RUNNING A SMALL FLOCK OF SHEEP

SECOND EDITION

DAVID G. HINTON

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Illustrations by Elspeth Lacey

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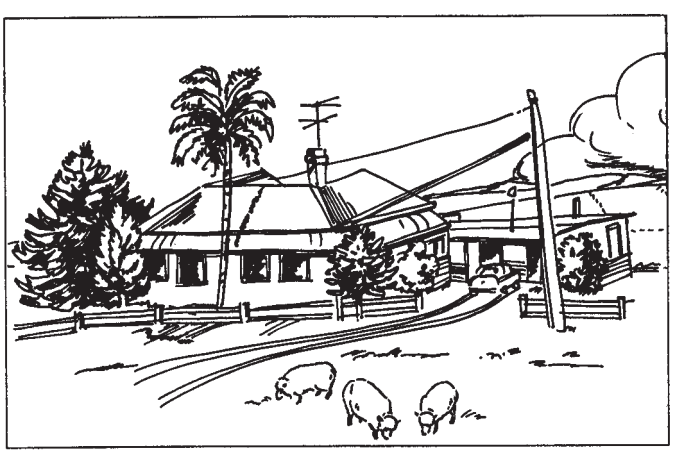
1

Introduction

Sheep farming is a very satisfying and challenging occupation, interest or hobby. Choosing the right sheep enterprise and starting with the necessary information are essential to success and enjoyment.

Preparation and understanding are the keys to successful sheep farming. This book provides the information you need to make the right choices about getting started as a sheep grazier. The step-by-step approach will prepare you for each procedure and event on a sheep farm. No matter how little or great your experience with sheep and wool, this book will explain, in understandable terminology, the main aspects of establishing and successfully managing a small flock of sheep in Australia. Whether you own a single pet sheep, a small commercial flock, prime lamb or wool producers, or just lawn mowers, the following pages will prove an invaluable guide.

Running a Small Flock of Sheep is best read from cover to cover for a broad understanding, then it can be kept handy as a ready reference. The Contents pages and Index will allow you to find the information you need quickly. Chapter 12, on management, provides a quick checklist of all operations and events. The glossaries of sheep and wool terminology will ensure that you are not left in the dark when talking to other farmers or reading farming literature.



2

Sheep in Australia

A woolly heritage – setting the scene

Sheep are not native to Australia but intensive selection has developed lines of sheep that are well adapted to conditions in the various regions of the country.

The first sheep to arrive in this country came with the first fleet in 1788 but they failed to survive. Merino sheep from the Royal Spanish bloodline were introduced in 1797 from the Cape of Good Hope. Fine wooled Saxon Merinos were introduced from Germany and they have, to a large degree, been responsible for Australia's superior fine-apparel wools. The fine wool industry that developed in Tasmania strongly influenced the establishment of a wool industry in the Western District of Victoria during the 1830s. In the 1860s, a larger, stronger, Merino strain called the Peppin was developed to suit the harsher inland areas and this strain still predominates in those areas.

The upheaval of the goldrush period put an end to the practice of shepherding and created a large demand for meat to feed the rapidly expanding population. British breeds of sheep were introduced as they produced more meat than the Merino breeds. A number of British breeds have influenced the meat producing side of the sheep industry, primarily by cross-breeding to produce prime lambs from dual purpose Merino/British cross-bred ewes.

By cross-breeding Lincolns and Merinos, two Australian breeds were established. The Corriedale is a dual purpose sheep that produces a heavy fleece of stronger wool and a large carcase, while the Polwarth is a robust wool producer that suits colder areas. The Comeback sheep, while not a specific breed, is the result of cross-breeding and then breeding back towards the Merino to produce medium to fine wools. The Perendale, a New Zealand breed, is the most notable of other dual purpose breeds in Australia.

From the late 1900s a number of new breeds were introduced, some with leaner and larger bodies to satisfy healthy eating and easy preparation preferences, others for new markets in the Middle East and most to provide an alternative to declining wool returns.

These new breeds included the South African Meat Merino, White Suffolk, Finn, Damara and Dorper sheep.

The coarse wool required for carpet manufacture has led to the development of breeds such as Elliotdale, Tukidale and Drysdale.

Advances in breeding technology have allowed rapid changes and improvement in breeds and importing of exotic breeds by the use of artificial insemination and embryo transfer techniques in stud flocks. This end of the sheep farming continuum is very high-tech, innovative and expensive for those who have the dollars and inclination to be industry leaders.

The sheep industry today – an overview

Wool industry

Today the wool industry primarily uses Merinos, Polwarths, Corriedales, Comebacks and their crosses. The Merinos, which predominate, are generally classified as strong, medium or fine; this traditionally reflected their body size and wool type, although recent advances are breaking this correlation. The stronger sheep are large and robust and are often referred to as 'South Australian' type Merinos but are found throughout the dryer regions of Australia. The fine wooled sheep are traditionally more delicate and require more intensive management; the quantity of wool cut is smaller but usually brings premium prices. Recent breeding advances are now producing large-framed, fine wooled Merinos. The finer end of this group is called super-fine, or, if they are kept in sheds and on controlled diets, Sharlea. Medium-type Merinos are most common in southern areas where more intensive farming and reliable pastures exist.

Sharlea (shedded), super-fine sheep.

Meat industry

For prime lamb production, breeders cross a large-framed ram, such as the Border Leicester, Dorset or Romney Marsh, with a Merino ewe producing a first-cross ewe or prime lamb mother. The dual purpose first-cross ewe produces a large cut of medium to coarse wool, is robust, milks prolifically and breeds easily with many multiple births. These first-cross ewes are mated to British breed rams such as the Poll Dorset, Dorset Horn, South Down, Suffolk, South Suffolk, Hampshire Down, Finnsheep, White Suffolk, Texel or Perendale and produce a second-cross prime lamb. First-cross Merino lambs can also be targeted for the prime lamb trade when demand is strong and large-framed ewes are joined to large-framed terminal sires (rams with meat trade qualities).

Prime second-cross lambs.

Export prospects sometimes create an opportunity for a specific carcase requirement. These markets may be longer term or for special cultural occasions and festivals.

Prime lamb producing flocks are run where reliable pastures or crops can grow to rapidly finish the lamb ready for market. This is usually in the higher rainfall areas or on irrigated land and some cropping areas. In lower rainfall areas breeders will produce store or unfinished lambs for on-selling to farms with the capacity to finish growing the weaned lamb ready for market.

Mutton, from older animals than lambs, is also an important meat product that comes from sheep sold because they are aged, surplus or have faults; mutton is mostly used for processing.

Live sheep export

Export of live sheep for meat purposes has a significant influence on the sheep industry. Wethers of various ages and higher weights make up the majority of live sheep exported, but some lambs, ram lambs and rams are also sold to the exporters. Specific market

demands for particular types of sheep also create niche marketing opportunities, such as with 'fat tailed' lambs for the Middle East. These sheep are usually purchased on condition of delivery to the pre-embarkation feedlot and are subject to health checks, very specific size, weight and age requirements, and pre-treatments such as scabby mouth vaccination.

Live sheep ship.

Specialist industries

Carpet wool is produced in a small number of flocks mostly in the more fertile areas. Milking sheep for cheese manufacture is a very small industry in high rainfall areas. The skins of Damara sheep, in particular, are used in high fashion fine leather clothing and accessories.

Damara leather clothes.

3

Sheep enterprises

There are different types of sheep and end products and each requires different methods of management. While most sheep produce both wool and meat, the primary purpose of most farmers is to produce either wool or meat, although some enterprises are dual purpose and many farmers breed sheep for other farmers to buy.

Wool (non-breeders, wethers)

This enterprise mostly uses Merino wethers to produce special lines of wool. Wethers are de-sexed male sheep that are either bred or purchased at 6–18 months of age and then sold at four to five years. Selection of good wool producers is essential, along with proper preparation and marketing of the wool. Routine animal health treatments prevent common problems, close supervision during flystrike waves is needed and lower quality feed is usually adequate.

Merino wethers.

Wool breeders

Merino, Polwarth, Corriedale and their crosses are kept primarily for quality wool production. Rams are usually purchased from studs. Ewes are either purchased at 6–18 months or bred on the farm; the latter is called a *self-replacing flock*. Correct selection of ewes and rams and skilled classing of breeders is critical.

Merino ewes (shorn).

Ewes may be mated to rams of the same breed, as in the self-replacing flock, with surplus weaners being sold to other farmers. Alternatively, the ewes can be mated to Border Leicester, Dorset or Romney Marsh rams producing *first-cross lambs*. The wether portion is sold as prime lamb and the ewes are sold at 6–18 months as breeders for prime lamb producers. It is common in larger flocks to have both self-replacing and first-cross breeders.

Prime lamb breeders

First-cross, Romney or Corriedale ewes are the predominant breeds for this enterprise since they are robust, easily managed sheep with high fertility and good milk production. These ewes grow around 4 kg of medium to coarse wool per year. They are purchased and then mated at 18 months to British breed rams such as Poll Dorset, South Down, Dorset Horn, Suffolk, Hampshire Down, South Suffolk, White Suffolk, Finnsheep and others. A meaty second-cross lamb is produced and is sold before weaning as prime *sucker lamb* at three to six months. Lambs that do not make butcher quality are weaned and then shorn before re-finishing or are sold as store lambs for other farmers to shear and fatten as turnover lambs.

First-cross ewes.

Prime second-cross sucker lambs.

While these sheep are easier to manage than Merinos, considerable effort must be put into providing good quality pasture for the ewe and lamb to ensure the lamb meets market requirements. Lambing should be timed to meet marketing plans and pasture growth expectations. This can mean that ewes may be lambing in winter, demanding extra skill and attention from the owner.

Turnover lambs (carryover lambs)

These are first- or second-cross lambs that were not marketable to butchers at such a reasonable price as sucker lambs, so are weaned and sold as store lambs. The re-finisher requires a fodder crop or lush pasture, most commonly found in irrigated or high rainfall

areas, to finish the lambs at a time when prices are normally high. The lambs are shorn before re-finishing commences. The economic success of this enterprise is heavily dependent on volatile markets retaining high prices; a large outlay and small profit margin make turnover lambs a risky enterprise. If crops or pasture fail and lambs do not finish on time the losses escalate as lambs grow into two-tooth sheep of much lower value.

Store lambs to be shorn and finished as turnover lambs.

Studs

Breeding stud sheep can be very interesting and challenging, but careful thought and preparation are needed before embarking on such a task. An in-depth knowledge of sheep husbandry and the chosen breed is essential. The cost of purchasing foundation breeders and other start-up and ongoing costs are very high. Mating, lambing, showing and recording all require a lot of extra work for the stud breeder. It may take many years and much expense before cost recovery is reached and, generally speaking, it is only the well-known studs that receive big prices. Showing, testing (LAMBPLAN, WoolPlan), performance recording and advertising can be used to promote the stud.

A stud flock owner usually buys stud rams to join with the nucleus ewe flock or may purchase semen for artificial insemination or even use embryo transfer (ET) technology to accelerate desirable features in the stud. Sales from a stud include stud rams, flock rams, a few stud ewes and, for wool sheep, flock ewes. Prices vary from many thousands of dollars down to meat value.

Each breed has its own society or umbrella organisation that registers breeders and all stud stock. These breed societies are an excellent source of information and most can be contacted through the Royal Agricultural Society or the internet. Some breeds no longer in commercial demand are maintained by enthusiasts to preserve the genetic pool and the long heritage that accompanies them. Many of these breeds belong to the Heritage Breeds group.

Carpet wool

These are a robust, easy care type of sheep that produce a specialty wool fibre used in carpet manufacture. Most carpet wool enterprises are self-replacing breeding flocks, running breeders and dry sheep. The main breeds are Drysdale, Tukidale and Elliotdale.

Carpet wool sheep.

Carpet wool sheep are shorn more than once and up to twice per year. Frequency of shearing is dictated by fleece growth rate and market requirements on fibre length. Sales are primarily wool, although many flocks also have a stud component. Higher rainfall and improved pasture areas are preferred for carpet wool flocks. The fleece must be kept clean, with low amounts of dust and vegetable matter.

Pets, spinners, rations and lawn mowers

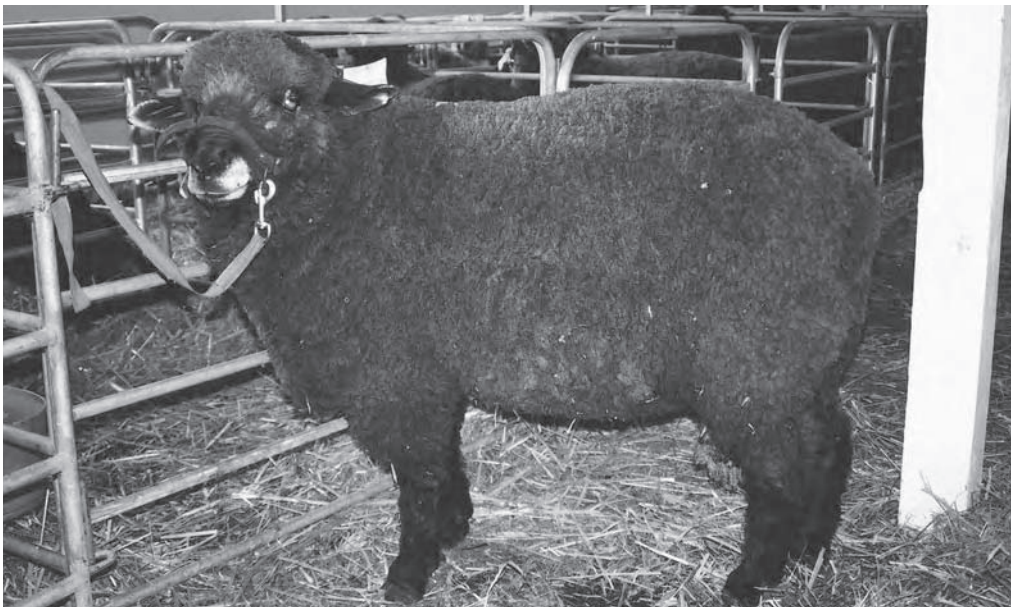
Sheep may be kept for a number of non-commercial purposes. Sheep are a minimum care animal compared to traditional pets such as cats, dogs or birds. They are self-feeding, require only minimum supervision and can add a great deal of interest and character to a rural lifestyle.

For people interested in hand spinning wool, growing your own wool has many advantages; however, careful selection, breeding and management are required to achieve the desired type and quality of wool.

Home-grown lamb provides very economical meat for the freezer and plate, as long as family members are not too attached to the animal prior to slaughter.

A flock of sheep can save a lot of time mowing a small block but they do require care and will complicate landscaping as they are hard on unprotected small trees and plants.

Many garden plants are poisonous to sheep, therefore sheep should be excluded from the garden. Only feed garden vegetation that is known to be safe.



Coloured sheep, for pets and hand spinning.

Most sheep in small groups will become accustomed to humans if they are adopted young and fed often. They will bleat and follow family members in hope of food, which can be annoying and deleterious to gardens if they are not confined to their own paddocks. Pet rams have no fear of humans, so they are extremely and unpredictably dangerous. They should be either sold or castrated well before reaching maturity.

Pet and novelty sheep.

4

Choosing a sheep enterprise

Choosing the right type of sheep enterprise is very important. To make this choice it is necessary to ask yourself the following:

- What is my purpose and aim in having sheep?
- What do I want to produce?
- How much time do I have for the sheep?
- How often can I check them? Twice a day, daily or weekly?
- How much money and time do I want to spend on setting up?
- Do I want a commercially viable operation or an inexpensive hobby?
- Do I want to get involved in the intricacies of stud breeding?
- What is my level of experience?

With your answers in mind, Table 4.1 will act as a guide to choosing the right enterprise or combination of compatible enterprises to suit your finances, experience, time and desired outcomes.

For example, if the aim of running sheep is simply to control grass and reduce fire risk then the least cost, minimum labour option of robust wethers is best.

Inexperienced operators are best to start with an enterprise that does not have a high degree of difficulty until confidence and competence grow.

Table 4.1 Enterprise selection guide

**Wool type: F, fine; M, medium; S, strong; C, coarse.*

Enterprise	*Wool type**	*Breed lambs*	*Labour input*	*Set-up cost*	*Supervision*	*Difficulty*
Wethers	F, M, S	no	low	low	low	low
Wool breeders	F, M, S	wool and 1st-cross	high	medium	high	high
Prime lamb breeders	M, S, C	prime	high	medium	high	medium
Turnover lambs	C	no	medium	medium	medium	low
Stud: wool breed	F, M, S	stud	very high	very high	high	very high
Stud: meat breed	M, S, C	stud	high	very high	high	very high
Carpet wool	Carpet	pure and prime	high	high	medium	medium
Pets, lawn mowers	M, S, C	optional	low–medium	low	low–medium	low
Rations	M, S, C	cross-bred	medium	medium	high	medium
Spinners	special	optional	medium	low	medium	medium

Notes

Breed. All breeding enterprises require adequate, good quality grazing to support lactation (milking) and lamb growth.

Labour. In a breeding flock it would be normal to handle all sheep at least six times each year.

Set-up costs. The initial capital cost can vary from a simple yard and adopted orphaned lambs to many thousands of dollars for stud stock, elaborate sheepyards and a shearing shed with all the latest technology.

Supervision. Inspection of the flock twice a day is necessary during lambing, so breeding sheep should be avoided by absentee owners. All sheep need some supervision depending on the degree of risk at the time. Risks include: weather, water supply failure, pasture quantity and quality, diseases (including flystrike), predators and age.

Merino flock.

Cross-bred flock.

Prime lamb breeders.

Stud breeding – Dorset Horn, a heritage breed.

5

Breeds

In the year 2000 the vast majority (75%) of the Australian sheep flock were Merino, with another 9% being Merino-derived dual purpose sheep. Around 12% of the national flock consisted of first-cross ewes and their progeny and 4–5% were British breeds primarily used to produce terminal sires and a few fat tailed varieties.[1]

Merino flock.

Breed websites. A web address is provided for breed groups (current at time of printing) at the end of each breed listing to aid in finding more information on particular breeds. These websites will provide contacts, stud lists and often the finer points of a

breed. Not all breeds (particularly the smaller breeds) have a devoted website, and some work under umbrella organisations such as the Australian Stud Sheep Breeders Association (www.assba.com.au). The less common older breeds are fostered by Heritage Sheep Australia and Rare Breeds Trust of Australia (www.rbta.org). State Agricultural Societies are also a good source for current contact details.

Wool breeds

Merino

Merino sheep from a variety of sources were introduced into Australia from 1797 by Captain John MacArthur, who was regarded as the father of our sheep industry. Since then the nature, appearance and productivity of the Australian Merino have changed dramatically. It is now recognised as the best Merino wool producer in the world.

Stud Merino rams.

Strains

Four distinct strains of Merino were developed throughout the 1800s:

Peppin strain. Medium wool sheep that flourish in hot, dry, inland areas and now predominate as the most common strain. This strain includes the best features of the Saxon, Vermont and Rambouillet Merinos.

Saxon strain. Fine and super-fine Merinos originally bred in Tasmania.

South Australian strain. Merinos with strong wool, a large body size and able to survive in harsh, dry areas.

Spanish Merino. Members of this strain, although few in number, now achieve body weights and fleece weights similar to the Peppin strain, and prefer the same climatic zones.

Stud Merino ewes.

Wool types

Merino sheep, when described by wool type, are classified as:

Ultra-fine wool. Fibre diameter 17.5 microns or finer with some down to 12.5 microns.

Super-fine wool. Small to medium frame, dense, soft fleeces of excellent colour, 17.6–18.5 microns and 70 mm staple length.

Fine wool. Medium frame, dense, soft fleeces of good colour, up to 19 microns and 75 mm staple length.

Fine-medium wool. Between 19.6 and 20.5 microns.

Medium wool. Large frame, heavy fleeces of soft handle, good colour, 20–22 microns and a staple length of around 90 mm. Extensively used for cross-breeding with large-framed rams to produce prime lamb mothers.

Strong wool. Very large frame, robust, plain body (few wrinkles), open faced and relatively easy care in dry areas, heavy fleece of 7–8 kg, 23–25 microns and 100 mm staple length.

Website: www.merinos.com.au

Poll Merino

This hornless Merino type is represented in all of the above classes. It has been bred by selecting for a recessive gene to produce a pure Merino without horns. The advantages of Poll Merino sheep are reduced poll flystrike and less injury to handlers and other sheep. Website: www.merinos.com.au

Merino rams.

Black and coloured wool sheep

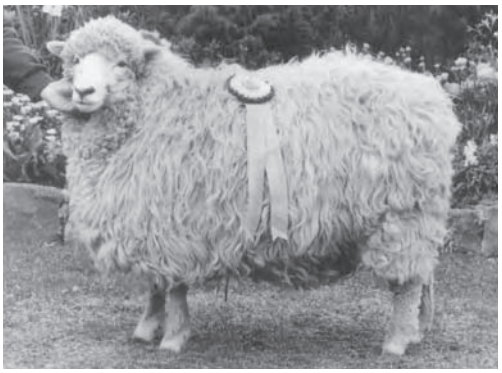
Breeding black and coloured sheep has become a specialty for people wishing to spin their own wool. These sheep are mostly derived from a variety of Merino bloodlines. Selective breeding is used to develop the characteristics that the hand spinner requires. Website: www.ballaratweb.net/bcsbaa

Coloured Merino sheep.

Carpet wool breeds

As the name suggests, these sheep have been bred to produce wool that gives carpet its resilience and hard wearing characteristics. The chalky white wool is coarse, greater than 35 microns, harsh to handle, long and fast growing, requiring shearing twice per year. Unlike other wool, carpet wool is medullated (has a core) that makes it hair-like and is able to hold dyes readily.

Drysdale. Large frame, black hooves, excellent prime lamb mothers as they milk well, horned, dual purpose, fleece is 40 microns and without any crimp.



Drysdale sheep.

Elliotdale sheep.

Elliotdale. Medium frame, robust, produces prime lambs (particularly if crossed to a terminal sire), ewes are polled and rams either horned or polled. Fleece is greater than 40 microns and 120–150 mm for six months' growth.

Tukidale. Medium frame, robust, produces good prime lambs, horned. The highly medullated, 35 micron (or greater) fleece grows at a rate of 2.5 cm per month.

Tukidale ewes.

Dual purpose wool and meat breeds

Merino-derived dual purpose breeds:

Bond. Large frame, produces good prime lamb carcases, a long stapled fleece of 22–28 microns. Website: www.bondsheep.org.au

Bond rams.

Comeback. A Merino crossed to a Polwarth or Corriedale then bred back toward a Merino wool type. Fleece is 21–25 microns and greater than 110 mm in length.

Cormo. Large frame, robust, plain body, fine fleece of 20–23 microns. Most flocks are in Tasmania.

Corriedale. Large frame, polled, good prime lamb, heavy, medium fine fleece of 25–30 microns and staple length of 150 mm. Website: www.corriedale.org.au

Dohne (pronounced Doon-ee). Developed in South Africa from Peppin-type ewes and German Mutton Merinos, now a leading wool breed in that country and recently introduced to Australia. Polled and plain bodied,

Corriedale ram.

Dohne ewes.

Polwarth rams.

wool 18–22 microns, high fertility of 110 to 150% and rapid lamb growth to weaning producing good prime lamb. Website: www.dohne.com.au

Polwarth. Large frame, polled, robust, plain bodied, heavy (6–7 kg), medium fine fleece of 21–25 microns and 110–120 mm staple length. Produces a lean carcase, desirable for specific markets, or use in selected cross-breeding. Website: www.polwarth.com.au

Meat breeds

Meat breeds are mostly used for cross-breeding. Those originating in the United Kingdom are often referred to as British breeds.

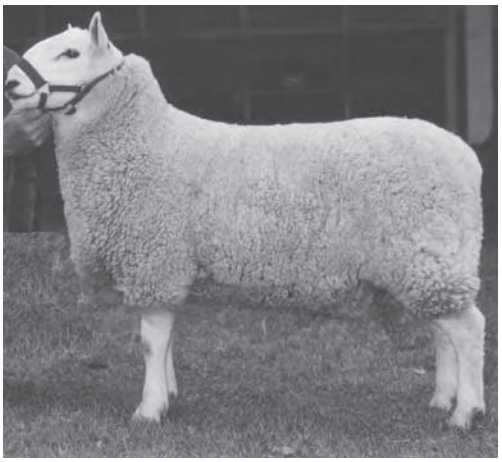
Long wool breeds

Border Leicester. Large frame, polled, Roman nosed, wool-less head and legs, long coarse fleece of 32–38 microns. Primarily used to mate with Merino ewes to produce prime lamb mothers and wether lambs for slaughter. Websites: www.assba.com.au; www.nswborderleicester.org

Border Leicester ram.

Cheviot. A large-framed, alert and active sheep, a wool-less face and pricked ears are distinguishing, thrives in southern hill country, the fleece is distinctive and used in tweeds and hand spinning. An ancient breed from the Scottish high country. Website: www.assba.com.au

Coopworth. Large-framed, dual purpose breed producing long, lean carcases; have high fertility, milking and mothering ability; wool is 33–38 microns. A relatively recent breed introduced to Australia in 1976. Bred from a Border Leicester × Romney cross. Website: www.coopworth.org.au



Cheviot ram.

Coopworth ram.

English Leicester. Large frame; good fertility, mothering and milking; an ancient breed with limited availability in Australia. Fleece is long (200–250 mm), curly and 32–38 microns. Prefers temperate areas. Websites: www.ballaratweb.net/elaa; www.assba.com.au

English Leicester ram.

Lincoln ram.

Gromark. Large-framed, dual purpose sheep developed from a Border Leicester × Corriedale cross in NSW in 1965. Wool is 27–33 microns. Mainly used as a terminal sire for large lean lambs. Website: www.gromark.com

Lincoln. A very ancient breed with a large, lean carcase and a fleece of 300–400 mm and 38 microns. Used in the creation of Polwarth and Corriedale breeds.
Website: www.assba.com.au

Perendale. Large frame, polled, very robust; good, fertile and protective mother; strong fleece of 28–34 microns and around 125 mm in length. Most popular in high rainfall, southern areas. Bred from a Cheviot × Romney cross in New Zealand in the 1940s. Website: www.perendale.com.au


Perendale ewe and lambs.


Romney ram.

Romney. Large frame, robust, polled, good mother and relatively lean lamb; heavy, coarse fleece of 30–40 microns and 200 mm staple length. Best in temperate, higher rainfall areas. Website: www.assba.com.au

South African Meat Merino (SAMM). A recent arrival in Australia (mid 1990s), dual purpose but emphasis on meat, high fertility and long breeding cycle. Fleece is 22–23 microns.


SAMM ewe and lambs.

Short wool breeds

Dorset Down. A medium-framed, quick maturing breed with black face, ears and legs and a white downy fleece. A terminal prime lamb sire but with limited availability. Website: www.assba.com.au

Dorset Horn. Medium frame, short fleece of around 27 microns. A fertile breed traditionally used as terminal sires. Website: www.assba.com.au

East Friesian. A large-framed, recent introduction (1996) from Sweden, it is primarily used as a terminal sire in cross-breeding. Produces hybrid vigour, rapid growth and large, lean carcases.

Finnsheep. Also called 'Finnish Landrace', or just 'Finn'. Large frame, polled, clear face and legs; fleeces are fine to medium. This breed was introduced in 1993 and is ideal for rearing large, lean prime lambs. The ewes are heavy milkers and readily produce multiple births with


Dorset Down ram.

Dorset Horn ram.

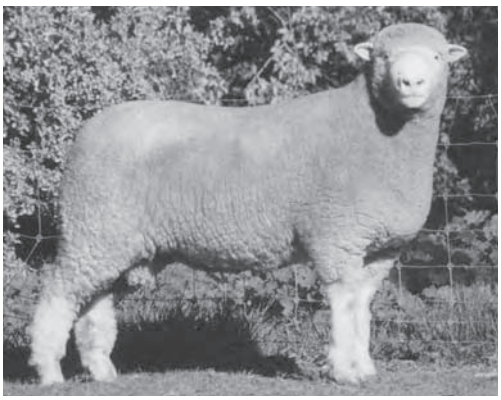
East Friesian ewes.

lambing rates often exceeding 200%. Finn wool is soft and lustrous, so highly sought for spinning and felting. Website: www.finnsheep.asn.au

Hampshire Down. Medium to large frame, polled, tall, black legs, ears and face and a 26 micron fleece of around 90 mm staple length. Used as terminal sires in cross-breeding in better areas. Limited availability. Website: www.assba.com.au

Finnsheep ram lamb.

Hampshire Down ram.



Poll Dorset ram.

Ryeland ram.

Poll Dorset. Medium frame, polled, short down-type fleece of 30 microns. A fertile breed with good mothering and milking ability. A well-developed breed, suitable for all prime lamb markets and currently the most popular terminal sire. Website: www.polldorset.org.au

Ryeland. Medium frame, polled and small, downy fleece. Good fertility and milking and easy lambing are claimed for this breed that provides terminal prime lamb sires for cross-breeding, mostly in southern high rainfall areas. Website: www.assba.com.au

Shropshire. Medium frame, black points, a very ancient British breed producing 100 mm long, 26 micron wool and quality prime lamb carcases. Very limited availability. Website: www.assba.com.au

Shropshire ram.

South Down ram.

South Down. Small frame, short legs, polled and small, downy fleece. This fertile breed primarily provides terminal sires for producing prime lambs mostly in southern areas. Website: www.assba.com.au

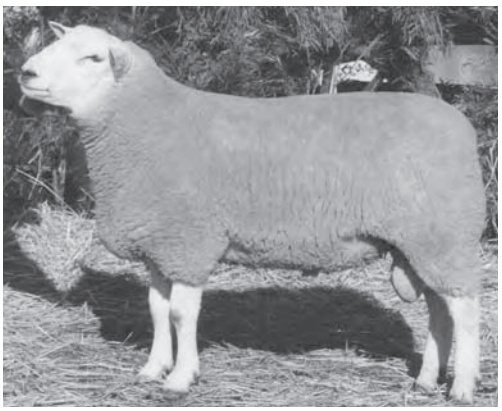
South Suffolk. Medium to large frame, chocolate coloured points with clean face and legs, black hooves, short, downy fleece of 28–30 microns. Used as a terminal sire for fast growing, lean prime lambs, adaptable to most regions in Australia. Website: www.victoriansouthsuffolksociety.com

South Suffolk ram.

Suffolk ram.

Suffolk. Large frame, polled, black legs and face, small, downy fleece of 24–27 microns. Mostly used for cross-breeding for prime lamb; best in higher rainfall southern areas. Website www.suffolk.com.au

Texel. An early 1990s introduction from northern Europe; produces a heavily muscled, lean carcase for the lamb trade and is mostly used as a cross-breeding sire. The fleece is around 100 mm staple length and 30–34 microns. Website: www.texel.org.au



Texel ram.

White Suffolk ram.

White Suffolk. Large frame, all white with no dark fibres in its downy type fleece. A fertile breed mostly used as terminal sires in prime lamb production. Website: www.whitesuffolk.org.au

Fat tail breeds

Awassi. First introduced to Australia in 1993 from the Middle East, it is primarily bred for export of ram lambs back to this region. The features of this multipurpose (meat, carpet wool and milk) sheep are: a brown face and points (legs and ears), droopy ears, fat tail and white body. It is very strong and hardy in all conditions.

Damara. First introduced from South Africa in the mid 1990s and bred for export as live sheep and carcases to the Middle East. A very fertile and robust fat tailed sheep with large frame and long legs. The breed has some resistance to parasites and does not need shearing. Suited to meat production and thrives in dry areas.

Karakul. Originating from Iran and Afghanistan, they feature a variety of colours including black, grey, tan, brown and white, although they are mostly born with a curly black pelt. Their ears are downward pointing, they have a Roman nose and fat tail. In Australia their primary use is to supply rams, lambs and young sheep to the Middle East.

Fat tail breed – Damara.

Damara ram.

Damara sheep leather products.

Fleece shedding breeds

Dorper. A new breed from South Africa, with a white body and black or white face; the fleece contains both hair and wool that will fall out if not shorn. A hardy breed developed from a Blackhead Persian × Dorset Horn cross, will do well in many conditions. Website: www.dorper.com.au

Wiltshire Horn. An easy care, horned, medium-sized breed that sheds its short fleece in spring leaving a hair undercoat for summer; produces prime lambs. Website: www.wiltshirehorn.asn.au

Dorper ram.

Fleece shedding breeds – Wiltshire Horn ram moulting.

Wiltshire Horn ewe.

Wiltipoll (Poll Wiltshire). An easy care breed that is predominantly Wiltshire Horn blood but is polled and completely sheds its fleece during spring and summer. The fleece is of no commercial value. Produces heavy prime lambs even in marginal conditions. The easy care nature makes them ideal for small holdings, organic farmers, grass control and pets. Website: www.wiltipoll.com

Wiltipoll ram.

Composite breeds

Both stud and commercial breeders cross different pure breeds to produce breeders known as Composite breeds. Composite sheep are selectively bred to gain hybrid vigour and enhance desirable characteristics for target markets. Often a new name is coined for a new composite breed, for example: Aussiedown is the name of a South Down × Texel cross.

Aussiedown ram.

East Friesian × Border Leicester lamb for future breeders.

Meatmaster. Must contain some Damara, but may be crossed with any other breed. Horned or polled, fat tailed, mainly short hair with an underlying blanket of fluffy wool and natural shedding ability. A highly productive meat producer, with minimal handling, lambs at intervals of eight months, good mothering, herding instinct and thrives in harsh conditions.

Others

There are other breeds in Australia that are found only in very small numbers and are used in specialist breeding programs or kept for heritage or sentimental reasons. Advances in breeding technologies allow new breeds to be developed with increasing frequency and rapidity. The new breed names will often indicate their genetic origins.

6

Economics – costs and returns

Farmers are traditionally 'price takers' rather than 'price makers', such as manufacturers or retailers who can set their own price, consequently farmers have limited control over the sale price other than to withhold the product until a better price is offered. Delaying sale stops cash flow, can incur extra costs for storage, transport and unsuccessful sale charges, may cause deterioration in quality of perishable product such as livestock and incurs a risk of falling market prices.

The profitability of sheep farming is dependent upon the difference between the price received for the product and the cost of production.

Production costs

Production costs are divided into three categories:

Capital costs. Land, sheds, fencing, yards and animals.

Fixed costs. Rates, your own labour, maintenance and pasture improvement.

Variable costs. Costs that vary in relation to the number of sheep, such as: drenches, vaccines, shearing, crutching, marking, fly treatments and marketing costs.

Selling price

Selling price is influenced by three major factors:

Overseas factors. Sheep products (wool, skins, mutton, lamb, offal and live sheep) are major export earners for Australia. The majority of sheep products are for export so prices received are heavily dependent upon factors such as overseas demand, trade wars, embargoes, shipping and fluctuations in the value of the Australian dollar. Consequently, there are no fixed or guaranteed prices for any sheep product.

Seasonal supply and demand. Most Australian pastures have both green and dry phases. Sheep grow and finish best on green pasture, so the supply of meat products is

directly influenced by our seasons and weather patterns. For example, in southern Australia prime lamb is in excess and therefore cheaper during spring, the peak growing season. Wool, being non-perishable, can be held over to minimise seasonal fluctuations.

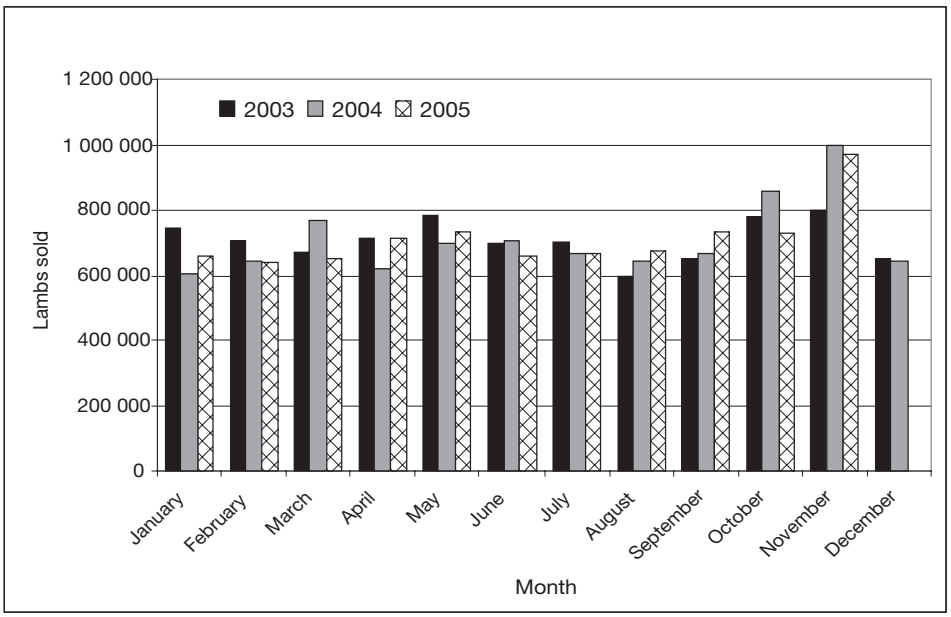


Figure 6.1 Seasonal variations in numbers of lambs offered for sale over three years. (Source: National Livestock Reporting Service.)

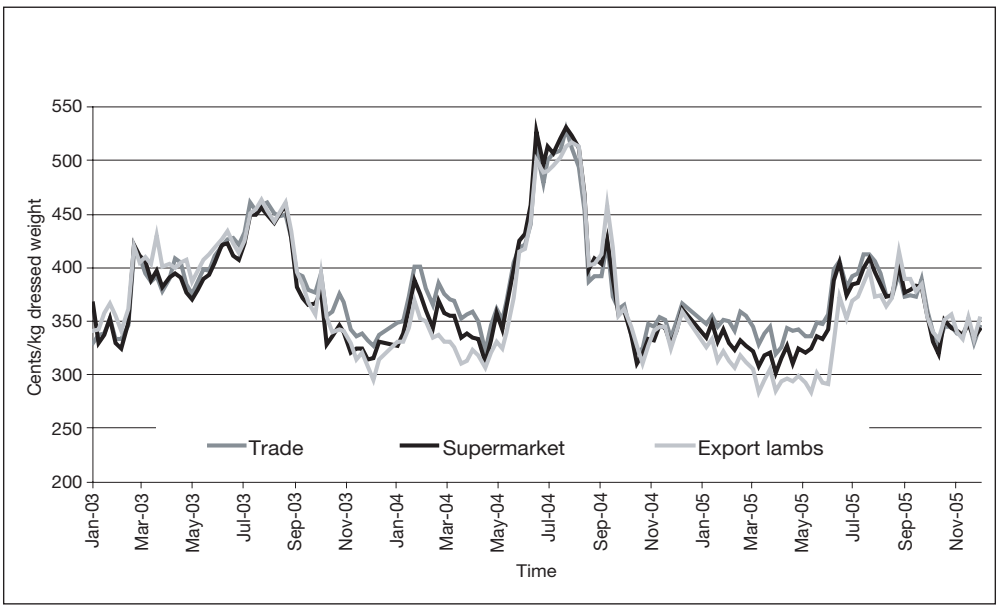


Figure 6.2 Seasonal variations in saleyard prices for lamb over three years. (Source: National Livestock Reporting Service.)

Daily supply and demand. Many factors influence prices from day to day, no matter what the selling method. Some examples of daily supply and demand are: an abattoir is affected by a strike and unable to operate; some buyers withdraw from an auction sale reducing competition and lowering prices; rain makes it difficult to muster and transport sheep, so fewer sheep are offered, reducing supply, increasing competition and raising prices.

A good indication of current selling prices for all sheep products is the market report in farming newspapers and on rural radio stations. The National Livestock Reporting Service provides an independent and objective report on larger sheep markets around the country.

Gross margins

A helpful measure of economic performance and useful budgeting tool is the Gross Margin (GM) of an enterprise. This is calculated by subtracting the variable costs from the income and dividing by the number of a specific resource, such as land, labour, capital or livestock. Common gross margin measures are:

- gross margin per ewe/wether;
- gross margin per Dry Sheep Equivalents (DSE), wether equivalents (see Chapter 9);
- gross margin per $100 of capital (land + improvements + stock = total capital ÷ 100) indicates return for every $100 invested; or,
- gross margin per hectare (ha) used by the sheep.

Table 6.1 Calculating gross margins for a single enterprise

Example: 100 first-cross ewe second-cross lamb breeding enterprise			
Income	minus variable costs	÷ units (number)	= gross margin (GM)
$13 183	– $3510	÷ 100 ewes	= GM $96.73 per ewe (A moderate return for a second-cross lamb breeding enterprise.)
$13 183	– $3510	÷ 250 DSE	= GM $38.69/DSE
$13 183	– $3510	÷ 25 ha	= GM $386.92/ha
$13 183	– $3510	÷ 3 000 ($100 capital) (e.g. $300 000 ÷ 100)	= GM $3.22/$100 capital (A very low investment return that reflects the high cost of land in small parcels.)

Note

These figures are examples only and indicate four particular situations. A sheep industry adviser will be able to provide current expected gross margins for most areas and enterprises. Table 6.2 gives a guide to profitability as expressed by gross margins.

Table 6.2 Typical gross margins for sheep enterprises in January 2005[2]

Enterprises assumed to be running on medium to high carrying capacity country with full pasture maintenance.

Enterprise	*Gross margin $ per:*		
	DSE	head	hectare
Prime lamb breeders: second-cross lambs	33.05	82.64	396.65
Merino breeders producing first-cross lambs	33.48	73.65	401.73
Merino ewes: self-replacing flock (19 micron)	25.97	49.34	311.62
Merino ewes: self-replacing flock (21 micron)	29.66	65.25	355.90
Merino wethers (19 micron)	17.11	15.40	205.28

Note

Caution: Use as a guide only. These calculations are for a particular time and locality and do not include fodder costs. Growers need to make their own calculations using current costs, sale prices and stocking rates for their particular farm. The calculation of a gross margin enables you to directly compare the relative profitability of similar enterprises. Compare gross margins against area, industry and your own expectations before commencing farming and then annually, as a measure of progress and indicator of changes needed.

It needs to be noted that a gross margin is not profit, because it does not include fixed or overhead costs (depreciation, interest payments, rates and permanent labour) that have to be met regardless of enterprise size. Take care and seek professional advice in making comparisons, particularly where different labour, capital and asset arrangements are in place. Allowances need to be made for risk factors, a learning period, personal preference and lifestyle choices.

7

Sheep farm resources and infrastructure

Planning for the right facilities, infrastructure and resources on a sheep farm is critical for both success and enjoyment. Frustration, mistakes and extra work will result from not having the right tools and equipment, inadequate paddocks and fencing, and the inability to move, hold and handle sheep as required.

Paddocks

The property is best divided into enough paddocks to allow different classes of stock, such as rams, weaners and lambing ewes, to be run separately. Additional paddocks will allow spelling for pasture improvement and the saving of pasture for low growth periods, which will assist management and improve stocking rate. Spare paddocks will also allow rotation of sheep that will help control sheep diseases such as worms (internal parasites). Separate paddocks need to be provided for animals that don't get along with sheep, particularly horses.

To assist in pasture and land management it is desirable, as far as is reasonable, that each paddock consist of one soil type or land class and topographical area. Slopes, flats, hill tops, cultivatable areas, rocky outcrops, erosion prone land, waterways and different soil types should be fenced into separate paddocks as far as practicable.

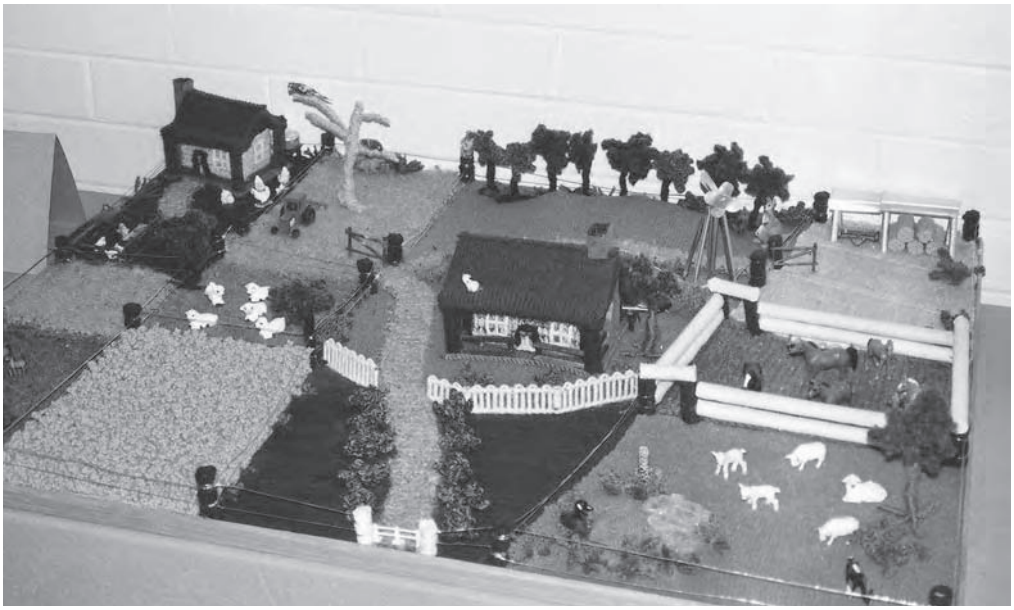
Land classes

The simplest system of land classes is:

Arable land. Suitable for cultivation and cropping.
Grazing and occasional cultivation. Limited cultivation for pasture improvement.
Grazing only. Limited machinery access, poor soil type or soil structure.
Limited grazing. Exposed or steep land, poor ground cover.
Vulnerable land. No grazing, erosion prone, wetlands, native flora reserves.

Aerial photograph

An aerial photograph of your property is a valuable planning tool; it will show all the features from a bird's-eye view. A number of clear, heavy duty plastic overlays positioned on the photograph will allow you to draw in fences, lanes, buildings and water points, mark soil types, trees and other topographical features, add paddock names and even sketch and trial ideas.



Plan your farm.

Each paddock needs to have access to water and a direct as possible route to the sheepyards. A laneway running through the property connecting paddocks will assist with mustering and inspection.

Paddock size

Paddock size is dependent on the total area available and the type and number of sheep to be run. Two examples are:

Ten sheep on three hectares. You could make do with one paddock, but two larger paddocks plus a small ram paddock would be ideal.

A 40 ha property with a 300 ewe self-replacing flock. This could be divided as follows: Thirty-six ha divided into four paddocks (one for ewes, one for weaners and two to allow rotation, drift lambing and pasture development); three ha allocated for a ram paddock; one ha for a holding yard (or yards), shed and homestead.

Trees and shelter

Trees to provide protection from the coldest prevailing winds will be a great asset, improving pasture growth, sheep health and productivity. A sheep proof plantation along

a fence line is the most economical method of establishing trees. Native tree species that are already growing in the area usually do best.

Wet areas

Waterlogged or low-lying wet ground is unsuitable for sheep. It can lead to foot and fleece disease and damage; liver fluke; sheep becoming bogged, cast or stuck; or pugging of the soil.

Summer or dry season grazing of wet areas may be possible, or setting them aside permanently as native flora reserves is an attractive option that will encourage bird life and improve amenity. Waterways are also best fenced out to exclude stock. This will avoid damage to the bank and ecology and reduce the risk of sheep drowning or becoming stuck.

Good planning for land type, shelter and water builds amenity and success.

Fences

Stock owners are liable for damage to vehicles, property or persons on any road or someone else's property caused by their stock, particularly if negligence can be proved against the owner. Negligence can include fences in a poor state of repair or gates left open. Straying sheep might be killed, lost or impounded and are at risk of contracting diseases that can be spread to the rest of the flock when they return.

Secure internal fencing is important for good management of pastures, plantations, gardens and sheep. Wandering sheep will eat saved pasture, destroy new pasture and young trees, cause repeated need for drafting or sorting, create unplanned pregnancies and spread disease. For all these reasons it is essential that a farm be fenced securely.

There are a number of fence styles, methods and materials that can be used to meet your requirements in both the long and short term. Consider what needs to be kept out (feral rabbits, goats, pigs and dogs) as well as what needs to be kept in.

Fabricated fence

The most effective fence for sheep is the factory built 'sheep' or 'sheep and lamb' fabricated fence, with a couple of plain wires or plain wire with barbed wire on top. The specifications for fabricated fences are shown in Table 7.1 as, for example, 5–70–30, meaning respectively, five horizontal wires 70 cm high and 30 cm between vertical wires. Wires are supplied in rolls ready to strain and attach to posts.

Table 7.1 Fabricated fencing (commonly called Hinged Joint or Ringlock)

(Other specifications are also available.)

Use and description		*Lines or wires*	*Height (cm)*	*Between verticals (cm)*
Sheep (low pressure)	5–67–30	5	67	30
Sheep	5–70–30	5	70	30
Sheep and lambs	6–70–30	6	70	30
Cattle, sheep and lambs	6–90–30	6	90	30
Cattle, sheep and lambs	7–90–30	7	90	30
Cattle and sheep	6–90–45	6	90	45
Boundary	8–90–30	8	90	30

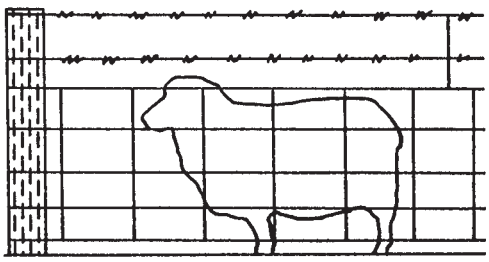


Figure 7.1 Fabricated sheep fence.

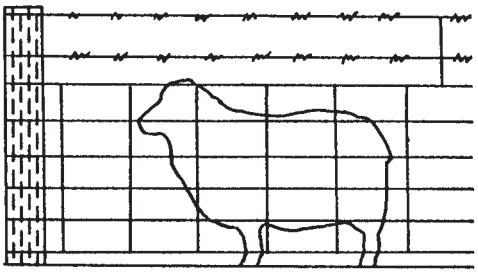


Figure 7.2 Fabricated sheep and lamb fence.

Plain wire fence

High tensile plain wires with posts and droppers will make an improved version of the conventional plain wire fence, but wires need to be kept well strained to hold lambs. Barbed wire is not needed for sheep but is recommended for cattle.

Electric fence

Internal electric fencing for sheep is effective and economical if well constructed and maintained. Alternating earth and hot wires are essential. A four-wire electric fence is adequate in low pressure situations but five- or six-wire fences are better in most instances.

Electric fence – alternating earth and hot wire, hardwood posts.

Rabbit proof netting fence with electric top wire, treated pine corner assembly.

Netting fence

If rabbit incursions from adjoining land are a problem, then a boundary fence using rabbit netting attached to plain wires and buried in the ground is the best option.

Posts

Treated pine, split hardwood, concrete or steel star posts are all effective for any type of fence. Fencing contractors will charge on a per kilometre basis.

Gates and gateways

Gates are usually best in the corners of paddocks. Avoid areas that are wet or low lying. Gates should be able to be chained shut and external gates should be capable of being secured by chain and padlocked. Gateways tend to get muddy; installing gravel or rock will keep the sheep clean and make accessing them easier.

Sheepyards and shearing sheds

Sheepyards

Essential to all sheep farms are a set of yards that allow the sheep to be mustered, held and handled as required. A small holding paddock large enough to hold the largest mob of sheep is the first requirement. Allow one square metre for each two sheep to be held; this will permit the sheep to move around and be held for long periods. Basic sheepyards include a large yard, a race, and two drafting pens as a minimum. The construction of the yards can be simple. Timber posts with timber or pipe rails, corrugated iron or mesh all make good yards.

Good sheepyards and shearing shed.

Timber sheepyards and shearing shed.

Bugle-shaped sheepyards with handling and drafting races.

Steel, cattle and sheepyards and loading ramp.

Basic sheepyards utilising timber and wire.

Less than basic timber sheepyards with motorised shearing plant.

Races

Drafting races. These are used for drafting sheep. This means sorting them using a drafting gate at the end of the race to direct sheep into the chosen pen. With one drafting gate sheep can be sorted two or three ways. With additional drafting gates further down the race, and skilled operators, more categories can be drafted.

Three-way or five-way drafting race.

Handling races. These are used for handling sheep for inspection, drenching, jetting, ageing, condition scoring or any treatment where sheep need to be standing and tightly packed to limit movement.

Sides 900 mm high are best fully enclosed so that sheep can only look and move forward. Drafting and combination races are approximately half a metre wide, narrow enough to prevent turning, and three to four metres long. Those with larger flocks can use a separate handling or working race 650 to 750 mm wide and many metres long. Sheep move more easily up a rise and away from the sun, so position races to run uphill and in a southerly direction.

Plans

Figures 7.3–7.5 show basic sheepyard designs. The sizes can be varied to match the maximum number of sheep; as a general rule allow one square metre for each four sheep in the largest yard and drafting pens. Position the yards in a well-drained area. A loading ramp with easy access for trucks and trailers will also be needed for loading and unloading livestock. Trees for shade and a windbreak will improve operator comfort.

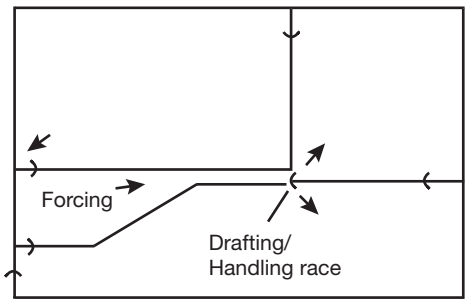


Figure 7.3 Basic sheepyard for small flocks.

More sophisticated designs using curved races are recommended for larger flocks. A

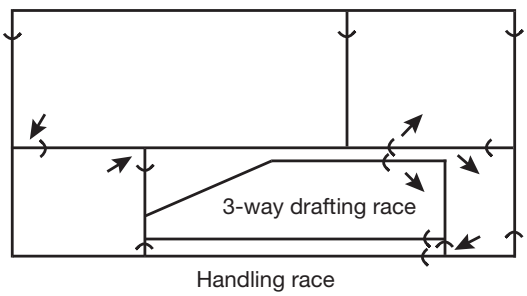


Figure 7.4 Sheepyard with three-way draft and separate handling race.

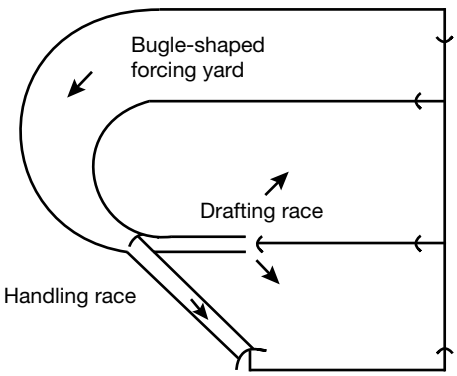


Figure 7.5 Bugle-shaped sheepyard (curved forcing yard).

variety of designs are available from agricultural departments and sheepyard manufacturers.

Shearing sheds

For shearing and crutching, a simple shed containing enough pens to hold a day's shearing, a small catching pen next to the shearing plant and an area to handle and store wool will meet the basic requirements. The pens should have slatted floors to keep sheep clean and the shearing board with a wooden floor. Modern sheds have a raised shearing board to improve wool handling efficiency.

Electric shearing plants are attached to a solid beam above the shearing area. The shearing boards should be well lit but not be exposed to direct sun. For very small flocks some shearers will bring their own shearing plant, either electric or motorised.

Conventional shearing shed – count-out door (right).

Multipurpose shed – shearing plant attaches to central bracket, catching pen (right), count-out pen (left).

Raised board, multi-stand shearing shed – catching pens behind, and count-out behind and under floor.

Count-out pens next to the shearing board hold the shorn sheep from one shearer. For elevated sheds they are accessed via a chute and lane under the shed, or for very small flocks the shorn sheep can move from the shearing board out of the shed and into the paddock or yards.

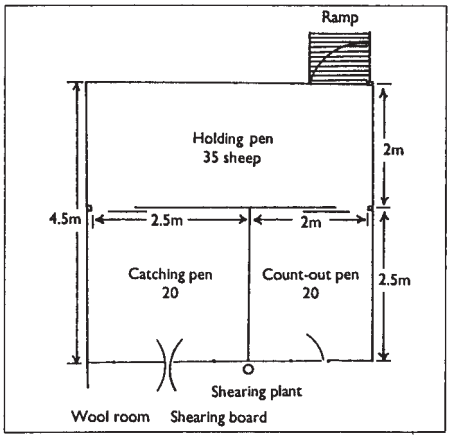


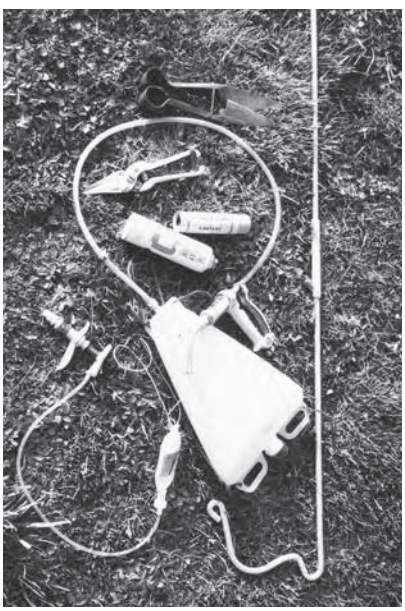
Figure 7.6 A basic single stand shearing shed. (To enlarge the holding pen, allow four sheep per square metre of floor area.)

Shearing is a physically demanding task; therefore strict Occupational Health and Safety standards must be observed. Consult your state workcover authority for guidelines and regulations.

Basic equipment and supplies

Table 7.2 Equipment and materials essential for sheep handling

Equipment	*Supplies*
For all flocks: *wool shears (dagging shears)* *drench gun and backpack* *foot parers (secateurs)* *vaccinator syringe* *holding pen* *yards, drafting and handling race* *loading ramp*	flystrike dressing drench raddle (marking chalk) vaccines
For larger flocks: *identification brand and/or ear tag applicator* *jetter and pump or spray-on applicator* *protective clothing* *shearing facilities and plant* *wool table* *wool press (can be hired)*	branding fluid ear tags fly prevention chemical wool packs and stencils
Additional for breeding flocks: *marking knife or ring applicator* *ear marker (optional)* *shepherd's crook* *lambing gear*	marking rings disinfectant obstetrical lubricant



Tools and supplies – shepherd's crook, wool shears, foot parers, raddle (chalk), spray marker, drench gun and backpack, vaccination syringe and vaccine pack.

Round wool table with scales.

Water

Water requirements vary with the type and quantity of feed eaten as well as the weather. During hot weather sheep on dry feed may drink from three to five litres of water per day and a ewe and lamb up to 14 litres. Water can be supplied from troughs connected to a permanent source via a ball valve or from a dam. Reserves in dams should be double the total requirements, as this will allow for losses through evaporation and seepage.

Allowances must be made for greatest demand situations. While on a long-term average, lactating sheep only require a maximum of seven litres per day, in extreme situations they can drink double that volume. Where water is supplied through troughs it is necessary to ensure the flow rate is adequate to cope with the whole flock arriving to drink at the same time (the normal pattern). As a rule of thumb the water supply to troughs should be able to deliver the total daily requirement in four hours.

The water quantity must be adequate and its quality safe. Water that is salty, very muddy, or contains algae or other pollutants can cause poisoning or deter sheep from drinking. Water with salt levels below 5000 ppm and magnesium below 400 ppm are suitable for all types of sheep. Private, government and water authority laboratories provide water testing services.

Fence off and check unsafe dams.

Pasture, fertilisers and soil treatments

See Chapter 13, ‘Grazing and pasture management’.

8

Responsibilities of sheep owners

Obligations, laws and regulations

When any stock are enclosed by a fence, owned or under supervision their health, wellbeing, whereabouts and compliance with various laws become the responsibility of the owner. Failure to meet these responsibilities can result in prosecution and a penalty. Offences include cruelty, failure to notify authorities of or control certain diseases, allowing stock to stray, failure to identify contamination and contamination of sheep products.

A weak or sick sheep – regular inspection is required to match risk.

An owner must:

- provide all the nutritional and water requirements of sheep to keep them healthy and able to meet the demands of pregnancy, lactation and growth;
- provide a safe environment and protect sheep from injury, predation, harmful food, water and events such as fire and flood;
- provide adequate supervision and inspection (from twice daily for lambing ewes to twice weekly for dry sheep with few risks);
- provide preventive treatments and measures to promote the health and welfare of the sheep (shear, crutch, drench, vaccinate, protect from predation or injury etc.);
- treat injury or disease promptly, obtaining veterinary or other expert attention where necessary;
- humanely destroy animals that are suffering or to prevent suffering where treatment is not given or is unlikely to promptly bring relief;
- notify an Inspector of Stock (Department of Primary Industries or Agriculture) of any

declared or notifiable diseases that are suspected. Each state has a list of diseases that require notification, e.g. footrot, foot and mouth disease, blue tongue and sheep lice;
- contain stock within the property boundaries unless they are being moved under supervision and in accordance with local regulations;
- refrain from using any preparation on or in sheep unless it is registered for that purpose (drug, medicine, paint, dye or chemical) and then only use it at the prescribed rate;
- observe withholding periods after using animal preparations, i.e. withhold sheep from sale or slaughter until the withholding period expires;
- identify sheep before sale using prescribed methods and Property Identification Codes.

Cast sheep – regular shearing and preventive treatments are the owner's obligation.

Each state, territory and local government office has its own regulations and these will change regularly. Ensure you are familiar with rules and regulations applicable to your locality.

Fencing must be adequate to protect sheep from straying and strays entering.

Quality assurance

A number of quality assurance programs exist to protect our products by offering assurances to purchasers and consumers, including importing countries. Some are compulsory, some voluntary and some necessary to be eligible for particular markets. Some of these programs are discussed in Chapter 21, 'Buying and selling sheep', and

include Vendor Declarations and National Vendor Declaration (NVD), National Livestock Identification Scheme (NLIS), Livestock Production Assurance (LPA) and other quality assurance schemes.

Always check local and current requirements and recommendations.

Protecting our product

The success of Australia's sheep, lamb and wool industry rests clearly on maintaining an image of clean, healthy and natural products for both domestic and overseas consumers. A number of laws and a lot of common sense regulate the way these products remain 'clean and green'. Regulations will differ slightly between states but the intent is similar, i.e. to protect consumers and the industry's reputation. Regulations include chemical use and user controls, and National Vendor Declaration (NVD) (see Chapter 21).

Feeding of animal products (including meat meal and bone meal) to sheep is banned. These animal products carry the risk of infecting sheep with diseases such as scrapie (ovine spongiform encephalophy), a disease similar to the better known Mad Cow Disease (bovine spongiform encephalophy, or BSE).

Chemical controls include registration of sheep treatments, i.e. products and rates that can be used for sheep, and withholding periods, i.e. the time stock must be withheld from sale, slaughter, handling (e.g. by shearers) or grazing after treatment or exposure. Similar regulations apply to chemical use on pasture or feed; the interval between application and grazing is stipulated.

Regulations pertain to export slaughter intervals. These are withholding periods imposed by importing countries when they differ from Australian standards.

Effective management of some diseases and contamination is dependent on rapid tracing of products or animals through all its movements and contacts back to the property of origin. The National Livestock Identification Scheme (NLIS) identifies sheep and lambs with a flock ear tag (see Chapter 21 for more information). An official Property Identification Number or Code is issued by state authorities. Check with your local State Department of Primary Industry or Agriculture to ensure correct compliance.

Protecting our sheep

Animal welfare legislation and related Codes of Practice set standards for the care and wellbeing of animals, including sheep. Protection includes preparing for natural events such as drought, fire and flood and predation by foxes, dogs or dingoes.

Livestock disease control legislation regulates the management of diseases

Sheep in a planned safe haven survive a wildfire.

affecting sheep, including both exotic (not local), endemic (common locally) and zoonotic diseases (affects humans). The state, territory and Commonwealth governments have comprehensive plans (AusVet plan) and cost sharing arrangements to tackle specific exotic diseases. There are also state and national programs for managing other specific diseases to contain spread, eradicate disease or protect sheep. Movement of sheep between areas and states can be restricted and parts of states can be declared Infected, Control, Protected and Residual Areas. Only specified sheep diseases are covered by regulations.

Sheep identification and traceability is an integral part of good disease management. Sheep must be identified by the Property Identification Code as required by each state.

Chemicals and treatments used on sheep are aimed at protecting sheep, consumers and the industry's good reputation.

Protecting people

People are the end users of sheep products so it must be remembered that anything given or applied to sheep can impact on the end user. Consumers of sheep meat, wool, skins and other products are protected from chemical or biological contamination by chemical controls, livestock treatments registration and withholding periods.

People who handle sheep on the farm or during transport, at saleyards or abattoirs must also be protected from infection or contamination. Shearers, farm hands and abattoir workers are particularly vulnerable to chemical contamination from skins and wool. Use only registered treatments and observe pre-slaughter and handling rules. Insecticide treatments, however applied, are one of the biggest risks to sheep handlers. Protective clothing, good hygiene and thorough washing are important for all staff handling or treating sheep.

Chemicals

Insecticides, herbicides, vaccines, antibiotics, disinfectants and a variety of medicines or chemicals are commonly used on sheep farms.

Before buying or using chemicals, ask:

- Is this appropriate for the job, conditions and age of plants or animals?
- What equipment is needed for administration?
- What is the correct dose rate?
- Do I have enough chemical or treatment?
- What precautions should I take?
- What are the withholding periods?
- Is it compatible with other treatments?
- Do I have the necessary qualifications and/or permits to use the chemical?
- How do I dispose of the empty container and any leftover chemical?

Before using a chemical always:

- Read the label.
- Follow directions.
- Only use registered chemicals on sheep. It is an offence to use a chemical or material on sheep unless it is registered for use on sheep.

- Store unused chemicals safely and securely.
- Dispose of chemicals and containers responsibly.
- Comply with chemical storage, carriage and use regulation.

Tethering

Tethering of sheep may expose them to increased stress and danger. In particular, tethered sheep are unable to evade predators, cannot obtain shelter from climatic extremes and do not obtain sufficient exercise. For these reasons, tethering of sheep should be regarded as a temporary method of restraint and one that requires a higher standard of animal husbandry. Do not tether sheep that are under six months of age.

If sheep are tethered the following standards should be met:

1. *Site.* Reasonably flat, well grassed, provide shade in hot weather and shelter from wind, be clear of obstructions and should not be waterlogged or cross a footpath or be close to any roadway.
2. *Tether.* A leather head collar or neck band connected to a chain by a swivel. The six metre long metal chain is attached to an anchorage by a 360° swivel at ground level.
3. *Care.* Change site every 24 hours; ensure adequate nutrition; inspect at least twice each day and three times in very hot weather; provide fresh, clean and wholesome water at all times in a stable container at the perimeter of the tether; provide adequate exercise and train sheep to adapt to tethering.

Home butchery

Slaughtering and dressing of lambs for home rations produce very economical meat for the freezer. There are state and municipal laws that regulate slaughtering, so you should check these out before commencing. As a general principle animals can only be slaughtered in rural areas (not towns), the meat must be consumed on the property, must not be sold or given away and offal should be disposed of by burial. Care should be taken to avoid sickness as a result of contamination, deterioration or disease in the carcase. Never feed uncooked offal or meat to dogs; this practice can infect dogs with hydatid tapeworms. Infected dogs pose a serious risk of hydatid disease for family members.

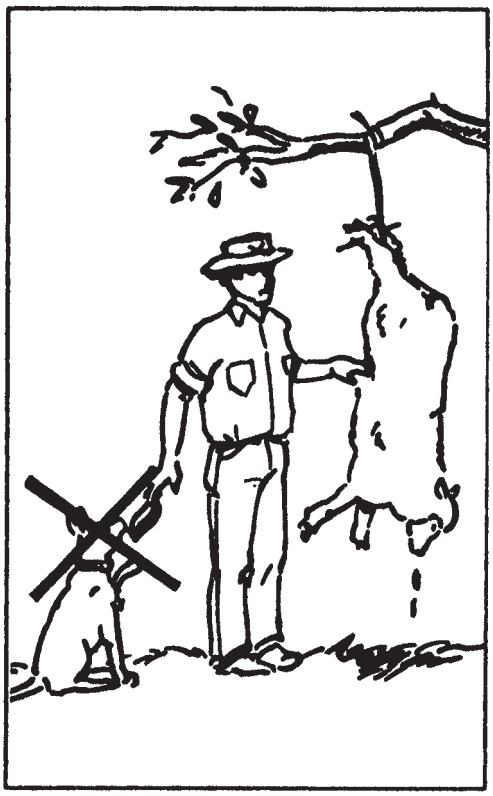


Figure 8.1 Never feed uncooked offal or meat to dogs.

Dogs

A well-trained sheepdog can do the mustering and yard work of two people. All pet dogs in rural areas need to be taught to respect sheep and not to attack. Dog attacks on sheep cause horrific injury and often death. Most damage is done when dogs form packs and attack sheep, at times many kilometres from home. Even the smallest and friendliest dog will follow its hunting instinct and join other dogs for a wild night out, so keep dogs locked up, especially at night. At all times keep dogs under supervision or restrained on a chain or in a run. Dogs that attack sheep need to be destroyed if they are not restrained. Farmers have the right to shoot stray dogs that disturb their sheep and to claim compensation for damage from the dogs' owners.

Dogs need to be regularly treated for worms, including the hydatid tapeworm, to protect the family and workers as well as keep the dogs healthy and ready for work.

Kelpie sheepdog.

9

Meet a sheep – facts, figures and features

Sheep facts and features

The term *ovine* is the scientific term for sheep and *ovis* is commonly used in relation to diseases of sheep. For example, ovine brucellosis is a disease of sheep caused by the organism *Brucella ovis*.

Sheep are *ruminants* because they have a rumen. The rumen is a large organ, the largest compartment of what is often called the stomach, containing micro-organisms that pre-digest the feed by breaking down the cellulose walls of the plant tissues. It is the rumen and its two associated organs (reticulum and omasum) that make sheep so efficient at converting pasture to meat or wool compared to non-ruminant or mono-gastric animals (such as horses and pigs). The types of micro-organisms predominant in the rumen change slowly to suit the type of feed, so changes in feed must be made gradually. Sheep have one true stomach called the *abomasum*, which follows the rumen, reticulum and omasum.

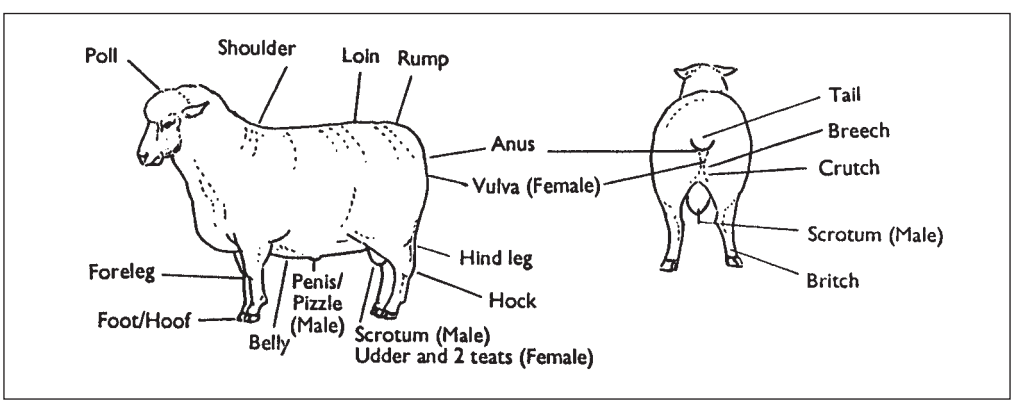


Figure 9.1 Points of a sheep.

Sheep figures

Table 9.1 Basic figures and statistics for sheep

Body temperature (rectal)	38.9ºC
Puberty (breeding age)	6–12 months
Lifespan	10 years; productive life is 5–6 years
Oestrus (heat cycle)	17 days average in season
lasts	36–48 hours
returns	4–6 months after lambing
	Breeding season varies with breed
Pregnancy (gestation)	147 days (140–160 days)
Birth weight	3–5 kg
Water consumption	3–14 litres per day

Sheep and wool terminology

Table 9.2 Terminology used to describe sheep and wool

(Additional wool terms are explained in the glossary at the end of this book.)

Sex description names:		
	Ewe	adult female
	Maiden ewe	ewe that has never lambed
	Ram	adult male
	Wether	castrated (de-sexed) male
Age description names:		
	Lamb	birth to weaning, sometimes to one year
	Weaner	weaning to 12 months
	Hogget	12–18 months
	Two tooth	18 months to 2 years
	Four tooth	2–2.5 years
	Six tooth	3.5 years
	Full mouth	4 years
	Broken mouth	over 5 years
	Cast-for-age (cfa)	sheep rejected as too old
Function description names:		
	Cull	inferior or faulty sheep rejected from the flock
	Dry	non-breeding sheep, usually a wether
	Dry ewe	ewe that is not lactating (milking)
	Wet ewe	lactating or about to lactate ewe
	Sire	father
	Dam	mother
Wool terms:		
	Fleece	total shearable wool on or off one sheep
	Staple	naturally occurring group of wool fibres
	Staple length	length in mm of a representative staple of wool
	Micron	unit of measurement of the diameter of a wool fibre
	Tensile strength	breaking point of wool fibres, measured in Newtons per Kilotex (N/Kt)

How old is this sheep?

Sheep have chewing teeth along both sides of the upper and lower jaws, with a small gap between the front incisor teeth. The front incisor or biting teeth are only present on the lower jaw and they bite against a dental pad on the upper jaw.

A sheep's age is estimated using the incisor teeth on the front of the lower jaw, a procedure called mouthing or ageing. As a sheep matures, milk or juvenile incisor teeth are progressively replaced by larger adult teeth that will in turn fall out in aged sheep.

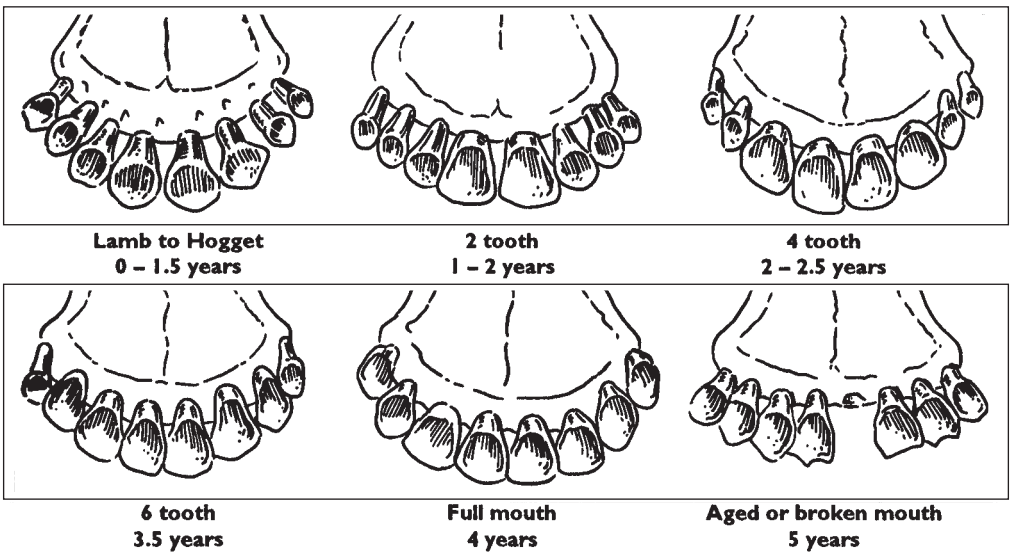


Figure 9.2 Incisor teeth at various ages.

How many can I run? – Stocking rate

The number of sheep run on a property or paddock is known as the stocking rate and it is influenced by the following factors:

Rainfall	Soil types	Pasture composition
Temperature	Drainage	Fertiliser use
Unusable land	Cultivation	Weeds
Other animals	Soil fertility	Management
Topography	Aspect of slopes	Degraded soils

In estimating stocking rate, allowances must be made for unproductive land such as dams, plantations, lanes and farm yards and for extra grazing animals like horses, cattle, rabbits and kangaroos.

Dry Sheep Equivalent (DSE) is used as the standard measure of stocking rate for all grazing animals. One DSE is equal to one two-year-old, non-pregnant, non-lactating 45 kg sheep maintaining weight. Therefore, one DSE/ha means that one hectare will carry one 45 kg wether sheep all year round. DSE rates can also be quoted for short-term grazing, for example: 'The crop carried 45 DSE/ha for two weeks'.

Estimate the stocking rate (DSE/ha) to ensure pasture will last.

Table 9.3 DSE for various classes of stock (per annum)

Class of stock		*DSE*
Sheep		
	Wether: 45 kg	1
	Ewe: Merino breeder	1.5
	Ewe: prime lamb breeder	2.0
	Ram	2.0
	Weaner and hogget	0.8
Goats		
	Dry	0.8–1
	Doe: breeder	1.3–2
	Doe: dairy	2.5
Cattle		
	Dry cow and steer	6–7
	Cows calving annually	10–12
	Weaner growing	4–10
	House cow	14–18
Others		
	Horse	10–20
	Rabbit: wild	0.2
	Wallaby, kangaroo	1–3

Stocking rates vary from 20 DSE/ha on highly fertile soils with improved pasture and high rainfall down to less than one DSE/ha in arid regions. In higher rainfall areas 6–12 DSE/ha would be a common stocking rate although probably less than potential.

Local knowledge will provide a guide but recognise differences between farms and the potential, by good management, to develop beyond the district average. When starting off, allow a margin for inexperience and a below-average season by stocking below the expected capability.

10

Working with sheep

Moving sheep

Stock sense can be learnt by watching experienced stock people handle sheep in the saleyards or on a farm. It is important to understand sheep behaviour patterns and out think sheep rather than using force or rushing madly about. Sheep are flock animals; they desire to be with others. They don't like being cornered so let them see a gate or way out and they will move easily. When moving sheep, steer them from the back and side, don't get ahead of them or they will turn and scatter.

Tips to make sheep movement easier and more pleasant are as follows:

- Handle sheep in groups or small mobs, rather than individually.
- Run sheep along fence lines rather than in the centre of a paddock.
- Use a good sheepdog; it can do the work of two people.
- Have gates in corners.
- Don't let them see other sheep unless that is where you want them to go.
- Control them from the rear and side; if the leaders see or hear you they will move away from that direction.
- Patience, pre-empting their next move and out thinking them will bring success.
- A pet sheep in a flock will come rather than be driven, causing great confusion.

Handling

Most sheep owners can expect to handle their sheep at least six times a year: for lamb marking, drenching, crutching, shearing, dipping and drenching again. However, the amount of 'hands on' work with sheep is dependent, to some degree, on the production system chosen. The amount of handling a flock requires is determined firstly by the type of sheep, and secondly by the sex and age of the sheep. Wethers require the least amount

of handling whereas lambing ewes, particularly maiden ewes, are the most demanding. Weaners require additional drenching and possibly extra feed supplements. Sheep owners should be aware of these differences and plan the management of their flock accordingly.

Efficiency can sometimes be improved by combining a number of handling operations. For example, crutching four to six weeks before lambing can be combined with a booster vaccination and a foot inspection. Integrating handling operations this way also saves on musters and reduces stress on the sheep.

Handling and drafting races allow easy handling of sheep without the effort of having to run them down and hold them for inspection or treatment. A well-designed handling race allows drenching, vaccination and standing inspections from either outside the race or working slowly through the sheep in wider races. Sheep handling devices allow sheep to be held or tipped over with a minimum of effort, and can be used for crutching, foot inspection and paring and a range of other operations.

Sheep handling device.

Homemade sheep handler.

A moving belt sheep handler.

A moving belt sheep handler preparing to tip the sheep.

Catching

When catching a sheep, beware of the potential for injury to both the sheep and the handler. Back injuries are easily aggravated by incorrect handling of adult sheep that weigh between 50 and 150 kg.

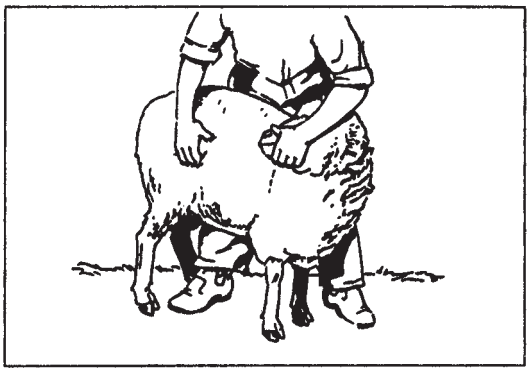


Figure 10.1 Preparing to tip-up a sheep.

To restrain an individual sheep for close inspection, muster the flock into a small yard where the sheep can be easily caught. From the side of the sheep, stop its forward movement by a hand under the neck or head and then hold the sheep over against your legs. Hold the lower jaw with one hand and put the other hand on its far hip. Turn the head around towards the sheep's far hip and push down on the hip, stepping back a little if necessary; this will force the sheep to collapse back on its tail. In this position the sheep sits on its tail and is supported by the handler's legs. With the back relaxed or bent, the sheep will sit quietly. Rams can be the exception if they keep their neck and back straight; it is often necessary to tip the ram backwards, lifting by its neck.

Grabbing the sheep above the hock of the hind leg is another way to catch sheep, but don't pull on the wool as this causes bruising. A shepherd's crook is also useful in more spacious environments where it is hard to get a hand on the target. The crook can be used around the neck or back leg, depending on the design.

Cross-bred sheep sits relaxed.

Shorn Merino sits comfortably and controlled.

Lifting

Using two people for heavy sheep, lift it by tipping it onto its back and take one side, two legs each. Lighter sheep can be lifted from the sitting position if you hold a back leg against its belly and put your other arm around its chest. Bend your knees and keep your back straight.

Tying/restraining

Sheep should only be tied for very short periods to avoid escape. Using a piece of cord or hay twine about two metres long, tie the ends together, place it under both hind legs, then pull the cord up between the hind legs. Pull the legs up to the belly and place the loop between the front legs then over the head of the sheep and shorten so that the head is bent forward but is comfortable. The forelegs are left free. Using this method, blood circulation is not restricted and release is quick and simple with no knots to undo. To release, push the head forward then lift the cord over the head and off the legs.

Tying a sheep for temporary restraint.

A securely tied sheep.

Counting

Counting sheep is a skill that requires considerable practice. Counting is normally done as sheep move through a gate or past a fixed point. Do not count sheep one at a time but in small groups adding as you would with coins or a column of figures, e.g. 3, 6, 10, 12, 15, 18, 22, and so on.

Shepherd dogs

Maremma sheepdogs are natural shepherd dogs. After bonding with the flock they permanently live with the flock and provide excellent protection from predators.

Maremma shepherd dog.

11

Fat scoring

Sheep are woolly creatures, which makes it difficult to determine their condition. A system of objectively estimating the condition of sheep is used for both marketing and supplementary feeding purposes. *Fat scoring* is the determination of the amount of fat stored along the back of the sheep, consistently reflecting the overall fat and energy reserves of the sheep. As fat is used up the bones feel more distinct. By feeling the rib area of the back an assessment is made and a rating or score given. Scores of one (no fat) to five (very fat) are used.

These fat scores can be translated into actual millimetres of fat at slaughter. This is measured at a position called the GR site, which is a point on the 12th rib 110 mm from the midline. Sheep sold 'over-the-hooks' (sold by dressed weight) are classed by weight and measured fat score; prices decrease as the class moves away from the optimum or target class.

Scoring sites

Finding the GR site

The 12th rib is the second last and 110 mm from the midline is approximately one adult hand width. So, simply lay your little finger along the midline pointing forward, then feel for the second last rib with your thumb and there you have the GR site. Move your fingers to the base of the wool so they are touching the skin over the GR site. Roll your fingers horizontally along the skin over the ribs, which will feel like harder bumps.

The GR site is the best site for estimating fat score, as this is where measurement is made in the abattoir. Other sites can be used to reinforce or confirm your estimate. The tail butt is not a reliable site as it does not consistently represent the rest of the carcase.

Short ribs of the loin site

Using your thumb on the midline and fingertips over the ends of the short ribs, the top of the backbone and ends of the short ribs are easily located. Basically, the points feel smoother as the animal gets fatter. In Figure 11.2 and following the description for the 'GR' site, is added a description of the 'loin short rib' site, denoted as 'loin' assessment.

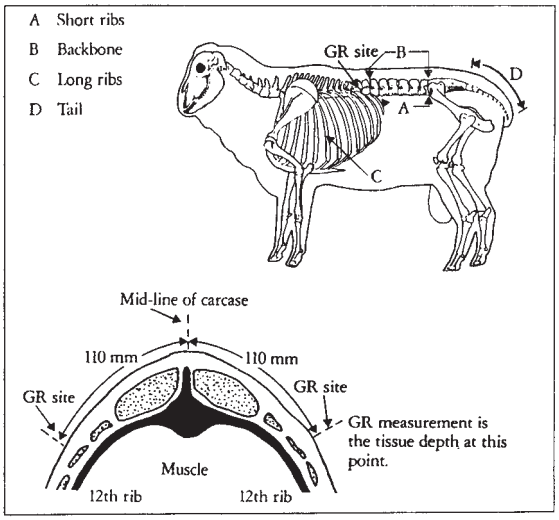
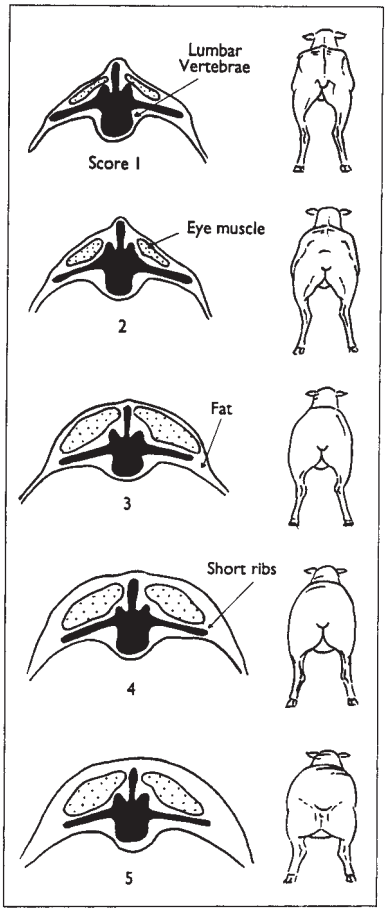


Figure 11.1 Site for fat scoring.

Figure 11.2 Fat scoring system ('GR' descriptions from Prograze (Victoria) Manual[3]); only use the 'Loin' assessment to reinforce the 'GR' estimate).



Score 1, very lean 0–5 mm fat.
'GR': individual ribs are easily felt and no tissue can be felt (sliding) over the ribs; depressions are quite obvious between ribs.
'Loin': backbone and short ribs can be felt readily, points feel hard and *sharp*.

Score 2, lean 5–10 mm fat.
'GR': individual ribs are felt with some tissue able to be felt over the ribs; depressions between the ribs are obvious.
'Loin': points of backbone and short ribs are *rounded*.

Score 3, medium 10–15 mm fat.
'GR': individual ribs can still be felt but they are quite rounded, with tissue movement felt over the ribs; depression between the ribs is less obvious.
'Loin': backbone feels like a raised *smooth* ridge, fingers cannot feel between short ribs although ends can still be felt.

Score 4, fat 15–20 mm fat.
'GR': the ribs are less obvious to feel, with only some depression between the ribs; tissue movement over the ribs is apparent.
'Loin': backbone felt as a ridge, short ribs cannot be felt.

Score 5, very fat >20 mm fat.
'GR': it is difficult to feel ribs or any depression between the ribs; sliding over the ribs is easy.
'Loin': backbone is a depression between two ridges on either side of the midline.

Fat scoring

Regular practice at fat scoring will develop confidence and provide a very useful skill for good management and marketing, and for reducing costs and improving profits. Comparing your assessments with others, particularly experts, will help build confidence and standardise your assessments.

Target fat scores for sale sheep will depend on the chosen market. On farm fat scoring is a very useful management tool to ensure stock are on track to achieve maximum productivity. In general, target fat scores for mature sheep on farms are given in Table 11.1.

Table 11.1 Target fat scores for mature sheep

(Prograze (Victoria) Manual[4])

Sheep type		*Target fat score*
Wethers	Minimum in winter	1.5
Rams	Pre-joining	3–4
	Non-mating	2–3
Ewes	Joining	2–4
	Pregnancy	2–4
	Point of lambing	2.5–3.5
	Lactation	2–3
	End of spring (growing season)	3–4

12

Management operations

This chapter lists and explains the routine management operations on sheep farms, how they are undertaken and when they are due. Fuller discussion on each procedure or condition will be found under the relevant section elsewhere in this book.

Flock management

Inspect

Good flock management requires that you know what is happening on the farm. Each mob in a flock should be checked at least weekly, more often in high risk seasons and situations, and up to twice daily during lambing. Inspections should assess pasture and water availability, sheep health, condition, progress and confinement.

Identify

Distinctively ear tag, ear mark or brand sheep to avoid any confusion with neighbouring sheep.

Brand after shearing and only use registered sheep branding fluids. Never use paint; to do so is an offence and damages the wool.

Ear tag using numbered, named or blank tags. They come in a variety of colours; different colours are often used to indicate the year of birth. Different styles of plastic ear tags can be purchased; each brand has its own applicator. Use of a Property Identification Code may be mandatory to provide traceability after sale or slaughter. Check with state regulations.

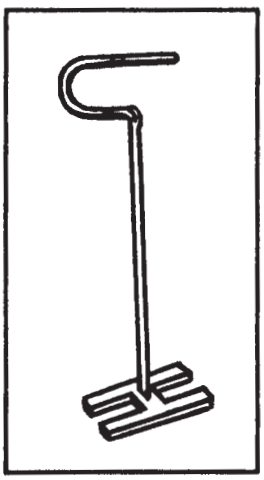


Figure 12.1 Branding tool that is dipped in a registered branding fluid.

Ear mark at marking time. A marking tool clips a notch from the edge of the ear. The shape of the notch and position on the ear should distinguish your sheep from neighbours. If ewes are marked in the opposite ear to wethers, drafting on sex is made much easier.

Shear

Sheep are shorn annually, with the exception of fleece shedding breeds and carpet wool sheep that are shorn up to twice each year. Shearing can be done at any time as long as sheep can be kept dry before shearing. Shearers will not handle wet or even damp sheep, which expose them to health risks. It is also necessary to have sheep off feed, at least overnight; this means their stomachs are not full and, therefore, they sit and bend a lot more comfortably for the shearer. It is best to avoid the coldest months. Provide good shelter and feed after shearing.

Shearing time can be moved by a maximum of two months per year, which is shearing at 10 or 14 months' wool growth; earlier shearing will mean a heavily discounted price for short wool and longer times introduce welfare issues. If buying additional sheep, ensure that they will fit into the shearing time of your flock. Multiple or split shearings should be avoided as this complicates external parasite control.

Shearing – sheep must be dry and fasted overnight.

Crutch

Crutching is carried out before lambing and as necessary, usually once or twice per year. Shear around the crutch (between hind legs), tail and pizzle to remove urine stained wool and manure dags (faeces matted in wool) to help prevent flystrike. With very daggy sheep it is necessary to crutch before shearing to avoid contaminating the fleece wool. The pre-lambing crutch for ewes includes one pass of the shearer's hand piece above and below the udder; this will aid the lamb in suckling.

A shearer will take only two minutes to crutch one sheep. Owners can crutch their own sheep with a standard shearing plant, electric hand piece or even with hand shears for small numbers.

Prior to sale a very small or 'key hole' crutch may be required to remove any faecal material that is unacceptable in an abattoir as it poses a hygiene and contamination risk.

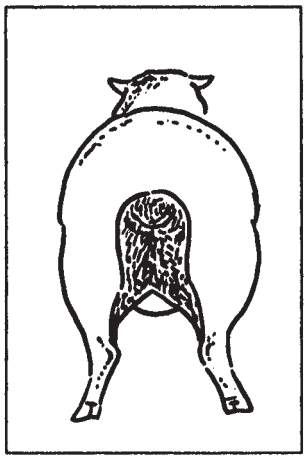
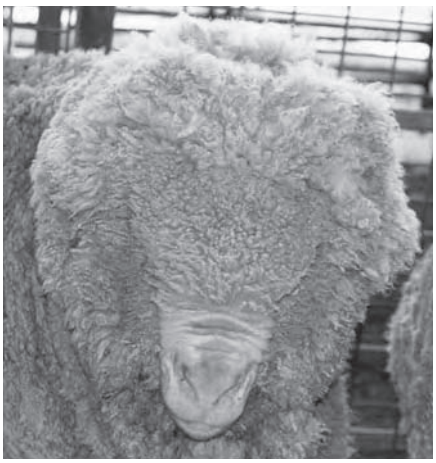


Figure 12.2 Crutching area.

Hand shears used for crutching, dagging and treating flystrike.

Wig

Shear wool from around eyes if vision is becoming obscured, usually at crutching. This is only necessary for woolly faced sheep, particularly some lines of Merinos.



Wool-blind Merino despite an earlier wigging.

Cull

Annually, after shearing and before joining, cull out sheep too old or unfit to survive and be productive or that have significant faults or disease. If strong enough and free of disease dispatch them for sale or otherwise direct to an abattoir for slaughter.

Pasture

Inspect pastures weekly to ensure an adequate quantity and quality of feed to meet the requirements of each mob. Move sheep to saved pasture and reduce numbers or feed a supplement if pasture is inadequate. Manage pastures to avoid under- or over-grazing, weed build-up or soil degradation and plan to save pasture for lean or high demand periods, reserves and for fodder conservation (hay making) if desired. Spread fertiliser on pasture in autumn or spring after soil analysis tests. See Chapter 13 for more details on grazing and pasture management.

Feed

In periods of pasture shortfall, regularly assess the condition of sheep in each mob by fat scoring (see Chapter 11). Supplement pasture feed as necessary, with grain, hay or other feed, to maintain the appropriate condition (see Chapter 14). Supplementary feeding is most commonly required between February and April and between June and September in winter rainfall areas. Ewes in the last six weeks of pregnancy need to be on a rising plane of nutrition. The alternative to supplementary feeding is to sell stock to reduce numbers or obtain agistment to see you over the shortfall period.

Water

Ensure that safe water is available in all paddocks at all times.

Stocking rate

Annually calculate the carrying capacity of each paddock and the whole farm for the year ahead and for each season. Adjust stock numbers to match estimates and prepare to conserve or purchase feed as a supplement for periods of pasture shortage. Allow a margin of flexibility in estimations to account for unpredictable seasonal variations (short droughts or bumper years). If stocking to the upper limits, then allow a bigger margin for purchasing fodder or agistment. To avoid these fodder costs, stock at a lower rate; this will reduce both income and expenses.

Breeding (refer to Chapters 15 and 16 for more information)

Rams

Well before joining, examine rams for soundness of body, teeth, feet, testicles, pizzle and penis. Ensure sufficient healthy rams are available (2%, or two per 100 ewes). Provide good quality green feed and supplement if necessary to have rams in peak, but not over-fat, condition (fat score 3–4).

Ewes

Before joining, inspect and cull ewes that are unlikely to breed or be able to support pregnancy and lactation. Look for broken mouths (aged), missing teats, prolapses, permanent wool or skin faults, ewes markedly poorer than the average (be careful not to cull all the twin bearing ewes) and mobility problems with feet or legs. Ensure that all ewes have a minimum fat score of 2; conception rate and fertility is better in ewes that are in good condition (fat score 3–4).

Join (mating)

Time joining so that there will be good feed available in the last weeks of pregnancy, for lactation, and so that lambs will have sufficient feed to reach market or growth expectations on time. Allow 147 days to lambing. Put two per cent (2%) of rams in with ewes for six to eight weeks. Many breeds do not normally cycle (come on heat) from June to late December. The first mating is normally at around 18 months but can be as young as six months if critical weight and growth criteria are met.

Pregnancy

A normal pregnancy lasts 147 days (five months) but allow for a range of 140–160 days. Maintain adequate feed; ewes should have a minimum fat score of 2.5 by lambing. Boost feed during the last six weeks. Grain feeding may be necessary to prevent pregnancy toxaemia (twin lamb disease) in the last weeks of pregnancy. Three to six weeks before lambing, crutch the ewes including an udder trim, and vaccinate them with a 5 in 1 or 6 in 1 Clostridial vaccine. Give a worm drench if the need for this is indicated by a worm test. Handle ewes with care.

Lambing

Try to supervise the ewes without disturbing them. Put ewes in a small sheltered paddock with good visibility and inspect them at least twice daily. Assist with difficult births (stuck lambs) and orphaned or separated lambs. Have plenty of pasture available and avoid hand feeding if possible, as this often results in mis-mothering.

Mark

When lambing is finished or when lambs are 4–10 weeks of age, dock tails, vaccinate with 5 in 1 or 6 in 1 Clostridial, ear mark and castrate males if desired. Merino-type lambs can also be treated to permanently reduce breech flystrike using currently recommended methods. A booster vaccination will be due in four to six weeks from marking. A clean work area and good hygiene are critical.

Breech skin treatment

Merino lambs are often treated to permanently reduce flystrike on the wrinkly breech skin. Mulesing was the normal practice and while appearing severe and messy, was warranted to reduce the far more severe flystrike problems. Alternatives to mulesing are currently being developed. These should be investigated as preferred treatments. Traditionally lambs were mulesed at marking or up to six months of age, but the younger the better. Experienced contractors should be used. Hygiene and fly protection are most important.

Wean

Separate the lambs from the ewes. Wean lambs to be retained, or store lambs at 6–12 weeks. Prime lambs are not weaned until they are sent to market. Turnover lambs are weaned at three to six months. Store and turnover lambs should be drenched and then weaned onto the pasture that has the best quality and is the most free of intestinal worm eggs and larvae. Booster vaccinations can be given at weaning if not given earlier.

Disease control (refer to Chapter 22 for more detailed information)

Infection management

Vaccinate with a Clostridial vaccine, using a 5 in 1 (for black disease, blackleg, enterotoxaemia (pulpy kidney), tetanus, malignant oedema), or 2 in 1 (for enterotoxaemia, tetanus) or 6 in 1 (for Clostridial 5 in 1 diseases plus cheesy gland). For prime lambs, use 5 in 1 or 2 in 1 vaccines; use a 6 in 1 for store sheep.

Vaccinate lambs at marking and four weeks later, ewes prior to lambing and dry sheep annually. Unless otherwise known, treat all introduced sheep as if they have not been vaccinated. Give them two doses four weeks apart; one dose provides very little protection.

These vaccinations are subcutaneous; they are injected under the skin, not into the muscle. Pick up a fold of skin in one hand, push the needle under the fold of skin holding the syringe flat against the sheep's body and then depress the syringe plunger. Use a 15 mm needle and avoid it coming out the other side of the fold. The best area for subcutaneous injections for lambs is the bare skin under the legs (armpits). For all others, inject under the skin below the ear, cheek or armpit. This will avoid blemishes to the carcase.

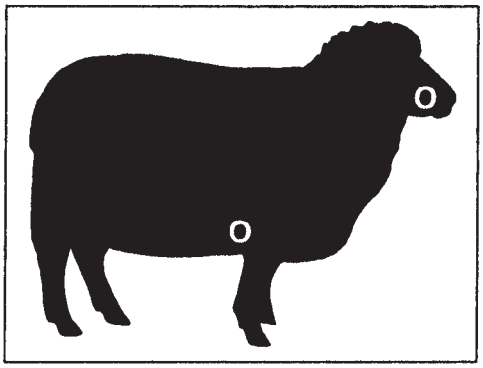


Figure 12.3 Subcutaneous injection sites for sheep.

Vaccinating sheep.

Most vaccines are purchased in sealed, ready to use sachets to which an auto-filling syringe is connected. It is important to use sharp needles and clean equipment. Do not use chemical disinfectants to clean the equipment as they may destroy the vaccine. Store vaccines correctly as indicated in the instructions on the container. Most require refrigeration.

After vaccination animals must be withheld from slaughter for human consumption for the withholding period specified by the manufacturer. Read the manufacturer's warnings and instructions.

A vaccinator and vaccine sachet.

Worms

Regular faecal worm egg count testing is highly recommended to determine the need and timing of drenches. General recommendations are to treat all sheep early in summer, and again in February for winter rainfall districts with over 500 mm rainfall, unless a long

acting treatment is used. Check with local and current recommendations. Non-slaughter lambs should be treated at weaning.

If diarrhoea (scours) or wasting (weight loss) and/or a high worm egg count test (worm test) indicate, a drench is needed.

Regular worm tests should be conducted throughout autumn to spring on younger, more susceptible sheep. Worm testing kits are available from a variety of laboratories.

Oral drenching

A drench gun is used for oral dosing. Rinse water through the gun before administering any drench, check that all the valves are working and, using a medicine glass, test a few doses for correct rate of delivery. Put the flock into a handling race and work from one end of the race to the other to avoid drenching the same sheep twice. Place one hand under the jaw, keeping the head level, and slip the gun nozzle into the mouth at the corner of the lips. Ensure the nozzle is on top of the tongue and towards the back, squeeze the gun and you will feel the sheep swallow the dose. Never drench sheep while they are tipped up.

Oral drenching.

Injectable

Worm treatments by injection are available both alone and in combination with Clostridial vaccines. They are injected under the skin, as for the vaccines above.

Topical

Drenches or treatments applied to the skin are also available. Carefully check the dose and sheep type recommendations before using them.

Slow release capsules

Slow release capsules can also be used with a special applicator to deposit the capsule in the correct position. Different capsules are used for adults and young sheep. They offer around 90 days of protection from re-infection.

Liver fluke

In all liver fluke areas treat sheep in April and December, more often when on irrigated or high risk paddocks. Treatment is an oral dose using a drench gun. Flukicides are available alone or in combination with worm drenches. Use a drench that is effective against all stages of the fluke in the sheep.

Sheep lice

Examine for sheep lice before shearing every year or if signs of rubbing appear. If lice are present, treat all sheep by dipping four to six weeks after shearing, or backline treatment (apply to the skin along the back with a special applicator) the same day as shearing. This should only be administered to well-shorn sheep (with an even, close cut all over).

For infestations in sheep that are not ready for shearing, the disease must be controlled to reduce fleece damage. A long wool backline treatment or backline jetting with a sheep dip chemical will give control until the sheep can be treated off shears.

Sheep lice, teased and matted wool – part the wool and look for lice.

Flystrike

Prevent flystrike by crutching and jetting with insecticide or backline treatment when fly waves are likely to occur from spring to autumn. Control worms and breed out body faults such as wrinkles and dips in the back.

Detect flystruck sheep early by frequent inspections during risk periods. Look for breech (crutch), pizzle and body strike.

Treat flystruck sheep early. Clip the wool from the struck area, expose all maggots and apply a flystrike dressing powder or liquid.

Lameness

Examine lame sheep immediately for an early diagnosis. Causes include: foot abscesses (drain by paring and/or injecting antibiotics); footrot (isolate and seek professional advice); arthritis in lambs (inject antibiotics); arthritis in adults (cull); and injury (treat or humanely destroy). For other causes seek advice.

Disease

Sick, injured or suffering sheep should be investigated and a diagnosis sought. Prompt treatment or humane slaughter is a duty of care. Veterinary advice should be sought in outbreaks of disease or multiple deaths and the appropriate Primary Industries or Agricultural Department advised of serious diseases.

Humane slaughter

An essential part of sheep ownership is to be able to kill a sheep to relieve or prevent unreasonable pain or suffering, which may arise from disease, injury, accident, fire or old age. Shooting is the most humane method of slaughter by a non-veterinarian. Figure 12.4 shows the point of aim. A .22 rifle and hollow point bullet are recommended for this purpose. Observe state firearms laws and licences when using a firearm.

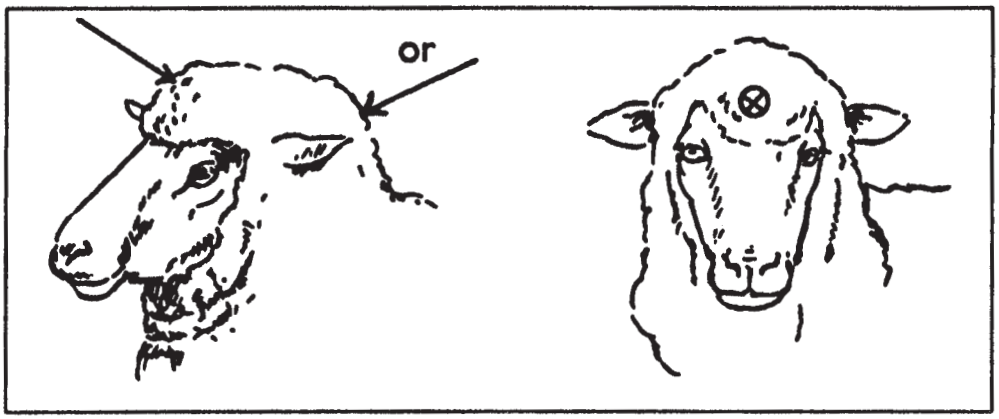


Figure 12.4 Point of aim for humane slaughter.

Calendars of management operations

Each farm and district will have a different sequence of events during the year so it is not possible to provide a recipe for all farms. It is recommended that farmers draw up their own calendar of management operations so that the year is planned and essential procedures are not forgotten or delayed to the detriment of the sheep.

Shearing and lambing times are the main variables that will influence the order of events. Four alternative calendars are given as examples in Table 12.1. Each will need to be fine tuned to suit the dates, seasons and purpose of each operation.

Table 12.1 Calendar of management operations for four enterprises

	1. Autumn lamb, spring shearing	*2. Spring lamb, autumn shearing*	*3. Spring shearing*	*4. Winter lamb, autumn shearing*
Type	Merino ewes	Merino ewes	Wethers	Prime lamb breeder
Month				
Jan.		Watch for flystrike	Watch for flystrike	Join Watch for flystrike
Feb.	Second summer drench if applicable	Second summer drench if applicable Shear	Second summer drench if applicable	Second summer drench if applicable
Mar.	Crutch and vaccinate	Dip Sell old sheep Join	Crutch and wig Vaccinate	Shear
Apr.	Lamb			Sell old ewes Dip
May	Lamb			Crutch and vaccinate
Jun.	Mark and vaccinate Mules or alternative			Lamb
Jul.	Re-vaccinate lambs	Worm test ewes		Lamb
Aug.	Wean and drench lambs	Crutch and vaccinate Lamb		Mark and vaccinate
Sep.	Watch for flystrike	Lamb	Shear	Crutch
Oct.	Shear Worm test weaners	Mark and vaccinate Mules or alternative Flystrike prevention	Worm test Dip	Re-vaccinate lambs Worm test Flystrike prevention
Nov.	Sell old sheep Dip Drench Join	Re-vaccinate Wean and drench lambs Drench	Sell old sheep Buy replacements Drench	Sell lambs or shear and wean as turnover lambs Drench
Dec.				Sell lambs or shear and wean Buy replacement ewes and rams

13

Grazing and pasture management

Pasture

Sheep are grazing animals and eat using a nibbling action, so they prefer short pasture; tall or rank areas will be avoided by sheep. Cattle have a different grazing action so prefer taller pasture.

Pastures are usually made up of a variety of plant species including grasses, legumes (clovers and medics) and weeds. A good pasture will have a mixture of improved grass and legume species with a range of growing patterns, early to late, which will extend the growing season. Pasture growth is largely controlled by available soil moisture and temperature. When the soil is dry or the temperature is cold, growth is reduced or stops. Soil fertility and structure, plant species and grazing management also play important roles in pasture productivity.

Annual (left) and perennial (right) pasture recovery after hay crop.

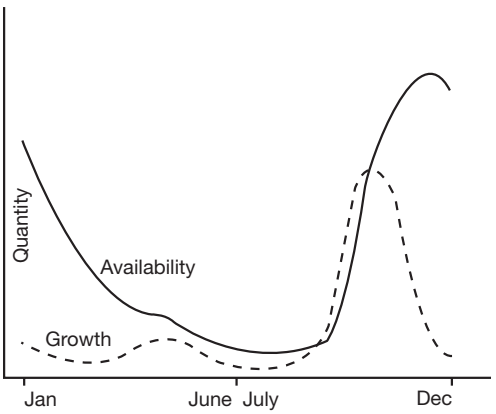


Figure 13.1 Typical pasture growth and reserves for a winter/spring rainfall area.

It is necessary to save feed from high growth periods for use in low pasture production seasons. Paddocks of dried-off improved pasture retain much of their nutritional value for several months while the weather remains dry. Plan lambing, sales and purchases so that total pasture requirements match the pasture available. Pastures can be improved by addition of fertiliser, cultivation, weed control and by sowing appropriate highly productive grasses and legumes.

Native plants will not produce the quantity or quality of improved pasture species, such as perennial ryegrass, phalaris and white or subterranean clover. Selected native pasture species can be appropriate in areas that are not suitable for improved pasture; they can often thrive in these conditions and provide valuable fodder if managed appropriately. Weeds compete for nutrition, water and sunlight, yet produce little edible leaf and may be poisonous or unpalatable.

Pasture plants have four phases of growth and decline as shown in Table 13.1.

Table 13.1 Pasture phases

Phase	*Growth phase*	*Quantity*	*Quality*	*Reason*
Phase 1.	Vegetative – immature Slow growth after grazing	Low	High	Leaf area reduced: less photosynthesis
Phase 2. *(Optimum)*	Vegetative Rapid growth	High	High 55–85% digestible	Large leaf area Mostly leaf
Phase 3.	Reproductive Slow growth	High declining	Declining	Lower leaves shaded and die Energy put into flowers, stalks and seed
Phase 4.	Dead No growth	Nil growth	Low 35–65% digestible	Mostly stalks and seed heads, some dead leaf

It is the aim of good pasture management to maintain plants in the vegetative phase (Phase 2) as long as possible and to ensure long-term sustainability of the pasture. This is done by grazing management as follows:

1, Don't graze too short; plants may die or recover very slowly. Keep pasture below 6 cm average height (2000 kg green DM/ha), otherwise it becomes rank and unattractive then shading results in dieback and the reproductive phase starts. *2*, Graze intensively for short periods then rest to allow recovery. This avoids selective grazing of preferred species that may be destroyed. *3*, Eventually allow seed set if annual species are present. *4*, Always maintain good ground cover to prevent erosion. *5*, Adjust grazing to seasonal conditions. *6*, Assess pasture regularly.

Grazing management

Managing pasture to gain optimum performance is a highly developed skill. First it is essential to understand the pasture content, the plant species present, their growing patterns and nutritional value and then be able to estimate the quantity of feed available. Having mastered that skill it is then necessary to know the requirements, in both type

and quantity, of pasture needed by each class of sheep at the various stages of growth and reproduction.

It is then helpful to develop a pasture budget for the normal year. Following a pasture budget or plan will ensure that there is enough feed for each class of sheep when they need it, pastures are not damaged by under- or over-grazing and targeted production goals and markets are met.

Grazing and pasture management is a skill, not just knowledge. Participation in a grazing management course, such as Prograze[5], is highly recommended. In these courses much of the time is spent walking pasture, identifying plants, measuring quantity and calculating stock requirements. The following will outline the basic terminology and measurements but it can never replace the skills learnt in a hands-on grazing management course.

1. Pasture assessment

The task is to:

Identify the plant species in each paddock and the percentage of each, or, as a minimum, identify the percentage of productive grasses, legumes and weeds. A division into annuals and perennials and green and dry (dead) is also helpful.

Estimate the number of kilograms per hectare of available feed; this is called the 'herbage mass'. Herbage mass is calculated on a dry matter (DM) basis, i.e. after all the moisture has been removed. This is written as kg DM/ha, or tonnes DM/ha. This estimation is made by taking many measurements of the green pasture height and converting that to kg DM/ha. A measuring stick marked off in centimetres is used to measure the height of green leaves at randomly selected places. Fresh young ryegrass will have a very low DM: 10% (high moisture level 90%) compared to dry coarse grass or straw with an 85% DM (see Table 13.2).

Estimate the amount of bare ground, and in dry situations the amount of ground cover. The percentage of bare ground (no pasture) reduces the measured quantity of feed available by the same percentage. Ensuring minimum ground cover is important to protect the soil and plants from permanent damage.

Estimate pasture digestibility, which is normally expressed as a percentage. Some plants take longer than others for a sheep's digestive system to

Clover pasture 10% grass, 90% clover, 200 kg DM/ha dead herbage.

digest and gain the available nutrients. The longer the digestion takes the less the sheep can eat; they can't eat more until they process the gut contents. The lower the digestibility, the lower the energy supplied and the more energy required processing the feed. Fresh young ryegrass will have a high digestibility compared to dry coarse grass or straw with a very low digestibility. Best pastures are around 75% or better digestibility.

Estimate pasture growth rate, the kg DM/ha per day of extra pasture grown. This will contribute to calculations of how long the paddock will feed a particular mob of sheep.

Table 13.2 indicates the estimated kg DM/ha under three different situations. This method of estimation is only applicable for grazed pastures. To verify the relevance to different situations, quadrants of pasture are cut, dried and weighed.

Table 13.2 Approximate relationships between pasture height and kg green DM/ha

(Source: Prograze (Victoria) Manual[6])

Average height (cm)	*Kg green DM/ha*		
	Lightly grazed 50% green	Moderately grazed 100% green	Dense 100% green
1	250	400	500
2	500	700	800
3	600	100	1100
4	800	1200	1400
5	1000	1400	1700
6	1150	1600	2000
7	1300	1750	2300
8	1450	1900	2600
9	1600	2000	2800
10	1700	2100	3000

2. Sheep requirements

Many factors affect the feed requirements of sheep, including age, growth rate, shearing, weather, lactation, pregnancy, and pasture quantity, quality and growth rate. Table 13.3 indicates the general pasture intake (requirement and grazing limitations) of sheep on a variety of pastures and situations.

From this table it can readily be seen that pasture quantity and digestibility play key roles in how much a sheep can consume in a day, which of course impacts directly on growth rate, fat score, milking ability and eventually on profitability.

Knowledge of the available pasture and growth rate and the needs of a particular mob can enable calculations of how long the paddock will last before reducing the feed reserve to a sustainable minimum and moving the mob.

By using these figures some general benchmarks can be set for different classes of sheep; a benchmark is a standard or minimum for the industry or class. High and low digestibility pastures have been used to give a range into which most green pastures can be classified.

Table 13.3 Predicted daily intake of pasture by ewes and weaner sheep

**For lactating ewes an allowance has been made for the pasture intake of lambs.*
Abbreviations: Kg/h/d, kilograms per head per day of green pasture dry matter; FS, fat score.
(Source: Condensed from Prograze (Victoria) Manual[7])

Sheep category and weight	*Herbage mass (kg DM/ha)*								
	500 kg green DM/ha			1000 kg green DM/ha			1500 kg green DM/ha		
	Pasture digestibility (%)			Pasture digestibility (%)			Pasture digestibility (%)		
	40%	60%	80%	40%	60%	80%	40%	60%	80%
	kg/h/d	kg/h/d	kg/h/d	kg/h/d	kg/h/d	kg/h/d	kg/h/d	kg/h/d	kg/h/d
40 kg ewe FS3									
Dry or pregnant	0.2	0.6	0.9	0.3	0.8	1.1	0.4	0.8	1.2
*Lactating**	0.4	0.9	1.4	0.6	1.3	1.8	0.7	1.4	1.9
50 kg Ewe FS3									
Dry or pregnant	0.3	0.7	1.2	0.4	1.0	1.3	0.6	1.1	1.4
*Lactating**	0.5	1.1	1.9	0.8	1.6	2.1	0.9	1.7	2.2
60 kg Ewe FS3									
Dry or pregnant	0.4	0.8	1.5	0.5	1.2	1.6	0.7	1.3	1.7
*Lactating**	0.6	1.4	2.2	0.9	1.9	2.5	1.2	2.1	2.6
70 kg Ewe FS3									
Dry or pregnant	0.4	1.0	1.7	0.6	1.4	1.9	0.8	1.5	1.9
*Lactating**	0.7	1.6	2.6	1.0	2.2	2.9	1.3	2.4	2.9
Weaner 15 kg	0.2	0.4	0.6	0.3	0.6	0.8	0.4	0.7	0.9
Weaner 25 kg	0.3	0.6	1.0	0.4	0.9	1.2	0.5	1.0	1.3
Weaner 35 kg	0.3	0.8	1.2	0.5	1.1	1.5	0.6	1.2	1.5
Weaner 45 kg	0.3	0.9	1.3	0.6	1.2	1.6	0.7	1.3	1.7

Table 13.4 Pasture benchmarks for sheep

This data should be used as a general guide only and should never be relied on without the supporting skills and understanding developed in a pasture management course and localising the interpretation.
(Source: Condensed from Prograze (Victoria) Manual[8])

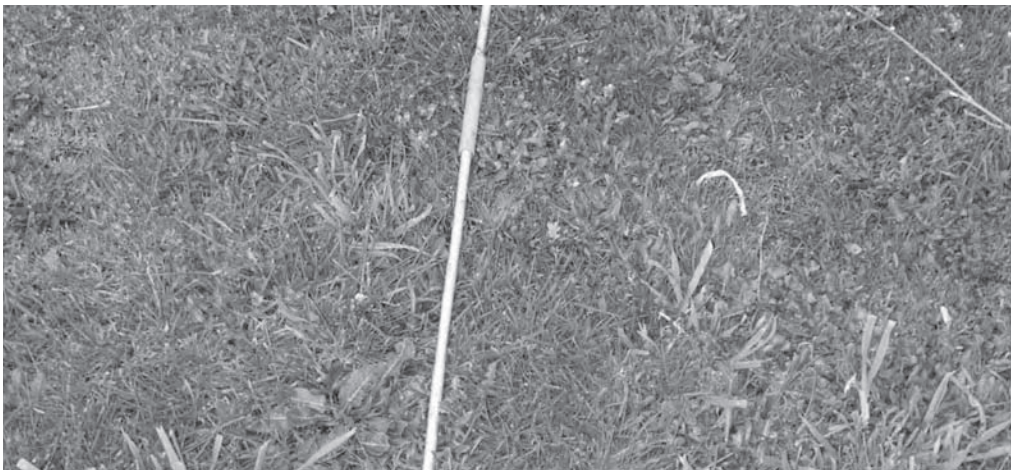
Sheep category	*Minimum pasture (kg green DM/ha)*		*Minimum digestibility and legumes*
	75% digestible	60% digestible	
Dry adult sheep (ewe/wether)	400	1200	
Pregnant ewe, month 3–4	500	1700	
Pregnant ewe, last month	700	Not suitable	
Lactating ewe, single lamb	1000	1700	60% digestibility
Lactating ewe, twin lambs	1500	Not suitable	70% digestibility
Weaned lamb, grow at 225 g/d (90% potential)	1600	Not suitable	70% digestibility and 30% legume
Sheep pasture	Minimum 300 kg Less results in slow recovery, plant and soil loss Maximum 2000 kg Higher leads to trampling waste, shading, death of lower leaves and dominant species develop		

Pasture 0 kg green DM/ha, dead pasture, good ground cover.

Pasture 600 kg green DM/ha, 0% bare ground, 90% grass, 0% legumes, 10% weeds.

Pasture 1600 kg green DM/ha, dense, two improved grasses 40%, legumes 60%.

Pasture 300 kg green DM/ha, 30% bare ground.



Pasture 800 kg green DM/ha, 0% bare, 80% unimproved grass, 10% legumes, 10% weeds.

Pasture 2000 kg green DM/ha, dense, 70% improved grass, 30% legume.

Fodder crops

Crops sown for the purpose of grazing or harvesting to feed to livestock are called fodder crops. These are useful to provide extra quality grazing at times when pastures are relatively inactive, such as summer or winter in southern areas. Fodder crops require good soil preparation to remove competition and create a good seed bed. The crop and cultivar need to be suited to the area and planting season. Good advice on how to graze the crop to ensure it continues as long as possible is essential; often short grazings followed by recovery intervals are best.

Many varieties are available including oats, rape, annual clovers, annual ryegrass and lucerne as a perennial.

Rape fodder crop.

Lucerne fodder crop cut for hay but also grazed.

Fertilisers and soil treatments

Soils deficient in one or more essential elements will produce stunted, slow growing pasture that will become invaded by weeds. Applications of the right fertiliser will correct these deficiencies and allow the improved and highly productive plant species to thrive. It is the most deficient element that will dictate the health and productivity of any pasture.

Soil tests are the first step in correcting deficiencies. Soil test kits provide easy to follow sampling instructions and packaging for the samples to be sent to the laboratory. The test results include a chemical analysis and soil chemistry, such as acidity or alkalinity (pH), and recommendations on fertiliser types and rates. With your soil test result seek advice from an agronomist and shop around the fertiliser suppliers for the best deal.

Most Australian soils are deficient in phosphorus, which is applied as superphosphate (commonly called 'super'), a more concentrated product, or in a blend with other elements. Potassium is applied as potash and trace elements such as copper, zinc or molybdenum can be added to the base fertiliser.

Nitrogen is a key to rapid grass growth and can be applied in various formulations. When other growth factors are not limiting, it will supply a rapid and short-term response to pasture or crops. Nitrogen is not necessary for legume (clover, lucerne,

medics) pastures as these plants have root bacteria that generate their own nitrogen, which also benefits surrounding grasses.

A fertiliser mixture is usually described using the chemical symbols NPK, for nitrogen, phosphorous and potassium respectively, and the ratios of each actual element, not the bulk material. For example, NPK 0:2:1 means zero nitrogen, two parts of phosphorus and one part potassium.

Fertilisers can quite easily double the carrying capacity of a paddock. Fertiliser mixed to order is normally purchased in bulk and delivered in a bin for spreading with a tractor-drawn spreader or direct from a truck. Contractors will undertake all these tasks for smaller land owners.

Lime or dolomite is used on acid soils to reduce acidity and improve the chemical balance. Lime must be used in large quantities, tonnes per hectare, to be effective. Gypsum is used when cultivating to correct soil structure problems.

Unimproved pasture that has run to seed and been wasted.

14

Feeding supplements

When and why supplementary feed?

The most common need for supplementary feeding is where there is insufficient pasture to maintain sheep in a healthy and productive state. Four factors influence the need to supplement the pasture: *1*) variation in pasture growth rate within a year; *2*) stocking rate and stage of breeding or growth of sheep; *3*) failure of normal pasture growth due to drought, fire, disease and *4*) abnormal seasons, and weather and environmental effects on sheep.

These factors fall into three categories:

1. *Predictable.* Regularly occurring events such as wet and dry seasons, cold winters, lambing and shearing are quite predictable and are to be expected. These can be provided for with normal management procedures such as saved pasture, hay or grain storage, setting appropriate stocking rates and adjusting lambing times.
2. *Unpredictable but frequently occurring.* Unpredictable events like a late autumn break, short spring or cold snap occur frequently. These occurrences must be provided for by keeping normal stocking rates well below full potential, agisting extra pasture or providing fodder in excess of that normally used.

Weather and seasons affect pasture.

Drought and flood are infrequent and unpredictable.

Fires can destroy pasture and fodder reserves.

3. *Infrequent unpredictable.* Events that often constitute disasters in communities, such as grass fires, droughts and locust plagues, fall into this category. Stores of fodder to allow for these events are not practical: they are often destroyed by the event, may deteriorate with long storage and be insufficient to meet the need. Therefore, agistment and fodder purchases are the most realistic options.

Feeding a supplement is a common option in all situations. Supplementary feeding is expensive so deciding when to start, how much to feed and which feed is best are essential questions.

Productive survival condition

Sheep have a minimum condition for survival, below which they will die, and it is necessarily higher during cold seasons. While sheep may survive at this minimum level they will not be productive, growth of young will be minimal, wool is likely to be tender and grow very slowly, and ewe conception rate and milk production will be very low.

In most situations there is little point in feeding sheep for survival alone. By starting earlier, sheep can be kept at a productive level and so return some income for the expenditure on feed. In this book *productive survival condition* is taken as the minimum level. While even better condition may improve productivity it is usually not economical to supplementary feed for these higher levels of production.

Assessing sheep condition

When to start feeding and how much to feed can only be determined by assessing the condition of the stock. Fat scoring determines the amount of fat reserve along the back of the sheep. By feeling a large number of sheep it is easy to establish a range of condition scores for each mob. Weigh a number of sheep that have an adequate fat score for the particular class of sheep. This weight will then become your target weight.

Commercial sheep scales are made to fit at the end of a race, a quick and accurate way to assess the range of sheep weights. Alternatively, for lighter sheep and those with strong backs, a set of bathroom scales is useful for weighing sheep. Get someone to weigh you while holding a sheep and then deduct your own weight.

Identify a few sheep in poor condition (up to 10 in each mob) for use as monitor sheep. Weigh and fat score them every two to four weeks, record the information and adjust rations to keep them close to the target weight and fat score.

Allowances need to be made for wool growth, pregnancy, twin pregnancy and lambing. Fat scoring in conjunction with weighing is more reliable than fat scoring or weighing alone, and together provides an accurate check on the effectiveness of the feeding program.

Figure 14.1 Weighing sheep using a bathroom scale.

Minimum fat scores

Weights of sheep vary with breed, bloodline, sex, age, time since shearing and stage of pregnancy, so the minimal fat score is the standard used to class sheep for productive survival feeding.

The following list provides the *minimum* fat score for sheep to function normally and maintain production. The slightly higher target fat scores as given in Chapter 11, Table 11.1, are a better option when feed is available.

Table 14.1 Minimum fat score for sheep

Class	*Fat score*
Dry sheep	1.5
Ewe, joining	2
Ewe, pregnant weeks 1–15	2
Ewe, late pregnant	2.5
Ewe, milking	2
Ram	3
Hogget	1.5
Weaner	2

A mob will always have a range of fat scores but the average for the poorest quarter of the mob should not fall below these minimum fat scores.

Which feed?

The feed to buy to supplement sheep is the feed that will give best value for money. Shop around on price but only compare the cost for each energy unit; that's what counts.

Energy

Energy is the major requirement of sheep and is essential for warmth, growth, activity and production.

Divide the feed price by the weight in kilograms to give a price per kilogram. Then divide this price by the number of energy units (see Table 14.2) in each kilogram; this gives the cost per energy unit.

Examples (rounded to one decimal place; c = cents):

Wheat @ $180/tonne ÷ 1000 = 18.0c/kg; 18.0c ÷ 12 energy units = 1.5c/energy unit.
Oats @ $166/tonne ÷ 1000 = 16.6c/kg; 16.6c ÷ 10 energy units = 1.7c/energy unit.
Hay @ $210/tonne ÷ 1000 = 21.0c/kg; 21.0c ÷ 7 energy units = 3.0c/energy unit.
Hay @ $2.80/bale ÷ 25 = 11.2c/kg; 11.2c ÷ 6 energy units = 1.9c/energy unit

Be sure to include delivery costs in your calculations. (Calculate the standard small square hay bale at 40 per tonne or 25 kg each.)

Table 14.2 Energy units per kg for common feeds

These values have been adjusted to allow for common dry matter rates.

Cereal grains	*Legume grains*	*Hay and straw*	*Manufactured feed*
Wheat 12	Lupins 12	Lucerne hay 8	Sheep nuts 10
Oats 10	Peas 12	Good hay 8	
Barley 12		Poor hay 6	
Triticale 12		Straw 5	

The energy value of hay varies considerably. Requesting a fodder analysis or feed test that measures energy value and protein will ensure value for money.

Protein

Protein is required for building body tissues. Protein levels in most feeds will be adequate for mature stock. If there is some green pasture available then protein levels will be adequate. Where there is only poor quality dry pasture available, weaners and hoggets may require a small supplement (4–10%) of lupins or peas to raise the protein level. Hay, straw and oats may have low levels of protein depending on quality.

Table 14.3 Protein values (% dry matter) for common feeds

Cereal grains	*Legume grains*	*Hay and straw*	*Manufactured feed*
Wheat 12	Lupins 30	Lucerne hay 14	Sheep nuts 9–12
Oats 5–10	Peas 23	Good hay 8	
Barley 12		Poor hay 7	
Triticale 12		Straw 5	

Feed quality

The digestibility of some feeds is poor, so take care to purchase good quality feed, particularly when buying hay. Sheep tend to waste hay that is not of excellent quality.

Bulky feeds such as hay and straw will not be able to provide sufficient energy for pregnant ewes and young sheep so some grain will be required. Pregnancy toxaemia may occur in late pregnant ewes on bulky feeds such as hay or straw; they cannot eat and process sufficient of these to meet their requirements.

Cost savings

Before commencing on an extended and expensive feeding program have a look for alternatives or ways of reducing costs.

- Cull or sell aged or faulty sheep.
- Shear early then cull.
- Avoid winter shearing; freshly shorn sheep require 69% more feed than unshorn sheep.
- Draft mobs into age and breeding groups for feeding.
- Reduce the number of ewes joined; this reduces feed requirements.
- Wean store lambs onto a high protein diet as early as six weeks then reduce the ewe's feed.
- Do not allow sheep to fall too low in condition; they require more feed just to function.
- Start feeding a little earlier, before sheep are in very poor condition. (This is even more critical with the onset of cold weather.)

Starting feeding – when and how

When to start

Feed will be wasted if feeding starts too early, while deaths, sickness, tender wool and production losses will increase if feeding starts too late. Feeding should commence as the poorest sheep approach their minimum fat score; this will allow time to introduce feed slowly yet before any damage is done.

How to start

Introducing new feeds or changing rations must always be done *slowly* to avoid digestive upsets and deaths.

Grain. Start grains at 50 grams per head per feed and increase in 50–100 g steps as long as all sheep are feeding. Allow two to three weeks to reach a full ration of grain.

Hay. Hay is unlikely to cause digestive problems but should be introduced gradually as sheep, particularly young sheep, need to be trained to accept hay.

Closely supervise mobs while changing rations. At any sign of scouring (diarrhoea) or digestive upset, delay any increase in the new feed until sheep are stabilised. Hay can always be fed as a supplement to grain to maintain adequate nutrition during periods when digestive upsets occur.

Feeding techniques

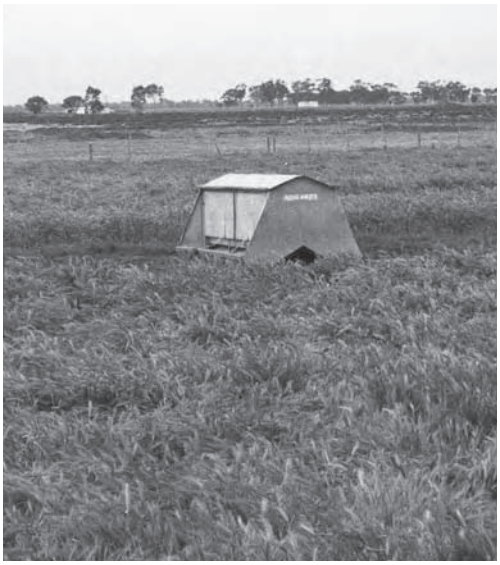
Grain

Most grains are fed whole to sheep. Processed grains need to be fed in a trough to avoid wastage.

Trail feeding. Trail grain onto firm and, if possible, dry ground ensuring all sheep have access to the trail. Once sheep are established on a feed it is best to feed only two or three times per week; this reduces labour and encourages sheep to forage for paddock feed rather than waiting around for the next handout.

Broadcasting. Weekly broadcasting of large grains, such as peas or lupins, onto firm ground will prevent gorging and the desertion of lambs by lambing ewes at feeding time. Be aware that you may also be feeding many birds and rabbits.

Self-feeders. Self-feeders for grains or pellets are useful for small groups of sheep, such as rams, that are well adjusted to its use. A prolonged and watchful training period is essential. Rain protection is usually best to avoid spoilage. Some grains flow better than others.



Grain and pellet self-feeder.

Hay

Hay needs to be well spread so that even the shy feeders have access. Large bales left for self-feeding are wasteful as the more aggressive dominate the bales and foul much of the hay. Feeding two or three times per week is best. Self-feeders are useful for lambing ewes or where hay is fed as a small supplement to grain.

Hay is often wasted and fouled, particularly if self-fed large bales.

Feed supplements for sheep

There are numerous options available for supplementing a sheep's diet. Table 14.4 lists five rations using commonly available feeds. The rations given are to replace half the maintenance requirement but this can be varied to 10, 25 and 75% as shown. For long-term feeding of greater than 75% supplement, seek professional help in designing rations.

Table 14.4 Maintenance rations for sheep of various classes

*The quantities below are for a half maintenance ration (50%) for sheep of various classes. The other half is to be supplied from pasture. Adjustments can be made as follows: for a 10% ration (90% pasture) divide given kg weight by five; for a 25% ration (75% pasture) halve given ration (divide by two); for a 75% ration (25% pasture) increase given kg weight by half (ration + [ration ÷ 2]). *, preferred ration, subject to price variations; n/s, not suitable.*

Feed		*Hay*	*Oats and lupins*	*Wheat*	*Nuts (pellets)*	*Hay and oats*	*Comments*
Sheep class	kg	kg feed per week in at least three feeds (50% of total requirement)					
Dry mature	35	2.5	1.8* 0	1.7	2.0	0.5 1.5	wether or ewe
Dry mature	45	3.0	2.2* 0	2.0	2.4	0.6 1.8	wether or ewe
Pregnant >15 weeks	40	n/s	2.5* 0	2.3	2.8	0.7 2.0	
Pregnant >15 weeks	50	n/s	3.0* 0	2.7	3.3	0.8 2.4	
Ewe and lamb week 1–4		6.3	4.5 0	4.2	5.0	1.3* 3.6	
Milking ewe > week 5		5.0	3.6 0	3.3	4.0	1.0* 2.9	add an increasing amount for lamb
Lamb	<15	2.2	1.3* 0.3	1.5	1.8	0.4 1.3	use high protein nuts growth rate 0.1 kg per day
Weaner	>15	2.5	1.5* 0.3	1.7	2.0	0.5 1.5	use high protein nuts growth rate 0.1 kg per day
Hogget	>25	2.8	1.6* 0.4	1.9	2.3	0.6 1.6	use high protein nuts
Ram	>50	4.2	1.9 0.4	2.1	2.5	0.9* 1.9	

Notes

This table is a general guide. Allowances must be made for variations in both sheep weight and breed, pasture quality, weather and environmental influences and the actual energy value of the supplement used.

Hay must be of good quality. Hay is not suitable for a 100% ration. Wheat, barley, triticale, peas and lupins have similar energy values and are interchangeable but peas and lupins have higher protein levels. Nuts (manufactured pellets) may vary in quality between manufacturers; check the label. Combination rations: oats 80% and lupins 20%; hay 20% and oats 80%.

To all long-term grain rations add 2% finely ground limestone (calcium carbonate) to prevent calcium deficiency developing and 0.5% salt unless salt is adequate in water. Buffers, minerals and vitamins can be added. Seek professional advice.

Adjusting rations

Using the method of weighing and fat scoring of marked sheep as described above (see 'Assessing sheep condition'), carefully monitor the condition of each mob. Regular adjustment of rations will ensure that sheep do not suffer, production is not affected and feed is not wasted.

During periods of cold, wet weather a 20% increase in feed is often required to replace lost body heat. An increase in feed is also required following shearing.

Withdrawal of rations should be gradual to allow the sheep's digestive system to adjust to green pasture. Gradually reduce the amount of supplement per feed over two to three weeks.

Stock confinement areas

In the event of prolonged drought it is recommended that stock be confined to conserve energy rather than wandering around in the search for feed and to protect the soil and pastures from damage. Flocks in mobs of up to 500 sheep can be confined to a small area and provided with troughs for water and feed. This will make management and supervision easier. Stock confinement areas are not suitable for lambing ewes or ewes with lambs at foot. The total nutritional requirements including roughage must be provided in a well-balanced ration. If considering this solution it is recommended that you seek specialist advice from drought information sources and professionals.

Storing feed

Grain should be stored in a silo or mouse proof shed. Hay also needs to be stored in a shed or under a tarpaulin.

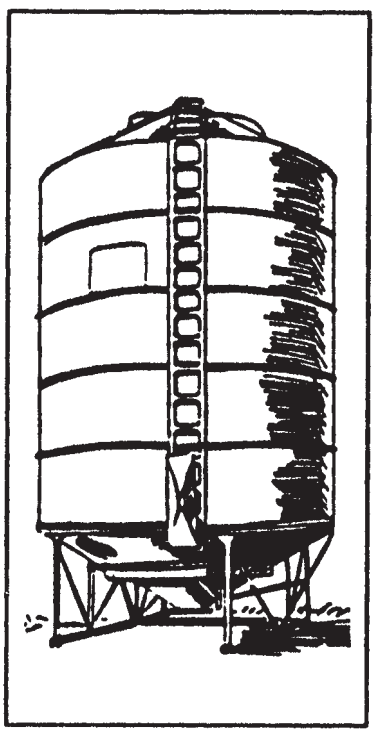


Figure 14.2 Silo for grain storage.

Health while feeding supplements

Sheep under feed stress or being hand fed are subject to a number of conditions that affect their health, therefore supervision of sheep should be more frequent and more thorough than normal. Look carefully for any sign of ill health, including:

Enterotoxaemia (pulpy kidney). Enterotoxaemia is commonly triggered by a change of diet or grain feeding so ensure that 5 in 1 or 6 in 1 protection is up to date; if not, vaccinate.

Grain poisoning. Grain overload will cause scours and deaths. Sheep will appear unwell, uncomfortable, separate from the flock, stop feeding and eventually develop diarrhoea and die. Avoid spilling grain and follow the recommendations for

grain feeding. Mild cases may recover without treatment but veterinary advice should be sought early and treatment commenced before irreparable damage occurs. If symptoms are widespread, an increase in roughage (hay) and a hold on the rate of grain will help.

Worms. As sheep will be grazing very short pasture, a rapid build-up of internal parasites (worms) may occur. Observe for signs of scours, worm egg test and treat early.

Stress. Make allowances for stress caused by weather, handling and reproduction by providing extra feed, gentler handling and shelter.

Expert advice should be sought early in the event of unusual sickness or death.

Hay stored outside deteriorates.

15

Breeding sheep

Ewe breeding cycle

Ewes normally come on heat (oestrus) for 36–48 hours every 17 days. Pregnancy (gestation) is around 147 days (five months) with a range of 140–160 days. The heat cycle returns after weaning or four to six months after lambing. Ewes are infertile for part of each year because their oestrus or heat cycle ceases. Most Merinos, Comebacks and Dorsets begin their heat cycles in October and continue until June, while most British breeds and cross-breds do not commence cycling until January.

Ewes are most fertile from February to May. During this time they produce more eggs and conceive more quickly so you have a more condensed lambing and the flock will have more multiple births and fewer non-pregnant ewes.

A fertile ewe flock.

Ewe preparation for joining

Health check

Ensure unproductive ewes are culled. Remove ewes that are barren (failed to lamb previously); have missing teats; have damaged udders; have a damaged vulva or prolapse; or have serious leg, foot or fleece faults.

Body weight

There is a critical liveweight or condition below which many ewes will not conceive. This liveweight varies with the breed and strain of ewes but is in the region of 30–40 kg or fat score 2. Above this most ewes will get in lamb (barring disease) and as weights increase, more twins are conceived. Flocks of ewes in good condition have more lambs than flocks of lighter ewes.

Feeding supplements before joining to increase the lamb drop is not likely to be profitable. Every effort should be made to manipulate stocking rates and grazing patterns to maintain the ewes in as good a condition as possible for joining. A minimum fat score of 2 at joining should be the target.

Teasers

For early joining (October–December) of Merino-type sheep the ewes can be stimulated to cycle by introducing rams into the flock. It is essential that the ewes have had no visual or smell contact with rams for a month before introduction. To avoid a widely spread lambing, infertile *teaser rams* are used. Teaser rams are vasectomised rams or wethers given injections of a male hormone. Teasers are left in with the ewes for 14–15 days and are then replaced with fertile rams. Most ewes will produce eggs and mate between 18 and 26 days of the teasers being introduced. This *ram effect* is also used to produce a very compact lambing.

Ram selection and care

Two rams to every 100 ewes (2%) is the usual ratio at joining, but one per cent (1%) of fit rams is enough in big flocks of, say, 700 ewes. It is risky to rely on only one ram in a flock; if he fails to perform then the whole breeding program is jeopardised.

Well before joining, rams should be selected for the breed characteristics required. Rams contribute 50% of the genetic potential to each lamb born to around 50 ewes per mating mob, so be prepared to pay a little extra to buy good rams; they are a good investment. Check rams annually before joining, or before purchase, for soundness of the testicles, penis, pizzle and feet.

Only buy rams from Ovine Brucellosis Accredited Free flocks. This prevents introduction of this fertility reducing, sexually transmitted disease. Selection of rams should be from properties with a tested and/or vaccinated status for Ovine Johne's Disease (OJD) that is an acceptable risk to your property. Market Assurance Programs (MAP) for OJD provide some protection. Tested flocks meeting the criteria are classed as Monitored Negative (MN), 1, 2 or 3 indicating the number of testing cycles for which

they have been MN. Check state regulations and movement controls and seek professional advice until you are fully aware and satisfied with the risks.

Rams should be kept physically fit and in fat score 4, but should not be allowed to become fat. In some years they will require supplementary feeding, particularly with green feed, for maximum fertility. They should be drenched, crutched, jetted and vaccinated with the rest of the flock and well before joining to ensure that they are in top condition.

Estimated Breeding Values (EBVs) or Australian Sheep Breeding Values (ASBVs)

Using a recognised industry wide genetic information system (such as LAMBPLAN for meat breeds, and Merino Genetic Services, Central Test Sire Evaluation (CTSE), Rampower and Merino benchmarks for wool breeds) to select rams will give a better result than just visual assessment. These services measure genetic production traits and produce Estimated Breeding Values (EBVs) for individual animals based on their own performance and that of relatives.

EBVs for post weaning weight, post weaning fat depth and post weaning eye muscle depth plus associated indexes are used by the majority of meat breed studs. For Merinos measurements include growth, body weight, carcase merit, reproduction, wool quantity and quality and disease resistance. Rapid improvements in the desired traits are possible using these measurements of genetic potential. Sheep with superior EBVs make more money for the commercial producer.

In 2005 Sheep Genetics Australia (SGA) was formed as a platform for standardisation, calculation and use of credible and accurate breeding values across all sectors of the Australian sheep industry, and includes a single national language, Australian Sheep Breeding Values (ASBVs).

Select sound, well-bred rams such as this Poll Dorset ram.

Joining

Joining (mating) should be planned so that there will be good pasture for the last stages of pregnancy, the milking ewe, weaners, and lambs so they will be marketable or ready for their purpose at the right time. Allow five months from joining to lambing.

Put 2% rams into the ewe mob for eight weeks. This gives each ewe three chances to mate and conceive. For autumn matings, when ewes are very fertile and in fat score 3 or better, a six week joining can be used (70% can be expected to conceive in the first 17 day cycle) and a very condensed lambing enjoyed.

Joining for longer than eight weeks will create a protracted lambing and more work. Rather than extend the lambing it is better to take the rams out at eight weeks and put them back for six weeks in the autumn when the missed ewes will be more fertile. If a ram mating harness and crayon is used, for second joinings, the late joined ewes will be identified with a crayon mark and can be drafted out for separate treatment.

The joining paddock should have readily accessible pasture and water, be large enough to avoid crowding and yet compact enough so that the rams can find all the ewes without too much travelling. Avoid steep or heavily timbered terrain.

Managing pregnant ewes

For the first 14 weeks of pregnancy ensure there is enough feed to maintain the ewes' body condition at a constant level. No special treatment is required at this stage.

During the last six weeks of pregnancy ewes should gradually gain weight and reach a minimum fat score of 2.5. Their feed level must be increased to cope with rapid lamb growth, lambing, lactation and to avoid pregnancy toxaemia (twin lamb disease) that causes ewes to weaken, collapse and, if not treated, die. Feeding grain will help prevent pregnancy toxaemia. Oats are an effective and safe feed supplement for late pregnancy. Wheat or barley are also suitable, although extra care is needed. Start feeding early and introduce sheep to grain gradually over two to three weeks (see 'Feeding' section for quantity and method).

If feeding grain over several months, 2% ground limestone should be added to raise the calcium level of the feed and avoid the onset of milk fever (hypocalcaemia). Energy is the major requirement when feeding pregnant ewes. Protein levels are usually adequate in pasture, particularly if there is a green pick available.

If the ewes have not been recently drenched for worms, conduct a worm test (faecal egg count) six to eight weeks before lambing. The results will indicate if a worm drench should be given at the pre-lambing crutching.

Crutch and vaccinate ewes three to six weeks before lambing is due to commence. Crutching helps to keep the ewe clean and an udder trim makes suckling easier for the lambs. Vaccinate with a 5 in 1 or 6 in 1 vaccine; this protects the ewe for the year and gives maximum disease protection to the lamb through the colostrum or first milk. Vaccination is in the head or neck area where skin and carcase damage will be minimal. Give a worm drench if indicated by a worm test.

Lambing

Newborn lamb.

Ewes will need to be inspected at least twice a day while lambing and be given assistance where necessary. Maiden ewes usually have more trouble lambing than older ewes.

The ideal lambing paddock is easily accessible for supervision, one where the ewes are visible without being disturbed, well drained on a gentle slope and sheltered with trees, hedges or tussocks.

Save a paddock with a good stand of feed for ewes to lamb in. Lambs with birth weights between 4 and 5 kg are the most likely to survive and this is largely determined by the ewes' nutrition during the last six weeks of pregnancy.

To reduce lamb losses at birth a number of procedures can be adopted.

Drift lambing

Drift lambing is a labour intensive method of lambing but does provide excellent supervision. A number of small paddocks are used and each morning the ewes that haven't lambed are quietly drifted or moved off into an adjoining paddock. The newborn lambs and ewes are left in the small lambing paddock for a day and are then moved into a well-sheltered paddock. By using this method ewes in difficulty or orphaned lambs are easily identified and mix-ups with bigger lambs are avoided.

Ram harness

At joining, a harness is strapped around the chest and forelegs of rams, a special crayon attached below the brisket so that when the ram mounts for service the crayon marks the rump/back of the ewe. By changing the colour of the crayon, service dates and therefore lambing dates can readily be identified allowing more intensive supervision at the point of lambing. This harness can also identify most non-pregnant ewes (no mark), or be used for stud purposes and second joinings to identify late joined ewes.

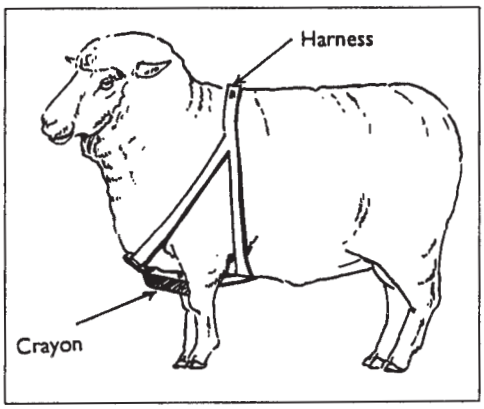


Figure 15.1 Ram mating harness and crayon.

Shed or isolate

Weak or foster lambs often need protection until they are stabilised and bonded with their mothers, often only for one day. Moving them to a shed or under cover is ideal to

reduce hypothermia or providing a temporary pen to keep them together until bonded and feeding will save many lambs. Lambing under cover during very bleak weather can also reduce lamb losses.

Assisting lambing

It is always a difficult decision to know when to assist a ewe that appears to be having difficulty lambing. Disturbing the ewe too early can make mothering-up difficult but waiting too long can result in the death of the lamb and eventually the ewe. The normal time from commencement of straining to delivery is about one hour. If assistance is given too early the ewe may not be fully dilated, resulting in damage to the ewe. It is best to note any ewes appearing to be in trouble and check on progress an hour or so later.

Ewe and lamb bonding.

Lambing equipment includes clean water, soap and/or disinfectant, shepherd's crook, lubricant (obstetrical), and two thin cords 500 mm long (boilable).

Hygiene is important so that infection is not introduced into the ewe. Before commencing clean the ewe around the vulva as well as your own hands and equipment.

Lubrication of hands and equipment aids manoeuvring and helps prevent tearing or injury. Always handle ewes quietly and gently. Small and sensitive hands are an advantage in manipulating lambs during birth. Remember, the uterus and vagina are very delicate organs as is the unborn lamb.

There are two basic reasons that ewes require assistance to give birth:

1. The birth canal (vagina) is too narrow because the lamb is too big (e.g. a big breed sire), the ewe is too small (e.g. a poorly grown maiden ewe) or the ewe is too fat.
   Signs. Two feet and the nose are presented normally but birth can't proceed (if the head is swollen the lamb is usually dead).
2. The lamb is incorrectly presented (malpresentation). Forms of malpresentation include breech (backwards), head back, one foreleg back, both forelegs back or parts of two lambs in the vagina together.
   Signs. Other than two feet and the nose are presented. Determine the position and presentation of the lamb while the ewe is either standing or on her side.

Swollen head on lamb that died during a protracted birth.

Normal presentation

The two forefeet are presented first, with the head resting on the outstretched forelegs with the nose pointing down, followed by the rest of the body (Fig. 15.2). A less common but normal presentation is upright and backwards, with two hind legs and tail presenting first (Fig. 15.3). To assist lambs that are normally presented but stuck, straighten the forelegs and pull the lamb out and down toward the ewe's feet in a smooth, even and gentle motion. Pull one leg slightly ahead of the other.

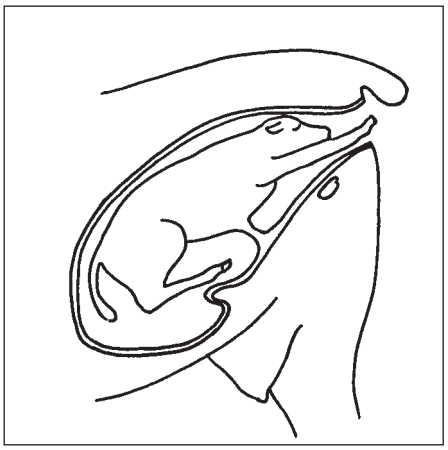


Figure 15.2 Normal presentation.

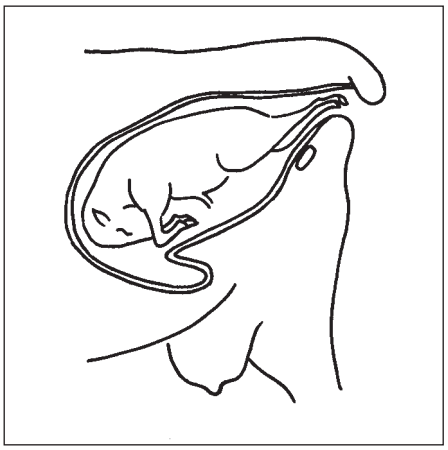


Figure 15.3 Backwards normal presentation.

Malpresentation

Do not attempt to pull a lamb out until it is properly positioned. Once a lamb dies it begins to swell and the uterus starts to contract creating a very tight package. This increases the risk of tearing. Incorrectly presented limbs or head can be gently manipulated to the correct position; pushing the lamb back into the uterus will provide more room to work. Avoid damaging the uterus and vagina with sharp projections such as hooves or teeth by covering them with your hand.

One foreleg back. Either push the lamb back and gently manoeuvre the leg forward or, with small lambs, assist the shoulder of the retained leg through the pelvis and deliver with traction on the other leg and head.

Head only, both forelegs back. Turn the ewe upside-down onto her back, locate the forelegs and work them around into the birth passage using liberal amounts of lubricant. Once the legs are realigned deliver as normal. If the lamb is dead it is easier to cut the head off, then push the lamb back into the uterus and realign the legs. Be sure to place a hand over the sharp neck bones.

Head back (Fig. 15.4). Attach a cord to both front feet using a slip knot or running noose, push the lamb back into the uterus and with the nose in the palm of your hand gently draw the head around to the normal presentation position. Delivery in the normal way can be assisted by another running noose around the back of the head and behind both ears (Fig. 15.5).

Breech (Fig. 15.6). In this situation, only the tail is presented. Do not try to turn the

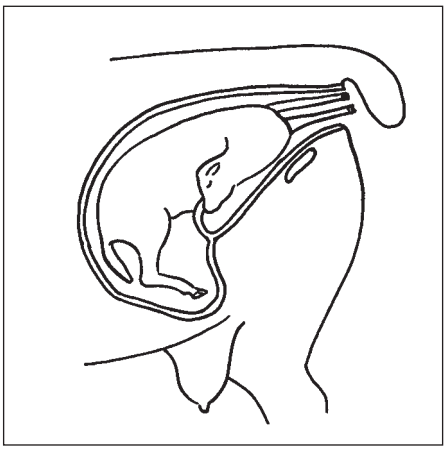


Figure 15.4 Head back presentation.

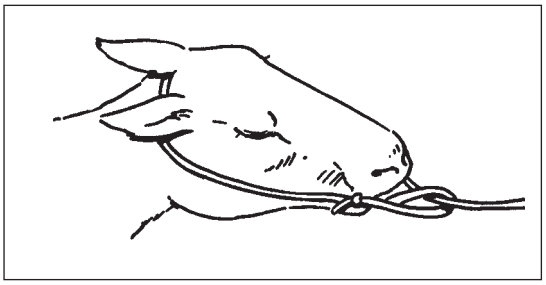


Figure 15.5 Running noose to assist delivery.

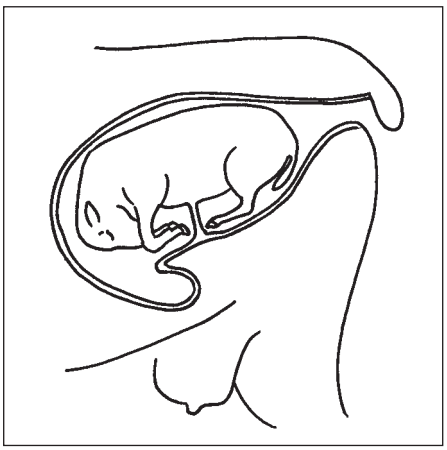


Figure 15.6 Breech presentation.

lamb as this will only damage the uterus. Push the lamb back into the uterus, then work the hind legs around into the birth passage one at a time with the hoof in your cupped hand. Deliver the lamb backwards, hind legs first, by applying traction to both legs in a downward direction towards the ewe's feet.

Twins and multiples

First, sort out which legs belong together, and to which head they belong; not an easy task. It may be necessary to push one lamb back while the other is delivered; always deliver any backwards presenting lamb first. Align legs and heads using the same principles as for single lambs and deliver with the help of traction. Once they are presented correctly delivery is usually easy as these lambs are usually smaller than singles. Flighty, nervous or stressed ewes will tend to run away and neglect the weakest or first born lamb; confining them all until bonded will assist. If one is deserted, rescue it for fostering onto a ewe that has lost its lamb.

After delivery

Ewe. Check the ewe to ensure there are no other lambs remaining in the uterus. Failure to do this may result in the decomposing retained lamb causing the ewe to becoming sick after a few days. If a decomposing dead lamb has been delivered, antibiotics obtained from your veterinarian will enhance the ewe's chances of survival.

Lamb. Ensure the lamb can breathe. Wipe mucus from the nose and mouth and give a pat on the ribs to stimulate breathing. Fluids and mucus can be cleared from the lungs by gently swinging the lamb around you while holding the hind legs.

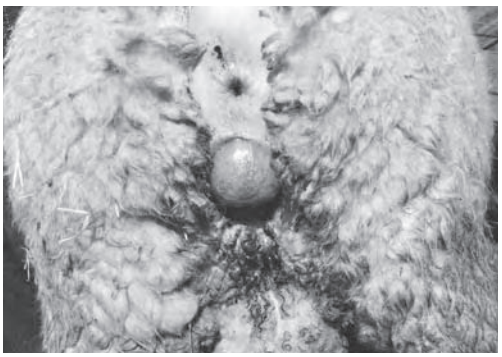
If you are unsure whether the lamb is alive, you can check by placing a finger in the throat, which should cause swallowing, or touching the eye cornea, which should cause a blink.

Allow the ewe to smell the lamb and the lamb to have a drink. If the ewe looks like it will run away, confine both in a small pen until bonding occurs and the lamb is drinking.

Isolate and pen a ewe and lamb until bonding and feeding.

Prolapses

Occasionally, just before or during lambing, a ewe may prolapse, i.e. part of the vagina and or uterus tears away and protrudes from the vulva. The prolapse looks like a lump of meat protruding from the vulva. If the ewe has not lambed she will strain as though she is trying to do so, become considerably distressed and do further damage during lambing if corrective action is not taken. Permanent damage and even flystrike may result if the prolapse is not corrected after lambing.



Vaginal prolapse.

Prolapse retainer being inserted.

Using disinfectant and a lubricant clean the prolapsed tissue and gently push it back inside the vagina and insert a ewe prolapse retainer. The tear-drop shaped paddle of the

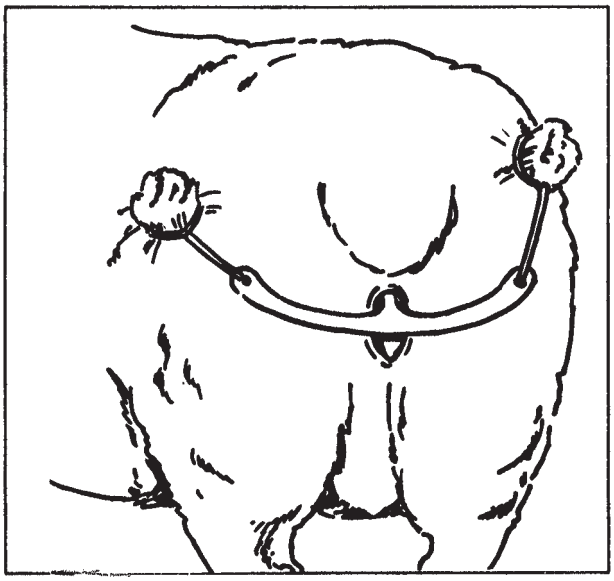


Figure 15.7 Correctly installed prolapse retainer.

retainer is held in place by the vaginal muscles and is further secured by tying the wings to tufts of wool.

In most cases the ewe will be able to lamb successfully with the retainer in place. The retainer is left in for several weeks after lambing until the prolapse is fully reduced. Once a ewe has prolapsed it is likely to have a permanent weakness and so be prone to prolapse at subsequent lambings.

16

Lamb care

Weak and hypothermic lambs

Lambs too weak to suckle after delivery can be assisted by feeding them about 100 ml of warm colostrum (the first milk from the ewe) by a tube into the stomach.

If they are unable to get milk or during very cold, wet and windy weather, lambs may lose excessive body heat and become chilled or hypothermic. When in this condition they will not move around, feel cold, and appear blue on the lips and in the mouth. Prompt action is needed to resuscitate hypothermic lambs. To decide on the appropriate treatment, measure the lamb's temperature by placing a thermometer in the rectum through the anus (back passage) for one minute.

If the temperature is 37–39°C, dry and feed the lamb. If it is below 37°C, dry, warm and feed the lamb dextrose, glucose or Vy-trate using a stomach tube.

When lambs are suckling strongly, return them to their mothers in a sheltered area or shed.

Orphan lambs

The first and best option for orphaned lambs is to foster them onto a freshly lambed ewe that has lost its lamb. Confine the ewe, rub the lamb on the ewe's nose and hold the lamb while it has a drink. Keep them confined and away from other lambs until the pair has bonded and the lamb is drinking on its own. A small portable pen used in the paddock is ideal or the ewe and lamb can be put into a shed. Fostering is also useful with a rejected twin or triplet.

Weak or cold lambs need intervention.

A drink (100 to 150 ml) of the first milk (colostrum) is essential for development of the digestive system and immunity to common diseases in the first few weeks of life. Natural colostrum is best and this can be milked from ewes whose lamb has died or from one side of a freshly lambed ewe. Colostrum can be stored in the refrigerator until required.

If no natural colostrum is available to use for orphan lambs artificial colostrum can be made using the following recipe:

750 ml warm cow's milk
1 beaten egg
3 ml of castor oil
2 teaspoons (10 ml) glucose or sugar
Feed the lamb 120–170 ml of this mixture four to six times a day for 48 hours after birth.

After that, use undiluted cow's milk or high fat calf milk replacer. Ewe's milk is stronger than cow's milk so fresh milk can be strengthened with the addition of a little powdered milk. Milk replacer powder should be mixed at the rate of 150 grams per litre of water. Feed the milk warmed to body temperature using a narrow necked bottle and soft lamb feeding teat.

Table 16.1 Daily milk feeding rate for orphan lambs

Period	*Feeds per day*	*Volume (ml)*
Day 1–2	4–6	120–170 colostrum
Week 1–2	4	200 increasing to 500
Week 3–4	3	700
Week 5–6	2	700 decreasing to 500
Week 7–8	2–1	500 decreasing to nil

Green pasture and water should be available at all times. From week three high protein lamb pellets should be provided ad lib. If the pasture is of poor quality, supplement it with pellets or crushed oats and high quality hay from the fifth week; continue after weaning.

Overfeeding orphan lambs can cause diarrhoea, which can be fatal if it is not treated promptly. In the event of diarrhoea, substitute the milk with electrolyte solution or a scour treatment until the scouring stops, usually within a day.

A milk self-feed for lambs.

Marking

Marking is performed when the lambs are 2–10 weeks of age. The tail is docked to reduce the risk of flystrike and ram lambs are castrated to halt development of

secondary sex characteristics. The lamb marking operation is often combined with ear tagging, ear marking, mulesing (or substitute) of wool breed lambs, and should always include vaccination against Clostridial diseases.

There are two common methods used to mark lambs: by knife (surgical tail docking and removal of testicles), or by constricting ring (constriction of the blood supply with strong elastic rings causes the tail and testicles to eventually fall off).

Equipment for lamb marking includes marking rings, applicator (Elastrator), lamb marking cradle (for larger flocks), disinfectant, double-ended marking knife (for knife method), vaccine and vaccinator syringe.

It is best to avoid marking in cold, wet weather. Choose a warm, still day, preferably the morning, as this reduces stress and losses through mis-mothering.

Cleanliness is a big factor in reducing losses after marking. All instruments that break the skin should be boiled for five minutes before marking and, with the exception of the vaccinator, be left in antiseptic solution between operations. Lambs should be marked in clean yards and dropped onto clean ground.

Lamb marking.

For all procedures the lamb should be securely held by an assistant or placed in a special marking cradle so that it is restrained on its back with its head slightly raised, its hind legs held apart and towards the shoulders and its rump facing the operator. If hand held, the lamb is usually supported on a fence rail at a convenient height to the operator and the catching assistant.

Marking is a good time for an accurate count of lambs. From this count you can calculate the often quoted lambing percentage, which is actually the number of lambs marked as a percentage of the number of ewes joined. If docking tails by knife, a count of the tails at the end of the day is a reliable tally.

Castration

By knife. The testicles are first exposed by cutting off the tip of the scrotum. A special double-ended lamb marking knife and clamp is most commonly used to remove the testicles. The thumb and forefinger of the left hand are used to squeeze the testicles gently forward. Each testicle in turn is grasped with the clamp (the 'handle' end of the knife) and drawn steadily out of the scrotum. The stretching action constricts the small blood vessels as they are severed, preventing undue blood loss. The operation is then repeated for the remaining testicle.

By constricting (elastic) ring. Fit an elastic lamb-marking ring to the applicator, then expand it by squeezing the applicator. Fit the ring over the scrotum and down to its base, draw the scrotum through the ring with your free hand. With the thumb and forefinger on each side of and below the ring (in the groin), manoeuvre both testicles into the scrotum and then relax the applicator. Check that there are two testicles present and then twist the applicator out from under the ring. Check again that one or both testicles have not slipped back; if this happens, remove the ring by hooking it off with one prong of the applicator and recommence the procedure.

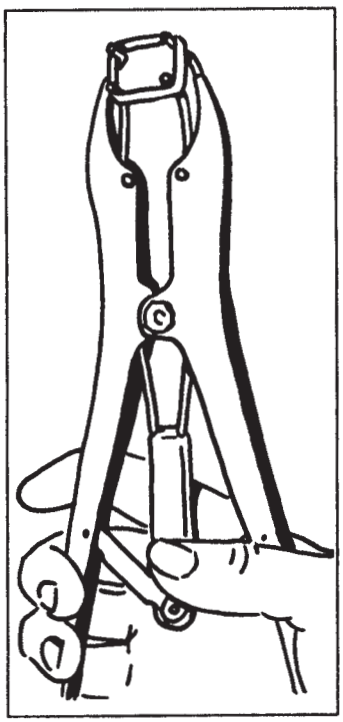


Figure 16.1 Marking ring applicator.

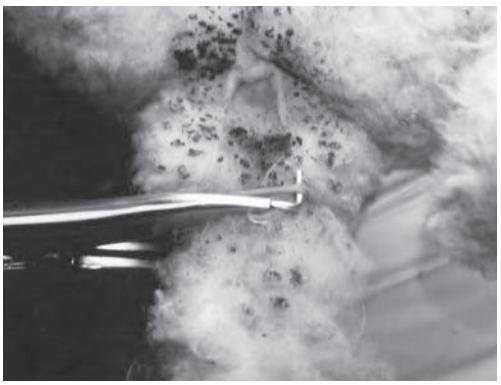
Manipulating testicles into scrotum for ring castration.

The ring constricts the flow of blood to the testicles and the scrotum, causing tissue below it to die. The dried tissue separates from the body after about three weeks but may take longer to fall away if it is held by wool trapped under the ring.

Tail docking

The length of the shortened tail is critical in reducing susceptibility to breech flystrike and skin cancer in older ewes. The tail should be docked at the point even with the tip of the vulva on ewe lambs or the equivalent on wethers; this is 60–70 mm from the butt.

By knife. With the knife, the wool-less skin on the underside of the tail is pushed toward the butt of the tail and then a quick cut is made through the tail in between the



Tail docking with a ring.

joints. This method leaves a slight protrusion of wool-less skin that heals over the severed stump, reducing the accumulation of stained wool and dags.

By gas knife. A gas knife is an advance on the knife method. This special knife is heated in a gas flame and when used in the same manner as a conventional knife the wound is seared, reducing the amount of bleeding and infection.

By constricting (elastic) ring. Using the elastic ring applicator, feed the tail through the expanded ring, relax the applicator on a joint at the correct length and then twist the applicator out. The tail will drop off over the following month.

Vaccination

Vaccinating lambs.

Vaccination against Clostridial diseases is essential. Use 5 in 1 vaccine, or 6 in 1 vaccine for store sheep. The 1 ml or 2 ml dose is injected under the skin on the bare areas under the legs (armpits). Pinch the skin up, insert the needle into the fold and depress the plunger; a bump will appear at the injection site. Alternatively, vaccination can be given in the head or neck region where potential skin or carcase damage is less likely. Do not inject into the muscle or underlying tissues.

Johne's disease vaccination should be undertaken as early as possible, but only if this is part of the property management strategy and permissible under state laws.

Mulesing

As explained previously, the sheep industry is urgently looking for an alternative to mulesing to satisfy trade and welfare demands. Investigate and use alternatives in preference to this procedure.

Mulesing involves the surgical removal of strips of wool-bearing skin from the breech, or crutch, area and the upper surface of the tail. This promotes stretching and enlargement of the natural area of bare skin around the anus and vulva and under the tail as the cuts heal. This in turn reduces the dampness, soiling and odours from sweat, urine and dung, making the breech area much less prone to flystrike. This operation is only necessary on loose or wrinkly skinned sheep such as Merinos.

The mulesing operation calls for a skilled operator able to deal with variations in the wrinkliness of sheep and so get a uniform result. Mulesing contractors are readily available and should be used for this procedure.

Mulesing results in some blood loss and stress, although it is mild compared to the

trauma of flystrike. Well-planned mulesing, usually combined with lamb marking, will minimise any adverse effects. Follow these steps:

- Choose a fine, mild day.
- Do not drive or stress lambs before mulesing and let them cool down before starting so that they bleed less.
- Use temporary yards to reduce the risk of infection.
- Do not drive the lambs after the operation; it is best to mules in the paddock in which the lambs are to stay.
- Allow the lambs to find their mothers as soon as possible after mulesing.
- Use only sharp shears and knives and dip them in a disinfectant after mulesing each lamb.
- Where possible, avoid mulesing when blowflies are active.
- Use a registered fly dressing on the wound.
- Avoid mustering the lambs for four weeks to allow the cuts to heal.

Feeding

Milk production by the ewe reaches a peak at two to three weeks from lambing and even under the best conditions will be down to 10% by 12 weeks; therefore, it is essential to increase the quality and quantity of grazing available to the lamb. By three months the lamb will be eating approximately as much as the ewe but it requires much better quality feed.

Weaning

Yard the ewes and lambs, draft them into separate mobs and then keep them well apart in securely fenced paddocks. Prime lambs are weaned at time of sale; for all other sheep wean at 6–12 weeks. If feed is poor, wean as early as six weeks onto the best possible pasture. By weaning earlier rather than later better feed utilisation is achieved and intestinal worm contamination from the ewes is reduced.

Drench lambs at weaning and move them to the best and most worm free pasture.

Well-marked prime lambs ready for market – docked tail is right length.

17

Weaner management

Good management of weaner sheep is an essential part of ensuring the long-term productivity and profitability of both weaners and the flock.

Good management of weaners has the following benefits:

Fertility. Well-grown ewe hoggets conceive better at their first mating than ewes that are too light.

Production. Total wool production over the first four years of life can be as much as 2.5 kg per head higher for well-nourished weaners compared to poor weaners.

Earlier sale. Better developed young wethers can be sold for mutton or for live shipment at an earlier age.

Earlier joining. Well-grown ewe lambs in suitable districts can be successfully joined when they are between six and 12 months old if they meet critical weights. This means extra lambs at lower cost.

Rearing good weaners involves a good feeding program using high quality pasture or feeds, and a regular drenching and worm management program to control internal parasites.

Feeding

The best lambs are those that grow fast from birth and keep growing after they are weaned. This means the feeding program for weaners starts with well-fed ewes.

By the time pasture dries off, lambs should be at least 12 weeks of age and 18–25 kg liveweight. Lambs dropped in autumn are drenched and weaned onto

Poor pasture makes poor weaners.

fresh green, clover-rich pasture. Wean winter and spring lambs onto the regrowth after hay cutting, fodder crops or low risk pasture that has not run ewes and lambs in the current year. Even a sparse green pick will give a useful lift to the protein content of a ration.

Supplementary feeding (also see Chapter 14, 'Feeding supplements')

Feed supplements if green feed or high quality dry feeds are not available. Early mown hay that includes plenty of clover, fed at the rate of 0.35–0.50 kg per head per day, is likely to produce the best results of the home-grown feeds, since it has a higher protein content than hay cut late. Lucerne hay is excellent if it is not too stalky or expensive.

Oats are the best feed and are easy to feed out, but are often low in protein, so add 10–20% lupins or peas. Other grains such as barley, wheat or triticale can be used but with extra care and supervision. All grains should be introduced slowly and be fed with some good quality hay if there is little pasture available.

If pasture is inadequate, start feeding when pastures dry off and keep it up until about a month after the autumn break or during winter.

Fat scoring a sample is the best guide to beginning and ending supplementary feeding. Regular weighing of a sample group can also be a good indicator.

Allow plenty of time for all weaners to become accustomed to feed supplements. If training is more urgent, put some adult sheep that have previously been hand fed in with the weaners until they learn the routine. Start feeding when weaner growth slows; this will be at the end of spring or early summer when the pasture dries off or during winter if pasture is inadequate. Continue feeding until there is a good green pick in the pasture and the sheep are obviously putting on weight. Do not wait until weaners are in light condition before beginning feeding or some may die before they are eating a significant ration.

Green clover-rich pasture produces well-grown healthy hoggets.

Worm control

Weaners do not have a well-developed immune system so are very susceptible to all sorts of infections, particularly internal parasites.

The best worm control program for weaners starts with control of worms in the ewes, and then continues with a regular testing and drenching program and the provision of safe pasture for the next 18 months. At weaning, lambs should be drenched and be put onto a *clean* pasture. Clean or safe pasture has only had cattle or properly drenched wethers on it since the previous summer.

Lambs should never be weaned onto a paddock where ewes and lambs have been running since February as such pastures are often heavily contaminated with worm larvae.

Poor worm control results in dead weaners.

Flystrike prevention

Dock tails to the tip of the vulva in ewes and to an equivalent length in wethers. Prevent scouring by good worm control.

Body strike is often a problem in weaners because they are susceptible to fleece rot and mycotic dermatitis. Avoid yarding or shedding weaners when they are damp. Treatment for fly prevention will be necessary in fly waves.

Booster vaccination

Ensure that the Clostridial vaccination program is up to date. Weaners require a second dose approximately four weeks after the marking injection and then an annual booster.

Weaners do not have a fully developed immune system so are very susceptible to these diseases, particularly pulpy kidney disease.

Scabby mouth

If scabby mouth is a regular problem, consider vaccination. If an unexpected outbreak occurs then manage the outbreak with good soft feed for mouth lesions and foot bathing or jetting to control flystrike on feet and leg lesions. Vaccination after an outbreak has commenced is of little benefit.

18

Wool sheep production

(Refer also to Chapter 15 for management of breeding.)

Selection criteria

High, clean fleece weight is the measurement of greatest economic importance for wool growing enterprises. Skin area, follicle density, fibre diameter and fibre length determine the weight of clean wool produced. Body size, disease resistance and fertility affect costs, productivity, losses and reproduction.

Skin area

The bigger the sheep and skin, the greater the area upon which wool can be grown. It is undesirable to increase skin area by increasing wrinkliness. This increases the susceptibility to fleece and skin disease and flystrike.

Follicle density

Follicle density is the number of fibres per square millimetre of skin; the more follicles, the greater the capacity to grow wool. Short-stapled sheep are often mistakenly described as having higher follicle density, but long-stapled sheep with soft-handling wool of good character or crimp and staple structure are more likely to have this trait.

Fibre diameter, quality numbers and character

Fibre diameter is the most critical factor in determining the end use of wool and therefore the type of buyer and price. This factor is more difficult to determine from the sheep's back but samples can be tested, and this is frequently done for ram selection of wool breeds.

Before diameter testing was available, the thickness of wool was estimated by the crimp (waves) rate in wool and recorded by a *quality number* or *wool count*. Historically the 'Bradford Quality Count' was the number of hanks of 560 yards in length that could be spun from one pound of a particular type of wool. Finer wool produces a greater length of yarn, so has a higher number than coarser wool. For wool classing purposes this was not very practical so the readily visible crimp rate was used and correlated to the quality number or count. Hand spinners and coloured sheep breeders still use the quality count numbers.

Strong wool has a low crimp rate and a low quality number (30s–40s) and correspondingly a high fibre diameter (>30 micron), whereas fine wools have a high crimp rate and quality number (>70s) and a low fibre diameter (<21 micron). Medium wools fit between these ranges.

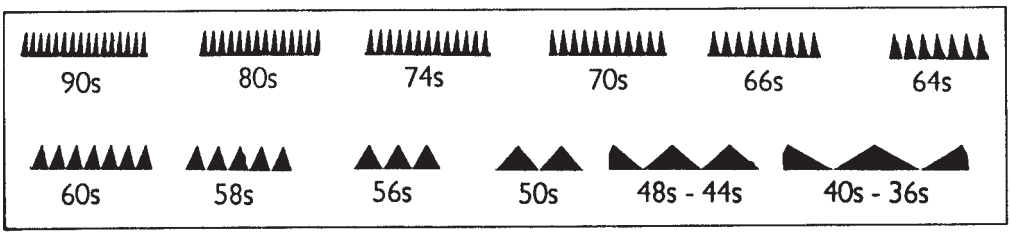


Figure 18.1 Quality number corresponding to crimp spacing on wool staple.

Unfortunately, in many lines of sheep there is a poor correlation between fibre diameter and crimp rate. Therefore, selecting or culling sheep on the basis of quality number will not necessarily remove the sheep outside the desired micron range and may tend to remove some of the best sheep.

With the exception of superfine wools, it is crimp definition or *character* rather than crimp rate that is important. Crimp character relates to how well defined the crimps are: sharp even crimps or wavy uneven crimps. Fleeces with a very distinct crimp tend to have a much more even (low coefficient of variation) fibre diameter, a lower mean fibre

Strong Merino fleece.

Medium Merino fleece.

Super-fine Merino fleece.

Medium cross-bred fleece.

diameter than their crimp rate suggests and often come from sheep with a higher than average follicle density.

Fibre length

This is closely related to staple length (group of fibres). Obviously the longer the fibre grows in a year the greater is the amount of wool harvested, all other factors being equal. Long-stapled sheep will usually cut more wool and have higher yields (more clean wool) than short-stapled sheep.

Body size

Generally speaking, the finer the wool the smaller the sheep, but body size is not a good selection criteria for wool. Modern breeding techniques and objective measurement are now breaking this correlation and producing larger framed, fine wool sheep.

Larger sheep have a number of advantages. They are more efficient converters of food to wool, have a faster growth rate and earlier maturity that gives production, marketing and early joining advantages. Changing to larger framed sheep is likely to increase wool production per hectare but if fibre diameter increases, the price per kilogram may fall. Stocking rates for large sheep are lower than for small sheep producing a cost saving in that there are less sheep to treat and handle. As a guide, 1000 fine wool Merinos would eat about as much as 930 medium or 880 strong Merinos.

Fleece disease resistance

Susceptibility to fleece rot, mycotic dermatitis and flystrike are all, to some degree, affected by inherited body and fleece characteristics. The sheep that are more resistant to these diseases appear to have plain bodies (minimal wrinkle); a level backline (no dips); good wool character (crimp definition); dense or tight staple structure; white wool and moderate wax content.

Fertility

Lambing percentage is a significant factor in a breeding flock but less important than wool production characteristics. Fertility of ewes is determined by the ability to conceive, multiple birth rate, ease of lambing and milking ability. For rams, fertility is determined by the ability to produce and deliver viable sperm.

Fertility of a flock is difficult to assess other than by examining flock records. Reject sheep with any obvious faults in teats, testicles or penis. These are usually individual rather than genetic characteristics. The environment, especially feed, has a significant influence on all fertility factors.

Multiple births are of little advantage if the ewes are not capable of supporting more than one lamb. A death or two runts often results from the infrequent multiple births in some lines of Merino-type sheep. Shelter, good management and plenty of good quality feed are needed by ewes with twins if both lambs are to survive and be productive.

Sheep selection for wool production

With these factors in mind, the general aim for a wool grower is to increase the clean fleece weight without increasing the fibre diameter. If first-cross prime lamb production is part of the enterprise then selection for these characteristics must be weighed against purely selecting for wool traits.

Cull sheep that have poor crimp definition (plain), short staple, or harsh handle or feel.

Select sheep that have large frames, plain bodies (few wrinkles), open faces, long staple, high yielding fleeces, dense fleeces, good character and good handle.

Breeders of wool sheep need to have clearly defined objectives that are adhered to over a long period. Ram selection is particularly important in achieving long-term goals.

Corriedale ram.

If selecting sheep from other localities, make allowances for weather and environmental differences. For example, do not expect sheep off irrigation to perform as well on dry pasture. Mycotic dermatitis resistance may not be a selection factor in dry regions but could present major problems in higher rainfall areas.

It is advisable to use a professional sheep classer in making initial purchases and in annual on-farm selections. Ensure that the classer is familiar with and working to your objectives and explains his/her decisions. Culling up to 30% of ewe weaners each year could be expected, particularly in new flocks.

Comparison of breeds

Wool fineness, quality number and staple length of the various breeds can be compared using the guide in Table 18.1. Variations will occur between studs and lines of sheep.

Table 18.1 Type, fineness and length of wool from various breeds

Breed	*Wool type*	*Quality number*	*Fibre diameter (microns)*	*Staple length (mm)*
Merino	Super-fine	70 and higher	18 and finer	50–70
	Fine	64	19–21	70–100
	Medium	60	20–22	80–110
	Strong	58	23–25	90–120
Polwarth, Cormo	Comeback	58–60	23–25	100–150
Corriedale	Fine cross-bred	56	25	100–150
	Medium cross-bred	50	30	120–170
British longwools				
Cheviot	Strong and extra strong	50–56	27–30	140–250
Perendale		50–56	27–30	
Romney		44–50	30–35	
Border Leicester		44–46	33–35	
English Leicester		40–46	33–38	
Lincoln		32–36	40 and less	
British shortwools				
Dorset Horn	Down wool	56	27	50–90
Ryeland		58–60	23–25	
South Down		58–60	23–25	
Suffolk		58–60	23–25	
Shropshire		56–58	25–27	
Hampshire Down		56–58	25–27	
Dorset Down		58–60	23–25	
South Suffolk		58–60	23–25	
Other breeds				
Finnsheep	Medium		27	75–125
SAMM	Medium/strong		22–23	
Tukidale	Carpet wool		>35	150 in six months
Elliotdale	Carpet wool		>40	120–150 in six months

Comparison of Merino strains

There are four major Merino bloodlines or strains: Saxon (fine wool), Peppin, Collinsville and Bungaree. Comparison between these Merino strains is difficult as variations exist

between studs and many studs are influenced by several strains. Table 18.2 shows a guide to the relative characteristics of these Merino strains. Individual flocks could show wide variations from the average characteristics shown.

Table 18.2 Characteristics of Merino strains

**Schlumberger yield test used.*

Characteristics	*Saxon*	*Peppin*	*Collinsville*	*Bungaree*
Body weight (kg)	45	49	52	53
Greasy fleece weight (kg)	4.8	6.0	6.5	6.5
*Yield, % clean wool**	68	70	72	74
Clean fleece weight (kg)	3.3	4.2	4.7	4.8
Staple length (mm)	88	94	100	104
Wool quality (visual 'count')	70	64	58–60	58
Fibre diameter (micron)	19–20	21	22	23–24

Genetic measurement

Performance recording services provide a means of objective assessment and selection of wool-type sheep. It is important to both ram breeders and buyers because the genetic improvement of commercial sheep flocks depends on the selection practices used by ram breeders.

These services measure genetic production traits and produce Estimated Breeding Values (EBVs) for individual animals and flocks based on their own performance and that of relatives. EBVs allow comparisons of studs and individual rams for particular traits.

Using a recognised industry wide genetic information system such as Merino Genetic Services, Central Test Sire Evaluation (CTSE), Rampower and Merino Benchmark to select rams will give a better result than just visual assessment. Sheep Genetics Australia (SGA) was formed in 2005 as a platform for standardisation, calculation and use of credible and accurate breeding values across all sectors of the Australian sheep industry and includes a single national language, Australian Sheep Breeding Values (ASBVs).

The emphasis on each breeding objective or criterion is the breeder's choice. Sheep are ranked in order of breeding value for each selection criterion or for combinations of criteria. This service enables ram breeders to be objective in improving their studs and in meeting client requirements. Ram buyers can choose from a stud whose breeding objectives are compatible with their own and inspect test records and rankings of the rams offered for sale.

Measurements, EBVs and indexes for wool breed traits include greasy fleece weight, clean fleece weight, fibre diameter, body weight, staple length, fibre diameter variation, fleece rot resistance, internal parasite resistance and individual conformation (soft rolling skin) and wool quality traits (handle). Using these measurements of genetic potential, improvement in the desired traits and therefore profitability are possible at an accelerated rate.

First-cross ewe breeding

Large-framed British breed rams, such as Border Leicester, are used instead of Merino rams to produce first-cross lambs. First-cross sheep are commonly described by abbreviations, e.g. BL×M or 1st ×. A self-replacing Merino flock often breeds both Merino and first-cross lambs. Large- and medium-sized ewes are best for this purpose, as are stronger wool ewes that do not fit the breeding direction of the Merino flock.

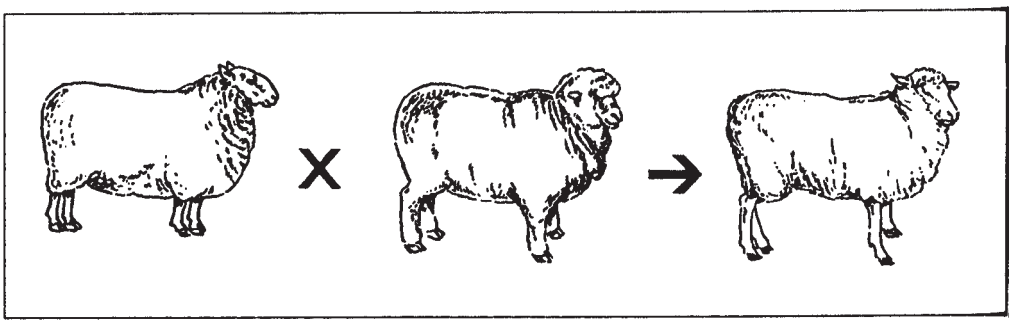


Figure 18.2 Border Leicester ram and Merino ewe produce first-cross ewe.

The ewe lambs are sold at 12–18 months, usually at a special first-cross ewe sale. The wether lambs are normally sold as prime lambs or for re-fattening as turnover lambs. The ewe lambs are shorn before sale, producing a line of lamb's wool different to the rest of the clip.

Pastures must be adequate and lambing times adjusted to ensure that the wether lambs are marketable and the ewe lambs grow to maturity in time for first-cross ewe sales.

Dual purpose breeds

Corriedale, Polwarth and Comeback-type sheep are dual purpose in that they are producing both high quality fibre and a marketable meat lamb. Selection in these breeds must use all the criteria previously considered but with additional emphasis on growth rate, muscle development, fat cover and lambing percentage.

Management practices and timing also have to be adjusted to meet marketing plans for lambs. Read Chapter 19 on prime lamb production in conjunction with this chapter for dual purpose breeds.

Carpet wool

Tukidale, Drysdale and Elliotdale breeds dominate the carpet wool industry. The breeding principles are similar to those already considered. A clearly defined goal is essential, particularly if breeding up from Romney or other crosses. A long, strong and high-micron fibre is the aim. The medullated (hairy) fibre, while excellent for dyeing and hard wearing purposes, poses a severe threat to normal finer wool clips; contamination with even single fibres of carpet wool must be avoided at all cost.

Carpet wool fleece (Tukidale).

Drysdale ram.

Wool for hand spinning

A good length (100–150 mm) medium cross-bred wool is easier to spin than finer Merino wools or coarser wools.

Hand spinning and knitting – a specialist industry.

Coloured wool sheep compete at shows.

Table 18.3 Wool type, use, spinning tension and characteristics

Wool type	*Use*	*Tension*	*Comment*
Fine Merino	baby wear, shawls	low and slowly	hard to dye, felt
Strong Merino	outer wear	medium	
Cross-bred	garments	medium	spins well
British Longwool	outer wear, rugs	high	dyes well, lustrous
Down wool, >75 mm	elastic yarns	medium	spins poorly

Both natural and environmental contamination in fleeces can affect the spinning and end quality.

English Leicester ram.

Grease. Excessive natural grease and wax will make the fleece stiff and hard to separate. Merino fleeces, in particular, have little grease and so hands may need to be lubricated with vaseline or olive oil.

Vegetable matter. This includes, for example, seeds, burrs, thistles, leaves and twigs. Some can be removed while spinning but avoid heavily contaminated wool, particularly when corkscrew, barley grass or thistle spines are present.

Dust. Avoid dusty paddocks and yards. A light wash may be needed before spinning as dust affects the tips and can cause variation in dyeing.

Dags. Stains, sweaty locks and very short wool need to be removed before spinning.

Kemp and hair. These hollow fibres dye differently to wool and appear much whiter. They should be avoided although a few can give interesting effects, such as in Scottish tweeds.

Wool faults. These include tenderness, cotted wool, wool rot, stained wool and mycotic dermatitis. These fleeces need to be avoided or at least tested for suitability for the end purpose.

Spinning wheel.

19

Prime lamb production

(Refer also to Chapter 15 for details of management of breeding.)

While selling prime lambs is the main source of income for a prime lamb enterprise, the potential income from wool and mutton should not be ignored.

Ewe selection and management

When buying sheep for a prime lamb enterprise, buy a productive line of ewes that are likely to produce a high percentage of lambs and be able support them with milk through to marketing. The most productive ewes are likely to be large framed, with sound feet and udders, and without undershot or overshot jaws. If the ewes are in wool when you are buying, the fleece should be dense, white and bright, with a good even crimp and a long staple for the time since shearing.

First-cross Border Leicester × Merino ewes are the most common prime lamb mothers, but a number of different crosses and pure breeds, such as Poll Dorset, Perendale, Romney, Finnsheep, Coopworth, SAMM and Corriedale, are also used.

Maiden ewes are normally purchased and joined at 18 months. Cheaper alternatives are to buy ewe lambs and wait or join early, or buy cast-for-age (cfa) ewes.

Allow for the lower fertility and production of ewe lambs and the lower fertility and shorter lives of cfa ewes, compared with the 18-month-old maiden ewe.

Prime lamb mother with first-cross ewe.

Ewes should be as heavy as possible before joining. To ensure they meet a target of fat score 3–4, wean last season's lambs at least three months before joining, drench with an effective drench (based on faecal worm egg test) and provide adequate pasture to allow them to put on the necessary weight. For mature ewes a minimum weight of 60 kg and fat score of 3 is desirable to ensure a high lambing rate. Maiden ewes should be at least 45 kg and fat score 3.

Wool contributes to the income of prime lamb enterprises and the value of lamb skins significantly influences the price obtained for lambs, so select ewes that do not have obvious wool or skin faults. Common faults are black or pigmented wool fibres in white fleeces, hair fibres, kemp and hairy breeches, fleece rot or yellow banding, and cotted or matted fleeces. Select maiden ewe replacements that have high fleece weights at the first adult shearing as these ewes are likely to continue to produce high fleece weights.

Ram selection

Rams used for prime lamb breeding are known as terminal sires because their progeny (offspring) do not produce another generation. The most popular terminal sires are Poll Dorset, White Suffolk, South Suffolk and Texel, and a number of the newer breeds are gaining popularity.

Terminal sire, Poll Dorset rams.

The Poll Dorset is the most commonly used and produces a fast growing, large lamb. The demand for larger, leaner lambs has created an interest in South Suffolk, White Suffolk and some of the newer breeds and composite breeds. The choice of ram breed will depend in part on the requirements of the target market and the preferred size, weight and fat score.

Rams have a 50% influence on the genetic potential of lambs, so it pays to buy good rams with high growth rates, good size and appropriate fat cover traits.

Ram fertility can be increased by feeding a high protein supplement for eight weeks before joining. A ration of 500 grams per head per day of lupins will be beneficial but remember to introduce it slowly.

'LAMBPLAN'

LAMBPLAN is a terminal sire stud flock rating scheme in which the rams are measured, scored and rated for their performance. By selecting from a LAMBPLAN stud flock, a choice is made from measured data rather than just by visual assessment.

LAMBPLAN measures and records genetic production traits and produce Estimated Breeding Values (EBVs) for individual animals and flocks based on their own performance and that of relatives. EBVs allow comparisons of studs and individual rams for particular traits.

Australian Sheep Breeding Values (ASBVs) is now the national language for sheep breeding values. The ASBVs, supervised by Sheep Genetics Australia (SGA), use a common calculation practice and provide credible, comparable and accurate breeding values for all sections of the Australian sheep industry.

Breeding objectives and priorities are determined by individual breeders and then sheep are ranked by ASBV score for individual criterion or for combinations of criteria. Selecting a ram with an index ranking of 110% for, say, growth rate will provide a 10% advantage for this trait over an average ram.

LAMBPLAN EBVs include growth rate, weight, carcase fat, eye muscle depth, wool weight and quality, reproductive and mothering performance and disease resistance. Production of superior prime lambs and therefore increased profitability are possible using EBVs and indexes for the desired traits when purchasing rams.

Joining/lambing

The joining time will be dictated by the planned marketing time, which in turn is controlled by pasture availability and market price. Plan to sell by the end of the pasture growing season but at a time when prices are seasonally as high as possible within other constraints. Allow five months for pregnancy and four to six months for growing before sale.

First-cross ewes, target fat score 3–4 at joining.

Lamb markets

There are four distinct markets or purchasers for lamb. To obtain best returns it is necessary to target the weight and specifications required.

Table 19.1 Lamb market specifications[9]

Market	*Carcase weight (kg)*	*Fat score*	*GR tissue depth (fat depth)*
Heavy export lamb	22–30 kg	2–4	5–20 mm
Food service lamb	22–26 kg	2–4	5–20 mm
Supermarket lamb	20–24 kg	2–2.5	5–12 mm
Domestic trade lamb	18–22 kg	2–3	5–15 mm

Individual lamb processors will have their own, more exacting specifications. If selling direct then it is essential to learn their exact requirements and prepare and select the lambs to suit. Selling to very specific targets requires competence and confidence at selecting the right lambs, otherwise disputes and disappointment will follow.

Prime second-cross lambs – know their weight and fat score.

Many lamb processors or buyers publish a price grid for over-the-hooks sales. Lambs are purchased at the scale after slaughter and dressing and the price per kilogram is dictated by where each carcase fits in the grid.

Table 19.2. Typical pricing grid for over-the-hooks sales

Hot standard carcase weight	*Fat score*				
	1	*2*	*3*	*4*	*5*
18.1–20 kg	1.85	2.05	2.15	2.15	2.05
20.1–22 kg	2.00	2.25	2.35	2.30	2.10
22.1–24 kg	2.00	2.45	2.45	2.40	2.10
24.1–26 kg	2.00	2.45	2.45	2.40	2.10
26.1–28 kg	2.00	2.45	2.45	2.40	2.10
28.1–30 kg	1.95	2.40	2.40	2.35	2.05
30.1+ kg	1.85	2.30	2.35	2.20	2.00
	Grid target		Price in dollars per kg		

Marketing

Plan to sell *sucker* lambs at four to six months of age; staggered sales are normal as growth rates vary. Prime lambs need to be sold when they are ready or *sappy*, i.e. between 18 and 26 kg dressed weight and with a fat score of 2.5–4 depending on the target market. Overly fat or poorly finished lambs will always receive discounted prices. If feed dries off, lambs will loose their *bloom*, i.e. the wool has a dry scraggy appearance, and they are unattractive to butchers.

An alternative to selling is to wean and hold the lambs over as turnover lambs. These are shorn and re-fattened on a green fodder crop or a good pasture, and are sold later in the season when they are a much larger lamb. If this is not possible, then the lambs are sold as store lambs for another grazier to shear and finish.

If selling over-the-hooks or using a price grid it is necessary to accurately estimate the final carcase weight, which will be the Hot Standard Carcase Weight (HSCW). This calculation is by weighing sheep and then using the correct dressing percentage to convert to HSCW. The dressing percentage can vary between 40% and 54% depending on fat score, fleece staple length, breed, gender, carcase trim and time off feed, although is mostly between 45–48%.

Dressing percentage variables are[10]:

Gender. Wether lambs approximately 1.5% lower than female lambs.

Breed. Merino and Merino crosses: 1.5–3.5% lower than second-cross lambs.

Carcase trim. Channel fat, kidneys and kidney knob in or out will affect weight.

Temperature. Chilled, approximately 2–3% less than HSCW.

Skin weight. Depends on wool length.

Fat score (FS). The lower the fat score the lower the dressing percentage. A general guide for second-cross lambs is FS 1, 41%; FS 2, 43%; FS 3, 45%; FS 4, 47%; FS 5, 49%.

Time off feed. Dressing percentage increases with time off feed. HSCW of lambs will increase by around 1% after four hours off feed, 2% after 12 hours and 4% after 24 hours off feed.

Larger leaner lambs

Consumers and retailers are demanding leaner and larger lambs, a difficult combination to achieve as large lambs tend to be overly fat. The target for the *Elite Lamb* or *Trim Lamb* category is 22–26 kg carcase weight and fat score 2–3.

One means of achieving this is to make male lambs into cryptorchids. At marking, the testicles are pushed up into the body cavity and are held in place by putting the marking ring around the scrotum. The male sex hormone causes the lambs to grow like ram lambs, faster and leaner than wethers but they are infertile. Only use polled breeds and highly productive lines of ewes and rams if male lambs are to be cryptorchidised. Do not use the procedure on runts or slow growing lambs. Cryptorchid lambs will be too lean for sale at normal weaning and so they must be shorn and finished on good pasture or a fodder crop before sale. If cryptorchids are held over they will develop male sex characteristics affecting meat quality and incur double fees for slaughtering and shearing.

Prime lamb flock – match best ewes with high performance ram for best results.

Well-grown sucker lambs.

20

Harvesting and marketing wool

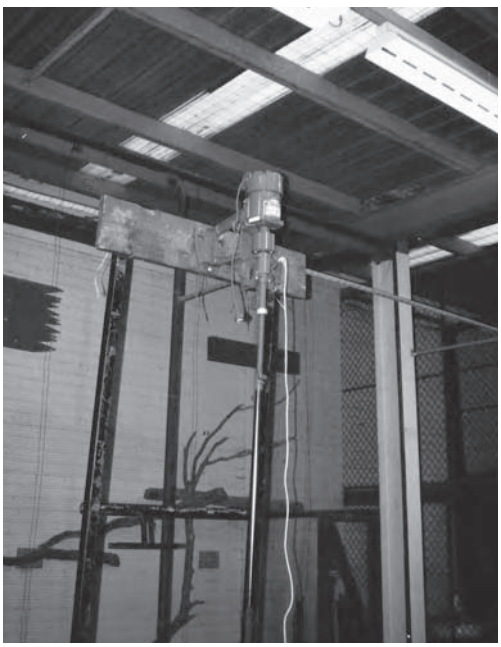
Shed preparation

The first consideration at shearing time is to prepare a clean area in which to shear the sheep and prepare the wool for sale.

All rubbish, including old bags, cigarette butts, twine and wire must be cleaned away. Special care is required to remove all foreign fibres such as mohair, carpet wool, cashmere and black and coloured wool from the shed and yards. These types of contamination in wool can cause expensive damage to wool processing machinery and severe faults in the finished product that are a major cost to the industry and the reputation of Australian wool.

Equipment

- Electric shearing plant
- Shed broom (not fibre or straw but a board on a handle)
- Wool table
- Wool bins (three-sided storage compartment)
- Wool press if selling bales (can be hired)
- Wool packs (bales) and/or clean bags
- Grinding plant for larger sheds
- Shearers have their own hand pieces, combs and cutters.



An electric shearing plant.

Shearing

A professional shearer can shear 150–200 adult sheep each day. Shearers are paid on a per head basis at award rates but for flocks of less than a day's work rates need to be negotiated. Owners can shear their own sheep but some instruction, a lot of patience and a strong back are essential before commencing shearing.

A portable shearing plant may be set up in the corner of a shed or garage and run from a portable generator or be motorised. It is advisable to use a temporary platform or trailer on which to shear and collect the shorn wool. Electric hand pieces have limited use for a large number of sheep and are prone to breaking down. Mechanically driven hand pieces are the most effective.

A portable, motorised shearing plant.

Avoid shearing in the cold months because of the risk of off-shears losses due to hypothermia (heat loss). Never shear wet sheep; wet wool will rot, is very difficult to dry and shearers are exposed to health risks associated with handling wet sheep.

Wool containing black or pigmented fibres must be carefully collected and bagged separately, immediately after it is shorn. The bags should be securely tied. These sheep should be identified before shearing and be shorn last to minimise contamination of other fleeces. In normal white wool flocks, ensure that all sheep having black fibres are identified for culling.

Skirting

Skirting is an important part of clip preparation. It involves the removal of inferior wool from the fleece, leaving it clean and uniform.

The belly wool is shorn first and cast aside by the shearer. It should be put in a 'bellies' bag. All urine stained wool from wether and ram bellies must be removed and, after drying, placed in a separate 'stained pieces' bag.

The newly shorn fleece should be thrown or spread out, shorn side

Rectangular wool table with fleece ready for skirting.

down, on a wool table. There is a skill to throwing a fleece. Pick the fleece up by grasping the two hind leg pieces, one in each hand. Pile the rest of the fleece between the arms and then, from one end of the wool table, throw the fleece out and up holding onto the hind legs. The fleece should spread out on the table.

A slatted wool table of 3.4 m × 1.7 m is easy to make. Alternatively a round 2.03–2.25 m diameter rotating wool table can save space and walking and may include built-in scales, useful for recording individual production and sheep classing or grading.

Skirt as lightly as the nature of the particular fleece allows, aiming to produce a clean, uniform fleece. Remove all the short, very greasy, dirty, seedy or burry wool from around the edge of the fleece. These are the skirtings or pieces. Urine stained wool (breech area of ewe), heavily water stained and other wool with unscourable stains must be removed and placed in a 'stained pieces' bag. Any wool with skin attached must also be removed and bagged separately.

The slatted table allows locks and short pieces of wool such as second cuts, face, leg and breech wool to drop off onto the floor. Locks are bagged separately and sold as such.

Following skirting, the sides of the fleece are turned into the middle and then the fleece is loosely rolled from the end so that the middle of the fleece is on top ready for the wool classer.

Lamb's wool

Lamb's wool is handled differently to fleeces from mature sheep. The two wool types must not be mixed so lambs should be shorn as a single group. Clean up the shearing board and wool room before commencing and after finishing the lambs.

Lamb boards used to pick up lambs' fleeces.

Lambs' fleeces do not hold together like normal fleeces so they are picked up using two small boards known as *lamb boards*. For skirting, the wool table is covered and the skirtings and shortest pieces of wool picked out, then the lamb boards are used again to gather the fleece and transfer it to the press, bag or wool bin.

Wool classing

The aim of classing wool is to place similar wools together, creating even lines, which are offered for sale to the best advantage of the wool grower.

Industry approved standards require the following: all Merino wool must be kept separate from cross-bred wool; all lamb's wool should be kept separate from wool off sheep previously shorn; and skirtings, bellies, locks and crutchings must be kept separate from fleeces.

All stained wool, dags and skin pieces must be removed from other wools and kept separate.

Classing for sale by auction

A registered owner classer or professional wool classer must prepare any wool submitted to auction. The classer's registered number must be stencilled on each bale. Contact the wool broker for specific classing guidelines before beginning shearing.

Classing for private sale

Wool buyers may require only basic sorting or classing in the shed, or they may require more complex classing; it's best to know before you start.

A general guide for unclassed or bulk clip preparation is to keep separate all fleeces and wool that are:

- visually different;
- tender;
- discoloured, matted or cotted, doggy, or affected by dermatitis or fleece rot;
- short or very long compared with the bulk of the clip;
- significantly different in yield and condition (visual assessment);
- different lengths, e.g. good length lamb's wool (40 mm or longer) should be kept free from shorter wools;
- contaminated with rubbish, non-wool fibres or stained or coloured wool.

Baling wool

New wool packs must be used for all wool to be sold through the auction system. They can be purchased from a broker or a stock and station agent. Unclassed wool for private sale can be bagged or packed in previously used bales that can be purchased or borrowed from the wool buyer.

In large sheds the classed fleece is stacked in a wool bin (a three-sided compartment) with similarly classed fleeces until there is enough to make a full bale.

Mechanical or hydraulic wool presses are used to compact wool into a bale of between 110 and 200 kg. A pack is unfolded and installed in the press with the top flaps folded back and secured.

Stack the fleeces systematically and evenly in the press, pushing each fleece into a corner. When the press is full, compact the bale and in older style wool presses secure the wool with the restraining device. Remove the wool press ram, refill the bale and then compact it again after removing the restraining devices. Repeat this process until the bale is at the required weight, then close the bale and hook the top flaps together using bale fasteners.

Remove the bale from the press, stencil it with the details of owner, wool description, classer identification and bale number (1, 2, 3 etc.). Only use proper wool bale stencil fluid.

Wool is described on the bale using a combination of standard abbreviations including:

AAA–A	indicates quality and length
BBB–B	secondary quality
FM	Fine Merino

M	Merino
COM	Combing (medium)
F	Fine comeback
CBK	Comeback
FX	Fine cross-bred
MX	Medium cross-bred
CX	Strong cross-bred
FLC	Tender fleeces
H	Prematurely shorn fleeces

Weigh bales to ensure they are within the required weight range. Some presses have built-in scales, which make the task easier. Bales outside the weight range will need to be re-packed: put the bale back in the press and compact before re-opening.

For 'bulk' or 'bar' bales, i.e. two or more wool descriptions stacked one on top of the other in the one bale, use paper, not bags or bale caps, to separate the various descriptions in the bale.

The International Wool Secretariat (IWS) has a type list to describe wool. It is long and complex, using codes with prefixes and suffixes. Additionally each wool broker has their own identification and description system. It is recommended that you consult your broker or buyer to find out the actual branding codes they require.

Despatch

Arrange transport to the wool store or place of sale after consulting with the broker or buyer. Ensure that the clip is insured, either by the broker or the buyer or your own insurance policy.

Send a consignment specification sheet before the wool arrives at the store and advise the broker when the wool is sent. This specification sheet details the number of bales, the weight and contents of each bale, the brands, the age of the sheep and any distinguishing features of the wool. Keep a copy of the specifications for insurance purposes and in case any disputes arise.

Marketing

There are four ways to sell wool: auction, wool buyer, sale by tender or private sale.

Auction

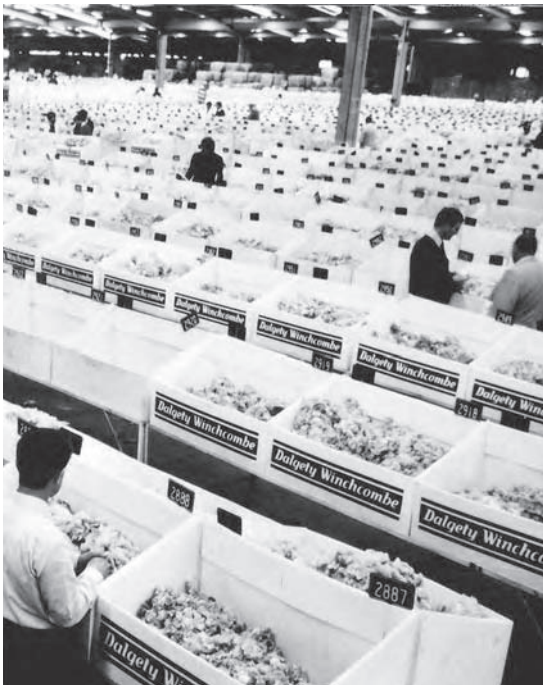
A sheep owner may sell wool at auction through a recognised wool selling agent or broker. Four bales is the minimum number that can be sold at auction. Properly classed bales in lots of less than four, and within the standard weight, are matched with bales of similar wool to form saleable lots, a process called *interlotting*. Small parcels of wool are normally sent onto a re-handling house to be *bulk classed*, i.e. re-packed with similar wools from other growers, in order to build up commercial sized lots. Each owner is paid in proportion to the weight of their wool, less all costs.

When using the auction system, aim to prepare one or more classed bales rather than a bulk bale comprising several descriptions of wool. Bulk bales incur much higher handling charges.

All wool bales submitted to auction under a grower's brand must weigh between 110–200 kg. Bales outside this range will be re-packed before sale, at the grower's expense. Wool brokers charge for their services in one of two ways and are consequently known as *commission brokers* or *flat rate brokers*.

Commission brokers deduct a percentage commission (1.2–1.6%) of gross proceeds after wool tax has been deducted.

Flat rate brokers have a set handling fee per bale. Fees vary between brokers, as do the charges included or that are in addition to basic fees.



Wool brokers showroom – sale is by sample and description.

Charges levied for wool sales include commission or handling fee, insurance, interlotting, test and certification fees, warehousing, freight, bulk classing and wool levy.

When choosing a broker, check their charges, payment method and timing and what other services (such as clip preparation or sheep classing advice) are provided. Some brokers will make pre-sale advances available but check the interest rate before accepting.

Wool buyer

Alternatively the grower may, by private negotiation, sell all or part of a clip to a wool buyer. This is the most economical and practical option for small flocks with just a few fleeces or for small lines, pieces and other oddments. Private sales can be made on the farm or at the wool buyer's shed and offers can be requested from any number of buyers.

The advantages of private sale are low marketing costs and rapid payment. Wool tax and freight to the store are the usual costs. Wool for private sale is not tested so little information is provided to the owner about the wool clip.

Sale by tender

In this rarely used method, the broker sells the wool on the show room floor and charges a commission.

Private sale

Fleeces may be sold privately to home spinners and craft shops, usually as individual fleeces.

Post farm gate wool processing – branded bale, scouring, top making to final cloth and by-products (lanolin).

Testing and certification

All wool sold by auction and larger lines of wool are objectively tested and measured by an independent authority that issues a certificate describing the wool. Grab samples are taken from each bale using a tool that makes a random selection from the bale. Buyers usually only see a sample of the wool before sale and therefore rely heavily on the test certificate.

The Australian Wool Testing Authority (AWTA) charges the broker for each test, issues the certificate and reports other information as requested. AWTA uses LASERSCAN technology to provide precise measurements of mean fibre diameter, standard deviation of diameter, coefficient of variation of diameter, comfort factor and fibre curvature. These characteristics of raw wool are important in determining the characteristics of top, yarn and fabrics produced from the wool.

Standard tests include:

Yield. Dry weight of wool free from all impurities (vegetable matter, grease, dirt and moisture) expressed as a percentage of greasy weight.

Fibre diameter. Measured in microns (μm).

Vegetable matter base. Dry weight of vegetable matter expressed as a percentage of greasy weight.

Additional tests for Sale by Additional Measurement (SAM) (optional) include:

Staple length (mm).

Coefficient of variation of staple length (%). This indicates the variation in length of

fibres within a staple (e.g. 0–12% excellent uniformity, 13–20% good to average, 21% or more increasingly mixed lengths).

Coefficient of variation in fibre diameter (%). This indicates the variation in the diameter of fibres within a staple.

Strength (Newtons per kilotex [N/ktex]). Uses the mean of at least 40 staples as a guide only (less than 17 is rotten, 17–25 usually tender, 25–30 tender/sound, more than 30 N/ktex increasingly sound).

Position of break distribution in staple. Percentage in tip, middle or base.

Clean colour–yellowness (Y–Z test). Yellowness increases as the score number increases; most wools are between 1 and 4.

Test for grower information: sheep lice presence, either yes or no, or degree of infestation. This is separate to the test certificate.

21

Buying and selling sheep

Sheep can be bought and sold:

- at a saleyard;
- by private arrangement with another farmer;
- through a stock and station agent;
- through a marketing scheme;
- direct to an abattoir or butcher;
- by futures contract.

There are two main types of sales held in saleyards: *fat sales* include prime lambs and cull or cast-for-age sheep (mutton) and *store sales* offer sheep that are suitable for farmers to buy. Butchers are the main buyers at fat sales but there are no restrictions on who can bid. Sheep are sold in dollars per head and usually for the whole of the lot being offered.

Buying

Before going to buy, be clear about what you want in terms of breed, age, wool length and type, shearing time and other features such as size and condition. If an agent or friend is assisting, it is important to instruct them clearly and be firm about your aims. It is wise for first-time buyers to enlist the help of an agent or experienced friend to guide in sheep selection and valuation. The same advice is applicable for private or saleyard purchase. Don't be intimidated by a vendor, agent or the situation; it is your money and, therefore, your decision. Be sure. At an auction sale anyone may bid but be aware there is no negotiation after the sale and sheep are sold with all faults unless specific guarantees are given.

When buying sheep:

- Find stock that match your needs.
- Check them carefully, don't be rushed.
- Look for wool faults (tender wool, lumpy wool).
- Look for breeding faults (poorly shaped feet).
- Look for variations in the mob, sheep that appear different.
- Check for diseases such as sheep lice, footrot and mycotic dermatitis.
- Check teeth to ensure that they are actually the age claimed.
- Ask about the mob and the vendor's flock, wool cut and disease and vaccination history.
- Inspect the vendor declaration for claims of disease or chemical issues.
- Check that they are correctly tagged under the National Livestock Identification Scheme.

If the flock has problems, look elsewhere. Before the sale reject any sheep with individual faults such as undershot jaws or injuries. Be sure that the vendor or agent agrees to remove the faulty sheep.

To check for contagious diseases such as sheep lice, itchmite and footrot, look for sheep showing signs of disease (rubbed wool or lameness) and examine them carefully until you are satisfied that they are disease free.

Buyer beware – check before you buy.

After concluding the purchase, select a reputable livestock transport operator, with a washed truck, to take the sheep home. If you are using an agent, they can arrange transport and will add this charge to the purchase account.

Settlement is normally required prior to taking delivery of the sheep, unless a prior arrangement is made with the selling agent or with your regular stock and station agent for the account to be booked through them.

When the sheep are delivered take time to count them and check the new mob again for any diseases. Keep them isolated from other sheep for as long as possible in case any undetected contagious diseases develop.

Use a clean truck and quality operator to transport sheep home.

Selling

Selling sheep should be a carefully planned exercise in marketing. You need to match your product to the buyer's demands so that you maximise price and profit. Effective marketing means selecting the best method, time and place for selling your sheep.

Sheep with declared diseases must not be sent to a saleyard or sold privately to a farmer without permission. However, sheep with footrot or sheep lice may be sent directly to an abattoir for slaughter.

Preparation for sale

Correctly preparing sheep for sale is important. Sheep being sold to butchers need to be free of faecal and urine stained wool. Don't do a full crutch as this may reduce the sink value. A key hole crutch is best, just enough to remove contamination. Avoid cuts and nicks in crutching before sale as these may turn into infections and abscesses by the time they reach the abattoir. Remember hygiene is critical in the food industry and good hygiene starts on farm.

Well-prepared lambs with keyhole crutch.

For store sales clean up daggy or dirty sheep, remove sheep that are lame, injured or have wool defects, and runts and those that are different to the bulk of the flock. A clean even line of sheep that will best meet potential buyers' needs are the order of the day. Appearance is the first impression to attracting buyers and bidders and it suggests a quality product.

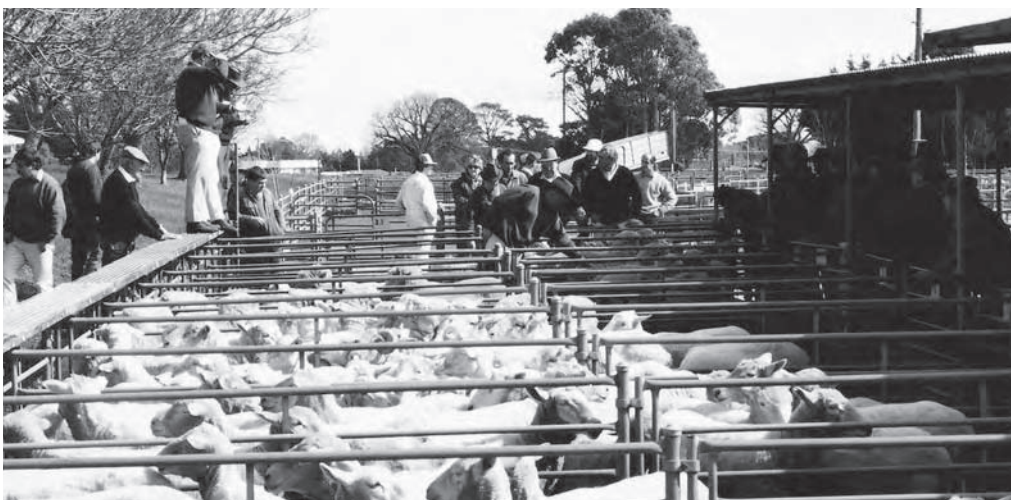
Transportation

The best prepared sheep can easily end up an unattractive mess by the time they reach the saleyard or abattoir. A few simple steps can avoid spoiling the consignments.

1. Muster the sheep the day before transport and allow them to empty out before loading. If they are not so full, they will travel more comfortably and will not be smearing green faecal material over each other.
2. Use a livestock transport operator you know and trust, otherwise supervise loading yourself.
3. Ensure the truck is clean, freshly washed out and does not have mesh or other protrusions from the floor or sides that will bruise or injure sheep. A clean truck is important in keeping your sheep clean and also in avoiding disease from previous loads.
4. Correct loading density is critical; a good operator will do this correctly. If sheep are too loose they will sit and get dirty or fall over on curves and bumps; if too tight, sheep may fall down and get dirty and even be smothered. Special care and lighter loading is needed for weaker or older sheep and for longer trips.
5. Never mix different classes of sheep. Pen rams, lambs, ewes and wethers separately.
6. Keep stress to a minimum by limited use of dogs, banning sticks, hitting and electric prodders, having good workable loading facilities and plenty of patience and skill.

Saleyards

Saleyards are where most farmers sell their sheep. It is necessary to use a stock agent; they will provide valuable advice on when and where to sell and they will draft sheep into



Saleyard auction of sheep.

saleable lots that will be most attractive to the buyers. The agent will auction the sheep, collect the proceeds, pay transport costs, duties and fees on your behalf and send you a cheque after deducting a commission and the costs.

Private sales

A private treaty sale may be arranged with or without an agent. Using an agent means that they are responsible for collecting the money; in most cases they pay the vendor before receiving the proceeds. Using an agent provides some protection against bad debts and slow payers.

Ram and stud sheep private sales are common; the purchaser inspects and selects the sheep at the stud. Other private sales are via advertisement and local acquaintances, particularly for small lots. The vendor is obligated to pay any levies or taxes personally, comply with identification requirements and issue completed tax invoices.

Butchers and 'over-the-hooks'

Both wholesale and retail butchers will buy directly from the farm, either in the paddock after inspection (paying on a per head basis) or over-the-hooks (paying cents per kilogram after slaughter when the carcases are graded for pricing). With over-the-hooks sales the vendor bears all losses through death, injury and carcases condemned as unfit for human consumption, but maximum prices can be achieved if the sheep match the better grades. It is still wise to use an agent to assist with negotiations, and to collect and process payment. Negotiate who pays the transport.

Selling direct, particularly over-the-hooks, has a big advantage as the abattoir can provide an individual carcase feedback report that will tell you a lot about your product and areas for improvement – a great educational tool. By prior arrangement it is very informative to visit the abattoir and watch your sheep being processed.

With grid sales remember to accurately estimate the final carcase weight (HSCW).

Liveweight (kg) × dressing percentage = HSCW kg.

The dressing percentage varies depending on fat score, fleece staple length, breed, gender, carcase trim, age and time off feed. See Chapter 19 for more information on dressing percentage. To maintain consistency between consignments, it is important to weigh sheep at the same interval off feed each time.

A well-designed trailer for moving sheep – non-slip floor, well ventilated and weather protection.

Sale by description

Sale by description is an alternative for larger lots of sheep. A number of companies and livestock agencies run a computer, online auction system where sheep are described precisely using set criteria. An assessor inspects and describes the sheep, which are then listed on the internet site. The vendor and purchaser are

put in contact with each other after the sale to arrange delivery. The proceeds, minus fees and commission, are sent to the vendor or agent after the sheep are delivered. Delivery and, therefore, transfer of risk is at the farm gate.

Levies, duties and taxes

A number of levies, duties and taxes are imposed on sales of livestock; these vary between states and from time to time. Some levies are collected on behalf of producer owned organisations, such as Meat and Livestock Australia (MLA), which use the funds for research, product development, training, education and promotion. Other taxes and duties are used to fund particular programs, such as a specific disease control program or compensation fund. Goods and Services Tax (GST) is also charged.

If selling through a stock and station agent they will deduct the levies, taxes and duties from your proceeds and forward them in bulk. If selling privately it is the vendor's responsibility to pay these charges directly; failure to do so may incur penalties and may also exclude the vendor and purchaser from benefits at a later time.

Quality assurance and regulations

Vendor declarations

Vendor declarations are a growing part of quality assurance in the meat and livestock trade. A National Vendor Declaration (NVD) provides the purchaser, both in Australia and overseas, some assurance as to the disease and chemical residue risks. Check on current legislation for NVDs in your state.

Whether compulsory or voluntary, a NVD will usually enhance the price offered, compared to non-NVD sheep, as it reduces the risk for the purchaser. Be particularly careful and diligent in filling out NVDs; a false or inaccurate declaration can lead to severe penalties and make you liable to be sued if the purchaser suffers loss as a result of the wrong information.

The NVD will include your Property Identification Code, numbers and description of the sheep, any recent treatments given and withholding periods and/or Export Slaughter Intervals (ESI) (withholding periods imposed by importing countries), any exposure to chemicals on pasture or elsewhere and may include flock disease status or exposure.

National Livestock Identification Scheme (NLIS)

Along with national vendor declarations and Livestock Production Assurance (LPA), the NLIS is aimed at quality assurance for all sheep products. NLIS will allow sheep to be traced from breeding property to end consumer; from paddock to plate.

Check with current requirements in your state for sheep identification. Whether voluntary or compulsory, identification of all sheep to their property of origin is a critical factor in promoting the industry, protecting consumers and satisfying the requirements of importing countries. Currently sheep are ear tagged with a visually readable tag (not electronic as for cattle). Ear tags are colour coded indicating the year of birth or introduced sheep.

Other quality assurance schemes

State and Commonwealth governments and private organisations have a variety of quality assurance schemes that target particular issues. 'FlockCare' is one that sets standards for a property for chemical residues, treatment procedures, yard and handling facilities and practices and record keeping. Ovine Johne's Disease 'Market Assurance Program' (OJD MAP) is another. These are voluntary schemes that can add value to the enterprise and product. Abattoir and meat processors that are part of quality assurance schemes may well impose conditions and standards on suppliers of sheep and lambs.

22

Diseases of sheep

All sheep owners are responsible for the health and welfare of their sheep and for controlling diseases that may threaten the wider sheep population. To detect diseases in a sheep look for visual clues of changes in behaviour. Sheep may appear dopey, be lame, scratch, rub, have fleece or skin changes, stay separate from the rest of the flock or begin to scour (diarrhoea).

Prevention of disease is far better than trying to cure diseases in a flock. Some disease causing organisms, such as intestinal worms, are always present in a flock, so it is a matter of controlling them so that they have little or no effect.

One critical form of control and prevention is to keep sheep well nourished. Natural immunity or defence falls when sheep are on an inadequate diet, making them more susceptible to disease.

Observation, risks and responses

Observation of environmental conditions can enable owners to predict, prepare for and even prevent many livestock health problems.

Many livestock diseases and problems only occur or become significant when the right set of conditions arise. By noting our observations about prevailing conditions and understanding the risks that are likely to occur in those conditions, a preventive response is possible.

We do this all the time. In summer we feel the heat and see the tall dry grass, and we subconsciously say to ourselves, 'there is a risk of fire today', and then respond by not driving into the paddock, watching the horizon for smoke and not lighting the incinerator.

By responding to observations and circumstances, animal lives, condition, production and dollars will be saved and enhanced. Table 22.1 shows some examples of

conditions, risks and preventive responses that can save us from losses and worry. Be alert and prepared for livestock diseases and problems. Look around and observe the warnings nature gives about risks and save on worry, suffering and loss.

Table 22.1 Observations, risks and responses to maintain livestock health

Conditions observed	*Risk*	*Response*
Tall grass in summer	Grass or bush fire	Firebreaks, safe areas for stock, avoid ignition sources
Wet summer	Worm larvae survive	Two summer drenches, worm test and treat more frequently
	Good feed	More stock or less feeding
Dusty or many flies	Pink eye	Avoid yarding, treat
Short green pasture	Rapid worm build-up	Worm test
	Insufficient for lactation	Check condition and feed
Late pregnancy	Weak newborn	Maximum nutrition
	Sick or dead lambs	Vaccinate ewe (5 in 1 or 6 in 1)
	Pregnancy toxaemia	Feed grain
Lambing	Difficult births	Inspect more, assist
	Milk fever	Treatments on hand
Lush pasture	Grass scours	Watch for flystrike, treat and prevention
Wet warm weather	Body flystrike	Watch for flystrike, treat and prevention
	Dermatitis, wool rot	Avoid yarding
Many thistles or weeds	Wool or skin damage	Slash, spray, lock-out
Grass seeds	Eye and foot problems	Check weepy eyes and lame, treat
Autumn break	Ryegrass staggers	Avoid handling
Grazed swampy areas	Liver fluke	Test and drench for fluke
New sheep	Footrot, lice, worms, Johne's disease	Check, isolate, treat, vendor declaration

Sheep diseases

The following notes give an introduction to the more common sheep health problems. More detailed advice or diagnoses can be obtained by consulting a veterinarian or specific information source.

Clostridial infections

These include blackleg, enterotoxaemia (pulpy kidney), black disease, tetanus and malignant oedema.

Cause. Blackleg is caused by the Clostridial family of bacteria. Clostridial bacteria can be found in the soil, where they can survive for a very long time. Most also occur quite naturally in the gut and manure of healthy animals.

Clostridial bacteria grow only where there is little oxygen, such as in rotting vegetable matter in the soil or in dead or bruised tissue inside the body of an animal. In the body they produce powerful and usually fatal toxins.

Signs and predisposing factors. Table 22.2 provides information on the predisposing causes of the Clostridial diseases and the signs that follow.

Table 22.2 Clostridial diseases, predisposing factors, signs and prevention

Predisposing factors	*Signs*	*Prevention*
Black disease *Damage to liver by liver fluke or parasites*	Sudden death, dark skin, wool plucks out, rapid decomposition.	Vaccinate and treat for fluke.
Blackleg *Damage to muscles from injury, vaccination, shearing, marking etc.*	Sudden death, swelling at the injury site, rapid decomposition.	Vaccinate and practice good hygiene.
Malignant oedema (blood poisoning, gas gangrene) *Injury from shearing, vaccination, mulesing, marking, crow attacks, dog bites etc.*	Swelling, wound discharge, death after one to two days.	Vaccinate and practice good hygiene.
Enterotoxaemia (pulpy kidney) *Slowing of gut from starchy food (grain), yarding, diet change*	Young sheep: convulsions, death in two to three hours, rapid decomposition. Older sheep: distressed, collapse with legs extended back, back and neck arched, death.	Vaccinate and give exercise and additional roughage.
Tetanus *Marking with rings, shearing wounds*	Signs appear after 3–10 days in lambs. Stiffness, muscular spasm, very sensitive to stimuli.	Vaccinate and practice good hygiene, particularly at marking.

Control. Practice good hygiene when treating, use temporary yards for marking and surgical procedures. Develop satisfactory immunity by vaccination. Vaccinate ewes prior to lambing, lambs at marking and then four to six weeks later, and all sheep annually. Vaccines are purchased in combinations: 2 in 1 vaccinates against pulpy kidney and tetanus, 5 in 1 against all five Clostridial diseases and 6 in 1 against the five Clostridial diseases and cheesy gland (CLA). An injectable combination worm treatment and 5 in 1 or 6 in 1 vaccine is available for use on some adult sheep and another for use with weaner sheep.

Treatment. Sheep are most commonly found dead. Treatment of sheep showing symptoms is rarely successful but would include antitoxins and antibiotics obtained from a veterinarian.

Internal parasites

Worms (roundworms and nematodes)

Cause. Roundworms are the most significant internal parasite of sheep. There are normally many species in the gut, the adult worms are very small (2–10 mm) and there can be many thousands infecting a sheep.

The most common test for worms is a 'Faecal Egg Count' (FEC); fresh dung samples are collected and usually combined in equal proportions, diluted to allow worm eggs to separate and a sample placed under a microscope where the worm eggs can be counted and then the number of eggs per gram calculated. Commonly the presence of 200 eggs per gram (epg) calls for treatment. In sheep showing signs of scouring or wasting the count can exceed 10 000 epg.

The microscopic eggs are passed in sheep droppings and the eggs hatch and mature on the pasture to become larvae. The larvae are eaten by other sheep. That completes their life cycle. When hot dry conditions persist, the survival of the worm larvae on the pasture is poor, so the period from autumn to spring is the primary spread and, therefore, danger period. Lambing ewes and young sheep are the most susceptible to roundworms.

Table 22.3 Common sheep roundworms

Biological name (genus or species)	*Common name*
Chabertia	Large mouth bowel worm
Dictyocaulus/Muellerius	Lung worms
Haemonchus	Barbers pole worm
Nematodirus	Thin-necked intestinal worm
Oesophagostomum columbianum	Nodule worm
Oesophagostomum venulosum	Large bowel worm
Ostertagia (Teladorsagia)	Small brown stomach worm
Trichostrongylus	Black scour worm
Trichuris ovis	Whipworms

Signs. Failure to thrive and loss of condition are the first symptoms of roundworm burdens but production losses will already have occurred before these visible signs. Sheep that are carrying a large number of roundworms will not gain weight even on lush pasture. Scouring (diarrhoea), indicated by manure stained breech and hind legs, will get progressively worse. By this stage considerable damage has already been done. Lung worms will cause coughing, particularly in lambs.

Scouring caused by intestinal worms.

Control. It is common in everyday use to refer to the treatment of sheep for internal parasites as a 'drench' or 'drenching', whatever the method of administration. While a drench is specifically the process of administering liquid orally, the more common broader sense is used in this book to mean treating sheep for internal parasites.

Different worm management programs have been developed in each state and for

specific regions within some states in an effort to specifically address the climatic, pasture and most troublesome roundworms in each region. Management programs under a variety of names (including: Wormbuster, WormPlan, WormKill, DrenchPlan) are based on an integrated worm management plan. These plans do not just rely on drenches, but also produce low worm risk pastures by grazing management, breeding resistant sheep, nutrition and targeting specific worms at their most vulnerable stage.

As understanding and knowledge grow, these programs will continue to evolve. It is therefore important to source the latest recommendations for your region and fine-tune them to suit your particular enterprise.

The major principles involved in controlling this very complex disease and associated drench resistance problems are:

- Create low risk pastures.
- Protect the most vulnerable sheep.
- Use strategic drenches.
- Worm test before other drenches.
- Drench test for resistance and effectiveness.
- Select for worm resistant sheep.

Create low risk pastures. Pastures with a low risk are those that have relatively few infective larvae. These generally are pastures that have not been grazed by young sheep (under 1.5 years), heavily infected sheep or lambing ewes. The season and district will dictate the length of time before a high risk paddock is considered safe. Cropped, hay and stubble paddocks are usually of low risk as is pasture burnt by wildfire. Paddocks grazed exclusively by cattle over several months will have a reduced risk.

Protect the most vulnerable sheep. Young sheep do not have a fully developed immune system so are therefore highly susceptible to worm build-up. Preparing a low risk pasture for weaners is a critical part of effective worm control. A few weeks before lambing ewes will lose some of their natural immunity to worms allowing a rapid escalation in both worms and eggs produced; this leads to highly infective pastures post lambing.

Strategic drenches. Strategic drenching means not waiting for signs of worm problems, but pre-empting worm build-ups and striking when the drench will be most effective. In winter rainfall areas summer drenches are the most efficient. Worms are killed in the sheep by the drench, while the heat and ultraviolet light destroy worm larvae on dry pasture, reducing the total population to a minimum. Treating lambs at weaning and moving them to low risk pasture breaks the cycle of infection and re-infection. Treating rams with the other sheep and then before joining will ensure they are at peak performance.

Worm testing before other drenches. To minimise drench resistance it is recommended that other than the strategic treatments, only drench if a worm test indicates need.

Drench testing for resistance and effectiveness. Using drenches or combinations of drenches that are effective is important to avoid wasting time and money, increasing resistance and leaving the sheep at risk. A regular drench test will indicate which

chemicals can be used and an effective program planned. (See 'Drenches and drench resistance' below.)

Select for worm resistant sheep. It is early days in the development of worm resistant strains of sheep. Selecting for or buying lines of more resistant sheep will be an important step in managing roundworm disease in the future and very much the present for stud breeders.

It is highly recommended to follow the worm control program designed for your region or area; enquire from your sheep or veterinary adviser. Table 22.4 provides a general guide to managing gastrointestinal worms, particularly for winter rainfall regions.

Table 22.4 General guide to worm management

Sheep type	*Management*
All sheep	Drench twice in summer (unless a long acting treatment is used): in November or December and then again in February. The best time for the first drench is 'hay-off': the time when pasture is flowering and ready to cut for hay. This allows maximum summer exposure of larvae to the sun. The second summer drench may be avoided if a worm test indicates a low worm egg count (less than 200 epg); this may be the case in dry areas or during droughts.
Wethers and dry ewes	Normally don't require drenching at other times unless symptoms of worms are evident or a test for worms indicates treatment is needed.
Unweaned prime lambs	Worm test at 12–14 weeks and drench as indicated and move to a low risk pasture.
Weaners and young sheep	Drench at weaning. Test in autumn, winter and spring and drench if recommended. Give these sheep the safest, most worm-free pastures. Weaner capsules may be an option if there are no clean pastures.
Lambing ewes	Drench prior to lambing. The February drench will suffice for early autumn lambing ewes and if signs of worms or a test recommends treatment.
Rams	Drench prior to joining.
New sheep	Quarantine, multiactive drench, 24–48 hour isolation, test.

Drenching technique

Separate the flock into groups of similar size and weigh some in each to ensure a consistent correct dose rate. Check, calibrate and test the drench gun; test measure some doses into a medicine glass. Stand sheep comfortably in the race. Position the head. It should be parallel to the ground and not stretched up or backwards, which could redirect the drench into the lungs causing coughing. Insert the drench gun while holding the head under the jaw. Insert the nozzle of the drench gun gently between the front and back teeth. Position the nozzle over the back of the tongue and squeeze the trigger. Allow time for the dose to be swallowed before moving onto the next sheep.

By following this technique, the dose will go into the rumen where it will be slowly absorbed, extending its exposure to worms. When a dose is incorrectly delivered in the front of the mouth the drench will bypass the rumen and go directly into the abomasums, shortening its effective life.

Drenches and drench resistance

Worm resistance to sheep antihelminthic (worm) treatments is widespread across Australia. Continuing to treat sheep with a product to which the worms have developed resistance is simply a waste of money and is not controlling the problem threatening the flock. Resistance is said to be present when the correctly delivered dose fails to kill 95% of the targeted worms. Resistance testing and professional advice are essential to design a program to effectively manage this problem and keep the flock healthy.

It is a dilemma that the more effective the drench the more it will select for resistance. In very dry areas, where worms are a minor problem and may be treated only once per year, it has been shown that resistance still builds rapidly as there are few surviving non-resistant larvae on the pasture to dilute the resistant worm population.[11]

Drenches are often referred to as 'long acting' or 'short acting', which is simply describing the time they are active or persistent in the sheep. Most drenches are short acting. They are only effective for a number of hours and provide negligible protection from re-infestation. Specific problem worms, such as Barbers Pole, can be treated with long acting drenches that prolong the time the sheep are protected.

There are many drenches and trade names but they all fall into one of several groups and are divided into 'broad spectrum'(effective against many types of worms), 'narrow spectrum' (effective against one or two specific worms) and 'combinations' (mixture of any narrow or broad spectrum chemicals).

Broad spectrum

Benzimidazoles (BZ) white
Levamisoles (LV) clear
Macrocyclic Lactone (ML) Endectocides (also controls nasal bot and itchmite)

Narrow spectrum

Naphthalophos
Closantel
Triclabendazole

Combinations

BZ, LV and ML
Naphthalophos (organophosphate compound), BZ and LV
Triclabendazole and ML

Sheep worms on any property may be resistant to one or more of these groups and if this is the case they are usually resistant to all the drenches in those groups.

Combination drenches can be used in an effort to overcome resistance but prior testing is needed to ensure the effectiveness of this treatment. Narrow spectrum drenches are used primarily to control specific susceptible worms that have developed widespread resistance to broad spectrum drenches such as Barbers Pole worm, found primarily in summer rainfall areas. Use of multiple drenches is sometimes a last resort or as a quarantine treatment for new sheep. Professional advice is essential to ensure the right combinations and dose.

To minimise the rate of worm build-up, increase effectiveness of drenches and

slow development of resistance to drenches, the following good practices should be observed:

Safe grazing. Plan the use of pastures, keep cleanest paddocks for young sheep, use cattle to clean up sheep worm larvae, avoid use of lambing paddocks by lambs or weaners.

Rotate. Rotate effective drenches annually.

Test. Test for drench resistance.

Strategic drenching. Twice in summer and then when indicated by a worm test.

Don't underdose. Weigh some sheep to be sure of correct dose rate.

Keep resistant worms out. Do this by drenching all new sheep on arrival, or better before despatch, with multiactive drenches (combinations of drench types) and quarantine in the yards for 24–48 hours. Quarantine these sheep and worm test 10–12 days later to ensure effectiveness.

For BZ and ML drenches withdraw feed 24 hours before drenching and at least six hours post drenching. For LV and organophosphate drenches *do not* hold animals off feed or water either before or after drenching.

Check current recommendations for your area and seek professional advice on designing a worm management program specifically for your property.

Liver fluke (trematodes)

Cause. Liver fluke is caused by a flatworm (*Fasciola hepatica*) that lives in the ducts of the liver. The adult fluke produces eggs that travel via the intestines to be deposited on the paddock in manure. A specific water snail (*Lymnea tomentosa*) is an essential intermediate host. The fluke egg hatches and the larva enters the snail. After further development it exits the snail and attaches to pasture waiting to be consumed by susceptible animals. The immature fluke migrate through the lungs and liver causing serious damage and acute fluke disease. Mature liver fluke reside in the liver causing liver damage and chronic fluke disease.

Another fluke or trematode infecting sheep is the stomach fluke (*Paramphistomes* spp.) but it seems to have little significance on sheep health so will not be considered further.

Liver fluke only persist when sheep graze permanently wet or swampy areas where the intermediate host snail can survive. Irrigation areas, swamps and springs all pose some degree of risk.

Signs. Acute fluke disease causes sudden weakness and death. Chronic fluke disease is more common. The sheep lose condition, are poor producers, sometimes exhibit 'bottle-jaw' (swelling under jaw) and may

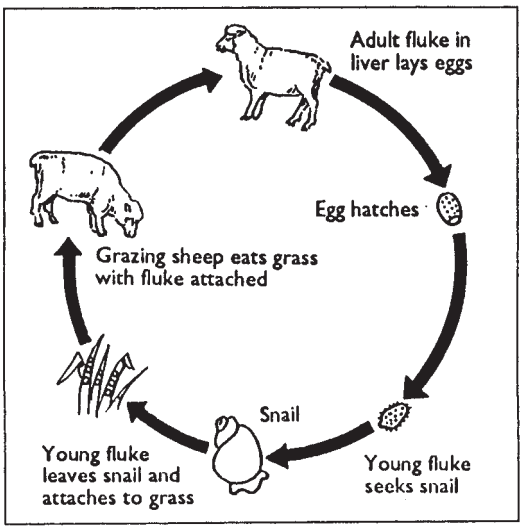


Figure 22.1 Liver fluke life cycle.

eventually die. Livers damaged by fluke are susceptible to black disease (Clostridial), resulting in sudden death.

Control. Treat sheep with a liver fluke drench that is effective against all three stages of liver fluke (early immature, immature and adult) before and after grazing liver fluke risk paddocks, or in April, July and December in areas where all paddocks are risks. Expert advice for planning a treatment program should be obtained if problems persist. Vaccinate sheep against black disease with 5 in 1 or 6 in 1. If practical, fence out swampy areas to exclude sheep.

Tapeworms (cestodes)

Tapeworms (*Moniezia* spp.) also infect sheep but, with the occasional exception in lambs, are of little consequence. Some broad spectrum drenches and other specific drenches are used for treatment. The tapeworm segments, which are full of eggs, are sometimes visible in manure.

External parasites

Sheep lice

Cause. A biting louse (*Bovicola ovis*) causes sheep to become itchy. They rub themselves on fences, trees and posts and may even bite themselves. Sheep lice are spread by direct body contact between sheep, but goats may also act as carriers. Wool becomes matted and loses value. Lice infested sheep are also less productive. It is commonly an offence to place lice infested sheep in a saleyard or public place.

Prevention is best but when an infestation does occur, first determine its source and prevent re-infestation. This may involve:

- fence improvement;
- control of stray sheep or goats;
- ensuring complete musters for delousing;
- encouragement of neighbourhood treatment programs;
- checking sheep before purchase.

Signs. There is wool on the fences, the sheep are rubbing and the sides of the fleeces are rubbed and matted. The creamy coloured lice (2 mm × 1 mm) are visible on the skin when the wool is parted. They will move away from light. Check any sheep

Fleece damage along the sides, caused by a sheep lice infestation.

that show signs of infestation and always check mobs prior to shearing.

Control. Control reduces sheep lice numbers and minimises damage. It is used in long wooled sheep where eradication is not feasible. For eradication off-shears treatment will be necessary.

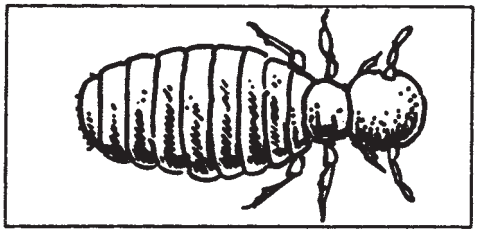


Figure 22.2 Sheep louse (normal size 2 × 1 mm).

Options for control are as follows (only use chemicals registered for this purpose):

1. Jet along the backline from head to tail, use a pressure pump and a hand-held wand, comb the hand wand through the wool along the backline until the solution runs off the sheep's belly.
2. Backline (pour-on). Use a long wool treatment at the correct dose for the wool length and ensure that the application is from head to tail on the wool tips along the backline using the applicator supplied by the manufacturer.

Control treatments may need to be repeated every three to six months until sheep are shorn. Observe withholding periods for wool and shearer safety.

Eradication. Eradication means destroying all sheep lice in the flock. This is normally achieved after shearing. Synthetic pyrethroids, organophosphates and Insect Growth Regulators (IGR) are the major chemicals used. If an IGR chemical is used, keep sheep isolated until all lice are gone. Insect Growth Regulators don't kill instantly but interrupt the moulting cycle, consequently taking some time for all lice to die.

Only use chemicals registered for this purpose and use them in exactly the manner prescribed. Options for eradication include:

1. Plunge dip, two to six weeks off-shears. Ensure wetting of the entire skin area.
2. Shower dip, two to six weeks off-shears. Ensure wetting of the entire skin area.
3. Backline (pour-on) must be used within 24 hours of shearing. These treatments are not as effective in sheep that have dermatitis (dermo) or are not cleanly shorn (wrinkly sheep). Some products can be used on unshorn lambs. Check age limits.

Control of itchmite and/or flystrike can be obtained simultaneously by choosing the appropriate product and dose rate. If lice resistance to one chemical is suspected, then use an alternative type.

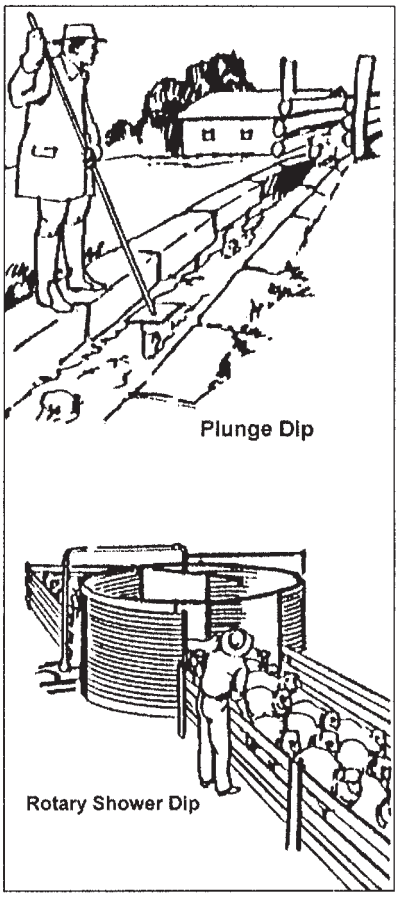


Figure 22.3 Plunge and rotary shower dips.

Blowfly strike

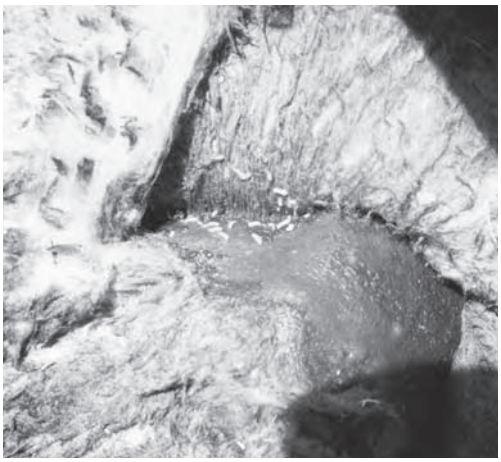
Signs of flystrike – dark, damp patches on the shoulder, loin and tail.

Cause. This is a very cruel disease where fly maggots eat the skin and flesh of struck sheep. Flies are attracted to damp areas in the fleece, particularly the pizzle, shoulders, brisket, breech or tail. The Australian Sheep Blowfly (*Lucilia cuprina*), a green coloured fly, is the principal fly involved.

Signs. Flystrike is a seasonal problem and flocks should be inspected regularly during hot and humid weather when flies commonly strike, even daily, during fly waves.

A flystruck sheep can be detected by its display of irritation; it may lag behind or separate from the flock and not graze. A wet, dark or greenish stained patch will be apparent on the fleece (body strike), often around the shoulders, on the tail and breech area (breech strike), or on the belly (pizzle strike). Wethers will kick at their belly, or on the top of the head (poll strike). Poll strike occurs mostly in rams.

A slow death often follows if the sheep is not treated.



Maggots on skin of flystruck sheep.

Death and severe suffering can result from flystrike.

Control. Good husbandry practices, such as shearing prior to strike periods in spring, crutching, mulesing or its equivalent, correct tail docking, worm control and timely chemical treatment, can reduce the incidence of flystrike.

Jetting chemicals will give good protection for 4–12 weeks depending on the product. Spray-on backline treatments claim up to 24 weeks' protection. Body strike can be reduced in the long term by buying or breeding less susceptible sheep with denser fleeces. Pizzle dropping, done at marking, will help reduce the incidence of pizzle strike. In this operation a small cut above the pizzle causes it to hang down below the wool line.

Run-through jetter.

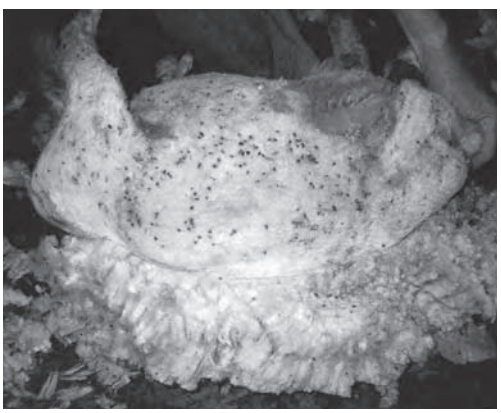
Treatment. Using hand shears, cut the wool away from the struck site. Clear all the maggots out of the wound and apply a blowfly wound dressing powder or liquid. Carefully follow the maggot trails to ensure that none remain. Destroy maggots and stained wool.

Itchmite

Cause. Itchmite is a microscopic mite (*Psorergates ovis*) that lives on the skin of Merino-type sheep and causes irritation. Itchmites develop slowly over a number of years before significant problems are apparent.

Signs. Rubbing and biting of the sides of the fleece. Usually only evident in a very few sheep (<1%) at first and then build up over several seasons. The absence of sheep lice on rubbed sheep is often suggestive of itchmite. Carefully taken skin scrapings will reveal the mites when the scrapings are examined under a microscope.

Control. Shower or plunge dip with an itchmite dip or dip additive; this is usually only necessary each second or third year. Alternatively, use a Macrocyclic Lactone (ML) type worm drench; a single drench and dose rate controls both parasites.



A heavy infestation of sheep ked seen at shearing.

Sheep keds

The now rare, large, blood sucking ked is often incorrectly called a tick. Eradication treatment involves dipping sheep in a

chemical registered for this purpose or drenching with a Macrocyclic Lactone (ML) drench. Check the registration claims.

Wool diseases (also see 'External parasites')

Mycotic dermatitis (dermo, lumpy wool)

This is a bacterial infection on the skin and wool of sheep. Young sheep and Merinos are the most susceptible and the incidence is highest in high rainfall areas or wet years. On infected areas a fluid is produced that mats the wool fibres together and dries into a crusty scab; as the wool grows the scab moves up and new layers form beneath it. Dermatitis usually occurs along the back where moisture penetrates the fleece.

Most dermatitis will die and grow out with the onset of dry weather. With severe cases an injection of antibiotic will lift the scab and allow the sheep to be shorn. Infected wool should be discarded. Avoid mustering wet sheep. Yard infected mobs last and add zinc sulphate (5 kilograms per 1000 litres) to compatible dips to avoid contamination while dipping. Cull sheep that remain infected as adults.

Fleece rot

This is a bacterial infection on the skin of sheep during warm, wet weather. Summer and autumn shorn Merino types are the most susceptible. Fleece rot occurs most commonly in high rainfall areas or during wet years. Along the backline where water penetrates a coloured fluid is produced that stains the wool fibres. A green stain usually predominates but a range of colours and shades can be present. Prevention is by selective breeding against the more susceptible types (open staple, crossed fibres, high suint or sweat, poor body confirmation and stronger wools) and/or by changing shearing time so that sheep have short wool during spring and summer. The only treatment required is jetting to control body flystrike.

Steely wool

This is caused by a copper deficiency, usually on light costal soils. The wool is very harsh and springy in many sheep, and white bands will be seen in the wool of black sheep. Test the sheep and treat them at the rate recommended by your veterinarian. The soil should also be tested and copper added with the fertiliser if required. Copper poisoning can easily occur, so seek professional advice before treating. Copper capsules are the main means of treatment.

Tender wool

The wool staple has a weak spot or break and wool may fall off the sheep. Hold a staple of wool between your thumb and forefinger of each hand and gently flick the staple with the second finger; if tender, it will separate at the break point. Wool fibre diameter and therefore strength directly relate to nutrition and stress. Feed shortages, pregnancy, lambing, sickness or extreme stress, which temporarily stops or slows the growth of the wool fibre, will cause a weakness leading to a break. Avoid conditions leading to sickness or feed stress, since once the wool has a break it will not be repaired for that season.

Lameness

Footrot

Cause. Footrot is a highly contagious disease of feet that is caused by the bacterium *Dichelobacter nodosus*, and causes severe pain and lameness in infected animals. Losses result from decreased growth, from lost wool production and marketing opportunities and from expensive treatment costs.

Moist, warm conditions, such as in spring, are ideal for spread of the disease, which is from foot to foot via pasture or mud. The bacteria may survive indefinitely in an untreated foot but will not survive for more than seven days away from the foot. Sheep, goats and occasionally cattle and deer can be affected.

Footrot is a notifiable disease and each state has control strategies and Infected, Control and Protected areas, each with different rules regarding footrot. Notification of the disease is compulsory and infected sheep must not be placed in a saleyard or public place or sold except for slaughter. Professional advice should be sought.

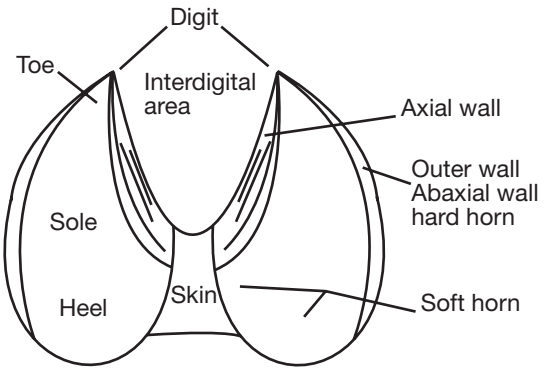


Figure 22.4 Points of a sheep foot, viewed from underneath.

Signs. The signs of footrot, in progressive order, are: inflamed, red and moist skin between the digits or claws; increasing lameness; a grey, pasty scum between the digits, or separation of the horn commencing at the heel and extending across the sole to the outside wall of the hoof.

Prevention. When buying sheep, carefully look for lameness and examine the feet for any suspects. Transport in a washed truck. Check the feet again and footbath at home, then keep them isolated until the end of spring. Exclude stray sheep and goats from flocks and pasture and avoid using roads

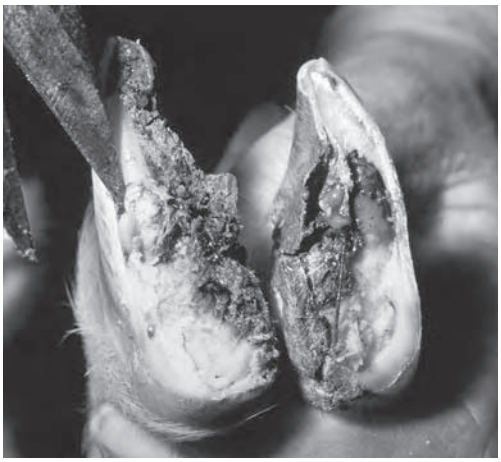
Normal foot.

Advanced footrot.

when droving sheep. Early detection and treatment of an outbreak of footrot will reduce the damage and cost.

Eradication. There are three methods to choose from:

1. Immediate slaughter of infected sheep at an abattoir.
2. Control the infection by footbathing and/or vaccination then slaughter affected sheep after shearing and/or weaning.
3. Control the infection by footbathing and/or vaccination then eradicate in summer. A planned control program to reduce the spread and severity of footrot is essential during spring. In summer, all feet should be examined, sheep sorted into *clean* v. *infected* mobs and footbathed. This is repeated every four to six weeks until there are two consecutive clean inspections. The mobs should remain isolated until they are tested in the following spring.



Pared foot showing underrun of sole with separation of horn.

Treatment products include vaccines for prevention (two doses give 10–15 weeks' protection) and footbath chemicals (zinc sulphate 10% (1 kilogram to 9 litres water), formaldehyde (Formol, Formalin) 5% (1:19 water)).

Antibiotics are useful for curing infected sheep if they are kept on dry ground or floor for 24 hours after treatment.

Expert advice should be sought before commencing treatment as footrot is caused by a complex bacterium with a number of strains and degrees of virulence. Eradication of Benign Footrot is rarely successful and is usually not economically justifiable.

A footrot expert will confirm a diagnosis and virulence, design an eradication program to suit each farm and situation, provide training on foot examination and paring, advise on techniques and equipment, and oversee the treatment program.

Conventional walk-through footbath.

Foot abscess

Cause. Bacteria create an abscess under the horn of the foot.

Signs. The abscess causes severe pain, it is usually only in one foot and is most commonly found in the toe or heel. The sheep is limping and often holds the infected foot up. The affected foot is hot compared to the other feet,

swelling may be present around the skin-horn joint and the abscess may burst, discharging yellowish pus and blood.

Treatment. Either inject with antibiotic obtained from a veterinarian or pare the affected hoof back to locate and drain the abscess or, in less severe cases, allow natural healing.

Ovine interdigital dermatitis

Cause. A mild infection of the skin between the toes that causes dermatitis. It occurs in wet conditions and will clear up when the pasture dries. It is similar to the first stage of footrot.

Signs. Mild lameness or reluctance to move and inflammation of the skin between the toes, usually in several feet.

Control. In most cases do nothing, but in severe outbreaks place the sheep in dry conditions such as a lane or shearing shed for 24 hours or walk them through a footbath of 10% zinc sulphate (1 kilogram to 9 litres water).

Grass seeds and injury

Cause. Grass seed between the toes, bruises under the hoof or cuts. Wet conditions and soft feet make sheep more susceptible to these problems. Sheep with soft feet that run along stony roads frequently receive sore bruised feet.

Signs. Sheep limp and are reluctant to move. Grass seeds may be seen penetrating the skin between the toes. Bruises, which are usually on the heel, are difficult to see without paring. Injury or a broken bone will be obvious when the leg is examined and manipulated.

Treatment. Remove grass seeds and treat the foot with flystrike dressing. If many sheep are affected it may be necessary to move them to a less seedy paddock until the seeds have dropped. Cuts should also be dressed with flystrike dressing. Broken bones should be splinted or the sheep put down.

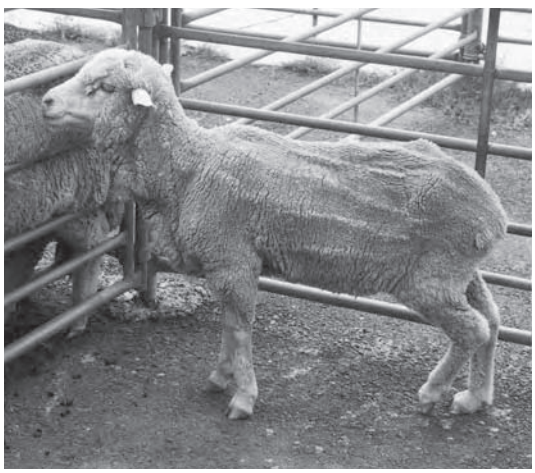
Arthritis

Cause. Infection of bone joints in very young lambs or aged sheep.

Signs. Lambs are stiff jointed and reluctant to move or even to drink. Older sheep show lameness in one or more legs that are stiff, the joints are swollen slightly and there is no other obvious reason for lameness.

Control. Minimise stress on lambs, lamb and mark in clean areas and practise good hygiene at marking and mulesing.

Treatment. Lambs should be treated promptly with antibiotics or they will starve; affected lambs are likely



Ewe with arthritis in left hind leg, holding up a swollen joint.

to remain as runts. Older sheep are usually culled or destroyed when they are unable to function adequately.

Nutritional diseases

Pregnancy toxaemia (preg tox, twin lamb disease)

Cause. A glucose deficiency may occur during the last six weeks of pregnancy when energy demands are high and feed intake inadequate. It occurs most commonly in ewes carrying more than one lamb as these ewes have less room to consume the necessary amount of feed and demands are high. As the ewe uses up her own fat reserves, toxic waste products (ketones) are produced resulting in irreversible brain damage.

Any activity, such as yarding, illness or bad weather, which causes stress and reduces feeding time may precipitate cases of pregnancy toxaemia.

Signs. The ewe becomes lethargic, stops eating, appears dopey and separates from the flock. After a few days she may stagger, appear blind, sit down and have acetone smelling breath (very sweet, like nail polish remover). She may then lapse into unconsciousness and die.

Prevention. Reduce stress on ewes in late pregnancy, and ensure a rising plane of high quality feed. Poor quality feed such as old pasture or average hay will not be adequate. If pasture is inadequate or of poor quality, a supplement of grain should be fed; 1–2 kg per week is usually adequate.

Treatment. Treatment must be early, before the ewe goes down. Inject 60 ml of dextrose or a milk fever treatment containing dextrose under the skin and/or drench with Vy-trate (160 ml every four to six hours), or an equivalent high glucose product until full recovery. Provide the ewe with a concentrated feed supplement (grain) to prevent a relapse.

Milk fever (hypocalcaemia)

Cause. Milk fever is caused by a fall in blood calcium levels. This is most common in ewes just before lambing and while milking, but may occur in any sheep. Calcium deficiency may be induced by yarding without feed, by transport, during very cold weather, when fed a grain diet for a prolonged period without calcium supplements, by sudden withdrawal of calcium supplements close to lambing, or by ewes grazing green oats, wheat or rapidly growing grasses.

Signs. A large number of sheep often affected. They go down suddenly with nervous signs and often with legs stretched out behind them and they usually die within a few hours.

Prevention. In pregnant and milking ewes avoid long periods away from feed and add 2% by weight of ground limestone to grain rations. If feeding is to cease before lambing, withdraw the ration very slowly to allow the ewe's system to adjust to reducing dietary calcium.

Treatment. Treat early with calcium borogluconate (milk fever injection) injected under the skin at the recommended rate and provide good quality feed.

Grass tetany (hypomagnesaemia)

Cause. A magnesium deficiency that usually occurs in ewes up to two months after lambing when grazing grass-dominant (little clover or medic) pastures.

Signs. Usually a number of sheep are affected. They collapse on their side with head thrown back and legs paddling. They may die within minutes.

Prevention. If grass tetany has been diagnosed, graze pregnant ewes on balanced clover pastures or feed them clover hay. If the problem is severe, feed 15 grams per head of Causmag on hay every second day. High magnesium licks may assist ewes that use them.

Treatment. Inject 2:1 magnesium/calcium milk fever treatment at the first signs of disease and follow up with Causmag on good quality hay.

Mineral deficiencies and toxicities

A wide range of deficiencies can occur and expert advice and testing is usually required for confirmation. Copper (steely wool) and selenium (weaner ill-thrift, white muscle disease) are the most common and relate to specific soil types, while calcium and phosphorus relate to feed and soil conditions. Zinc, cobalt and Vitamin A and E deficiencies also occur in some areas. An expert diagnosis, test and advice are the first steps in dealing with deficiency diseases. Some are treated by adding fertiliser to pasture but most are treated by rumen pellets, drench additives or injection.

Toxicity or poisoning occasionally occurs, often in conjunction with damage caused by some plants or overdosing with mineral supplements.

Other diseases

Brucellosis

A sexually transmitted disease that causes sterility in rams. Only buy rams from Ovine Brucellosis Accredited Free Flocks. Accredited studs have an approved isolation and quarantine plan and are tested by blood sample and veterinary examination of scrotum and testicles.

A ram with obviously enlarged right testicle.

Cheesy gland (caseous lymphadenitis, CLA)

CLA bacteria form large abscesses in the lymph nodes (glands). The abscesses that are close to the skin often burst during shearing and so spread more bacteria. This disease causes serious losses at slaughter due to carcase condemnations. Control by vaccination of lambs and then adult sheep annually. The vaccine comes in combination with Clostridial vaccines (6 in 1).

Mastitis

Two forms of mastitis (udder infection) occur in milking ewes:

1. *Black (gangrenous) mastitis.* The udder becomes hot, swollen and turns red, dark blue and then black. The ewe has a high temperature and may die within three days. Antibiotic injections may save her life but not the udder, which will dry up and slough off.
2. *Non-gangrenous mastitis.* One or both sides become hot and swollen. Milk clots in the udder, which eventually becomes hard and unproductive. Antibiotic treatment given early may save the udder. Ewes that are not productive in both halves of the udder should be culled before joining.

Ovine Johne's Disease (OJD) (pronounced yo-nee's)

Cause. A bacterium (*Mycobacterium paratuberculosis*) that invades the intestine wall. The bacteria cause a thickening of the gut wall and the sheep is unable to absorb digested nutrients; the result is a gradual loss of condition, productivity and eventually death. Bacteria are shed in faeces, contaminating the paddock where they can survive for many months or even years in kinder environments. The bacteria are ingested during grazing to complete the life cycle.

The course of the disease may take many years, may have no clinical signs or may progress rapidly over some months, particularly when sheep are stressed. Goats and deer are also susceptible to the sheep strain of Johne's disease.

Signs. Wasting, decreased production, occasionally diarrhoea and eventually death from starvation. It is also common for infected sheep to show no symptoms for many years. A distinct tail or group of poor doers develops in a mob or flock. Signs are not dissimilar to that of worm infestations.

Diagnosis. With such a long incubation period and poorly defined signs, diagnosis is difficult in the live animal. Common tests are blood samples and faecal culture. It is only with testing of large numbers and repeat testing that these tests provide some value. False negative blood tests are common and the faecal culture takes several weeks. On autopsy the thickened intestines are often obvious in clinically affected sheep. Gut samples are taken for laboratory examination to locate the bacteria in the tissues: a definitive diagnosis.

Control. Attempts to eradicate this disease have been unsuccessful on a state or national scale. In individual flocks

Typical Ovine Johne's Disease affected sheep – poor condition and weak.

eradication can be achieved by complete destocking of susceptible species for at least two summers.

Control methods currently available are:

- Reduce stocking rate and therefore stress and exposure.
- Protect young sheep from heavily contaminated paddocks.
- Keep sheep healthy by managing other diseases, such as worms.
- Keep flock younger by selling aged sheep earlier.
- Good property security to prevent strays and straying.
- Vaccinate lambs to be retained as replacement stock.
- Early culling of heavily infected sheep or sheep showing clinical signs.

Each state has a control program in place to manage this very difficult disease. It is essential to get professional help for diagnosis and development of a control or prevention strategy.

Prevention. Obviously it is best to prevent the introduction of this disease but with limited tests and often very low rates of infection one can never be absolutely sure. Buying sheep from low prevalence areas, such as hot dry areas, and asking for vendor declarations of OJD status will assist as will inter- and intrastate movement controls.

Possibly the best prevention is to buy from flocks, mostly studs, that are part of the Market Assurance Program (MAP), a nationally recognised program run by each state. Flocks entering this program have to meet isolation and quarantine standards and undergo an exhaustive testing period before they are registered as Monitored Negative 1 (MN1). Testing and monitoring by veterinarians continues, including inspections and autopsies, and progressively over years the flock status moves to MN2, MN3 and so on. As the status suggests this is not an absolute guarantee of freedom but the best that is available. All the monitoring is negative for the set period.

Treatment. There is no cure for this disease.

Perennial ryegrass toxicity (perennial ryegrass staggers)

This condition arises when sheep graze perennial ryegrass (*Lolium perenne*) that is infected with the ryegrass endophyte (a microscopic fungus). This endophyte produces alkaloids (chemicals) that protect and enhance the survival of the host plant and in return are provided a favourable environment and nutrients. Unfortunately this symbiotic relationship does not extend to grazing animals, which can show a diverse array of adverse conditions. In sheep, staggers is normally seen around the autumn break, and the severity may vary from an occasional animal to a major outbreak, depending on the year. The sheep appear normal until they are moved, when some will stagger, collapse, often head first, and go into spasm. If the sheep are left alone they will usually recover in 5–10 minutes. For the few weeks when this disease is present avoid moving the sheep, and attempting to transport them is unwise. Heat stress, lowered reproductive success, reduced feed intake and even death are less obvious effects of this condition. Perennial ryegrass toxicity should not be confused with the fatal disease, annual ryegrass toxicity (ARGT).

Pink eye (contagious ophthalmia)

Cause. An infection of the eye that usually occurs during dry periods. Dust, grass seeds and flies will aid spread.

Signs. Inflammation around the eyeball with excessive tears often wetting the cheek. The eye develops a blue haze, becomes opaque, then white and is blind. Sheep with both eyes affected will behave as totally blind. It is more common in younger sheep and a large number may be affected.

Treatment. Check under the eyelids and remove any grass seeds. Yarding for treatment will increase spread of infection. Most will recover unassisted over two to three weeks. Blind sheep will usually cope while in a mob and familiar surroundings. Antibiotic ointments and aerosol sprays applied daily will assist recovery but are not very practical.

Plant toxicity

Poisoning by plants can exhibit a multitude of effects including rapid death, slow death, infertility, unusual lactation, staggers, nervous signs and jaundice. Plants may only be toxic at certain stages of growth or under specific conditions and the toxins may be cumulative before affecting the sheep. Veterinary diagnosis is recommended.

Pizzle rot (sheath rot, balanoposthitis)

Cause. A bacterial infection of mature wethers grazing lush clover-dominant pasture. Small ulcers develop into scabs on the skin around the tip of the pizzle and if the pizzle membranes become infected, a foul smelling pus is present. The pizzle swells if scabs block the opening and the wether is unable to urinate. The pressure of urine will cause a rupture either through the skin or internally.

Signs. Scabs around the pizzle, an arched back, stiffness, distress, swelling of the pizzle, dullness and eventually rupture. Wethers may become flystruck and may die. The course of this condition takes several weeks.

Prevention. Restrict access to lush clover-dominant pasture. Testosterone injections given at the base of the ear help to prevent severe cases and should be used in years when pasture is likely to cause problems. This hormone will increase masculinity, wool production, fibre diameter and make the wethers quite difficult to handle.

Treatment. Move affected mobs to pastures with less clover; this will cure

Signs of pizzle rot and associated flystrike.

most mild cases within two weeks. In severe cases it is necessary to make a slit below and along the full length of the pizzle, using a sharp knife or shears. Flushing with a mild antiseptic and applying a flystrike dressing assists recovery.

Scabby mouth (scabby leg, contagious ecthyma)

Cause. A contagious viral infection to which sheep develop lifetime immunity after the initial exposure. The worst outbreaks occur when sheep without immunity, usually lambs, are mixed with infected sheep. Thistles that puncture lips and feet can predispose sheep to a severe outbreak.

Outbreaks of scabby mouth on ships carrying live sheep have resulted in rejection of whole consignments and damage to our reputation. Consequently, vaccination with scabby mouth vaccine is a current pre-condition of eligibility for purchase for the live export trade.

Signs. Thick, brown scabs form on the lips, mouth and nasal areas, teats and/or on the skin above the hoof, particularly between and above the heels. If the firmly attached scabs are lifted, a raw skin surface that bleeds easily is exposed. Healing is spontaneous in three to four weeks unless delayed by flystrike or a secondary infection. In severe cases sheep may not eat and so lose condition rapidly. Flystrike can be a major concern in leg infections.

Scabby mouth – head lesion.

Scabby mouth – feet and leg lesions, very susceptible to flystrike.

Prevention. A scabby mouth vaccine is available. It needs to be given before the first signs appear in the mob to allow for immunity to develop. Sheep that have been exposed, even if they showed insignificant symptoms, will be naturally immune to the virus. The vaccine is applied to the skin on a superficial scratch. Follow directions.

Treatment. The only treatment needed is to minimise flystrike on the legs. If this is a problem, walk the sheep through a footbath of jetting fluid weekly or spray or brush jetting fluid onto the legs of small mobs.

Handlers of infected sheep or vaccine may become infected and exhibit red papules, blisters and scabs, usually on the hands and arms. The human infection is called Orf and runs a similar course to that in sheep.

Skin cancers

Sheep are susceptible to cancers on the nose, ears, tail and vulva, essentially all areas exposed to the sun. A scaly appearance develops to a swelling and eventually to a red meaty growth that is liable to become flystruck. These sheep should be humanely destroyed to prevent suffering. Tail docking to the correct length and mulesing that leaves wool over the tail will reduce tail and vulva cancers.

Skin cancer on the nose and flystruck.

Skin cancer on the tail.

Skin cancer of the ear.

Urolithiasis (bladder stones)

Chemically formed stones block the urinary tact, usually in wethers. They show restlessness and will unsuccessfully attempt to urinate. Eventually the bladder or urinary

tract bursts. They then become dull and lethargic, lapse into a coma and die. The process takes several days. A large volume of urine is often found in the abdomen and makes a sloshing sound if the body is moved. Extended yarding and transport can precipitate this condition.

Chemical analysis of the stone will indicate the source of the offending chemicals, which may be of plant, water or soil origin. Veterinarians will be able to provide techniques for managing problem chemical sources. Increasing the water intake will help to flush stones through while they are small. Salt licks placed near watering points can be beneficial as they increase thirst and therefore water consumption. Surgical treatment is usually too late by the time signs are noticed.

Glossaries

Glossary of sheep farmer's terminology

Afterbirth. Placenta and membranes discharged from the uterus after giving birth.

Broken mouth. An aged sheep (over five years), which has broken or missing incisor teeth.

Cast. A sheep that is unable to rise on its own.

Cast-for-age. A sheep rejected as being too old for commercial production.

Composite breed. A new breed created by crossing and then breeding to create a consistent line that has the desired features of both breeds' genetics (e.g. Comeback, Corriedale, Perendale).

Cross-bred. Parents are of different breeds, bred from two or more breeds.

Crutch. Area between hind legs, below the tail. To shear wool from this area.

Cryptorchid. Testicle(s) retained in body, not the scrotum, naturally or by rings at marking.

Cull. To sell or dispose of inferior sheep.

Dags. Faeces (manure) matted on wool.

Dam. Ewe, mother of a sheep.

Dead herbage. Pasture measure of quantity of dead plant material in pasture (kg DM/ha dead).

Digestibility. A percentage measure of the proportion of a feed that is digestible by a sheep.

Drench. Give an oral dose of medicine; commonly used for internal parasite (worms and fluke) treatments that may be oral, topical or injectable.

Dressing percentage. The proportion of the post slaughter, dressed carcase weight (HSCW) of the original live weight.

Dry ewe. Ewe not suckling a lamb, not lactating (milking).

Dry Matter (DM). Fodder measure, dried to remove moisture (kg DM/ha).

Dry sheep. Non-lactating sheep, usually a wether.
Dry Sheep Equivalent (DSE). A standard measure for comparing stocking rates, equivalent to one 45 kg wether maintaining weight.
Dystocia. Difficulty in lambing.
Ewe. Female sheep.
Fat tailed sheep. Breeds of sheep (Awassi, Karakul, Damara) derived from Middle East and African countries, have a distinctive broad tail. Preferred by Middle East importers.
Feed test. A fodder testing service measuring energy, protein, dry matter and digestibility.
First-cross (first X). Product of mating two different pure breeds; Border Leicester rams crossed with Merino ewes are common prime lamb producers.
Four-tooth. Sheep with four adult incisor teeth (two to three years).
Full mouth. A sheep with all eight adult incisor teeth (four years).
Gestation. Period of pregnancy, time from conception to birth (147 days).
Gross margin. Income less variable costs, used in economic analysis.
Ground cover. The percentage of or weight of plant material, dead or alive. A minimum level of ground cover is needed to protect the soil from erosion.
Hectare (ha). A unit of measure for land area, 10 000 square metres (2.47 acres).
Herbage mass. A measure of the quantity of pasture (herbage), kg DM/ha.
Heritage breed. A breed of sheep no longer in commercial demand but continued by dedicated enthusiasts to preserve the genetic pool and heritage values.
Hogget. Young sheep, usually 12–18 months.
HSCW (Hot Standard Carcase Weight). This is the weight of livestock after slaughter but before chilling.
Joining. Putting rams with ewes for mating.
Lactation. Time of producing milk.
Lamb. A baby sheep, usually birth to weaning, sometimes to 12 months.
Maiden ewe. Ewe that is yet to have a lamb.
Marking. Procedure of removing tails, castrating males, vaccinating and giving identifying ear marks to young lambs.
Metabolisable Energy (ME). The energy available from a feed for animal use.
MJ ME/kg DM. Megajoules of metabolisable energy per kilogram of Dry Matter.
Oestrus. Heat, ovulation, producing eggs ready for mating.
Ovine. Scientific name for sheep or relating to sheep.
Poll. Top of the head.
Polled. Genetically hornless.
Ram. Entire male sheep.
Reproductive stage. Plant or pasture has moved from vegetative phase to producing stalks, flowers and seeds.
Rotational grazing. Sheep are systematically rotated around several paddocks. The move intervals are dependent on fixed times or pasture regrowth.
Sappy lamb. Well-finished prime lame.
Scour(s). A term used for diarrhoea.

Second-cross lambs. Lambs from first-cross ewes mated to a purebred ram.
Selective grazing. Stock preference for some pasture plants, species or parts of plants above others.
Set stocking. A set or fixed number of animals graze a paddock for an indefinite period.
Sire. Ram, father of sheep.
Six-tooth. A sheep with six adult incisor teeth (three-and-a-half years).
Steely wool. Harsh, stiff handling wool caused by copper deficiency.
Stocking density. Sheep per hectare (ha) on a defined area at any particular time.
Stocking rate. The number of stock carried on a paddock over a designated period, expressed as per head or Dry Sheep Equivalent (DSE).
Store. Sheep suitable for farmers rather than butchers.
Stud. Purebred, breeding sheep or flock with pedigrees and registered with a breed society.
Sucker. A suckling or unweaned lamb.
Teaser. Infertile (vasectomised) ram or hormone stimulated wether, used to promote oestrus (heat) in ewes.
Terminal sire. A meat breed ram used to produce prime lambs for slaughter (not breeding).
Turnover lamb. A weaned lamb being fattened for prime lamb.
Two-tooth. A sheep with two adult central incisor teeth (one-and-a-half to two years).
Vegetative stage. Pasture or plant phase when leaves are being produced in contrast to the reproductive stage. The optimum stage for pasture production.
Weaner. Lamb weaned (separated) from its mother (2–12 months).
Wet ewe. A lactating ewe rearing a lamb or about to give birth, having a fully developed udder.
Wether. Castrated male sheep.
Worm test. A testing service measuring worm eggs in faeces (manure).

Glossary of common wool terms

Belly wool. Wool shorn off the belly of the sheep.
Britch wool. Wool shorn off the britch or lower thigh of the sheep.
Carpet wool. Very coarse wool used in the manufacture of carpets.
Character. Crimp definition.
Classing. The placing together of wools of a similar quality and style.
Clean wool. Wool fibre free of any impurities.
Combing. Process in the preparation of worsted yarn; long fibres are laid parallel and the short fibres, broken ends and vegetable particles are removed.
Comeback wool. Wool from cross-bred sheep that have been bred back towards the Merino, usually 21–25 micron.
Cotted wool. Wool fibres felted together in the fleece.
Crimp. Natural wave formation in the wool fibre.
Crutchings. Wool shorn off the crutch and inner thighs of sheep.
Dags. Staples of wool heavily covered with manure.
Fibre diameter. Measure of fineness of wool, measured in microns (μm).
Follicle density. Number of wool fibres in given area of skin.
Fribby wool. Wool containing an excessive amount of sweat points.
Greasy wool. Wool in its natural condition as shorn from the sheep.
Hungerfine. Wool finer than normal, as a result of starvation or under-nutrition.
Kemp. Short, straight, white and brittle hairy fibres.
Lamb's wool. Wool shorn from lambs.
Locks. Very short wool and second cuts that fall from the fleece during shearing and skirting.
Medullated. Hair-like fibre, with a medulla as distinct from wool, unacceptable in finer wool. Some breeds such as fat tailed sheep and some carpet wool sheep have medullated fibre.
Micron (μm). Unit of measurement for wool fibre diameter.
Noil. Short and tender fibres extracted from the long fibres during the combing process.
Pieces. Wool removed from the fleece during skirting.
Plain. Straight fibred wool, lacking crimp.
Quality number. A number indicating the fineness of wool, visually assessed by the crimp rate.
Staple. A natural group of wool fibres in a fleece.
Suint. Dried perspiration in wool.
Tender wool. Will not stand the normal pressure applied during combing.
Top. A continuous ribbon of combed fibre, laid parallel and not twisted.
Wiggings. Wool shorn from the eyes and face.
Yield. The amount (%) of clean wool obtained from greasy wool. The Schlumberger Test is one of several methods of testing yield.

Information and further reading

Information sources

Information Notes; Agnotes; Fact sheets, Department of Primary Industries or Agriculture in each state:

- Victoria: www.dpi.vic.gov.au
- New South Wales: www.dpi.nsw.gov.au
- Queensland: www.dpi.qld.gov.au
- Western Australia: www.agric.wa.gov.au
- South Australia: www.pir.sa.gov.au
- Tasmania: www.dpiwe.tas.gov.au
- Northern Territory: www.primaryindustry.nt.gov.au

Australian Wool Innovation Limited: www.wool.com.au
Australian Wool Services Ltd: www.wool.com
Australian Stud Sheep Breeders Association: www.assba.com.au
Australian Wool Testing Authority: www.awta.com.au
Animal Health Australia: www.aahc.com.au
Bureau of Meteorology: www.bom.gov.au
Meat and Livestock Australia: www.mla.com.au/publications
The Australian Association of Stud Merino Breeders: www.merinos.com.au
The Australian Wool Growers Association: www.australianwoolgrowers.com.au
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