FOREWORD

This publication is the second in a series which collectively constitutes the Australian Deer Industry Manual.

Each publication focuses on a particular aspect of the Australian Deer Industry and the complete manual provides an up-to-date, objective perspective of the Industry, the market for its products and technical production information.

This publication provides general information on the management of the commercially important species in Australia.

The manual refers to the industry quality assurance program and the National Velvet accreditation scheme. Both programs should be adopted by all deer farmers.

The project to develop the Deer Industry Manual is funded by the Rural Industry Research and Development Corporation and the Australian Deer Industry. The project is managed by the chairman of the Deer Industry Company, Mr Terry Mahoney.

Peter Core
Managing Director
Rural Industries Research and Development Corporation

Henry Shapiro
President
Deer Industry Association of Australia
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INTRODUCTION AND ACKNOWLEDGMENTS

This manual provides an overview of the management requirements of the major deer species farmed in Australia.

The Australian Deer Industry Code of Practice describes ideal management and handling practices that meet the welfare requirements of farmed deer and maximise handler safety. The Australian Quality Assurance program provides detailed information on management practices designed to ensure production of consistently high quality products for international and domestic markets.

Annual management strategies for deer should be based on a clear understanding of what constitutes good husbandry and good stockmanship. These general principles can then be incorporated into an understanding of the special requirements of deer including their seasonal reproductive patterns and their changing nutritional requirements.

Management based on maximising reproductive rates and weight gains along with maintenance of acceptable welfare standards should be the aim of every deer farmer. Specific management may vary depending on species farmed, farm location and annual climatic conditions. These factors need to be taken into consideration in any management program.

Special acknowledgment is paid to those who provided information for use in the compilation of this section of the Deer Industry Manual.

In particular: Scott Champion, Tasmanian Institute of Agricultural Research (Fallow Deer); Mr Stephen Sinclair, QLD DPI (Rusa Deer, Chital Deer, Red Deer); Mr Bruce MacKay, NSW Agriculture (Red Deer); Dr Andrew Hanson, Orange Veterinary Clinic (Red Deer); Mr Terry Mahoney, Gundooee Stud (Wapiti/Elk); and Mr Lyle Murray, DIRBYH Sambar Deer Farm.

NEW FARMERS

People considering deer farming are encouraged to investigate all commercial species before they decide which species is most appropriate for their situation.

Each species has advantages and disadvantages and people who are involved with one species tend to be biased to their preference to exclusion of other options. Farmers also tend to be biased to their management practices so prospective new farmers should visit several farms to ensure they have the opportunity to consider a range of opinion on management, handling and marketing.

Factors which should be considered include:

- environment
- farming objective
- property size
- production preference (venison, velvet, elite breeding stock)
• size of animals
• life style requirements
• availability of breeding stock
• price of stock
• proximity to processing facilities
• availability of technical services.

There are other factors not included in this list but may influence decision making.

Other modules of the Australian Deer Manual may assist decision making. Available modules are:

1. Investment and Economics
2. Fencing and Handling Manuals
3. Origin and Species Selection
4. Deer Health
5. Deer Velvet Antler
6. Pasture Assessment and Grazing Management

QUALITY ASSURANCE

The Australian Deer industry has developed an industry Quality Assurance (QA) Program that it actively encourages all deer farmers to adopt.

The QA program is managed by the Deer Industry QA Board. The Board ensures that industry assessors are appropriately trained, issues QA accreditation certificates, amends and updates industry QA manuals as necessary and deals with industry related QA issues.

Management and transport practises described by the QA program aim to:

• minimise carcass bruising
• minimise hide damage
• ensure welfare requirements of deer are maintained
• encourage safe management and handling practices
• minimise carcass, hide and co-product contamination (bacteria, chemicals, etc)
• reduce reliance on costly ‘end point’ inspection of carcasses in abattoirs
• provide consumer confidence in products supplied by the Australian Deer industry to all markets
• maximise returns to producers

The Program encourages the Deer industry’s conformation to accepted international quality assurance programs and standards. It provides market protection for products by guaranteeing the quality of its products, in particular food products.

The Program recognises the vital, inescapable, role farmers have in the food quality chain and its adoption of the Deer Industry QA Program by all Australian deer farmers is strongly encouraged.
VELVET HARVESTING

The cycle of velvet antler growth is described in The Australian Deer Industry Manual (Part 5).

Velvet antler is harvested by operators who have completed a velveting course accredited by the Australian Deer Horn Company and can demonstrate their proficiency of antler removal. It is performed within defined animal welfare and hygiene protocols and is an accepted husbandry procedure. Velvet antler products are primarily used in Asian medicine.

Antler can be removed at the velvet stage or when hard antler growth becomes evident. Unlike velvet antler removal, hard antler removal does not require the use of drugs. The removal of velvet or hard antler does not affect the reproductive performance of stags.

Hard antler removal from stags is considered necessary to ensure safe handling and management of males, however on some breeding properties males are left in hard antler to demonstrate their velvet producing capacity. Stags retained for velveting and those in hard antler (and not used as breeding sires) should be grazed separately to breeding mobs to prevent management problems and enable preferential feeding prior to slaughter.

There is an animal welfare requirement to remove all hard antler prior to transporting animals.

Figure 1 - Red Deer Stags in Velvet
SELECTION OF BREEDING STOCK

Genetic improvement in livestock performance (growth rate, reproductive rate, resistance to disease, etc) is achieved through selection of superior animals within a herd. Genetic progress relies on selection based on accurate, objective, assessment of the variation in performance of individuals and the heritability of characters used as the basis of selection. Selection may be based on individual animal performance, life time performance, pedigree performance, progeny performance and performance of near relatives.

Breeders should limit the number of characteristics they select for at any time as there is a general rule that as the number of characteristics selected for increases, there is a corresponding decrease in the progress made in each characteristic (trait). Selection can be undertaken as:

- Single trait selection, ie having one clear objective
- Tandem selection, ie improve one trait then the next
- Independent culling levels, ie acceptable performance levels are set for a range of characteristics. If an animal fails in one then it is removed from the breeding population no matter how good its results in the others may have been
- Index selection, ie all characteristics are balanced into an overall index which gives animals a rank.

However, selection can only improve genetic merit if:

- the producer has clear objectives for the breeding program;
- the breeding program focuses on only a few characteristics;
- the breeding program maintains a high level of selection pressure;
- the producer uses production records;
- the selected characters are heritable.

These rules are important as there is a tendency to try and link what we see (the animal's phenotype) with the true genetic merit of the animal (the animal's genotype) when these links are difficult to establish. There are many factors that influence the appearance of an animal and environmental factors (nutrition, health, sex, production status etc) contribute 60-80% of an animals' appearance. Frequently selected traits in commercial deer farming include, liveweight at different ages, antler size and shape, temperament, disease resistance and carcase leanness (quality). Commercially important traits may change with time as market requirements change.

The degree of genetic gain a breeder can expect to see in their herd depends on many factors including:

- **Heritability** (how strongly a character is passed to successive generations)
- **Selection differential** (the superiority of the animals being joined over the average for the population)
- **Generation interval** (the rate of turnover in the population or the average age of parents when offspring are born)
- **Correlation between characters** (any positive or negative correlation between characters. For example if two characters are negatively correlated an increase in one character will mean a decrease in the other character)

*It is important to remember that comparisons of the relative genetic merit of animals in different herds is extremely difficult. Environmental influences often have a greater influence on animal performance than genetic influences. A `rule of thumb' is to only compare animals within herds and compare genetic improvement programs (breeding goals, selection pressure and record keeping) between herds.*
Objective comparisons of animals can only be made when they are of the same sex, the same age, the same production status and they are managed in the same environment.

Not all characteristics have the same heritability. Some (qualitative characters) are determined entirely by genetics and the character will be present or absent (e.g., coat colour). Others (quantitative characters) are largely influenced by the environment (body weight, growth rate, reproductive rate, etc.) and the genetic merit of these characters may be masked by environmental influences (nutrition, disease, etc).

While heritability estimates are not widely available for deer, Table 1 details some ‘guesstimates’ of heritability for various production traits in Fallow deer. Note that a heritability factor of 1.0 indicates high heritability and a factor close to 0 indicate low heritability.

Table 1 - Heritability ($h^2$) ‘guesstimates’ for Fallow deer (from [15])

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>$h^2$ estimate</th>
<th>$h^2$ level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coat colour</td>
<td>1.0</td>
<td>high</td>
</tr>
<tr>
<td>Growth</td>
<td>0.2 to 0.4</td>
<td>moderate</td>
</tr>
<tr>
<td>Antler size</td>
<td>0.3 to 0.4</td>
<td>moderate</td>
</tr>
<tr>
<td>Carcass fatness</td>
<td>0.3 to 0.4</td>
<td>moderate</td>
</tr>
<tr>
<td>Ovulation rate</td>
<td>?</td>
<td>low</td>
</tr>
<tr>
<td>Fawn survival</td>
<td>0.1 to 0.2</td>
<td>low</td>
</tr>
<tr>
<td>Temperament</td>
<td>?</td>
<td>low</td>
</tr>
<tr>
<td>Disease resistance</td>
<td>?</td>
<td>low</td>
</tr>
</tbody>
</table>

Recording Programs

Maintenance of records and is an integral part of programs to maximise productivity. Any females that do not produce an offspring should be culled. This can be done by wet and drying hinds pre-weaning to detect non-lactating animals. Dry females along with females of bad temperament should be culled.

Any recording program should start with the tagging and weighing of offspring, and preferably the identification of their sire and dam. This is only possible if single sire mating is practised, and if some time is devoted to “matching up” dams with offspring (can be done at weaning, but is more accurate if done at birth).

In addition, it is desirable to record the following:

- weaning weight, taking into account date of birth,
- live weight at 6, 12, 15 and 25 to 27 months;
- carcass weight when appropriate,
- velvet weight and quality (including 2 year olds),
- casting and harvest date of antlers.
When evaluating weaning weights and growth rate to weaning, it must be remembered that male calves are heavier than female calves, and two-year old females will always wean lighter calves than older females.

Comparisons are only valid within herds - differences in environment have a profound effect on comparisons between herds.

**Calculation of Growth Rates**

To determine accurate growth rates for stock they should be weighed regularly and ideally at weaning, 6 months and 12 months. As animals are not born on the same day but groups of animals are usually weaned on the same day, animals born later in the calving/fawning season are usually lighter than those born early in the season.

If initial selection of stock is made on weaning weight, those born later in the season will be disadvantaged - they will be light weight.

A more accurate estimation of their early growth can be made by taking the birth weight from the weaning weight and dividing by the number of days from birth to weaning.

For example:

<table>
<thead>
<tr>
<th>Birth weight (A)</th>
<th>10kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaning weight (B)</td>
<td>65kg</td>
</tr>
<tr>
<td>Days from birth to weaning (C)</td>
<td>100</td>
</tr>
<tr>
<td>Growth rate, ie ( \frac{B-A}{C} )</td>
<td>0.550kg/day</td>
</tr>
</tbody>
</table>

**ARTIFICIAL BREEDING**

Artificial breeding technology including both artificial insemination and embryo transfer is available in the deer industry and is a tried and proven management tool for introducing superior genetic material into a herd at relatively small expense and for increasing the rate of genetic gain in the herd. Results however can be variable and depend largely on the skill of the operator and the management of the deer. Deer farmers contemplating any artificial breeding program should consult with a veterinarian experienced in artificial breeding in deer.

It is essential in any artificial breeding program to eliminate as much stress to the animals as possible. Females in the program should be carefully selected on temperament and only proven breeders used. Facilities should be of a practical design and the animals well educated to using the yards. Offspring should also be weaned from their mothers prior to the commencement of the program.

Out of season breeding is also possible through the use of melatonin implants and may be useful where this better aligns the time of high feed demand during lactation, with the seasonal pasture production cycle. Decisions as to whether to use artificial breeding programs must be based on the cost of the program compared to the value of the progeny produced.

*Figure 2 - Embryo Transfer*
HYBRIDISATION

Hybridisation or cross breeding is a management tool used by animal breeders to improve growth rate and improve reproductive performance of stock.

Advantages of cross breeding include:
- increased birth weight of offspring
- earlier marketing of animals for processing
- heavier carcass for age
- higher carcass yields
- increased antler production in males
Disadvantages of crossbreeding may include:

- longer gestation
- risks of birth difficulties, particularly with yearling females
- later sexual maturity
- require more feed for age
- larger animals can be more difficult to handle

A major factor that should be considered in the development of any breeding program is that larger animals generally need to eat more food. However hybrid animals may use available feed more efficiently because they waste less of what is on offer.

Most hybridisation programs for meat production use pure bred females that are mated to a terminal sire (larger animal with select meat traits). Offspring of this type of cross grow quickly and reach processing size more quickly than pure bred animals. All hybrid progeny are sold and the pure bred female hind is maintained with a small replacement breeding program or replacements are purchased, and sires are purchased as required.
FALLOW DEER

Introduction

Fallow deer (*Dama dama*) are found in NSW, Victoria, South Australia, Western Australia, Queensland and Tasmania, and represent the only deer species found in the latter state. They originated in the temperate regions of southern Europe and Asia Minor and are a hardy species with a high reproductive potential.

Handling

Fallow deer are wary and alert, reacting to events and stimuli that would pass other farmed species without reaction. They can be handled successfully after a process of hand feeding, active training and regular contact.

A system of laneways is required that leads directly from each paddock to the yards and handling facility. Lane ways with long, straight parallel fences should be avoided. Designs which curve or have other structures constructed as part of the lane way and create the illusion for the deer of being able to escape around a blind corner work more effectively. Lane way fences should be at least 2.0 metres high. Experience suggests the race should narrow to 2.0-3.0 metres at the entrance to the yards. It is generally accepted that loading races should be almost 1.0 metres wide, enabling two to three animals to run up together for loading.

Yards are required for processes such as weaning, tagging, vaccinating, drenching and weighing. Ideal yards should include a covered area as fallow deer are much quieter in dimmed light. The area should be light enough to allow both deer and operators to easily see each other. Artificial or natural light sources can be used to encourage fallow deer to move through the handling facility as they will naturally move towards the light. Yards can be simple but should integrate well with the handling facility and minimise stress on both the deer and the operator.

Figure 3 - Fallow Deer Buck and Does
A handling shed should:

- utilise light strategically to facilitate the movement of the deer;
- have sliding gates leading to the crush;
- have smooth walls to meet quality assurance requirements. Plywood or conveyor belting can be used;
- provide adequate ventilation and controlled lighting;
- facilitate efficient flow of stock through the facility and the ability to draft animals from the mob;
- have a cradle or crush set on a set of scales. The cradle or crush should have a collapsible floor and adjustable sides to allow the animal to be immobilised and handled safely and efficiently; and
- have floors covered in sand, wood chip or saw dust. Hard or concrete floors should be avoided where fallow deer are being handled.

When handling fallow deer in the yards the herd should be split into small groups for ease of handling. Stags should not be held in the same pen as fawns or does due to their aggressive behaviour, particularly when in the restricted area of a pen. Stags and does should not be yarded during the mating season. If fawns are yarded with their mothers, care must be taken to ensure they are not trampled.

**Reproduction**

Fallow deer are seasonal breeders. The mating season or rut, begins in mid-April and lasts about two months. The oestrous cycle has a duration of 21-26 days and a high proportion of does (about 80%) usually conceive during the first cycle. Gestation length ranges from 225-234 days (average about 230 days) so most fawning occurs in the first two weeks of December, although some fawns can be born in January.

Ideal reproductive rates for fallow deer are fawning and weaning rates of greater than 90%. However reproductive performance is very dependent on management factors (especially nutrition) and average reproductive performance on some farms is less than 90% weaning rate.

Pregnancy diagnosis is best done through ultrasound. Reliable diagnoses can be performed at 35 days although they are usually performed between 60 and 70 days.

**Nutrition, Body Weight and Condition Score**

Mature does should receive adequate nutrition prior to the rut to maximise conception rates. It is generally accepted that a minimum live weight of 30 kg is required in yearling does to attain adequate conception rates. This should be considered a minimum weight, not a target weight. The better grown yearling does are at their first mating, the greater the conception rate and the better the ability of the does to manage their first pregnancy.

Puberty and first conception is directly related to body weight but usually occurs in fallow does at about 16 months. Fawn birth weight is usually about 10% of adult doe live weight during the rut.

Fallow deer readily adapt to hand feeding and they can be successfully fed a range of supplementary feeds including cereal grains, lupins, silage, good quality hay, and forage crops. Irrigation offers the opportunity to increase the length of the green feed season and can be useful during high feed demand times of late Summer and Autumn.
Poor feeding of pregnant does can reduce fawn birth weights and subsequent survival rates.

**Joining**

Most recommendations suggest that bucks should be introduced to does in early April in preparation for the does first oestrus cycle. Early introduction of bucks can assist in the synchronisation of oestrus cycles and increase the percentage of does that conceive in the first or second oestrus cycle.

This practice, along with removal of bucks by the end of May can help to minimise the number of late fawning does in the herd.

Male to female ratios of about 1:30 are usually recommended. It should be remembered that bucks can lose up to 30% of their body weight during a 3-4 week period during the rut. As a result, they may require preferential feeding prior to the rut to ensure they have adequate body reserves to sustain them through this period of reduced feed intake.

Suggested numbers of does per sire for sires age 16 to 20 months is 10 to 15 does. Sires aged 27 to 30 months can manage 15 to 25 does and mature sire can manage 30 to 35 does. Ideally, and especially in large mobs, yearling does should be separated from adult does and mated in yearling groups (young does do not compete well with mature does for the attention of bucks).

Females should be exposed to more than one male and the dominant stag is sometimes replaced during the mating season. As bucks are strongly territorial, when more than one buck is used in a joining group, it is important to ensure the area of the joining paddock is large enough to allow bucks to develop non-overlapping territory. If land area is limited bucks can expend too much energy fighting. Younger bucks can also be restricted from mating due to the close proximity of the dominant buck.

Reports suggest that single sire groups can be effective for young bucks (16 months) to prevent the impact of these dominance hierarchies in the population.

**Artificial Insemination (AI)**

AI and embryo transfer (ET) technology are commonly used in specialised fallow deer breeding programs. Decisions as to whether to use AI must be based on the cost of the semen and procedures compared to the value of the progeny produced.

**Fawning**

Fawning tends to occur over a short period of time and it is directly related to the high rate of conception at first oestrous and the high percentage of does in a population that show oestrous at the same time (usually occurring over a 12-14 day period).

Fallow does tend to become restless about 48 hours prior to parturition, they may move away from the herd, pace the fence line and as birth approaches frequently lick their vulval region. During birth does may lie on their side, however many will remain standing and may keep grazing. Following birth the doe may lie with the fawn for a number of hours.

Male fallow fawns usually have birth weights between 3.8 and 4.2 kg and females between 3.6 and 4.0 kg.
Shelter is important during fawning with respect to minimising mortality. In fallow deer it provides shelter for the young from sunlight, and may also play a role in allowing the mother and young to hide, strengthening the maternal body and hence survival. Shelter sheds, wind-breaks and long grass can all be used for this purpose.

Shelter areas should be checked for ants (see Australian Deer Industry Manual Module 4).

**Figure 4 - Fallow Does and Fawns**

**Weaning**

Optimum weaning time will vary according to the farm. Traditionally fawns are weaned at between six and seven months following the rut. They can be weaned pre-rut if poor seasonal conditions dictate that the fawns require supplementary feeding to gain condition and the does need to gain weight prior to joining.

Weaners should be provided with best available feed (either in the paddock or in yards) and should be separated from visual contact with their dams.

They will become accustomed to yards and human contact if they are frequently handled or fed in the yards at weaning.

**Hybridisation**

Hybridisation is possible within the fallow deer population through the use of the Mesopotamian sub species (Dama dama mesopotamica). Various reports show that hybrids have earlier birth dates, high birth weights, higher growth rates from birth to weaning and during periods of active growth following weaning. This results in higher live weights for the hybrids at 10 months and provides the opportunity for the use of hybrids to decrease the time taken to reach puberty and slaughter weight. Selected strains of fallow deer (Danish, Hungarian, Yugoslavian, etc) may also offer opportunities to increase growth rates, carcase traits and antler production in offspring.
Animal Health

Routine vaccinations with clostridial vaccines, as for sheep and cattle, is recommended. Monitoring of faecal egg counts should occur to provide warning of build-up of internal parasites which can be especially damaging to undernourished weaners. Other potential problems are pasteurellosis and necrobacillosis, although fallow deer appear to be less susceptible to problems which have been seen in other species, such as malignant catarrhal fever (MCF), yersiniosis and lungworm.

Velvet Production

Mature Fallow deer bucks typically yield up to 1.0 kg of velvet per year although selected strains and species (Danish Fallow, Hungarian Fallow, Mesopotamian Fallow) may yield more.

In comparison to returns from venison production, Fallow deer velvet production must be considered of secondary importance to fallow deer fences.

On commercial properties it is desirable that no deer in hard antler are present on the property. On some breeding properties males are left in hard antler to demonstrate their velvet producing capability. Antler can be removed at the velvet stage or when hard antler growth becomes evident. Unlike velvet antler removal, hard antler removal does not require the use of drugs and removal of velvet or hard antler does not affect the reproductive performance of stags. Hard antler removed from bucks is considered a procedure to ensure safe handling and management practices and there is a requirement to remove all hard antler prior to transporting animals.

Venison Production

The major commercial product from Fallow Deer farming is deer meat (venison) production.

Dressing percentages (100 x hot carcase weight/liveweight) range from 52 to 58% in Bucks aged 12 to 24 months with carcase weights of 22 to 32 kg. Older heavier bucks can produce carcase weights of up to 42 kg.

Ideally fed and managed animals should be processed at 15 to 18 months of age to maximise venison quality and minimise grazing pressure on properties.

Most available information on castration suggests that castrated animals have lower live weights than entire animals of similar age so it is not generally recommended to improve growth performance. However castrated animals can be processed while entire males are in the rut. This management practice provides an ability to supply markets with high quality product through the year.

Some European markets are said to preferentially consume venison produced by fallow deer.
### Summary Calendar of Operations

<table>
<thead>
<tr>
<th>MONTH</th>
<th>BUCKS</th>
<th>DOES</th>
<th>YEARLINGS</th>
<th>FAWNS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JANUARY</strong></td>
<td>Remove velvet regrowth. Veterinary examination of breeding stags. Ensure breeding males can be in good condition before end of March.</td>
<td>Abundant good feed must be available for lactating does - supplement if required (silage, oats, hay).</td>
<td>Remove spikes from yearling stags as soon as they harden in January. Maintain yearling growth. Weigh and sell venison animals heavy enough for slaughter. Drench and vaccinate as necessary.</td>
<td></td>
</tr>
<tr>
<td><strong>FEBRUARY</strong></td>
<td>Continue on good feed in preparation for rut.</td>
<td>As for January - good feed important for pre-rut condition.</td>
<td>Maintain growth of replacements. Weigh and sell venison animals heavy enough for slaughter.</td>
<td></td>
</tr>
<tr>
<td><strong>MARCH</strong></td>
<td>Select best bucks for breeding and introduce into joining mobs.</td>
<td>Pre-rut weaning. Vaccinate with 5 in 1. Separate wet and dry does. Cull dry and poor temperament does. Sort mating groups and bucks introduced - run yearling does as separate mob. Ensure does maintained in good condition. Feed if required.</td>
<td>Minimum weight of 35kg for mating. Supplementary feed as required. Select breeding does.</td>
<td>Weigh, sex and tag calves if not done at birth. Pre-rut weaned fawns require best available nutrition. Vaccinate all calves with 5 in 1. Daily feeding and handling through yards for 5 days then overnight yarding.</td>
</tr>
<tr>
<td><strong>APRIL</strong></td>
<td>Good nutrition to ensure optimum velvet production.</td>
<td>Joining continues. Replace bucks after 2 cycles if single sire mating. Continue to observe mating groups for unusual behaviour.</td>
<td>Best feed available to maximise growth. Continue with good quality nutrition. Weigh stock to observe growth rates.</td>
<td></td>
</tr>
<tr>
<td><strong>MAY</strong></td>
<td>Remove stags by last week of</td>
<td>Adequate nutrition to maintain</td>
<td>Adequate nutrition to maintain</td>
<td>Maintain growth</td>
</tr>
<tr>
<td>MONTH</td>
<td>BUCKS</td>
<td>DOES</td>
<td>YEARLINGS</td>
<td>FAWNS</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------------</td>
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<td>--------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>month.</td>
<td>body weights.</td>
<td>body weights.</td>
<td>Vaccinate with second 5 in 1.</td>
</tr>
<tr>
<td>JUNE</td>
<td>Good nutrition to ensure optimum</td>
<td>Adequate nutrition to maintain body</td>
<td>Adequate nutrition to maintain body</td>
<td>Maintain growth - supplement if required.</td>
</tr>
<tr>
<td></td>
<td>velvet production if necessary from the rut.</td>
<td>weights.</td>
<td>weights.</td>
<td>Weigh animals to observe growth.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post- rut weaning.</td>
<td>Post rut weaning.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remove bucks.</td>
<td>Remove bucks.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sell castrates and cull does.</td>
<td></td>
</tr>
<tr>
<td>JULY</td>
<td>Good nutrition to ensure optimum</td>
<td>Adequate nutrition to maintain body</td>
<td>Adequate nutrition to maintain body</td>
<td>Maintain growth - supplement if required.</td>
</tr>
<tr>
<td></td>
<td>weight gain and velvet production.</td>
<td>weights.</td>
<td>weights.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pregnancy testing of does.</td>
<td>Sell castrates and cull does.</td>
<td></td>
</tr>
<tr>
<td>AUGUST</td>
<td>Good nutrition to ensure optimum</td>
<td>Adequate nutrition to maintain body</td>
<td>Adequate nutrition to maintain body</td>
<td>Maintain growth - supplement if required.</td>
</tr>
<tr>
<td></td>
<td>velvet production.</td>
<td>weights.</td>
<td>weights.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue to record dates of button</td>
<td>Sell castrates and cull does.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>casting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEPTEMBER</td>
<td>Good nutrition to ensure optimum</td>
<td>Adequate nutrition to maintain body</td>
<td>Adequate nutrition to maintain body</td>
<td>Maintain growth - continue supplement if</td>
</tr>
<tr>
<td></td>
<td>velvet production.</td>
<td>weights.</td>
<td>weights.</td>
<td>required until Spring growth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Record dates of button casting.</td>
<td>Sell castrates and cull does.</td>
<td>suitable.</td>
</tr>
<tr>
<td>OCTOBER</td>
<td>Good nutrition to ensure optimum</td>
<td>Adequate nutrition to maintain body</td>
<td>Market remaining slaughter deer.</td>
<td>Maintain growth - supplement if required.</td>
</tr>
<tr>
<td></td>
<td>velvet production.</td>
<td>weights.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sort velvet mobs on basis of casting dates.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOVEMBER</td>
<td>Velveting.</td>
<td>Restrict nutrition if does becoming fat.</td>
<td></td>
<td>Fawning - weigh and tag fawns.</td>
</tr>
<tr>
<td></td>
<td>Sell cull animals</td>
<td>Fawning.</td>
<td></td>
<td>Observe calving groups for abnormal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>behaviour.</td>
</tr>
<tr>
<td>DECEMBER</td>
<td>Velvetting continues</td>
<td>Ensure adequate nutrition - supplement if</td>
<td>Maintain growth rates.</td>
<td>Fawning continues - most fawns born</td>
</tr>
<tr>
<td></td>
<td>Remove regrowth.</td>
<td>necessary.</td>
<td></td>
<td>between November 30th and December 15th.</td>
</tr>
<tr>
<td></td>
<td>Maintain nutrition.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Timing of all management operations will vary depending on farm location and annual climatic conditions.
**RED DEER**

**Introduction**

Feral Red Deer (*Cervus elaphus elaphus*) populations in Australia developed from Red Deer introduced from Europe and northern Asia in the early 1870’s. They are adapted to temperate environments and are farmed in most livestock producing areas of Australia. Commercial Red Deer farming commenced in Australia in the 1970’s and current estimates show that Red Deer are one of the two predominant species farmed in Australia.

There are numerous subspecies and hybridisation is common. Most farmed stock in Australia are derived from European strains and are based on Australian feral herds (Scottish and German bloodlines) and more recently imported English and to a lesser extent Yugoslavian and Hungarian bloodlines.

**Figure 5 - Red Deer Hinds**

**Handling**

Handling of Red deer requires good ‘stock sense’ involving plenty of patience, an understanding of animal behaviour and good powers of observation.

Whilst Red deer can not be regarded as fully domesticated they quickly adapt to the establishment of a routine of regular handling and hand-feeding. It is possible to yard large mobs of deer with very little labour, given the correct farm layout. Deer can be trained to come for feed when called, and this is the easiest way of moving stock from one paddock to another. Gentle pressure from people on foot or on motorbikes will encourage deer movement, but patience and caution is necessary, particularly if one or two obstinate animals baulk in gateways. Deer pushed too closely will often panic and injuries may occur, even in quiet mobs of deer.
It is usually easier to yard and handle deer early or late in the day. If possible avoid windy days for handling deer as it creates unease in most groups. A system of wide lanes simplifies the yarding of red deer, with a series of progressively smaller paddocks leading into the lane. If the deer are moved quietly and without fuss by people with whom they are familiar, it is possible to move and yard them without any great difficulty.

There are a multitude of deer yard designs used for red deer, and most having good and bad features. Most use the principle that deer are much easier to handle under conditions of reduced light intensity. Most yard systems have a series of progressively smaller pens, with or without swinging gates to assist in drafting. Once in pens the animals can be manhandled for most operations - drenching, ear tagging, vaccinating and velvet removal. Various types of crush or cradle are available commercially and the inclusion of scales is important for many management programs. A well designed crush reduces risk of injury to operators.

Holding and hand feeding newly weaned deer in handling facilities will educate and familiarise young deer to the facilities. Yard weaning along with hand feeding in the handling facilities will educate young deer to the facilities. Calves should be moved from pen to pen and through the drafting system daily for five days after which they can let into an adjacent paddock during the day and yarded each night for up to 10 days. This also gives the opportunity to identify those deer of poor temperament which should be culled.

Deer in hard antler should never be yarded. All male deer should be velvetted or have antlers removed when velvet begins to strip. Similarly, deer should not be handled during the rut when stags can become aggressive. Usually deer give warning of aggression by grinding their teeth, lolling tongue and rolling eyes.

**Reproduction**

Red deer hinds are seasonal breeders, that is they have a number of oestrous cycles (up to eight if not mated) during a breeding season. Although their breeding season rarely begins before mid March in Southern states (in response to decreasing day length) anecdotal evidence suggests that mating and subsequent calving can begin up to three weeks earlier in Southern Queensland. The average length of an oestrous cycle is 18.8 days, with oestrus seldom lasting more than 24 hours. Ovulation occurs 24 hours after the first signs of oestrous and fertilisation occurs about 36 hours after mating. Early in the season cycles are often shorter. Most hinds will conceive on their first oestrous. Matings are equally frequent by day or night, and a stag may mount a hind many times before ejaculation. Hinds are sometimes served by more than one stag. A hind's position in the social hierarchy does not change at oestrus, but some become much more aggressive towards subordinates and demonstrative towards humans.

The mean duration of gestation is 233 (± 4.5) days. In Southern States births rarely occur before the first week of November and most calves are born during the first two weeks of December. Pregnancy diagnosis using ultra-sound equipment can be a useful. Assessment of pregnancy status using ultra-sound equipment is best undertaken between 30 and 130 days of pregnancy (end May/early June).

Farmed red deer should achieve an average calving percentage of 90%, with an 85% weaning rate however survey results over a large number of deer farms over the past few years have revealed a wide range of weaning rates largely influenced by management practices.
Stags also have an annual cycle of reproductive activity which is controlled principally by daylight length. They show rutting behaviour (as libido and testosterone levels increase) from mid-March to early April. However they produce semen for about 10 months of the year. During the rut the voice changes to a deep-throated roar, the neck girth expands and the urine develops a characteristic rutting odour. The period of intense rutting activity may last from 4-6 weeks, although some stags may rut actively for as little as 1-2 weeks. During this period the dominant stags will vigorously herd and protect their harem of hinds. Red stags are extremely aggressive during the rut, and must be treated with great care, even if the antlers have been removed.

Stags are fertile at around 16 months and can be used successfully as yearling but rutting behaviour and body changes associated with the rut are not as marked as with older stags. Stags peak between 8 and 13 years but above 15 whilst stags continue to produce semen they show little rutting behaviour.

Figure 6 - Red Deer Stags in Hard Antler

During early summer (November-December) stags are in a state of reproductive quiescence, with rapidly growing velvet antlers. Examination of the stags pre rut including testicle examination and palpation is recommended. Stags with small or soft testicles should be culled as size is correlated to semen production. Select sires with greatest healthy testicular circumference at the time of antler regrowth removal.

The above characteristics should be considered when devising management strategies for red deer, with the other principal factor being the requirement to provide the nutrition which allows the species to reach its potential as a farm animal.

Nutrition, Body Weight and Condition Score

Puberty and conception in hinds is directly related to body weight, with a lower critical body weight at 16 months of 65 kg. This is a minimum weight and not a target, which should be 80 kg at joining. There should be little difficulty in achieving this weight in farm deer, and hinds should then calve each year for 10-12 years at least.
Overseas research has shown that an increase in hind weight of 50% (from 60 to 90 kg) results in a doubling of the number of calves born and surviving and an increase in the weight of the calf drop by 160%. It is essential to feed calves well during their first winter and subsequent summer to ensure that they are able to first conceive at 16 months of age. Feed supplements may be necessary during this period (especially during Summer) to ensure adequate growth.

Body condition also has a major influence on conception rates. Hinds in poor or over fat condition will not cycle or may conceive late (maidens that calve late often calve late in subsequent seasons). Hinds should be assessed for condition score prior to the rut (early March) and be provided with supplementary feed if necessary.

The food intake of stags is greatly reduced during the rut, so that dominant animals will lose 15% or more of their body weight, with subdominant stags losing 5-10%. This weight loss cannot be prevented, but it is essential that good feed is available in September, when appetite begins to increase. The winter weight loss will be redeemed by the end of January, with the stags once again going into the rut in the best possible condition.

Joining

A general recommendation is to introduce stags in late February or early March in anticipation of the first oestrous cycle in mid March. Early introduction of stags can advance oestrous by 6 days and assist in synchronisation of the first oestrous cycles.

Good records including the date of arrival of the first calf can assist in determining the optimal time of introducing the stag. If the first calving date indicates conception corresponds with the date the stag is introduced then this could indicate that all hinds were cycling when the stag was introduced and an earlier joining may be possible in the following year.

To avoid late calves, it is best to remove the stags from the hinds after a defined mating period - by mid-June at the latest. This will ensure that the last calves are born in late January.

During the summer months the stags should be run separately from the calving hinds, with velvetting management being of paramount importance in November and December. All farm stags should be velvetted, or have their antlers removed as soon as they harden. The removal of antlers does not affect reproductive performance in any way.

A ratio of one stag to 30 hinds (or 3 stags with 100 hinds) for mature stags is recommended although ratios of up to 1:50 can be successful. Younger stags should be joined at the rate of 1:15 for yearlings and 1:25-35 for two year olds.

Single sire mating is the only successful mating technique if progeny are to be registered or genetic gain using superior sires is sought. Single sire mating also results in less stress on the stag if mating groups can be kept well separated but if mating groups are in close proximity stags may expend considerable time and energy protecting harems from threats that don’t exist. To ensure pregnancy stags should be replaced after three weeks.

If multiple stags are used it is desirable to use a large paddock and introduce them to the hinds at least two weeks before oestrous activity begins. This will allow dominance hierarchies to be determined, and harems to be formed. It is not rare for a dominant stag to hold the entire hind group for a period of weeks, preventing all other stags from serving females. In this situation it is possible that the stag's fertility will eventually be impaired, and some hinds will not become pregnant.
To maximise pregnancy rate the dominant stag may be removed after three weeks, allowing the remaining two or three stags to complete the mating of late hinds. In this way superior stags can be used to effect, with calves identified to sire on the basis of birth dates. However, there may be practical difficulties in this system, not the least of which may be to actually remove the original stag from the paddock. Rutting red stags are very aggressive and are potentially dangerous - they must be treated with great caution, and handled as little as possible during the breeding season.

There are advantages in mating first calving hinds in separate groups, using an experienced, proven stag. These young females can be given preferential feeding, without bullying from older hinds, and at calving there will be an opportunity to watch this group carefully for problems.

Stags need to be checked regularly for injury and ill health. It has been estimated that 10% of stags produce semen of poor quality and are thus of lowered fertility. Stags may also become sexually exhausted before the end of the joining period and in commercial situations replacement with a follow up stag at least 18 days before the end of joining should be considered.

**Calving**

As calving approaches, the hind becomes restless, and separates from the group, usually seeking a sheltered area. Calving is usually rapid and calves are able to stand and suck 30 to 45 minutes after birth. For first few days calves will “freeze” if disturbed and care should be taken when driving around calving paddocks. The dam will leave the newborn calf in cover and will return several times each day to suckle the calf.

Calf tagging and weighing should be undertaken within 24-48 hours of birth, as after that time most calves will be disturbed by an approach and will move quickly away. If calf handling is undertaken quietly and carefully, mismothering is minimised. Contamination of calves with human scent can be prevented if disposable plastic gloves are worn during calf handling Where calves are not tagged, hinds are best supervised from a distance and any animal in obvious difficulty assisted.

The biggest single factor affecting calf mortality is birth weight. Calves below a birth weight of 5.5 kg are less likely to survive that calves of greater birth weight. Calf birth weight is directly influenced by hind nutrition.

**Figure 7 - Red Deer Hinds and Calves**
**Weaning**

Red deer calves can be weaned at 30-35 kg body weight, at about 3 months of age. Recent research in New Zealand indicates that calves should be weaned before March 1st to reduce stress on the hinds and increase early conception rates. Early weaning also allows calves to be custom fed to maximise weight gains and can also have an influence on temperament by removing calves from the influence of badly behaved hinds. However late calves and calves not reaching 30 kg should not be weaned until after the rut.

Pre-rut weaning requires a higher level of management than is generally practised on many Australian deer farms and is dependent on calves being born early in the season.

If calves are not weaned before the rut they will usually wean themselves at 4-6 months of age. Hinds in poor condition, and possibly those nursing large male calves often decline in milk production faster than do well-nourished mothers.

At weaning there should be visual separation of dams from calves. Often weaned calves are hand feed in yards for a week or two, before they are turned out to good pasture. Daily contact and feeding of the weaners is an excellent means of quietening deer and accustoming them to human contact and to the handling facilities.

**Artificial Breeding**

Artificial breeding technology including both artificial insemination and embryo transfer is a tried and proven management tool for introducing superior genetic material into Red deer herds at relatively small expense. Results however can be variable and depend largely on the skill of the operator and the management of the deer.

Hinds in the program should be carefully selected on temperament and only proven breeders used. Facilities should be of a practical design and the animals well educated to using the yards. Calves should also be weaned from the hinds prior to the commencement of the program.

**Hybridisation**

Whilst hybridisation with Wapiti/Elk genetics can be used to improve animal performance it should not be used as a substitute for optimal nutritional management. The reproductive management of terminal sires as well as the nutritional management of both hinds and offspring need to be optimised in order to obtain maximum benefits from hybridisation.

Caution needs to be exercised when using F1 and F2 Wapiti/Elk hybrids over Red hinds. Hinds must not be allowed to get over fat during pregnancy as over fat animals are predisposed to calving problems.

**Animal Health**

Whilst Red deer are generally hardy and tend to show a greater resistance to parasites and disease than other farm livestock this situation can change when animals are placed under stress. Avoidance of stress, including climatic, nutritional and physical stress is the key to maintaining healthy deer. Provision of adequate shade and shelter in both Summer and Winter can be of assistance in minimising climatic stress.
Deer farmers should be aware of nutritional deficiencies which can occur in their area and seek veterinary advice on monitoring blood levels of trace elements if deficiencies are suspected. Internal parasites can be detected by monitoring faecal egg counts and this should be carried out prior to commencement of any drenching program. External parasites such as cattle tick and bush tick can also be a problem in some areas. Treatment programs for ticks include chemical applications and advice on the best control program should be sought from the local private or government veterinarian.

All deer should be vaccinated with 5 in 1 vaccine to assist in the prevention of clostridial diseases. This involves two injections 4 to 6 weeks apart at weaning followed by an annual booster injection. Red deer are also susceptible to Malignant Catarrhal Fever (MCF) and can become infected through contact with sheep but incidence of this disease in Australia is low.

Most adult mortalities appear to result from misadventure rather than disease.

**Velvet Production**

Some herds specialise in high quality velvet production and in the selection of breeding stock that will maximise velvet production.

Velvet antler products are primarily used in Asian medicine. The majority of velvet antler produced in Australia is sourced from Red deer. Production is a specialist operation requiring knowledge of animal physiology, genetics and nutrition. In addition farmers wishing to remove velvet from their own deer need to undertake an accreditation course and demonstrate their proficiency in antler removal.

New antler growth begins in early summer with A Grade velvet antler generally cut between 55-65 days after antler casting. Velvet production is dramatically influenced by stag nutrition, especially during the rut, post rut, winter and early spring periods. Stags should be fed a high quality diet ad libitum.

Velvet stags are best managed as a separate mob so that attention can be paid to management and nutrition. From about mid August the mob should be checked regularly and the date each stag casts its buttons noted. When the majority of a mob have cast, animals can be sorted into small groups on the basis of casting date. Small mobs are more easily managed and there is reduced risk of velvet damage during harvest. Only those animals that cast before the end of September are likely to produce worthwhile `second cut' velvet.

At harvest velvet weights should be recorded so that poor performing stags can be culled.

**Venison Production**

Venison is the major product of Red deer farming. Breeding and selection of animals for venison production is based on animals that maximise production of high quality venison in the shortest time possible.

Dressing percentages (100 x hot carcase weight/live weight) range from 52 to 56% in stags aged 12 to 24 months. Carcase weights for Red deer range from 48 to 65 kg. Older animals and hybrid animals (Red x Wapiti/Elk) can be significantly larger.

Ideally fed and managed animals should be processed at 15 to 18 months of age to maximise venison quality and minimise grazing pressure on properties.
<table>
<thead>
<tr>
<th>MONTH</th>
<th>STAGS</th>
<th>HINDS</th>
<th>YEARLINGS</th>
<th>CALVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>JANUARY</td>
<td>Remove velvet regrowth. Ulceric examination of breeding stags. Ensure breeding males can be in good condition before end of March.</td>
<td>Abundant good pasture must be available for lactating hinds - their demands will be increased more than double those of late pregnancy. In areas of summer feed shortage supplementary feeding may be necessary, eg. silage, nuts, lucerne chaff, oats, cut green crops.</td>
<td>Remove spikes from yearling stags as soon as they harden in January. Maintain yearling growth. Weigh and sell venison animals heavy enough for slaughter</td>
<td></td>
</tr>
<tr>
<td>MARCH</td>
<td>Ensure in good condition. Select best breeding stags. Observe mating groups for stag injuries etc.</td>
<td>Sort mating groups and stags introduced - run yearling hinds as separate mob. Ensure hinds maintained in good condition. Feed if required. Target weight 80 kg.</td>
<td>Best feed available to maximise growth. Vaccinate with second 5 in 1.</td>
<td></td>
</tr>
<tr>
<td>APRIL</td>
<td>Good nutrition to ensure optimum velvet production.</td>
<td>Joining continues. Replace stags after 2 cycles if single sire mating. Continue to observe mating groups for unusual behaviour.</td>
<td>Continue on good nutrition.</td>
<td></td>
</tr>
<tr>
<td>MAY</td>
<td>Remove stags by 21st May.</td>
<td>Adequate nutrition to maintain</td>
<td>Maintain growth.</td>
<td></td>
</tr>
<tr>
<td>MONTH</td>
<td>STAGS</td>
<td>HINDS</td>
<td>YEARLINGS</td>
<td>CALVES</td>
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<td>------------------------------------------------</td>
</tr>
<tr>
<td>JUNE</td>
<td>Good nutrition to ensure optimum velvet production.</td>
<td>Adequate nutrition to maintain body weights.</td>
<td>Maintain growth - supplement if required.</td>
<td></td>
</tr>
<tr>
<td>JULY</td>
<td>Good nutrition to ensure optimum velvet production.</td>
<td>Adequate nutrition to maintain body weights.</td>
<td>Maintain growth - supplement if required.</td>
<td></td>
</tr>
<tr>
<td>AUGUST</td>
<td>Good nutrition to ensure optimum velvet production.  Record dates of button casting.</td>
<td>Adequate nutrition to maintain body weights.</td>
<td>Maintain growth - supplement if required.</td>
<td></td>
</tr>
<tr>
<td>SEPTEMBER</td>
<td>Good nutrition to ensure optimum velvet production.  Continue to record dates of button casting.</td>
<td>Adequate nutrition to maintain body weights.</td>
<td>Maintain growth - continue supplement if required until Spring growth suitable.</td>
<td></td>
</tr>
<tr>
<td>OCTOBER</td>
<td>Good nutrition to ensure optimum velvet production.  Sort velvet mobs on basis of casting dates.</td>
<td>Adequate nutrition to maintain body weights - don’t let get over fat.</td>
<td>Market remaining slaughter deer.</td>
<td>Maintain growth - supplement if required.</td>
</tr>
</tbody>
</table>

Note: Timing of all management operations will vary depending on farm location and annual climatic conditions.
ELK/WAPITI

Introduction

Elk/Wapiti are closely related to red deer and although their management and handling requirements are generally similar to those for Red deer, there are some important differences. They are the largest of all the deer species and are thought to have evolved in Asia and North America.

Early North American settlers referred to these animals as Elg or Elk as they reminded the settlers of moose they knew in Europe. In the early 19th Century, in an attempt to use a common name for the animals, the name used by Shawnee Indians (Wapiti) was adopted. The name is pronounced WA-PITI which translates to ‘White Rump’ in the Indian dialect.

Original Wapiti imported into New Zealand interbred with Red deer until there were few, if any, pure Wapiti remaining. Although the New Zealand hybrids remained bigger than pure Red deer and retained markings of Wapiti, they are smaller than pure WAPITI animals in North America. (New Zealand wapiti are about 60% of the size of Canadian wapiti.)

In Australia today the terms Wapiti and Elk can create confusion. Widely used terminology within the deer industry now is: Elk - 75% or more of genetic make up is Canadian Wapiti. Wapiti - a Wapiti/Red deer hybrid carrying 50% to 75% of Canadian Wapiti genes. Hybrid Red Deer - no more than 50% of Canadian Wapiti genes.

Differentiation between commonly accepted different sub species of Wapiti is under constant review by Biologists and Taxonomists (see Deer Industry Manual - part 3). Taxonomist suggest some groups previously thought to be different sub species are in fact the same sub species. The sub species have been mis-named because of phenotypic differences that have resulted from breeding within isolated populations in specific environments.

The predominant sub species of Wapiti farmed in Australia is Cervus elaphus canadensis. Groves (6) suggests commonly described sub species including: C.e. manitobensis (Manitoban or plains Elk) and C.e. nelsoni (Rocky Mountain Elk) are the same species.

For simplicity throughout the remainder of this section, Elk, Wapiti and Hybrid Red Deer are collectively referred to as Wapiti.

Because Wapiti were only introduced into Australia in the mid 1980’s, only a relatively small population exists in Australia. There are three major Elk (Canadian Wapiti) breeding specialists in Australia who have for the past 10 years imported superior Genetics from North America. Progeny from these farmers can now be readily accessed across Australia.
Handling

Like Red deer, Wapiti handling requires good ‘stock sense’ involving patience, an understanding of animal psychology and good powers of observation.

Early pioneers of Wapiti farming quickly realised that putting these animals though yards designed for smaller deer was like using sheep yards to handle cattle.

Elk/Wapiti are much larger and heavier than Red Deer and people can be intimidated by their size. However, with the establishment of a regular handling and hand-feeding routine, it is possible to yard large mobs of these animals with very little labour, given the correct farm layout. Wapiti can be trained to come for feed when called, and this is the easiest way of moving stock from one paddock to another. Gentle pressure from persons on foot or on motorbikes will hasten the process, but in general it is necessary to exercise great patience in moving deer, particularly if one or two obstinate animals baulk in gateways. If the deer are pushed too closely then panic will be an almost certain result, and injuries may occur, even in fairly quiet mobs of deer.

The animals are extremely intelligent and have a curious nature. They appear to be relaxed and friendly in paddock situations and respond quickly to human contact. Although they can be friendly and untroubled by human pressure in paddocks they can be difficult to handle in inappropriate yards. Wapiti don’t usually like to be in small confined areas but can be trained with good management in well designed and sited yards.

Wapiti can be handled in any reasonably constructed yards that are strong and robust. Walls on handling complexes should be a minimum of 2 metres high and a ‘flow through system’ provided that does not allow animals to be boxed in blind corners.

Like Red deer these animals are usually easier to yard and handle early or late in the day and when it is not windy. A system with a central lane way linking all paddocks to the handling facility is simple and convenient.
In complex facilities (in particular yards) that are small and do not allow animals the impression of a simple flow, some animals become extremely nervous. Nervousness leads to absolute stubbornness demonstrated by the animal just standing in the middle of a pen refusing to move.

An ideal system for Wapiti provides operators with swing gate that lead onto one another, and allows animals to be simply walked through the yards to a circular pen. The major factor of this system is that the operator is always behind doors and can use them to apply pressure to keep the animals moving.

Overhead walk way systems are not recommended for Wapiti as animals will only stand and look at the operator in a very stubborn way. A Hydraulic Crush is highly recommended for Wapiti as it will not only ease the handling situation, it will save farmers a lot of time and money during Velvet harvesting. Where farmers are using a small number of Wapiti Bulls in a Terminal Sire program, veterinary work is usually carried out when the animal is anaesthetised.

The animals become accustomed to their environment and animals born on a property quickly become familiar with the property. Moving herds around paddocks is relatively easy. In most cases because of their curious nature stock will be waiting at the gate for it to be opened. They can be easily trained to respond to a managers call by simply calling out during supplementary feeding.

Yard weaning along with hand feeding in the handling facilities will educate young deer to the facilities. Move the calves from pen to pen and through the drafting system daily for five days after when they can let into an adjacent paddock during the day and yarded each night for up to 10 days. This also gives the opportunity to identify those deer in poor temperament which should be culled.

Males in hard antler should never be yarded. A male deer should be velvetted or antlers removed when velvet begins to strip. Similarly deer should not be handled during the rut when males become aggressive. Usually deer give warning of aggression by grinding their teeth, lolling tongue and rolling eyes.

NB 1. Experienced operators strongly suggest that dogs should not be allowed near these animals.
2. New born animals should be viewed cautiously as cows can be very protective of their calves for the first few days after birth.

It is recommended that new farmers wishing to build or alter the handling complex consult an experienced Wapiti farmer regarding designs before proceeding.

Reproduction

Wapiti cows, like most other species of deer, breed seasonally. During their breeding season which usually begins in mid March, cows cycle every 21 days. Ovulation occurs 24 hours after the first signs of oestrous and fertilisation occurs about 36 hours after mating. Early in the season cycles are often shorter. Most cows will conceive on their first oestrous although bulls may mount many times before ejaculation. Some cows become much more aggressive towards subordinates and demonstrative towards humans.

The average gestation length of pure Canadian Wapiti is said to be 255 days while the average for NZ Wapiti is 245 days. Most calves are born during the first two weeks of December but birth can occur from November to January.
Pregnancy diagnosis using ultra-sound equipment can be useful. Assessment of pregnancy status using ultra-sound equipment is best undertaken between 30 and 130 days of pregnancy (end May/early June).

Farmed Wapiti should achieve an average calving percentage of 90%, with an 85% weaning rate however survey results over a large number of deer farms over the past few years have revealed a wide range of weaning rates largely influenced by management practices.

Bulls also have an annual cycle of reproductive activity which is controlled principally by daylight length. They show rutting behaviour as libido and testosterone levels increase from mid-March to early April. However they produce semen for about 10 months of the year. During the rut the voice changes to a high-pitched bugle sound, the neck girth expands and the urine develops a characteristic rutting odour. The period of intense rutting activity may last from 4-6 weeks although some stags may rut actively for as little as 1-2 weeks. During this period the dominant bulls will vigorously herd and protect their harem of females. Wapiti bulls can be very aggressive during the rut, and must be treated with great care, even if the antlers have been removed.

Males are fertile at around 16 months and can be used successfully as yearlings but rutting behaviour and body changes associated with the rut are not as marked as with older stags. Males peak between 8 and 13 years, but above 15 years, whilst males continue to produce semen, they show little rutting behaviour.

During early summer (November-December) males are in a state of reproductive quiescence, with rapidly growing velvet antlers. Examination of the males pre-rut including testicle examination and palpation is recommended. Males with small or soft testicles should be culled as size is correlated to semen production. Select sires with greatest health testicular circumference at the time of antler regrowth removal.

These characteristics should be considered when devising management strategies for Wapiti, with the other principal factor being the requirement to provide the nutrition which allows the species to reach its potential as a farm animal.

Nutrition, Body Weight and Condition Score

Puberty and conception in hinds is directly related to body weight. Wapiti mature later than Red deer and maiden cows should be 85% of adult body weight at joining. A guide lower critical body weight at 16 months is 135kg (a minimum weight and not a target) which should increase to 150kg at joining. There should be little difficulty in achieving this weight in farm animals, and cows should then calve each year for 10-12 years at least.

It is essential to feed calves well during their first winter and subsequent summer to ensure that they are able to first conceive at 16 months of age. Feed supplements are recommended during this period (especially during Summer) to ensure adequate growth. Wapiti should have access to good quality roughage (hay) throughout the year.

Body condition also has a major influence on conception rates. Females in poor or over fat condition will not cycle or may conceive late (maidens that calve late often calve late in subsequent seasons). Breeding females should be assessed for condition score prior to the rut (early March) be provided with supplementary feed during the lactation period if necessary.
Bulls lose a considerable percentage of their body weight (up to 30%) during the rut. They should be managed to ensure that prior to the rut they have adequate body condition to maintain them during the rut.

Wapiti Bulls mature at an older age than Red deer (4 to 5 years) and continue to grow up to five years of age.

Introduction of Bulls

Providing cows are near to their mature weight, bulls can be introduced immediately after weaning and they should cycle by the middle of March and give birth to early calves in mid November. Early introduction of bulls can advance oestrous by 6 days and assist in synchronisation of the first oestrous cycles.

Good records including the date of arrival of the first calf can assist in determining the optimal time of introducing the male. If the first calving date indicates conception corresponds with the date the male is introduced then this could indicate that all hinds were cycling when the stag was introduced and an earlier joining may be possible in the following year.

To avoid late calves, it is best to remove the bulls from the cows after a defined mating period, by mid-May at the latest. This will ensure that the last calves are born late in December.

During the summer months the bulls should be run separately from the calving cows. Velvetting management is of paramount importance in November and December and all farm stags should be velvetted, or have their antlers removed as soon as they harden. The removal of antlers does not affect reproductive performance.

Figure 9 - Canadian Wapiti (Elk) Bull
Joining

A ratio of one bull to 35 cows (or 3 bulls with 100 cows) for mature bulls is recommended although ratios of up to 1:40 can be successful. Younger stags should be joined at the rate of 1:10 for yearlings and 1:15 for two year olds.

Single sire mating is the only successful mating technique if progeny are to be registered or genetic gain using superior sires is sought. Single sire mating also results in less stress on the bull if mating groups can be kept well separated. If mating groups are too close bulls may expend considerable time and energy protecting harems from threats that don’t exist. To ensure pregnancy bulls should be replaced after three weeks. Importantly, Wapiti bulls should be kept well away from Red deer stags within and between paddocks as Red stags can intimidate Wapiti Bulls and decrease their joining effectiveness.

If multiple bulls are used it is desirable to use a large paddock and introduce them to the cows at least two weeks before oestrous activity begins. This will allow dominance hierarchies to be determined, and harems to be formed. It is not rare for a dominant bull to hold the entire cow group for a period of weeks, preventing all other bulls from serving females. In this situation it is possible that the bull’s fertility will eventually be impaired, and some cows will not become pregnant. A suggested minimum area allowance per bull is 2,000 square metres.

To maximise pregnancy rate the dominant bull may be removed after three weeks, allowing the remaining two or three bulls to complete the mating of late cows. In this way superior bulls can be used to effect, with calves identified to sire on the basis of birth dates. However, there may be practical difficulties in this system, not the least of which may be to actually remove the original bull from the paddock. Rutting Wapiti bulls are very aggressive and are potentially dangerous - they must be treated with great caution, and handled as little as possible during the breeding season.

A strong management recommendation is to mate first calving cows in separate groups, using an experienced, proven bull. These young females can be given preferential feeding, without bullying from other cows, and at calving there will be an opportunity to watch this group carefully for problems.

Bulls need to be checked regularly for injury and ill health. It has been estimated that 10% of bulls produce semen of poor quality and are thus of lowered fertility. Bulls may also become sexually exhausted before the end of the joining period and in commercial situations replacement with a follow up bull at least 18 days before the end of joining should be considered.

Calving

As calving approaches, cows become restless and separate from the group, usually seeking a sheltered area. Calving is usually rapid and calves are able to stand and suck 30 to 45 minutes after birth. For first few days calves will ‘freeze’ if disturbed and care should be taken when driving around calving paddocks. The dam will leave the newborn calf in cover and will return several times each day to suckle the calf.

Ideally calf tagging and weighing should be undertaken within 24-48 hours of birth, as after that time most calves will be disturbed by an approach and will move quickly away. If calf handling is undertaken quietly and carefully, mismothering is minimised. Calves can be quietly and quickly accessed and tagged from within a vehicle. Contamination of calves with human scent can be prevented if disposable plastic gloves are worn during calf handling. Cows are best supervised from a distance and any animal in obvious difficulty assisted.
The biggest single factor affecting calf mortality is birth weight. Calves below a birth weight of 9kg are less likely to survive than calves of greater birth weight. Calf birth weight is directly influenced by cow nutrition and it is not uncommon for a Canadian Wapiti (Elk) calf to weight up to 19kg at birth.

**Weaning**

Wapiti calves can be weaned at 50-80kg body weight, at about 3 months of age. Hybrid calves are very demanding on their others and general recommendations are to remove the calves in early March. This allows cows to recover their body weight quickly, and experience a high and rising plane of nutrition for joining. Early weaning allows calves to receive specialised supplementary feed to maximise weight gains and removes calves from the influence (temperament) of badly behaved cows. However late calves and calves not reaching 45kg should not be weaned until after the rut.

Early calves are important to venison production programmes as they enable progeny to be off the farm with excellent eights and less than 12 months of age and before the spring flush of pasture has dried off. Target weights for males should be 130-145kg.

Pre-rut weaning requires a higher level of management than is generally practiced on many Australian deer farms and is dependent on calves being born early in the season. If calves are not weaned before the rut they will usually wean themselves at 4-6 months of age. Cows in poor condition, and possibly those nursing large male calves often decline in milk production faster than do well-nourished mothers.

At weaning calves should be visually separated from dams. Often weaned calves are hand feed in yards for a week or two, before they are turned out to good pasture. Daily contact and feeding of the weaners is an excellent means of quietening deer and accustoming them to human contact and to the handling facilities.

**Figure 10 - Hybrid Wapiti Cows and Calves**
Artificial Breeding

Artificial breeding technology including both artificial insemination and embryo transfer is a tried and proven management tool for introducing superior genetic material into Wapiti herds at relatively small expense. Results however can be variable and depend largely on the skill of the operator and the management of the deer.

Artificial insemination in Wapiti is undertaken using a cervical method (similar to cattle) and average conception rates of 65% to 85% are achieved.

Cows in the program should be carefully selected on temperament and only proven breeders used. Facilities should be of a practical design and the animals well educated to using the yards. Calves should also be weaned from the hinds prior to the commencement of the program.

Hybridisation

While a common use of Wapiti/Elk genetics is to improve animal performance it should not be used as a substitute for optimal nutritional management. The reproductive management of terminal sires as well as the nutritional management of both females and offspring need to be optimised to obtain maximum benefits from hybridisation. Caution needs to be exercised when using pure Wapiti/Elk and hybrids over Red cows. Cows must not be allowed to get over fat during pregnancy as over fat animals are predisposed to calving problems.

A general recommendation is that sires carrying up to 75% Wapiti (Elk) genes should not be joined to Red deer hinds of less than 105kg live weight. Joining of pure Canadian Wapiti (Elk) bulls with large Red Deer cows should be left to breeding specialists.

Animal Health

Whilst Wapiti are generally hardy and tend to show a greater resistance to parasites and disease than other farm livestock this situation can change when animals are placed under stress. Avoidance of stress, including climatic, nutritional and physical stress is the key to maintaining healthy deer. Provision of adequate shade, shelter and good quality fibre (hay) in both Summer and Winter can be of assistance in minimising climatic stress.

Deer farmers should be aware of nutritional deficiencies which can occur in their area and seek veterinary advice on monitoring blood levels of trace elements if deficiencies are suspected. Internal parasites can be detected by monitoring faecal egg counts and this should be carried out prior to commencement of any drenching program. External parasites such as cattle tick and bush tick can also be a problem in some areas. Treatment programs for ticks include chemical applications and advice on the best control program should be sought from the local private or government veterinarian.

Ideally all deer should be vaccinated with 5 in 1 vaccine to assist in the prevention of clostridial diseases, although most farmers of Wapiti in Australia don’t vaccinate their stock. This involves two injections 4 to 6 weeks apart at weaning followed by an annual booster injection.

The Wapiti/Elk fading syndrome common in Wapiti in NZ has not caused any problems in Australia to date. This may be in part due to the naturally higher percentage of fibre in Australian grazing diets than NZ diets.
Wapiti and Red deer are reported to have higher requirement for copper than other livestock. Most Australian Wapiti farmers routinely dose their stock with copper to maximise velvet production and monitoring good health. Veterinary advice should be sought before treating stock.

**Velvet Production**

Some herds specialise in high quality velvet production and in the selection of breeding stock that will maximise velvet production.

Velvet antler products are primarily used in Asian medicine. The majority of velvet antler produced in Australia is sourced from Red deer, although Wapiti genetics influence a significant volume of ‘Red deer’ velvet production. Production is a specialist operation requiring knowledge of animal physiology, genetics and nutrition. In addition farmers wishing to remove velvet from their own deer need to undertake an accreditation course and demonstrate their proficiency in antler removal.

New antler growth begins in early summer with A Grade velvet antler generally cut between 55 and 65 days after antler casting. Velvet production is dramatically influenced by stag nutrition, especially during the rut, post rut, winter and early spring periods. Stags should be fed a high quality diet including access to good quality roughage, ad libitum, all year.

Wapiti Velvet is characterised by its greater length and greater thickness compared to red deer velvet. Thickness (beam) circumference is considered a major quality criterion on Asian markets. New superior Canadian Wapiti (Elk) genetics have been brought to Australia in recent years. Parent bulls of these superior genetics in North America produce up to 20kg of velvet annually.

Velvet bulls are best managed as a separate mob so that attention can be paid to management and nutrition. From about mid-August the mob should be checked regularly and the date each bull casts its buttons noted. When the majority of a mob have cast, animals can be sorted into small groups on the basis of casting date. Small mobs are more easily managed and there is reduced risk of velvet damage during harvest. Only those animals that cast before the end of September are likely to produce worthwhile ‘second cut’ velvet.

At harvest, velvet weights should be recorded so that poor performing stags can be culled.

**Venison Production**

Venison is a major production of Wapiti farming. Breeding and selection of animals for venison production is based on animals that maximise production of high quality venison in the shortest time possible.

Cross breeding (Red x Wapiti) is one way to achieve earlier slaughter weights and avoid heavy supplementary feeding in Autumn as progeny are ready for processing at 11-12 months instead of 15 months as is common with pure Red deer.

Factors that should be considered in selecting a sire for venison production include:

(i) Production system
(ii) Body weights of dams
(iii) Breed of dams
(iv) Market specifications for product
Terminal Sires for Venison production should be selected from stock available from a recognised breeder who offers a distinct line selected and bred for Venison production. Sires selected for Venison production have visibly noticeable large hind quarters.

Dams should be proven breeders selected for size, preferably over 100kg.

Eastern European Red Deer Hinds are gaining popularity for crossing with Wapiti, because they tend to be larger than other red deer (130+kg) and can take the larger Elk Bulls. Whichever way you intend on going remember the 3-1 Bull Weight Ratio to females.

A worthwhile rule of thumb in determining the size of a sire relative to a dam is the 3:1 Bull weight:Female weight ratio (ie the bull for a 100kg female should be no more than 300kg.

Sires and dams selected for velvet production should diversely originate from herds that can demonstrate selection and genetic improvement in velvet production capability.

A guide to average mature liveweights of stock is provided in the table below although readers should accept that there is variation within each of the sub species groups.

Table 2 - Average liveweights ([17])

<table>
<thead>
<tr>
<th></th>
<th>Female (kg)</th>
<th>Male (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Deer</td>
<td>100</td>
<td>210</td>
</tr>
<tr>
<td>Red/Wapiti (Elk) Hybrid</td>
<td>130</td>
<td>256</td>
</tr>
<tr>
<td>NZ Wapiti</td>
<td>170</td>
<td>310</td>
</tr>
<tr>
<td>Wapiti (Elk)</td>
<td>230</td>
<td>400</td>
</tr>
</tbody>
</table>

An example of the increase in size achieved by cross breeding Wapiti x Red deer offspring and pre red deer offspring are provided in tables 3 and 4.

Table 3 - Liveweight and Carcase Data (from [17])

<table>
<thead>
<tr>
<th>Character</th>
<th>11 month Wapiti/Red</th>
<th>2 year old Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liveweight</td>
<td>116.4kg</td>
<td>123kg</td>
</tr>
<tr>
<td>Dressing percentage</td>
<td>56.7%</td>
<td>56.9%</td>
</tr>
<tr>
<td>Tissue depth</td>
<td>4.7mm</td>
<td>10.0mm</td>
</tr>
</tbody>
</table>

* Tissue depth is a measure of the fat content of a carcase

Table 4 - Comparative Carcase Data (adapted from [17])

<table>
<thead>
<tr>
<th></th>
<th>One year old</th>
<th>Two years old</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liveweight</td>
<td>Dressing</td>
</tr>
<tr>
<td>Red Deer</td>
<td>94.8 (kg)</td>
<td>57.9 (%)</td>
</tr>
<tr>
<td>NZ Wapiti</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NZ Wapiti x Red Deer</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Canadian Wapiti (Elk) x Red Deer</td>
<td>116.4 (kg)</td>
<td>50.1 (%)</td>
</tr>
</tbody>
</table>
# Summary Calendar of Operations

<table>
<thead>
<tr>
<th>MONTH</th>
<th>BULLS</th>
<th>COWS</th>
<th>YEARLINGS</th>
<th>CALVES</th>
</tr>
</thead>
</table>
| JANUARY  | Remove velvet regrowth.  
Veterinary examination of breeding stags.  
Ensure breeding males can be in good condition before end of March.  
Internal parasite drench.  
Copper supplement. | Abundant good pasture must be available for lactating hinds - their demands will be increased more than double those of late pregnancy. In areas of summer feed shortage supplementary feed may be necessary, eg silage, oats, cut green crops, clover, lucerne hay, lupins, barley. | Remove spikes from yearling stags as soon as they harden in January.  
Maintain yearling growth.  
Weigh and sell venison animals heavy enough for slaughter. |                                                                                                                                 |
| FEBRUARY | Continue on good feed in preparation for rut.                        | Weaning - late February/early March  
Wet and dry hinds to determine calving and weaning rates.  
Vaccinate with 5 in 1.  
Cull non performing and bad temperament cows. | Maintain growth of replacements.  
Weigh and sell venison animals heavy enough for slaughter. | Weigh calves.  
Sex and tag calves if not done at birth.  
Vaccinate all calves with 5 in 1.  
Daily feeding and handling through yards for 5 days then overnight yarding. |
| MARCH    | Ensure in good condition.  
Select best breeding stags.  
Observe mating groups for stag injuries, etc. | Sort mating groups and stags introduced - run yearling hinds as separate mob.  
Ensure hinds maintained in good condition.  
Feed if required.  
Internal Parasite drench.  
Copper supplement. | Best feed available to maximise growth.  
Wean calves.  
Vaccinate with second 5 in 1.  
Copper supplement. |                                                                                                                                 |
| APRIL    | Joining continues.  
Replace bulls after 2 cycles if single sire mating.  
Continue to observe mating groups for unusual behaviour. | Adequate nutrition to maintain body weights. | Continue on good nutrition.                                                                                                                                 |
| MAY      | Good nutrition to ensure optimum velvet production.  
Remove bulls | Adequate nutrition to maintain body weights. | Maintain growth.  
Internal parasite drench. |                                                                                                                                 |
<table>
<thead>
<tr>
<th>MONTH</th>
<th>BULLS</th>
<th>COWS</th>
<th>YEARLINGS</th>
<th>CALVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>JUNE</td>
<td>Good nutrition to ensure optimum velvet production.</td>
<td>Adequate nutrition to maintain body weights.</td>
<td>Maintain growth - supplement if required.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>by end of May.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY</td>
<td>Good nutrition to ensure optimum velvet production. Some Wapiti drop buttons late in July.</td>
<td>Adequate nutrition to maintain body weights.</td>
<td>Maintain growth - supplement if required.</td>
<td></td>
</tr>
<tr>
<td>AUGUST</td>
<td>Good nutrition to ensure optimum velvet production. Record dates of button casting. Internal parasite drench. Copper supplement</td>
<td>Adequate nutrition to maintain body weights. Internal parasite drench. Copper supplement.</td>
<td>Maintain growth - supplement if required.</td>
<td>Copper supplement.</td>
</tr>
<tr>
<td>SEPTEMBER</td>
<td>Good nutrition to ensure optimum velvet production. Continue to record dates of button casting.</td>
<td>Adequate nutrition to maintain body weights.</td>
<td>Maintain growth - continue supplement if required until Spring growth suitable.</td>
<td></td>
</tr>
<tr>
<td>OCTOBER</td>
<td>Good nutrition to ensure optimum velvet production. Sort velvet mobs on basis of casting dates. Velvet harvesting begins.</td>
<td>Adequate nutrition to maintain body weights - don’t let get over fat.</td>
<td>Market remaining slaughter deer.</td>
<td>Maintain growth - supplement if required.</td>
</tr>
<tr>
<td>DECEMBER</td>
<td>Velvetting continues. Remove regrowth.</td>
<td></td>
<td></td>
<td>Calving continues - most calves born between November 30 and December 15. Ensure adequate nutrition - supplement if necessary.</td>
</tr>
</tbody>
</table>

*Note: Timing of all management operations will vary depending on farm location and annual climatic conditions.*
RUSA DEER

Introduction

Rusa deer (*Cervus timorensis*) are a tropical deer species originating from the Indonesian archipelago. Feral populations were established in NSW and the Australian Torres Strait Islands by the early 1900’s and commercial farming of Rusa deer commenced in Queensland in the early 1980’s. Small Rusa deer farms were maintained in NSW and Victoria in the 1970’s and small numbers are present on some farms in Southern states today. Current estimates show Rusa to be the predominantly farmed deer species in Queensland (approximately 50% of the total farmed deer numbers).

Two subspecies commercially farmed are Javan Rusa (*Cervus timorensis russa*) and the smaller Moluccan Rusa (*Cervus timorensis moluccensis*). Interbreeding (hybridisation) between the two subspecies has occurred in farmed populations, to the extent that the majority of farmed Rusa are either Javan or Moluccan x Javan.

Figure 11 - Rusa Hinds and Fallow Does

Handling

The layout of a farm, and yard design, are important considerations in providing a workable farm with ease of stock management including safe and humane handling, especially in the case of deer farming which requires more specialised fencing and handling facilities.

Paddock layout should allow for access to a central laneway leading to yard facilities, with provision in paddock design for shade and shelter. Paddock number (subdivision) should be sufficient to allow adequate grazing management and segregation of breeding, weaner/young stock and finishing animals for slaughter. Boundary fencing is commonly 1.8 metre high deer mesh netting that should be maintained in a stock proof condition. Cheaper fencing (to about 1.5 metre) for internal subdivision and areas of low stock pressure is usual. Some locations require adaptations to secure boundary fences from predator entry (eg. foxes, dingoes, wild pigs).
There is no ‘standard’ deer yard design, however yards should be designed to accommodate adequate safe handling of small mob and pen size groups, complete with a crush restraint to allow husbandry procedures such as ear-tagging, vaccination, drenching, pregnancy testing, velvet and hard antler removal etc. Adequate drafting facilities within the yards are essential to enable adequate segregation of mobs and as an aid to weaning. Conventional ‘drop floor’ V or Y-shape crushes appear suitable for individual Rusa deer restraint, and ideally would incorporate a set of weigh scales for monitoring liveweight.

Rusa deer (particularly those in larger herds) are generally quiet and placid in the paddock. While they will move well from paddocks into yarding and handling facilities (easier handling with larger mob size), management is simplified if prerequisites of adequate layout and facility design, stockmanship skills, patience and adequate deer education of yard set-up and procedures are met.

With education and training, Rusa deer are considered readily tractable (ie. able to be confidently handled and managed). Stags in hard antler may be aggressive when under stress in yards, particularly in mixed mobs. They should be quickly segregated to avoid injury to other animals.

Hard antler removal from stags is considered an essential procedure to ensure safe animal handling and management practices, and is a requirement prior to stock transport and slaughter. While aggression towards human handlers is considered rare, it must be appreciated that common to all deer species, stags in the mating season must be respected and not handled unless necessary.

Castration is not currently considered a routine husbandry procedure to control aggression in prepubertal male Rusa deer as mature males subjugate the juveniles. However culling of stags on temperament is encouraged.

Reproduction

Related to their tropical origins, naturally synchronised breeding seasons (affected by photoperiod) are not apparent with Rusa deer. Breeding and calving is possible all year round although a degree of acquired seasonality has occurred within farmed herds in Australia.

Moluccan Rusa hinds reproduction cycles and stag antler growth cycles appear to be non seasonal. Calves can be born throughout the year and an average gestation period is about 240 days. Average calving percentage of greater than 90% (number of calves born for number of females mated) is common. Unrestricted year round mating is common practice, although farmers in areas that experience cooler winter months (particularly June to August) have found a controlled mating program that encourages spring calving (September onwards) beneficial. A three month mating period from late January is used. Oestrus cycle is 18 to 20 days for both subspecies.

Although Javan Rusa hinds are apparently fertile all year round, they are observed, under Queensland farming conditions, to be strongly seasonal in both reproduction and antler cycles. Field observations show that a majority of mature Javan hinds calve between March and May and have gestation periods of about 252 days. The predominant calving period for first calvers appears to be between June and October. Stags are presumed to be sexually active and fertile in the hard antler stage only.

Mature Javan Rusa hinds (second calving onwards) have recorded pregnancy rates around 95%, with first calving hinds recording slightly lower pregnancy rates of 85%. Intercalving intervals have been measured between 271 days (for late calving hinds) to 366 days for autumn calvers. Restricted mating programs (ie. removal of stags from breeder herd from late October to January to avoid calving in cooler winter months of June to August in southern Queensland areas) are increasingly practised. With good management and nutrition hinds can calve by 19 months of age.
although most animals first calve at two years of age. Generally no Javan Rusa births are recorded over summer (December to February) periods.

Most Rusa stags are in velvet antler over summer and so few males are available to mate females during this period. This means spring calving is difficult to achieve. The use of Moluccan (or Javan/Moluccan cross) Rusa stags, with a characteristically more variable velvet antler growth cycle, has aided the ability of Rusa farmers to calve their animals in spring in southern/south-east Queensland.

Javan Rusa stags show most mating activity between July to September, with Javan/Moluccan and Moluccan stags more variable in their mating activity concomitant with timing of hard antler periods. Stag aggressiveness during the rut is usually limited to aggression between hard antler animals, and breeding stags establish a hierarchy of dominance. Unlike some temperate deer species, Rusa stags do not attempt to form hind harems. During the rutting period Rusa stags are also observed to wallow and thrash antlers in long grass.

As a general observation, it appears that irrespective of nutrition and management, Moluccan Rusa are about 70% the size of comparable Javan Rusa animals. Commonly, Rusa deer herds use both Javan and Moluccan sub species and often manage herds of Javan/Moluccan hybrids.

**Nutrition, Body Weight and Condition Score**

Nutrition management in late pregnancy should avoid hinds being ‘over-fat’ at calving in order to prevent the incidence of dystocia. Anecdotal evidence of wedge-tailed eagle (*Aquila audax*) attacks on young calves in Queensland has been documented on some properties. While attacks are likely to concentrate on poor/ill-thrift calves, the provision of adequate shelter may minimise losses.

Puberty in Rusa deer is influenced by nutrition. Javan females reach puberty (ability to conceive) at 45 to 50 kg liveweight and Moluccan females 35 to 40 kg live weight. Rusa stags generally attain puberty and corresponding to pedicle growth, at 30 to 35 kg live weight. These live weights for both sexes should be obtained at around 9 months of age.

Annual growth rates are influenced by seasonal pasture production, with nearly 60% of annual weight gain for mature animals occurring from October to January.

Nutritional strategies on a property must accommodate the feed requirements for maintenance and growth of weaner stock, breeding stags, stags and cull hinds for slaughter. In addition are requirements for pregnancy and lactation, although observations that Rusa hinds appear to carry some fat reserves suggests a capacity to accommodate short periods of nutritional stress.

Seasonal pasture growth patterns in tropical and sub-tropical Queensland shows growth and quality gains during the wet season (approx. October to February/March) with declining growth and quality in the dry season (March/April to September). High nutritional requirements for both stags and hinds do occur during the poorer pasture growth and quality periods (ie. during Autumn (pre-rut and mating, parturition and lactation) and winter). Generally requirements for post-rut weight gain for stags coincides with wet season induced improvements pasture growth and quality.
Nutritional deficiencies are met by supplements including grains (legume and cereal), protein meals, molasses, forage crops, good quality hay and silage. Rusa deer can be expected to consume between 2.5 to 3.5% of their liveweight in dry matter daily. Provision of an adequate supply of quality drinking water is essential.

Drought management strategies are important.

**Joining**

Rusa stags produce sperm at 45 to 50 kg LW and would be able to mate as first hard antler males (spikers) from 12 to 14 months old, however spiker stags would generally be removed from the herd and run in separate 'bachelor' mobs for primarily venison production.

Breeding sires are generally at least 2 years of age. In consideration of non-seasonal breeding, mating management entails a minimum male:female breeding ratio of between 1:30 to 4:100 (ie. approx. 3 to 4%).

Problems with non-restricted mating include the need to muster and yard mixed mobs of hinds in various stages of pregnancy and lactation, young stock and stags in hard antler. As a consequence handling and yarding considerations are more important.

Although mature Rusa stags demonstrate an individual pattern of antler growth and sexual activity, the pattern for individual animals is repeated annually. Like other male deer they can lose up to 15% of pre-rut liveweight during the mating season.

While Rusa hinds and stags are still productive at greater than 10 years of age, anecdotal evidence suggests increased production efficiency for culling animals under this age, with a 10 to 15% yearly replacement policy in an established breeder herd.

**Figure 12 - Moluccan Rusa Stag in Hard Antler**
Calving

Birth weights for Javan Rusa average approximately 4.7 kg for females and 5.1 kg for males, smaller Moluccan Rusa calves average approximately 3.5 kg for females and 4.0 kg for males. Twinning is rare.

High incidences of perinatal mortality (up to 20%) have been observed in farmed Rusa herds due to interactions of mismothering, predation, environmental stress and poor nutrition. Calving during the cooler winter months presents potential hypothermia and weather stress problems and should be avoided where possible. It is recommended that parturient (late pregnancy and due to calve) hinds are provided with:

- access to shade and shelter to minimise environmental stresses such as heat and cold windy weather (important also for calves);
- the ability to isolate themselves from the main mob (ie. adequate paddock size) with minimal human disturbance; and
- grazing areas within predator-proof fencing and adequate nutrition through late pregnancy and during lactation.

Rusa hinds exhibit similar calving behaviour to other deer, they will hide their calves in the first week post-calving. Calves themselves are essentially immobile and hidden if approached within the first 3 to 4 days.

Weaning

Rusa calves are weaned from 4 (if controlled) to 7 (if natural) months of age at a minimum liveweight of around 25 kg for Javan and 18 kg for Moluccan Rusa. Weaning rates (calves weaned per hinds mated) generally exceeds 85% for mature hinds, and 75 to 80% for first calving two year old hinds.

Weaner animals should be segregated from main mobs and preferentially fed post-weaning. During the weaning period, young deer should be trained and accustomed to yard handling and laneway design, concomitant with supplementary feeding to enforce training and handling attributes. Animals can be ear-tagged, sexed, weighed and vaccinated during this time.

Artificial Breeding

While both Artificial Insemination (AI) programs and pregnancy diagnosis monitoring have been trialed in Rusa deer with varying success, these procedures have not yet been commercially adopted.

Hybridisation

Hybridisation with Sambar deer (Cervus unicolor) is documented as a fertile cross (Samson-deer) but it is currently considered of no commercial farming value in Australia. Natural matings of Rusa stags with red deer (Cervus elaphus) hinds is reported from some Queensland properties with female offspring apparently fertile (males appear to be infertile). However problems in social compatibility of tropical to temperate species breeding cycles has limited cross-breeding with little commercial interest in such hybridisation at this stage.

Health Considerations

Mortality rates recorded in Queensland for animals older than 6 months (ie. post-weaning) have been around 2% for females and 4% for males, although breeding males can have mortality rates approaching 10%. Most adult mortalities have been assumed to be associated mainly with stress-related incidences including environmental (exposure), nutritional and handling (trauma) stress.
Predation is also a factor on some properties. Adequate nutritional management, adequate predator proof fencing, provision of shade and shelter, adequate handling skills and yard facilities will minimise these mortalities. These are important initiatives in mortality (and disease) prevention for Rusa deer.

Routine vaccination with clostridial (5 in 1) vaccines is recommended, using similar regimes to those required for sheep and cattle. Leptospiral vaccination programs have also been suggested as a preventative measure on some properties where the disease is potentially present (eg. cattle and deer properties).

Monitoring of Rusa deer properties to date does not suggest intensive adoption of control programs for internal parasites by either oral or injectable drench formulations. However intensification of production enterprises and high stocking rates may predispose to animal health challenges and animals showing ill-thrift and poor productivity should be monitored. Any drenching programs should be strategically focussed and faecal worm egg counts obtained prior to recommendations. Drenching of primarily young stock at weaning is practiced as a precautionary measure.

Rusa deer, as a tropically adapted species, are tolerant to cattle tick exposure with associated degree of resistance, however they are susceptible to the effects of the paralysis tick with infestations on juvenile stock potentially fatal.

Rusa deer are also particularly susceptible to Malignant Catarrhal Fever (MCF) arising from contact with sheep (carriers of the virus) and high death rates can occur; hence farming in conjunction with sheep or adjacent to sheep properties is to be avoided.

Venison Production

While economic by-products such as hides and co-products such as velvet antler offer some income to the Rusa farmer, the major commercial activity from Rusa deer farming is deer meat (venison) production.

The following information pertains to Javan Rusa only. Dressing percentages (100 x hot carcass weight/liveweight) appear to range around 60 to 62% in stags aged 13 to 15 months with carcass weights of 40 to 55 kg (at optimal feeding levels). Carcass tissue (fat) depths will range from 8 to 18 mm at this age depending on level of nutrition and feed type.

Most meat animals are ideally slaughtered prior to the rut at between 14 to 20 months of age, with meat quality declining with increasing age at slaughter. Comparative data on castrate and entire male Rusa deer suggests similar meat quality and carcass weight attributes, however castrate males will have higher fat content in the carcass.

Assuming adequate standards of on-farm and pre-slaughter animal handling and husbandry, venison from Rusa deer is considered to compare favourably with that from other deer species.

Velvet Production

Antler cycles of Rusa deer appear similar in phases and lengths to those of temperate deer and generally a complete cycle for any one male occurs over 12 months. However synchronisation of cycles with other males is not as evident, although observations are that the majority of males in a herd appear be at a similar stage of antler growth at any one time. Antlers are usually cast between October and February. While data is limited, it appears that spiker antler weights vary from 50 to 200 grams with mature (2 year old plus) stags yielding 1.0 to 2.5 kg hard antler. Mature velvet antler weight yields tend to approximate these values also.

Summary Calendar of Operations
Due to their ability to breed year round, it is difficult to confine husbandry procedures for Rusa deer to set calendar periods. The actual timing of management and husbandry procedures varies from farm to farm.

**Management Criteria**

**Stags**

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**Hinds**

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<td>Lactation</td>
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**Stags**

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**Hinds**

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CHITAL DEER

Introduction

Chital deer (Axis axis) are a tropical deer species originating from India and Sri Lanka, with a feral population established in Queensland in the 1880’s. Deer farming commenced in Australia in the late 1970’s, however chital deer have always been a minority farmed species. Most Australian chital farms are in Queensland where they currently number less than 10% of the total farmed deer in Queensland. Nevertheless some commercial farming of the species occurs.

Most Chital deer in Australia are located in the sub-tropical and sub-tropical/temperate zones of Queensland. They offer the potential of year round venison production and an inherently high reproduction rate. However the high breeding rate is associated with high quality feed requirements throughout the year which subsequently increases the cost of supplementary feed requirements during the dry season.

As a gregarious species, Chital deer are more easily managed in large mobs. Chital deer are still regarded as a difficult species to handle or farm commercially so their commercial management requires high level management skills.

Figure 13 - Hand Reared Chital Hind

Handling

The layout of a farm, and yard design, are important considerations in providing a workable farm with ease of stock management including safe and humane handling, especially in the case of deer farming which requires more specialised fencing and handling facilities. Paddock layout should allow for access to a central laneway leading to yard facilities.

Paddock number should be sufficient to allow adequate grazing management and segregation of breeding, weaner/young stock and finishing animals for slaughter. Boundary fencing is commonly 1.8 to 2.1 metre high mesh netting fences that should be maintained in a stock-proof condition. Cheaper internal fencing is available. Some locations require adaptation to secure boundary fences from predator entry (eg. foxes, dingoes).
There is no 'standard' deer yard design, however yards should be designed to accommodate adequate safe handling of small mob and pen size groups, complete with a crush restraint to allow husbandry procedures such as vaccination, drenching, pregnancy testing, velvet and hard antler removal etc. Adequate drafting facilities within the yards are essential to enable adequate segregation of mobs and as an aid to weaning. Conventional ‘drop floor’ V or Y-shape crushes appear suitable for individual chital deer restraint, and ideally would incorporate a set of weigh scales for monitoring liveweight.

There appears to be a general consensus that chital deer are the most timid, nervous and excitable of the deer species currently farmed in Australia. Handling difficulties are well documented, however adequate facility design, good understanding of the deer, good stock skills and patience will improve handling of this species. The deer should be regularly introduced to the yards to familiarise them with the yards and common procedures.

Of particular importance is the segregation of mobs in the yard into female breeders (hinds) with juveniles (calves) and yearlings, and mature males (stags). Stags in hard antler are particularly aggressive and stress sensitive when yarded in mixed mobs. They should be quickly segregated to avoid injury to other animals and themselves. Direct aggression towards human handlers is not common although handlers can be injured when animals move rapidly and jump to escape. Although castration is not currently considered a routine husbandry procedure to control aggression in prepubertal male Chital deer, culling of stags on temperament is encouraged.

**Reproduction**

Like Rusa deer, Chital deer do not appear to have a well defined rutting or breeding season and are able to calve during all months of the year (considered truly non-seasonal breeders).

Chital hinds are able to undergo continuous series of oestrus cycles (cycle length 18 to 20 days) throughout the year. Hinds are capable of ovulating and conceiving soon after giving birth and have the ability to produce three calves in 28 months assuming an average calving interval of 275 days, optimal fertility and nutrition. Mean gestation length is assumed to be 234 days.

Chital stags appear capable of successful mating all year round although semen quality and fertility potential is lower in the velvet antler growth phase than in the hard antler phase. It is suggested that the libido and fertility level of the stags determine mating and calving periods.

In Queensland calving appears concentrated between March and October for multiparous or mature hinds (second calving onwards) although first calving (primiparous) hinds have been observed to calve all year round. Some data has suggested peak rutting behaviour mid-summer and peak calving around September - October. While restricted or controlled mating in chital has been successful, it is considered that within Queensland farming environments non-seasonal breeding regimes appear the most biologically efficient.

**Nutrition, Body Weight and Condition Score**

Mature Chital stags weigh 80 to 100 kg, while mature hinds weigh between 40 to 50 kg. Puberty in chital deer is influenced by nutrition. Females reach puberty at 10 to 15 months of age and males 12 to 16 months. Minimum mating liveweight for hinds is considered to be 30 kg, and most conceive when 35 kg in liveweight. Stags appear to reach puberty at 35 to 41 kg liveweight. Limited production data for farmed Chital deer suggests a mean slaughter liveweight of about 48 kg for stags 13 to 18 months old and 60 kg for stags 24 to 32 months of age. These weights suggest daily growth rates (birth to slaughter) range from 60 to 100 grams per day. Birth to weaning liveweight gain of about 150 grams per day have been recorded. The range in growth rates reflects the variable planes
of nutrition due to both seasonal influences and pastoral resources (feed management) on individual properties in different locations.

Interestingly, compared to temperate species of deer, there is no observed seasonal (rutting) decline in liveweight and condition except for slight decreases (5 to 6%) in dominant stags during mating and antler growth.

Nutritional strategies on a property need to accommodate feed requirements for maintenance and growth of weaner stock, breeding stags, stags and cull hinds for slaughter. In addition are requirements for pregnant and lactating hinds, with an observation that chital hinds do not appear to carry significant fat reserves which limits their capacity to accommodate periods of nutritional stress. In realisation of the climatic variability which Queensland pastoral industries experience, drought management strategies are also be important.

No reliable feed requirement guidelines are available for chital deer. In view of the non-seasonal breeding policies and mixed mobs all year round, it can be argued that feed requirements on a chital property will need to be adequate to high quality for most of the year. Chital deer can be expected to consume between 2.5 to 3.5% of their liveweight in dry matter daily. Provision of an adequate supply of quality drinking water is essential.

Seasonal pasture growth over most of sub-tropical and tropical Queensland is defined by periods of increasing growth and quality from October to March (wet season) with both quality and quantity of feed declining rapidly during the period April to September (dry season). Chital deer are currently commercially farmed on predominantly native pastures with some improved and sown pasture also present. Supplementation during the dry season and for finishing stock for slaughter involves good quality hay with grain (both legume and cereal) and protein supplements. Use of forage crops and silage is also an option.

Joining

In considering non-seasonal breeding, mating management would entail a male:female breeding ratio of between 1:30 to 3:100 (ie. approx. 3%) as a minimum, (1:20 is used on some properties). Problems with non-restricted mating include the need to muster and yard mixed mobs of hinds in various stages of pregnancy and lactation and young stock and stags in hard antler. This demonstrates the importance of handling and yard design.

Calving

High incidence of perinatal mortality has been observed in farmed chital herds due to interactions of mismothering, predation, environmental stress and poor nutrition. As a consequence, it is recommended that animals in late pregnancy and due to calve are allowed access to shade and shelter to minimise environmental stresses such as heat and cold windy weather (important also for calves), the ability to isolate themselves from the main mob (ie. adequate paddock size) with minimal human disturbance, are grazed within predator-proof fencing and fed adequate nutrition through late pregnancy and during lactation.
Anecdotal evidence of wedge tailed eagle attacks (predation) on chital calves have been documented in some areas and farmers should ensure a degree of shelter is available in paddocks during calving.

Birth weights for chital average 3.4 kg for females and 3.6 kg for males.

**Weaning**

Under restricted mating policies, chital deer are commonly weaned at 12 to 18 weeks of age and minimum liveweight of 13 kg. However non-seasonal breeding policies would generally require a policy of weaning at observed peak calving periods.

Conditions on Queensland properties suggest calf survival rates in excess of 75% per calving and an annual weaning rate of approx. 100%. It is desirable to segregate weaner animals from main mobs and preferentially feed post-weaning. During the weaning period, young deer should be trained and accustomed to yard handling and laneway design, coupled with supplementary feeding to enforce training and handling attributes. Animals can be ear-tagged, sexed, weighed and vaccinated during this time.

**Figure 14 - Chital Stags and Hinds**

**Artificial Insemination**

While both Artificial Insemination (AI) programs and pregnancy diagnosis monitoring have been trialed in chital deer with varying success, these procedures have not been commercially adopted at this time.

**Hybridisation**

Hybridisation with Hog deer (*Axis porcinus*) is documented but currently considered to be of no commercial value in Australia.
Animal Health

Mortality rates recorded in Queensland for animals older than 3 months (ie. post-weaning) have been around 6% for females and 15% for males. Most adult mortalities have been assumed to be associated mainly with stress-related incidences including environmental (exposure), nutritional and handling (trauma) stress. Adequate nutritional management, provision of shade and shelter, adequate handling skills and yard facilities will minimise these mortalities. These are important initiatives in disease prevention for chital deer. Paddock observations of deer condition have been unreliable in assessing health status, hence yarding and closer animal examination is required for suspect animals.

Routine vaccination with clostridial (5 in 1) vaccines is recommended, using similar regimes to those required for sheep and cattle.

The adoption of control programs for internal and external parasites (by either oral or injectable drench formulations) has not yet been required for this species in Queensland, however intensification of production enterprises and high stocking rates may predispose to animal health challenges and animals showing ill-thrift and poor productivity should be monitored.

Chital deer, as a tropically adapted species, are tolerant to cattle tick exposure with associated resistance, however they are susceptible to the effects of the paralysis tick with infestations on juvenile stock potentially fatal.

Malignant Catarrhal Fever (MCF) is a possible threat to chital deer in direct contact with sheep and situations where this could occur should also be monitored.

Venison Production

While economic by-products such as hides and ‘trophy hunting’ offer some income to Chital farmers, the major commercial activity from chital deer farming is venison production.

Chital deer appear to have some advantage over temperate farmed deer species in that stags have less seasonal variation in carcass composition and lower carcass fat content. Annual variations from 2.2 to 7.2% of carcass fat content have been measured. Older chital stags do have higher fat contents than younger stags however, and desired slaughter turn-off to ensure meat quality occurs between 16 to 34 months of age.

Dressing percentages (100 x hot carcass weight/live weight) appear to range around 60% with expected carcass weights for 16 to 34 month old stags ranging from 28 to 36 kg, with older and heavier stags attaining 40 to 50 kg carcass weight. Chital deer are also known to be high yielding in subsequent boning procedures. Assuming adequate standards of on-farm and pre-slaughter animal handling, venison from Chital deer is considered to compare favourably with that from other deer species.

Velvet Antler

Chital stags, like other farmed deer species in Australia, will grow a complete set of antlers each year and stags remain actively grow velvet antler for approximately 3 to 4 months. The interval from casting to casting appears to range from 45 to 60 weeks. Individual stags usually replace their antlers annually but not necessarily in synchrony with other stags. This means on any property it is possible that stags in hard antler and velvet antler can be present at the same time.
A degree of concentrated antler casting (and hence subsequent antler velvet growth) has been suggested between August and November, however within and between farm variation is likely to occur with antler casting periods.

Velvet antler is used primarily in Asian medicine, however while chital stags may yield up to 1 kg of velvet per year, velvet harvesting is not generally considered a commercial activity for chital deer and hence is of minor economic importance to Chital deer farmers.

Summary Calendar of Operations

Due to their ability to breed year round, it is difficult to confine husbandry procedures for Chital deer to set calendar periods. The actual timing of management and husbandry procedures varies from farm to farm.

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**SAMBAR DEER**

**Introduction**

Sambar are well established in the Victorian high country and in small localised areas of NSW and according to some reports, the Northern Territory.

They originated from Southern Asia and India and are usually seen as solitary animals or only in very small groups in the wild.

There is only one known commercial Sambar deer farm in Australia.

**Handling**

Sambar deer are renowned for their individuality. Even when part of a mob each animal is likely to assess each challenge or threat with little consideration of the reaction of other animals. This means animals need to be handled with patience and time devoted to training and familiarisation of animals to handling facilities is invaluable.

A system of lane ways suitable for other deer is also suitable for Sambar.

Facilities suitable for handling Red Deer and Wapiti appear suitable for Sambar, however experience suggests that operators should work the deer from above the pens rather than from within them.

The unpredictable nature of Sambar deer increases the risks of working in a pen of Sambar. The deer can be moved through gates and races with the aid of a long pole used from a platform above the yards.

**Figure 15 - Sambar Stag and Hinds**
Reproduction

Sambar deer are bred throughout the year although rutting peaks are likely to occur only in Spring (September/October) and early autumn (March/April). The oestrus cycle is thought to be about 17 days and the gestation period is thought to average about 233 days. This means calves are predominantly dropped in May/June and November/December.

Little accurate information about annual calving and weaning rates is available, although anecdotal information suggests annual weaning rates of close to 98%.

Nutrition, Body Weight and Condition Score

Most nutritional information for Sambar deer is based on anecdotal information. However that data suggests a similar requirement (on a metabolic liveweight basis) to other deer.

Guide live weight for mature Sambar hinds is about 130kg and for sires about 225kg.

If females can be successfully joined at about 75% of mature weight (similar to other deer) an estimated minimum mating weight for Sambar hinds is 85 to 95 kg.

Until better information is available feeding regimes used for Red deer (linked to production status) are probably reasonable for Sambar deer. Owners should monitor the deer regularly to ensure nutrition requirements are met.

Joining

Non season breeding activities of Sambar suggest management requirements would be similar to those suggested for Rusa and Chital deer.

In the absence of other data a male to female breeding similar to Rusa deer (1:30) is suggested.

Calving

A guide average birth weight of 4.5 to 5.5kg is reported. Other calving activities are similar to Rusa deer.

Weaning

In Australia’s only commercial Sambar deer farm, calves are weaned naturally by the hind. No other weaning policy is used.

If Sambar deer are to have a place in the commercial deer industry a more defined program will be necessary.

Artificial Insemination

Data is not readily available on artificial insemination in Sambar deer.
Hybridisation

Sambar deer hybridise readily with Rusa deer and this easy cross breeding program appears to offer the greatest commercial opportunity for Sambar deer.

Sambar/Rusa hybrids grow rapidly and can be used in developing an efficient venison production program.

Animal Health

Little is known of animal health requirements of farmed Sambar deer. To date few, if any, problems have been reported.

Figure 16 - Sambar Stag

Venison Production

Sambar deer and Sambar/Rusa hybrids are reported to produce stock that average a high dressing percentage (60%-65%). For Sambar deer he has processed, Lyle Murray reports an average live weight of 110 to 115kg at 12 months of age with a 65 to 70kg carcase.

Meat quality of Sambar deer is thought to be similar to other deer.

Velvet Antler

Sambar velvet does have a value although only minimal quantities of Sambar velvet antler are sold within Australia.
Summary Calendar of Operations

Due to their ability to breed year round, it is difficult to confine husbandry procedures for Sambar deer to set calendar periods. The actual timing of management and husbandry procedures varies from farm to farm.

### Management Criteria

#### Stags
- **Mating**
  - Main mating period
  - Mating
- **Velvet antler**
- **Velvet/ hard antler**
- **Hard antler**
- **Antler casting**

#### Hinds
- **Main calving period**
- **Extended calving**
- **Lactation**
- **Weaning**
- **Late Weaning**

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