treatment.**

Combined chemical and physical restraint

Xylazine may be used before the stag is placed in the crush. A low dose will reduce stress, and may make the stag less reluctant to enter the crush.

Administering local anaesthetic and tourniquets

A local anaesthetic (usually a lignocaine formulation) is injected around the base of the pedicles. Injections may be to specific nerve blocking sites, or as a ring block around the pedicle. After 4 minutes, test to ensure the anaesthetic has taken effect but touching or pricking the velvet on the outside of the base of the antler.

A tourniquet of a clean, pliable material that will withstand tension is applied around the base of each pedicle. Twine or rubber strips are suitable. They should be applied tightly enough to compress the surface blood vessels, but not so tight that they damage the tissue.

Velvet antler removal

Antlers should be removed with a sharp disinfected saw. The cut should be made 1 cm to 2.5 cm above the coronet, the junction of the pedicle and the antler. Cutting too low can damage the pedicle, and may leave the stag with permanently malformed antlers.

A wound powder can be applied to reduce bleeding and infection. This need not be an antibiotic; veterinary charcoal powder is effective. Tourniquets may be removed before the stag is released from the crush, or within 30 minutes of application for chemically restrained stags.

Release from restraint

Physical restraint

Once bleeding has been controlled, release the stag from the crush and return it to the group in the holding pen. The group should be held in a quiet pen to ensure there is no bleeding.

Chemical restraint

An intra-venous injection of yohimbine is used to counter the effects of xylazine. The injection can be given into either the jugular vein in the neck, or the cephalic vein in the upper front legs. The stag should recover in approximately 2 minutes. It should then be returned to the group in a quiet holding pen to ensure there is no bleeding.

Returning stags to the paddock

Stags should be standing before they are released. If they are not, they should be stimulated by increased lighting or gentle sound or touching. Stags may be still partially sedated, so care is needed in moving them along laneways when returning them to the paddock.

Once in the paddock, stags should be watched carefully for any bleeding or abnormal behaviour. Monitoring is best done at a distance with binoculars. Any stag lying on its side should be encouraged to lie on its chest or to stand. If stags show excessive bleeding, prolonged lack of alertness, unstable standing or movement, laboured breathing or bloat, a veterinarian should be consulted.

Monitoring should continue until all deer are behaving normally.

For further information, contact:
National Velveting Standards Body
C/- New Zealand Game Industry Board
Box 10-702
Wellington
Phone (04) 473 4500 Fax (04) 472 5549

AgFACT no. 63, April 1996
ISSN 1172-2088

99991

9 418835 000019

AgFACT

This document is for internal use by AgResearch only

Deer species, domestication and farming

Deer farming, a relatively recent addition to New Zealand's range of agricultural enterprises, owes its origins to large, well-established populations of feral deer and a flourishing export industry in feral game meat. The farmed deer industry has now grown to around 1.5 million deer, based on strong export markets in venison and velvet antler.

Feral deer

Red deer, *Cervus elaphus*, is by far the most numerous and widespread of the eight species of introduced feral deer in New Zealand. Others include fallow, sika, whitetail (or Virginia), sambar, rusa and wapiti (or elk). The last is, strictly speaking, a sub-species of *Cervus elaphus*. Red deer is the most important and popular species for farming. Of the minor species, fallow deer and wapiti are used and a few rusa and sika deer are farmed.

Red deer were the first to be liberated in 1851, the first of many liberations over the next 70 years. The first liberations of fallow deer were in 1864 and of wapiti in 1905.

Red deer

Red deer are found in most forested land and in the tussock high country from Stewart Island in the south to the Kaimai Range in the north. Their spread and increase after introduction was rapid, favoured by ample food, total protection and an absence of natural enemies.

By the early 1900s control operations became necessary to prevent damage to native forests, soil and young pine plantations. Protection was removed in 1931. Since then more than a million have been shot by government cullers and thousands are killed annually by sportsmen and commercial hunters.

Physical characteristics: A mature red stag is up to 1.2 m high at the shoulders; hinds are smaller and of lighter build. Body weights vary with locality and feed availability. A typical mature feral red stag weighs 150 to 160 kg. Substantially higher liveweights are achieved by farmed animals with good nutrition.

The summer pelage (coat) of the mature animal is a glossy reddish brown; the winter coat, a drab grey-brown. Mature animals of both sexes have a straw-coloured rump patch, and the underparts of the body and between the thighs are generally creamy.
Antlers are almost round in cross section. They have a lightly pearled main beam, from which branches a brow tine immediately above the coronet; a bez tine which is usually shorter than the brow tine; and a trez tine roughly half way up the main beam. Above the trez tine is a fourth or top tine, sometimes called the royal or fighting tine. There can be several top tines.

Behaviour: Red deer are essentially gregarious and live, for most of the year, in matriarchal herds of females with the young of both sexes, and separate groups of stags. An old and experienced hind is usually the leader of each group. Except when they attach themselves to a group of hinds and defend a harem during the rut, stags exist in loose-knit companies with no apparent leader.

Fallow deer

Fallow deer are found in a number of widely separated herds in the North and South Islands, having reached pest numbers in only one or two locations. Control has been undertaken periodically but, in recent years, commercial meat hunting, deer stalking and live capture for farms have kept numbers within tolerable limits.

Physical characteristics: Mature fallow bucks are about half the size of red stags and seldom exceed 90 cm at the shoulder.

Unlike most deer species, the fallow shows wide colour variation in both sexes. The most common variety in New Zealand is the melanistic or black variety. In this variety, as in all others, the belly is of a lighter shade, with a well-defined dividing line along each flank. The lighter-coloured ("Spanish" or "menil") variety has a deep rich fawn summer coat with numerous prominent white spots on the flanks and a black stripe along the spine.

The tail, which is longer than in most species, is black on top and white beneath and surrounded by a white rump patch. The winter pelage is a duller grey-brown and the white spots become less noticeable. Intermediate colour variations are common.

Behaviour: Fallow deer are extremely timid and much more flighty than red deer – a significant factor in farming. They have a distinctive bouncy gait when alarmed, lifting all four legs together when running. They are extremely agile and can jump higher and more easily than red deer.

Mature bucks tend to live apart from does until the start of the rut. During the rut they expend much energy in marking out territories and rutting stands, but they neither fight each other nor herd their harems to anything like the same extent as red deer.

Wapiti

The rugged and almost impassable terrain of Fiordland west of Lake Te Anau, and competition for forage with the numerically superior red deer, probably limited the spread of wapiti beyond the region where they were first introduced.

ISSN 1172-2088

Physical characteristics: Apart from the almost non-existent moose, wapiti are the largest of the game mammals introduced into New Zealand. A mature bull can stand about 1.5 m at the shoulder, exceptional specimens weighing nearly 500 kg. An adult bull in New Zealand averages 270 to 320 kg, a cow seldom more than 230 kg.

In summer the head and neck of males are a dark chocolate colour and the back and sides are a lighter brownish-grey. Legs and undersides are dark, except for a creamy patch between the hind legs which extends over the rump and base of the tail. Winter pelage becomes lighter overall. Females tend towards a more uniform fawny-grey. Calves, like those of red deer, are richly coloured and spotted at birth.

Wapiti antlers are larger than those of red deer and usually curve backwards at the top. The bez tine is always well developed, but the fourth tine is usually the largest – a characteristic of the species.

Behaviour: The social behaviour patterns and reproductive cycle of wapiti are very similar to those of red deer. A significant result of the similarity between the races is that they interbreed quite freely in the wild. Deer farmers take advantage of this to obtain larger, hybrid calves from red hinds.

Domestication and farming

The first deer farms probably evolved from the experiences of a few people who held small groups of deer in captivity. On some high country tussock properties where feral deer were plentiful it was a simple, though expensive matter to run a fence round them and create a deer "farm".

In the 1970s the slump in world beef prices, and dramatic increase in prices paid for feral venison, stimulated serious consideration of deer farming, which was legalised in 1969. Farms were established in many places within the feral range of the species concerned and stocked either with captured feral animals or by purchase from established farms.

Some of the earliest deer units were located on relatively low-fertility native grassland, an environment similar to the summer habitat of the feral deer but where fencing costs were high in relation to carrying capacity. But deer adapt quite readily to the best quality pasture on first-class land, where fencing costs per stock unit are reduced and the animal's full productive potential exploited.

The farmed deer industry has now (1996) grown to around 1.5 million deer, and makes export earnings of more than $200 million annually.

Although some basic principles of deer farming have been established, the industry is still young and developing rapidly. AgResearch in particular, and Otago and Massey Universities, are active in many aspects of research and technology development in deer farming and the deer industry. Prospective deer farmers, and those already in the industry, would be well advised to review published information regularly, to canvass the opinion of experienced deer farmers, and to seek advice from the NZ Deer Farmers' Association and reputable consultants.

Useful publications

A Salute to World Deer Farming - Proceedings First World Deer Congress 1993. Ed. Ian Woodhouse. NZ Deer Farmers' Association, PO Box 2678, Wellington.

Modern Deer Farm Management 1990 (revised). David Yerex and Ian Spiers. Wellington, GP Books.

Proceedings First World Forum on Fallow Deer Farming 1993. Ed. G.W. Asher, AgResearch, PB 50034, Mosgiel.

The Deer Farmer, monthly magazine, PO Box 11092, Wellington.

Wapiti Behind the Wire 1991. David Yerex. Wellington, GP Books.

For further information, contact:
General Manager
NZ Deer Farmers' Association
PO Box 2678, Wellington

Author: Dr Ken Drew
AgResearch, Invermay Agricultural Centre, Private Bag 50034, Mosgiel

AgFACT no. 81, May 1996
ISSN 1172-2088

99991

Farming red deer

Deer farming, with a balance of velvet and venison production, has a promising future in New Zealand. Red deer is the most important and popular species for farming.

Farm establishment

Permits to farm are no longer required, but the farmer needs to inform the Department of Conservation if steep land is to be farmed. The farm can be stocked from the wild, or from surplus stock from other deer farms.

Transporting deer

An industry code of practice and standards has been developed for transport of deer. Accredited transport operators offer a quality assurance system linking farm practice and transport needs. Only animals in good condition should be transported. Keep hinds apart from males, and young stock apart from adult stock. If transported together, stags should be of similar size and must be de-antlered before the journey. Avoid transporting mature stags during the rut, but if males over 12 months of age have to be transported around the breeding season, they should be boxed or penned individually.

Deer travel better in a darkened (solid-sided) stock crate, as it helps to keep them calm and reduces injury risk. Stock crates must be well ventilated, firmly secured to the vehicle deck, and provide each animal with floor space of 0.4 m^2/100 kg liveweight. The floor should be slatted or covered with rubber matting to provide animals with sure footing.

Deer should be fed and watered before loading. They should not travel for longer than 12 hours without water, or 24 hours without an opportunity to feed and a rest. They can be released directly into the paddock (often best done at night) or into darkened yards. Newly acquired deer are best put into a paddock by themselves but adjacent to deer in other paddocks.

Yards

Deer do not handle as easily as other stock, so good yard design is important. Most successful yards have the following features:

- long lead-in race, ideally curved so that the yards are out of sight until the last minute;
- working area walls at least 2.1 m high, with at least the lower 1 m closely boarded;
- a purpose-built handling pen;
- raceways at least 6 m wide;
- no iron sheeting or corrugated iron – it is noisy and frightening to deer;
- no sharp projections;
- central, circular crush pen, with a maximum diameter of 5 m;
- small pens, with timber gates and timber railings;
- no sharp corners or long narrow raceways.

Fencing

Boundary fences must be 2 m high. They are usually netting fences with 150 mm mesh – to prevent dogs and fawns getting through. Posts are spaced at 5 m intervals. Alternatively a 13-wire fence with 2 m battens at about 0.6 m intervals can be used. Internal subdivision fences can also be netting, or 6-wire electric (suitable for yearlings and hinds) or 13-wire with alternate wires electrified. There should be water troughs and shelter in each paddock.

The main points to remember when erecting fences are:

- use well-stayed, heavy duty strainer posts;
- use stout, well-stayed angle posts;
- ensure posts in dips and gullies are very well footed;
- do not over-strain the wires.

Handling deer

Deer need different stockmanship techniques to sheep and cattle. Patience is the key as deer can move rapidly if startled. Approach deer quietly and apply pressure slowly and firmly. Let them make their own way. Move positively, without hesitating, because deer, like dogs and horses, are quick to detect incompetence and negative attitudes. Use as few people as possible. Dogs can be used provided they are well controlled.

Paddock layout, gate placement and the approach to yards are very important in mustering and shifting deer. Individual handling of deer, e.g., for drenching or velveting, is best done in covered yards. Always wear protective clothing when handling deer – they can kick very effectively, and stags with antlers can be very dangerous.

Animal health

The key feature in deer health is disease prevention rather than cure. This is more important with deer than traditional livestock because deer are easily stressed by yarding, handling or under-feeding. Most of the serious health problems in farmed deer seem to be associated with stress and inadequate nutrition.

Watch abnormal behaviour closely. It may not be possible to save an animal that suddenly shows disease symptoms. But an early post-mortem should reveal the cause of death and allow action to reduce the incidence of further disease. Specific diseases are covered in other AgFACT titles.

ISSN 1172-2088

Reproduction

Basic breeding facts

- Puberty: hinds and stags 14 to 16 months.
- Onset of breeding season: mid March.
- Length of oestrous cycle: 18 days
- Gestation length: 234 days (range 227 to 241)
- Onset of calving: mid November

Red deer in New Zealand seldom produce twins, so the main breeding aim is to achieve 100% calving. But in practice, this means 95% conception and 85 to 90% live calves at 3 months.

Female mating management

Hinds mated at 16 months of age need to reach a minimum liveweight of 70% of their mature weight (mature weight of NZ red hinds is typically 100 to 110 kg) to achieve 90% calving or better. As with sheep and cattle, adequate feeding is needed to ensure that hinds calve every year. Yearling hinds should be mated separately from mature hinds to avoid bullying.

Male mating management

In most cases, herd sires should be 3 years or older. Single-sire mating can be used with confidence. However, backup stags should be used in case the primary stag is sub-fertile. One stag can successfully mate up to 50 hinds. In large paddocks, or where cover is broken, several sires can be used, as the herd will split into several groups with a stag in each. Stags are dangerous during the rut, and should be treated cautiously.

Calving management

Hinds need to be set-stocked in calving paddocks through December and January. Avoid unnecessary disturbance during calving. Calves generally weigh 8 to 10 kg at birth. Some calf mortality (5 to 10%) is normal, mostly within a few days of birth.

Providing shelter is important for new-born calves, but don't let pasture become rank as feed quality will drop, reducing hind milk production and calf growth rates. If young calves must be handled (for ear tagging or weighing) a familiar routine and a quiet, calm approach are needed.

Selection policies

Females

Expected breeding life is 10 to 12 years. Dry hinds (detected by udder examination or ultrasonic pregnancy scanning) should be culled if policy allows. Matching calves visually to their mothers is not always accurate but it is now possible to use a DNA parentage test and then cull hinds showing poor milk production on the basis of their calf's growth rate.

Males

Body weight at 15 months gives a good indication of ultimate body and antler size. The bottom 25% should be culled for meat at this stage. The best potential herd sires can be identified at 26 months, from their body weight, velvet yield and temperament. Animals to be retained for a specialised velvet antler herd should be selected from 2-year-old stags. Any animals of bad temperament should be rejected.

Feeding

The most important task when farming deer for profit is to balance the budget of seasonal feed requirements with seasonal pasture production. Where there are differences between supply and demand, feed should be conserved or purchased.

Pasture quality and quantity vary seasonally. In most regions supply is reliable in spring and winter, very unreliable in summer and uncertain in autumn. Spring pasture is very nutritious, but feed quality decreases in summer. Hay is not only low in feed value but also variable in quality and palatability.

Further information on feeding and nutrition is given in other AgFACT titles.

For further information, contact your consultant or veterinarian.
Author: Dr Ken Drew
AgResearch,
Invermay Agricultural Centre,
Private Bag 50034,
Mosgiel

AgFACT no. 82, May 1996
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Calving in deer

Weaning, mating management and calving management are closely interrelated, and affect the breeding performance of hinds and the growth performance of calves. Good calving management practices can help maximise calving performance.

Hind liveweight, weaning date, mating and subsequent calving performance

The liveweight of a young hind at mating has more effect on calving percentage than difficult births or calf loss. Good feeding in the first year is vital if the animal is to reach threshold puberty weight. To achieve an 85 to 90% conception rate in a herd of yearlings at mating at 15 months of age, the minimum weight should be 70% of the typical mature hind weight of the herd. Thus target average weights for mobs of yearling hinds are well above this minimum (see AgFACT no. 11, Feeding and nutrition of calves and hinds).

Calves should be weaned early enough to enable adult hinds to recover some weight before mating. Increasing the level of hind nutrition counters the effects of lactation and can help to ensure a good conception rate, especially in the first 20 days of the mating cycle. It also keeps hinds in good condition for back up mating. Hinds should be held on a stable or slightly rising plane of nutrition over mating but can be grouped in May.

Concentrated calving is a useful management tool. Earlier weaning means earlier conceptions, at a higher success rate. A calf feeding from its mother on good pasture can be expected to gain about 400 grams per day, so bringing calving forward 10 or 12 days gives calves more time gaining precious weight, while better spring pasture is still around.

A 6-week mating period allows hinds to go through two cycles, so that the primary sire can be backed up with a selected back up or chaser stag. It is advisable to have a definite end to mating sometime in May, depending on the type or part of the country, to reduce the number of late calvers. The aim is to restrict the calving period to 6 weeks, and then be able to concentrate on lactation management.

Calving season (November to December)

Preparing hinds for calving

Hinds should have a minimal worm burden before calving. A spring worm drench and a clostridial vaccine boost are given in mid October so that antibodies are passed on in the colostrum to give protection to the calf. Hinds should be vaccinated 2 to 3 weeks before the start of calving, because they are easier to handle at this time, and to give time for the antibodies to develop.

Hinds can be sorted into early calvers and late calvers based on udder development, early pregnancy scanning and foetal ageing, or sorted according to sire.

Preparing the calving pasture

The calving pasture should be in a quiet part of the farm with plenty of fresh water and feed that will last until calving has finished.

For the first 4 to 5 days calves will hide and cannot be moved easily. If natural cover is unavailable, attach tree branches to a hay feeder, or leave strips of unmown grass to provide cover. Avoid leading such strips up against fences because that can encourage calves to try to go through, with unfortunate consequences such as desertion or becoming entangled in fences.

Overcrowding is the biggest cause of mismothering, desertion and calf beating. A

ISSN 1172-2088

maximum of eight hinds per hectare seems to be a comfortable stocking density, if the hinds are settled and ground cover is good.

Routines at calving time

It is sensible to establish an observation routine early, before calving starts. An ATV is a good way to get around as the deer are used to machines and it provides good observation. Because most births are in the early morning or early evening, establishing a calving beat just before evening, or about 8.30 or 9.00 in the morning, is a good idea.

Hinds seldom have trouble giving birth. Most births take 2 to 2½ hours from the time the water bag shows. Routine observation will soon reveal a hind in trouble. There is a delicate balance between helping and doing more harm than good, so it is important to observe first. A hind in trouble will usually pace the fence and may show signs of discomfort or straining, or there could be a calf leg pointing out at an odd angle. But it pays to call the vet sooner rather than later.

Having easy access from the calving pasture to a laneway that leads to a shed will help if assistance is necessary. Calving problems are rare and the calf death rate from birth to weaning is normally 5 to 10%; most deaths occur within a few days of birth.

Post-calving

Avoid any disturbance of the dam to calf bond, especially in the first 12 hours, as this increases the risk of mismothering. Hinds are especially sensitive about dogs, children and people on foot. The most effective calving tool is a pair of binoculars, and the best management is minimum disturbance and leafy green pasture available for milking.

Owing to the close relationship between calving, weaning and mating management we strongly recommend this AgFACT be read in conjunction with AgFACT no. 106, Weaning in deer.

For further information, contact your local consultant or veterinarian.

Author: Tony Pearse
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
Private Bag 50034
Mosgiel

AgFACT no. 105, June 1996
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Weaning in deer

Weaning, mating management and calving management are closely interrelated, and affect the breeding performance of hinds and the growth performance of calves. Careful management of hinds at weaning and mating is important to ensure early and concentrated calving periods and high rates of pregnancy.

Time of weaning

Deer are very adaptable to various management systems, provided the basics of feeding and preventive animal health programmes are observed. There are three options for time of weaning: early pre-rut weaning, weaning at mating and post-rut weaning.

Pre- or post-rut weaning seems to make little difference to liveweight at 15 months, which is critical for the profitability of venison production, and for ensuring good performance in young hinds. However, most intensive deer farmers favour early pre-rut weaning because of its advantages for mating and weaner management, especially weaner health programmes.

Early pre-rut weaning (late February to 1st week in March)

Advantages

1. Early weaning provides an opportunity to manage the feed supply better. Because the feed requirement of a weaned hind is about half that of a lactating hind, hind condition can be built up before mating, which can help ensure high pregnancy rates (greater than 80%) to the first 18-day cycle.
2. Early weaning also creates time to sell or cull surplus breeding hinds, and to select individuals for special breeding programmes (e.g., AI) and Tb-test them if necessary.
3. Early weaning provides an opportunity to start a simple animal health programme for weaners without worrying about handling big groups, and gives young stock time to become used to being managed before the winter.
4. Favourable weather and feed conditions reduce stress, helping calves to recover quickly from the stress of separation, and to continue their high autumn growth rates.

Disadvantages

1. Early weaning accentuates the stress of separation.
2. It requires increased care during handling and yarding because of the large size difference between calf and dam.
3. Changing to new feeds, especially concentrates, can be risky at this time. Introducing grains or deer nuts to hinds and their calves 2 weeks before weaning can often be useful.

Weaning at mating (late March)

Some farmers prefer to wean at the onset of mating while separating hinds into mating groups, putting out the stags and selecting culls. Weaners are another month older, larger and less stressed.

However, weaning at this time greatly increases the workload, and may also reduce the number of hinds that will conceive to the first cycle, thus extending the eventual calving span. Other disadvantages include delay in beginning a drench and vaccination programme, loss of hind condition and depression of weaner growth rates after weaning.

Post-rut weaning (late May to June)

If single-sire breeding programmes are not practised, or the farm is run extensively on a low input basis, weaning after mating is an option which is being increasingly considered.

Calving spread will tend to be greater, but the young stock finish autumn in good condition and weight, and can be sold to advantage at this time. On extensive properties, parasitism may not be a problem during autumn, but if indicated, control programmes can be used with unweaned stock.

Weaning procedures

If possible 3 weeks before weaning, hinds and calves can be yarded in small groups to allow ear tagging, hind–calf matching, drenching and

ISSN 1172-2088

vaccination while the calves are still with the mothers. Weaning then becomes a quick and simple separation and drench.

It is an advantage to return calves to a pasture with which they are familiar, with the hinds separated at some distance. If possible a small nucleus group can be weaned first, and then added to, or a small group of five or six quiet dry hinds held with weaners for herd control and a calming influence.

Opinions vary on whether weaners should be held in yards or returned directly to pasture, but there is some preference for holding overnight for 2 to 3 days, with mothers separated out and returned to pasture straight away. Weaners, whether yarded or on pasture, should have access to fresh clean water and good quality hay or pasture. Supplements should be used only if the calves are already accustomed to them.

Weaning paddocks should be well fenced and secure and well sheltered from bad weather. Farmers must also be aware that in small poorly ventilated yards heat exhaustion in young stock is a high risk.

Yards must be fully checked for foot traps, broken boards and poorly fitting gates. Overcrowding, excessive and sudden noise, dust or very muddy conditions are all aggravations, and weaners should not be held on bare concrete for any length of time as they risk hoof and tendon damage.

Possible animal health programmes for weaners

This is an outline only and a health programme should be discussed in association with your veterinary adviser.

1. Lungworm control: Drench at 3- to 4-week intervals depending on drench type (February to mid June) using either an oral or pour-on form. Dosage and drench conditions are specific for the product, and liveweights and weather conditions, and must be observed for effective control.
2. Clostridial vaccination: 2-ml doses at or before weaning, plus 2-ml booster dose 6 weeks later. The standard five-in-one vaccines are normally used.
3. Trace elements: as required.
4. Leptospirosis vaccination: vaccination at weaning if required.
5. Yersiniosis vaccination (Yersiniavax): at weaning or at handling before weaning followed 6 weeks later by a booster.
6. After weaning observe young deer for problems of infection, injury, lameness or scouring and treat as early as possible. Under stress such problems can worsen quickly. Weaners must be fed to appetite (ad libitum) on high quality feed to ensure good health and production.

Owing to the close relationship between weaning, mating management and calving management we strongly recommend this AgFACT be read in conjunction with AgFACT no. 105, Calving in deer.

For further information, contact your local consultant or veterinarian.

Author: Tony Pearse
AgResearch
Sheep, Deer and Equine Division
Invermay Agricultural Centre
Private Bag 50034
Mosgiel

AgFACT no. 106, June 1996
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Fading elk syndrome How to control worms in the abomasum in elk

Fading elk syndrome most commonly affects North American elk or wapiti, and is characterised by chronic weight loss, with or without obvious scouring (diarrhoea). The cause was unknown until the late 1980s, when roundworm parasites in the abomasum were shown to be involved. Several steps can be taken to prevent, treat and monitor the syndrome.

Background

Ever since elk or wapiti were imported onto New Zealand farms in the 1980s, a high proportion of animals have been afflicted with fading elk syndrome (FES). Most elk farmers appear to have had problems, regardless of geographical location, and some have been worse affected than others. The cause of the syndrome proved difficult to determine, because the only consistent signs were weight loss and a low level of protein in the blood.

Research on FES showed that elk are extremely susceptible to parasites in the abomasum (true stomach) which, in the larval phase, burrow into the abomasal lining and severely affect the efficiency of digestion by reducing acid secretion. The enzymes important for protein digestion need an acid environment, but because the parasites reduced acid production, protein digestion was poor and animals lost weight even though they were eating normally. Another allied problem was that many of these elk appeared to be low in copper. This was also a consequence of the low acidity in the abomasum which reduced the uptake of copper.

Current thinking is that red deer have evolved with, and developed resistance to, these abomasal parasites in Europe and Asia, but some of these parasites were not present in North America, which meant elk never developed resistance. Elk were afflicted only when brought to New Zealand and farmed with red deer.

Few elk cope well with the parasite, in contrast to most red deer, although a small proportion of red deer, particularly when under severe stress, may also develop subclinical or clinical disease.

Elk hinds are most affected during spring and summer when under the stress of pregnancy and lactation, whereas most stags are affected in winter and spring after losing weight during the rut, followed by the stress of colder weather.

Prevention and treatment

Several steps can be taken to reduce the risk of exposure to FES.

- **Do not intermix red deer and elk.** To reduce exposure to FES, make sure elk have their own grazing blocks.
- **Try to graze elk on longer pastures.** Because parasite larvae tend to survive best in the bottom 5 cm of pasture, leaving the pasture long reduces their uptake.
- **Develop a drenching programme** with your veterinarian to prevent the build-up of abomasal parasites and lungworm. A strategic drenching programme should be developed specifically for your farm.

Research has shown that some anthelmintics are ineffective against the larval stages of the parasites in the abomasal lining, a problem that appears to be worse in elk than red deer. Trials have shown that elk appear to metabolise or excrete the anthelmintics more quickly than do red deer, which means they have less time to act.

The most effective anthelmintic is pour-on moxidectin (Vetdectin®, Cydectin®), applied at the normal dose rate. Ivermectin (Ivomec®) should be used at twice the recommended dose rate for deer. At normal dose rates it kills the adult parasites but is ineffective at clearing larvae from the abomasal lining.

ISSN 1172-2088

Monitoring the problem

Faecal egg counts are of no value in monitoring the problem in deer because it is the larval stages that cause the damage and eggs are not being produced at this stage. A pepsinogen test, which is useful for diagnosing a similar condition in cattle (ostertagiosis), is of no use in deer.

If animals do develop signs of weight loss it is important to eliminate FES as a possible cause by treating them as soon as possible with moxidectin or double dose ivomectin. If weight loss continues, your vet should investigate other causes of chronic weight loss.

Remember that stags always lose weight during the rut, and a greater-than-acceptable weight loss can be hard to detect under a thick winter coat. It is important to observe animals well, weigh them periodically and monitor their food intake and general well-being.

Recovery

Once animals have lost weight owing to FES, full recovery of abomasal function and the start of weight gain can take many weeks after treatment.

High quality feeds with high protein levels are needed to restore the animal to its former state. Copper and vitamin supplements may be needed to assist the recovery.

For further information contact, your local veterinarian.

Author: Colin Mackintosh
AgResearch,
Sheep, Deer and Equine Division,
Invermay Agricultural Centre,
Private Bag 50034,
Mosgiel.

AgFACT no. 107, August 1996
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Meeting the standards for the Deer QA On Farm Programme

The Deer QA On Farm Programme, administered by the New Zealand Game Industry Board, has been set up as part of the Deer QA pasture to plate quality assurance programme, which has international recognition. The programme helps deer farmers meet the requirements of an international market that is increasingly emphasising quality.

What is a quality assurance system?

A quality assurance system is designed to:

- prevent defects
- identify the cause of problems, determine corrective action and modify the system to prevent the problem recurring
- operate a business using defined procedures and methods to meet customer expectations consistently

The aim is to ensure all links in the quality chain are able to deliver goods on time, in the right quantity, to the right specification and at the agreed price, without fail.

Deer farming quality assurance standards

The Deer QA On Farm Programme operating standards cover four main areas:

- Facilities
- Animal health, welfare and production
- Velvet
- Transport

Implementation

Step one Farmers wanting to be part of the scheme are first sent a 16 page checklist which enables them to carry out their own self-assessment. Rather than taking a pass/fail approach, the programme is designed to help farmers reach the agreed standards and achieve desired outcomes. This approach allows farmers the scope to develop procedures appropriate for their particular situation.

Step two An independent assessor, usually an experienced deer farmer or veterinarian who has been trained for the role, assesses the farm. If the farm meets the standards it becomes accredited; if the farm has deficiencies, accreditation will not be given until they have been rectified.

(**N.B.** Until October 1997 the programme will be funded by the New Zealand Game Industry Board before moving to a user pays basis.)

The operating standards

The following are examples of the issues covered in the four main areas:

1) Facilities

Deer sheds and yards The operating standards call for deer sheds and yards that are "designed, constructed and located for the safe and humane confinement and handling of deer". The requirements include making sure there are no protruding hinges, bolts or catches that could harm deer, ensuring there are no dangerous gaps, and providing things like good ventilation. Similar standards are also required for on-farm auction facilities.

Loading ramps Loading ramps should allow safe and unobstructed loading and unloading of deer. As well as avoiding dangerous protrusions and gaps, the standards call for a ramp floor of permanent non-slip design and construction. There are also recommendations on dimensions.

Deer handling and treatment facilities Deer handling and treatment facilities should allow safe, hygienic and humane handling for the treatment of animals and the removal of velvet.

Accessways Accessways to handling facilities should be designed to allow for the natural flow of animals, and any protrusions, such as gate hinges, gudgeons, catches and bolts, should be cut flush.

Gates The standards include having gates that are free of protrusions and that can be opened and secured in such a way that animals cannot get caught behind them.

ISSN 1172-2088

Fences Fences must be designed to contain safely the species of deer farmed.

The operating standards also cover topics such as **water, power supply, indoor housing–quarantine, other buildings, land use** and **shelter.**

2) Animal health, welfare and production

Animal remedies The standards call for farmers to store, use and administer safely animal remedies and observe manufacturer's or veterinary recommendations, or both.

Breeding management Farmers are required to use breeding management techniques that enable the animal's reproductive potential to be expressed and to avoid disease transmission, physical injury and dystocia (birthing difficulties).

Handling An appropriate level of skill and knowledge is required during handling to minimise stress, injury or risk of disease to deer and to ensure the safety of the handler.

Nutritional management The standards call for optimal nutritional management, "appropriate to the differing feed requirements of age, breed, sex, size, production systems, season and climate".

Other areas covered by the standards include: **farm management, culling, hygiene, identification, knowledge and training, purchasing, records, separation of age–sex groups,** and **weed and pest control.**

3) Velvet

Removal of velvet The standards call for safe and humane velvet removal according to the established Code of Recommendations.

Velvet and antler management Broken or diseased velvet, or hard antler, which are likely to cause stress, injure or infect other deer should be removed.

Velvet handling and storage The standards deal with how to handle and freeze velvet after it has been cut, its transport, and record keeping.

4) Transport

The standards call for the use, where possible, of a transport operator who is accredited under the Deer QA Transport Programme.

A number of qualifiers are laid down, covering when deer should not be transported, such as within a week of velveting.

Farmer's deer crates Standards cover issues such as internal dimensions, protrusions, ventilation and footing.

Further information

Copies of the Deer QA On Farm Programme Operating Standards are available from:

New Zealand Game Industry Board
PO Box 10-702
Willeston Street
Wellington
Phone (04) 473 4500 Fax (04) 472 5549

AgFACT no. 108, August 1996
ISSN 1172-2088

99991

AgFACT

This document is for internal use by AgResearch only

Parentage testing of deer

Parentage testing by DNA profiling ensures accurate pedigrees, an important component in maximising the rate of genetic gain. DNA profiling can verify pedigree records, particularly in multi-sire mating system, and can sort out the confusion that can occur even with the most meticulous pedigree recording, tagging and single sire mating. Costs are more than covered by the resulting increase in genetic improvement, reduced workload and better prices for certified stock. The principles outlined for deer are equally applicable to other classes of stock.

Why test?

To make maximum genetic progress in a breeding programme, deer farmers need to be able to verify the genetic background of their breeding livestock. Confirming a breeding animal's parentage assures farmers they are breeding from, or buying, elite stock, rather than having to rely on someone else's breeding records and so run the risk of pedigree error. As well as checking parentage records, parentage testing can also be used to solve cases of unknown parentage. DNA testing is a quick and efficient method of parentage testing.

DNA testing is also an important tool for stud breeders who are serious about maximising genetic gain. If one stag is considered better than another, it is important to be able to identify their progeny and see if the key traits are being passed on. Breeders can then select replacement hinds which have been bred from better parents.

It is to the advantage of deer farmers to buy stock from a breeder who is using parentage testing to verify pedigree.

Pedigree error: effect on genetic gain, and causes

Pedigree error can reduce genetic gain considerably. Most studies of error have involved cattle, but the results are applicable to deer and other classes of stock. For example, one study of dairy cows found that a misidentification rate of 15% reduced the genetic gain for milk fat by 9 to 17%.

In a 1991 New Zealand study, 19% of 302 deer calves that underwent routine pedigree checks had one or both of their parents incorrectly assigned. Undetected, this would significantly reduce genetic gain.

Pedigree error can occur in a number of different ways, such as mismothering, cross-fostering and cross-suckling, semen and embryo mix-ups during AI or embryo transfer (ET) programmes, mistakes in record-keeping, and mixed sire mating. The last named can occur unexpectedly because a gate is left open or a stag jumps a fence, or it can occur as part of the breeding programme which involves using a back-up stag. As well, the wide variation in red deer gestation length means the calving dates of first-cycle and second-cycle mating groups will merge, making paternity difficult to pinpoint.

Testing methods

DNA testing is available through *Genomnz*, an AgResearch Technology Development Unit at the Invermay Agricultural Centre. Send by courier (address below) a sample of at least 5 millilitres of heparinised blood taken from each animal. Blood sampling is usually done by a veterinarian.

The profile costs up to $70, depending on numbers, for which the client receives a report on the animal's parentage, and if the pedigrees are correct, a certificate confirming that. For a further $10 per profile *Genomnz* can supply the client with the actual profile, which may be needed for AI, ET and export purposes. Once prepared, the profile is kept on computer for future progeny matching.

Aside from parentage testing, the technology allows DNA profiling for permanent livestock

ISSN 1172-2088

identification and deer hybrid identification. *Genomnz* also offers chromoscan tests or karyotyping, in which cells can be examined for chromosome abnormalities which might cause infertility or congenital abnormalities in livestock.

Examples of how parentage testing can be used

Pedigree verification

A deer farmer buying an expensive stag will want to know the animal has the parentage claimed by the stud breeder. Many stud breeders will already have certificates verifying the parentage of the animal as a result of DNA testing by *Genomnz*. A prospective buyer can have the validity of that certification checked by sending a blood sample to *Genomnz* where the DNA profile of the sample can be checked against the animal's DNA profile which is already held on computer.

Parentage identification

Parentage testing can remove a lot of the guesswork when it is not clear which progeny has been sired by a particular stag, or when there is doubt about which calf belongs to which dam, because of cross-suckling.

If *Genomnz* already holds blood samples for the breeding herd and sires, a farmer can use DNA testing instead of observing calving. Blood samples can be taken from the progeny and sent to *Genomnz* where they can be matched back to identify the offspring's parentage. DNA profiling allows *Genomnz* to tell the farmer if the progeny is from a main sire or a back-up sire.

DNA testing is far less labour intensive and less intrusive than having someone present to observe calving. DNA testing is often cheaper than parent–offspring matching, and is also more accurate.

For further information, contact:

Ian Woodhouse
Genomnz
AgResearch
Invermay Agricultural Centre
Private Bag 50034
Mosgiel
Ph (03) 489-3809 Fax (03) 489-3739

Courier address for blood samples:
Genomnz
Invermay Agricultural Centre
Puddle Alley
Mosgiel

AgFACT no. 131, August 1996
ISSN 1172-2088

9 418835 000019

99991

AgFACT

This document is for internal use by AgResearch only

Blood testing for tuberculosis in deer

A tuberculosis test must be both sensitive (able to detect all infected animals) and specific (able to differentiate between animals with Tb and those reacting to other bacteria). The skin test has been relied on for many years for testing cattle, but in deer it throws up false negatives, which means diseased animals can be missed, and false positives, which means healthy animals are condemned. To overcome these shortcomings, the Deer Research Laboratory at Otago University has developed a blood test for Tb.

Why use a blood test?

The Mid-cervical (neck) Skin Test (MCT) for Tb involves injecting a small amount of purified protein extract (PPD) of *Mycobacterium bovis* into the skin and looking for a reaction around the injection site. It provides a good system of screening animals, being 82% sensitive and 98% specific, but there are two main drawbacks:

- **False negatives** These occur in diseased animals that fail to react to the MCT.
- **False positives** These occur when an animal that has been exposed to other bacteria similar to *M. bovis* reacts to the MCT even though it is not infected with Tb.

The Blood Test for Tuberculosis, or BTB, which has been officially recognised by the Ministry of Agriculture, helps identify those animals that showed a false positive MCT reaction and can therefore be salvaged. It also identifies badly diseased animals that did not react to the MCT and that could infect other animals in the herd.

The BTB is carried out under highly controlled laboratory conditions, and is over 95% sensitive and 98% specific.

The BTB offers the farmer considerable benefits in terms of **whole herd information**. The control of Tb is an exercise in **risk management**, and information is needed to assess risk. The reactors in the herd need to be seen as **indicators**. This high quality information derived from a few animals can give a precise view of what is going on in the herd.

The BTB also has the advantage of being a particularly robust test as it can be done several days after sampling, if a **good quality blood sample** has been taken. This feature is particularly helpful for the testing of blood samples which may have come from a place that is remote from the laboratory.

How does the BTB work?

There are two main components of the BTB – the Lymphocyte Transformation Test (LT) and the Enzyme Linked Immunosorbent Assay (ELISA). The LT measures the response of immune cells, or T cells, and the ELISA measures the antibodies that are produced by the immune cells, or B cells, when they come in contact with *M. bovis*. The ELISA can be carried out as a separate test, but when used in conjunction with the MCT its sensitivity is improved.

How is the BTB used?

Because BTB is expensive (see below), it is better used in series with the MCT:

- The herd is first screened by skin testing.
- Animals that show up as MCT positive are then tested 2 weeks later using the BTB test.
- If any of these animals are found to have *M. bovis*, the ELISA can be used on the rest of the herd to identify any MCT-negative animals that in fact have Tb.

The BTB option is better than a second, comparative skin test, for which it is necessary to wait a further 90 days. Farmers need wait only 2 weeks after the MCT to do the BTB. The important thing is that because the two component tests of the BTB look at different indicators of infection, maximum information is gained from the MCT-positive animals.

ISSN 1172-2088

How is the ELISA used?

The ELISA can be used as a separate test, and is cheaper than the BTB. It has been officially recognised by the Ministry of Agriculture. The sensitivity (the ability to detect infected animals) is increased 14 to 28 days after an MCT. The ELISA is useful in herds with persistent Tb. The MCT is used first and MCT positives are slaughtered or BTB tested. The MCT-negative animals are bled 14 to 28 days after the MCT for the ELISA assay. The ELISA detects severely diseased animals that the MCT has failed to find. In combination, the MCT and ELISA have a sensitivity of 95%. ELISA cannot be used to clear MCT-positive animals and is normally used to find deer that are Tb infected and MCT negative.

Procedure for BTB testing

1. Two weeks after the MCT, animals that returned a positive test are bled for a BTB; if the ELISA test is to be used, MCT-negative animals are also bled.

2. Blood samples need to be booked into the laboratory. Contact your veterinarian or the Otago University Deer Research Laboratory (address given below) for further information on requirements for submitting samples.

3. Animals for testing should be quietly mustered and run into proper deer handling facilities where they can be restrained properly. Stress on the animals during mustering and handling must be avoided. The way animals are handled before bleeding can affect the quality of the blood sample, which is the most important variable in a BTB.

4. Approximately 10 days after the blood has been received by the laboratory, copies of a written report are sent to your veterinarian and to the MAF Veterinary Officer. Communications on results are directed through your veterinarian.

5. Payment must be received before results are sent out unless a recheck (resample) of an animal is required. The BTB test costs $100 + GST per animal. Discounts for the BTB are made by arrangement with the laboratory for sample numbers greater than 20. The ELISA test costs $10 + GST per animal.

Reasons for a recheck

(a) The animal was under stress at sampling time and the cells failed in culture, resulting in No Data for the LT component of the BTB.

(b) The organisms *M. avium* and *M. bovis* are very similar. The cells failed to distinguish between the two, resulting in EQUAL response, an EQUIVOCAL result in the LT component of the BTB.

(c) There was a low antibody response to *M. bovis* in the ELISA component that needs rechecking.

Please note: Tb testing is carried out under the auspices of the National Deer Tb Control Programme and the Animal Health Board Pest Management Strategy under the Biosecurity Act 1993. All decisions on which tests to apply in any given situation should be made in conjunction with MAF and the testing officer, either a veterinarian or MAF officer.

For further information, contact:

Otago University Deer Research Laboratory
PO Box 6384
Dunedin North
Phone (03) 479-7710
Fax (03) 477-2160

AgFACT no. 132, August 1996
ISSN 1172-2088
99991
9 418835 000019

AgFACT

This document is for internal use by AgResearch only

Deer Industry Vision 2000 – the New Zealand deer industry's strategic intent 1995-98

Deer Industry Vision 2000 sets out the New Zealand deer industry's planned direction over the next three years. Published by the New Zealand Game Industry Board, the document indicates the maturity of the industry and recognises the need to identify key issues (growth, marketing, commercialisation, product quality) and develop strategies to address them.

The Deer Industry Vision 2000 document, published by the New Zealand Game Industry Board (NZGIB), is the result of detailed consultation among the NZGIB, the New Zealand Deer Farmers Association and the New Zealand Deer Industry Association. This co-operative approach is an important aspect, because the NZGIB does not own the products and does not have single-desk-seller status. It does, however, own the Cervena and ZEAL trademarks for venison, and its role is to develop markets for venison under these trademarks, as well as promote quality control. The NZGIB itself is elected by producers, processors and exporters, which means that all sectors are represented.

The strategic intent set out in the document has four clear objectives, outlined below:

1) Managed growth

Managed growth is vital if the industry is to move away from the boom and bust cycle of market highs followed by lows in which oversupply pushes down returns. The aim is to have steady, sustainable production growth which keeps supply and demand in balance, and secures sustained profitability.

The NZGIB has no power to compel farmers, processors or exporters to adopt specific growth targets, but rather seeks co-operation and information from all sectors so that the industry has good statistics available to monitor the size and demographics of the New Zealand deer herd. Having this information will in turn improve forecasting of production trends and provide guidelines for optimal industry growth rates.

2) Premium market positioning and brand marketing

The aim is to establish New Zealand as a quality supplier of venison and velvet.

Venison

The value of **premium market positioning** and **brand marketing** can already been seen through the NZGIB's Cervena strategy, which is being used in North America, Australia and New Zealand. The reputation of Cervena relies on consistency in quality and availability, as well as the knowledge that Cervena has come under stringent quality control from "pasture to plate". This means that a New York restaurateur, for example, can order it and confidently expect to take delivery of a quality product.

Within New Zealand the product is audited. The slaughter plant must be ISO9002 accredited, the majority of animal transporters are accredited, and increasingly deer farms are also going through the accreditation process. This sort of quality assurance will help develop a greater market preference for Cervena. The strategic intent also focuses on expanding year-round sales by reducing perceptions of market seasonality.

The ZEAL quality trademark is used on produce going into Europe. It has the same level of quality management as Cervena except that there are no requirements about the age of the animal at slaughter. The aim still is to increase market differentiation and preference for the brand.

Plans for future development include:

- Investigating other markets, especially in Asia.

ISSN 1172-2088

- Introducing new cuts and value-added products, and improving carcass utilisation.

Velvet

New Zealand does not have a product brand for velvet. New Zealand has captured about 60% of the Korean market, against traditional quality market suppliers such as Russia. The introduction of a velvet brand would help improve awareness of, and preference for, New Zealand velvet. New Zealand produces antler of consistent quality, an advantage that should help trade and improve price premiums. As with venison, it is also important to develop other new products, such as velvet extracts and tonics.

3) Product potential fully realised

All deer products can be developed through adding value, handling the product in improved ways and capitalising on research, such as with antler product development.

Venison

Better product utilisation Processing at present focuses on the back steaks and back legs – in effect half the carcass produces 75 to 80% of the return. Upgrading the value of the other parts by developing new cuts and value-added products will help realise product potential.

Research and development Programmes are in place to investigate issues such as microbiological aspects of product shelf-life and eating quality.

Velvet

Research is focusing on producing scientific information to support velvet marketing programmes, microbiological aspects of product quality, alternative velveting techniques, and further development and commercialisation of tonic extraction technology.

Skins and co-products

Research is focusing on developing an industry grading system, a means of tracing individual skins through the processing system and a quality-related payment system for skins.

4) Total quality management

Total quality management is seen as an attitude, rather than a specific programme. The aim is to move more deer farms under the "pasture to plate", or in the case of velvet, "pasture to patient", quality assurance programmes. Strong quality management programmes are needed to maintain New Zealand's competitive edge as a quality producer.

The aim is develop accreditation systems for all deer products. The range of initiatives includes:

- increasing the number of velvet producers accredited to ISO9002;
- increasing the number of accredited farms;
- bringing stock agents, freight forwarders and "in-market" quality standards into the quality assurance equation;
- encouraging quality-linked payment systems;
- introducing an environmental management strategy (e.g., ISO14001).

A copy of "Deer Industry Vision 2000" is available from:

The New Zealand Game Industry Board
PO Box 10-702
Wellington
Phone (04) 473-4500 Fax (04) 472-5549

AgFACT no. 133, August 1996
ISSN 1172-2088
99991
9 418835 000019

AgFACT

This document is for internal use by AgResearch only

Sire selection in deer

Selecting the right sire is vital in setting the direction of any deer operation, whether it be velvet or venison production. Simple genetic arithmetic indicates that a sire will influence 50% of the genetic characteristics of its progeny, which can number 100 to 200 over several seasons.

Setting objectives

Objectives should be set according to the future direction of your operation, and they will determine the characteristics on which sires will be selected. Once the breeding objective (e.g., improving venison or velvet production) is defined, then the traits to be selected for can be worked out.

Focusing on either venison or velvet, or both, is the first choice to be made, always remembering that the more characteristics selected for, the slower the rate of increase in each one.

Venison

The major factor influencing the performance of a stag's progeny is the strain or breed of the stag. There is enormous variability in the size of animals classed as being in the "red deer family", from the relatively small sika, through New Zealand and European reds, to the very large North American wapiti or elk. Thus the stag purchaser's major decision is which strain (or breed) of sire to choose.

All strains will freely crossbreed with the New Zealand red deer hind, with various costs to efficiency and management. For example, extremes in size range may lead to calving difficulties. An example would be an elk to a red – a large sire over a small dam. Intensive management may be required to watch for calving difficulties, which may not suit a less intensive farm management programme.

There is a risk that fewer calves will be born, and a reduction in calving rate may well be enough to negate any of the financial advantages of the hybrid calves' increased growth rate. When picking a strain type that differs from the base herd there is always a cost to be considered.

Records

Breeders must be able to supply records as set out below. A lot of trust is involved, so use a breeder in whom you have confidence. Some breeders can confirm the pedigree of high-priced stock through DNA typing, or the animal may be registered.

Industry reputation counts for a lot, and there are good, well-established breeders right around the country.

Which records are important?

In addition to the production figures of a prospective sire, other production criteria are important. The animal's ranking, and how it compares with the average, are critical. For example, if it is one of 20 elite sires selected, is it number one or number twenty and are the elite sires a selection of 200 or 50? Thus it is also very helpful to know how many stags of that age are in a group of potential sires. A high ranking in a small group may mean less than a high ranking in a large group.

Generally, breeding animals should be in the top 6 to 8%; however, an average stag from an exceptional herd will generally be a better bet than a top stag from an average herd. Therefore, selecting the right breeder is as important as selecting the right individual stag. The investment in a high-priced, quality stag is quickly returned with the genetic progress made.

The key weight measurements for selecting prospective venison sires are:

Weaning weight	Reflects mainly the mother's lactation ability and how well she was able to feed the calf. If available, additional important information includes the actual age at weaning (e.g., was it born early or late in the season?).
Weight at 12 to 15 months (puberty)	Weight and rank in herd at that time are the key measurements. They indicate its ability to grow in the first year of life, which is an important trait for venison production. This marks a significant stage of life. The stag has either made it or it hasn't.
Weight at 27 months	The next peak in a stag's growth patter. By this age the stag will be about 70 to 80% fully grown and will have expressed itself as much as possible within the managment

ISSN 1172-2088

	Regime it has had until then. A ranking in the top 6 to 8% at 27 months is likely to be maintained - it is a positive indication of future superiority.
Adult mid-winter weight	The mid-winter lean weight of stags more than 2 years old provides the best indication of the animal's mature size because it is not confounded by the amount of fat, which is a significant factor in autumn weights of older stags. Because peak autumn weights can vary widely, the winter measurement is more useful.

Velvet

As with selecting a sire for venison production, a velvet sire needs to be selected on the basis of the sire size and strain or breed type you need to achieve your long-term goals. The comments about sire and dam size made under the venison heading apply here as well.

Records

All sires are sold to a greater or lesser degree on their velvet production. The most important measurements are:

Animal weight at 15 months	When comparing animals within a similar blood-line, the heavier animals at 15 months tend to become better velvet producers.
Two-year-old velvet antler or hard antler weight	The weight and grade of 2-year-old antler is a critical indicator for velvet genetics. Its comparative ranking is the most positive indicator for future velvet production. Analysis of antler data shows that the top 2-year-old velveters will be top velveters for the rest of their productive lives. A possible link between velvet antler spike weight and future velvet production is being investigated. Two-year-olds, however, produce their velvet late in the season, which means that growth can be negatively affected by seasonal conditions. To ensure an accurate comparison between 2-year-olds, antler weight should be corrected to 55 days' growth, but this correction can be made only if breeders have recorded casting and harvest dates.
Antler style	Both weight and grade of antler of a prospective sire are important because antler genetics are strongly inherited. Weight alone can be deceptive. Style, beam, tine placement and antler form are important to velvet buyers. The bez tine does not always appear; its absence points to some genetic influence that could affect the antler's worth as a trophy and for velvet. A higher-than-average antler grade at a young age indicates positive characteristics.

Other important considerations

Temperament and basic structural soundness

Temperament can probably be inherited, although an animal's handling and treatment can also influence its behaviour. Avoid animals of bad temperament, even if their production traits appear good. Also take into consideration the animal's basic structural soundness.

Timing of purchase

Stags are better purchased in December or January to give them time to settle in before the mating season starts. Avoid trying to buy and relocate a new stag in March when it will be under stress and pressure to compete with other stags.

Dam history

Velvet history on the dam side is often neglected, but is equally important as the sire's history when assessing an animal for velvet or antler growth. Combining a good sire history with a good dam history can rapidly increase the rate of genetic progress in velvet production.

For further information, contact:
The New Zealand Elk and Wapiti Society
Mrs Janey Hayes, Publicity Officer, "Lochinvar", 2RD, Te Anau

AgFACT no. 141, February 1997
ISSN 1172-2088
99991
9 418835 000019