Practical Sheep Keeping

Second Edition

Kim Cardell

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THE CROWOOD PRESS

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First published in 1998 by
The Crowood Press Ltd
Ramsbury, Marlborough
Wiltshire SN8 2HR

www.crowood.com

Paperback edition 2012

This e-book first published in 2013

British Library Cataloguing-in-Publication Data
A catalogue reference for this book is available from the British Library.

ISBN 978 1 84797 586 7

Illustrations by Tony Phillips-Smith.
Photographs by Fiona Teagle and Kim Cardell.

Dedication
To my late parents Peggy and Willmar Cardell, who knew a thing or two about sheep, and to my brother Peter who knows even more.

Acknowledgements
Grateful thanks to the following friends and colleagues who have contributed in so many ways to the production of this book by reading manuscripts, supplying information, and offering comments, advice and encouragement. They are all stalwarts of the sheep industry.

Roger Ash; The British Wool Marketing Board; David Croston, BSc; Alastair Dymond; Ron Harrison, BSc; Cath Hoyland, BSc; Richard Janes, BSc (Animal Sciences); Peter Johnson; Tony Phillips-Smith; Mike Prettejohn, MRCVS (former president of the Sheep Veterinary Society); David Sullivan; Ian Wilkinson; Robin Hill; and Fiona and Peter Teagle.

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Introduction

The environment, animal welfare and climate change have become major global issues since this book was first published. But, although the sheep industry has been affected by them, it has not been radically changed as a result. This is largely because global sheep farming remains a mix of subsistence, pastoral and high-tech and, while embracing the twenty-first century, it retains its proud traditions. Sheep must have shepherds and must depend on Man, while Man still depends on them.

However, one phenomenon of the last decade that has touched on the industry is the Internet. Advice and facts about every aspect of worldwide sheep keeping are at the end of a computer key. We can now surf for all the information – practical, academic or quirky – that we could ever need.

The missing element is the sheep. This book is intended to be an introduction to the practical side of sheep keeping and to provide a framework which allows small flocks – as small flocks often do – to grow into larger flocks.

The keyword is 'framework'. Unlike the Internet, no book is big enough to include every detail of sheep management; but it can set out the fundamentals of what is involved. Anything additional or more advanced will be somewhere at the end of that computer key.

Flock Facts

Life-span	Sheep can live for 20 years.
Breeding span	Average span in a commercial flock is 5 years. More than 10 years in a small flock.
Breeding frequency	Normally once a year. Some breeds capable of breeding every 8 months.
Gestation period	Average 147 days.
Breeding age	Rams able to serve at 4–5 months. Some ewes will breed at 8 months and lamb at 13–14 months.
How many rams	Three adult rams per 100 ewes. One ram lamb per 20 ewes.
Litter size	Hill sheep, one. Lowland sheep, two or three. Four or five not unusual.
Birth weight	Average 4–5kg depending on breed.
Milk production	Dairy ewe 350–500 litres per lactation. Commercial ewe 2 litres per day.
Wool weight	Average 2–4 kg fleece per year. 7–10kg from Longwools.
Growth rate	Can average 1.5–2kg per week.
Age fully grown	Usually 18 months to 2 years.
Age of lamb when sold for meat	3–12 months (average 4–8 months) and weighing 35–45kg.
Replacement rate	Average 20 per cent. That is, in a flock of 100 ewes, 20 are culled and replaced each year. Lower in a small flock.

These figures are averages from a wide range of facts, figures and breeds.

1 Where to Begin

Sheep are a full-time responsibility and need hands-on attention – much of it physically hard.

A small flock must be managed as professionally as a large commercial flock. Not only does common sense demand it, but the law demands it too. Sheep are very vulnerable to neglect and ignorance. They demand good stockmanship as summed up in the Five Freedoms of animal welfare:

- Freedom from hunger and thirst.
- Freedom from discomfort.
- Freedom from pain, injury or disease.
- Freedom from fear or distress.
- Freedom to express normal behaviour.

So, the questions to ask before establishing a flock are:

- Do I have time to keep a daily watch on them?
- Do I have time to sort out any problems when they occur?
- Do I have a source of advice?
- Am I physically fit to handle sheep?
- Is there help in an emergency?
- Do I have land which is suitable for sheep?
- Can I afford to invest in the basic essentials?
- Can I afford to keep them until they start paying their way?
- Can I accept that they will eventually be sold or slaughtered?
- Do I know the legislation affecting the industry?

- Can I cope with the form-filling and bureaucracy?

Setting up a flock can be plagued by red tape. In the UK and some other countries it is compulsory to:

- Register a flock, even if it consists of one pet sheep.
- Complete Movement Forms before moving sheep to the premises and record all sheep movements on and off the property thereafter.
- Register the premises where the sheep are to be kept.
- Identify the sheep with official tags.
- Keep a Holding Register.
- Record the use of all medicines.

Most of this paperwork needs to be up and running before buying any sheep. Sources of advice and websites for up-to-date information and legislation are included in the Appendix.

For those who can cope with red tape, producers in Europe can also sign up for the Single Payment Scheme, which is the main agricultural subsidy scheme. It is not compulsory, but those joining it will need to adhere to certain requirements in order to receive payments. The requirements usually reflect current laws and good agricultural practice.

Sheep farmers may also have access to grants for countryside conservation schemes and production systems such as organic.

Climate Change

New management and production controls may be introduced into the sheep industry as the issue of climate change is addressed. Sheep produce and emit methane and carbon dioxide through belching and flatulence. Both are end products of rumen fermentation, both are useless to the animal and both are implicated in climate change.

Resources

Labour, capital, land, equipment and information are the five main resources for sheep keeping.

Fig 1 Basic sheep management equipment includes (from the left): stock fencing, hay feeder, straw bale, torch, bucket, electric fencing components and hurdles.

Labour

The small flock cannot usually afford to pay labour so the owner is the major source, although a flock being established as an extra enterprise on a farm is likely to have labour to call on.

Local contract shepherds will do routine work. Most are trained and experienced shepherds, undertaking fencing, routine health care, dipping, shearing and lambing.

Single-handed shepherding is not difficult with manageable sheep, good fencing, land in one block and good handling pens. For transporting, dipping, shearing and lambing, an extra hand may be needed.

In the event of illness or holidays, there must be one person who can be called on to check the sheep daily, recognize a problem, deal with it and have the authority to call professional help such as a veterinary surgeon.

As a rule of thumb, allow one hour every day to check the flock and deal with any immediate problems and, on average, one day a week for routine management. The lambing period can require at least a month of dedication.

Capital

Setting-up costs depend on what is already available. If the land is well-fenced and watered and has a suitable building, the main expense will be the sheep and basic equipment (Figs 1 and 2).

Budget for everything at the start, even if some items such as lambing equipment are not immediately needed; it may be at least twelve months after buying the sheep before any money comes in.

Setting up on a shoestring is challenging; be prepared to substitute time for money by making equipment, buying it secondhand or moving stock around cheap rented land. But never cut costs on sheep care and always make fencing a priority.

Land

Most small flocks are established on farms where the land is adjacent to the farmhouse. Land which is not within sheep or human walking distance of the home can involve considerable costs in transport, time and inconvenience.

Land for sheep should be well-fenced, well-drained, have a water supply and shelter. If it appears to be suitable but has never carried sheep before it is worth finding out the reason. There may be a mineral deficiency in the soil or a predator problem.

A stream can supply water provided it is accessed safely and legally and stock do not pollute it. Conversely, it may already be polluted upstream and this, plus any wet areas, are a health hazard and should be fenced off.

Shelter in the form of trees, hedges or simple housing is essential and a building, if only for housing a sick animal, is necessary.

Renting Land

In autumn and winter, when cattle are housed, a neighbouring farm may welcome sheep to eat off surplus grass, graze a pasture reseed or even scavenge waste vegetable crops. But beware of basing flock numbers and policy on this supply of grazing because it may not be reliable.

Check that the land is suitable and that the flock will not be forced to stay on muddy ground.

Always have clear agreements with the landowner as to:

- The start and finish dates.
- Which fields can be used.
- That electric fencing is allowed.

- What public rights of way have to be considered.
- Who is responsible for insurance.
- What responsibilities the landowner will have – such as daily checking, fencing and feeding.
- Payment – amount per month or per head and when due.
- What else is included in the costs – such as feeding hay or silage.

Another source of grazing is from property owners whose land is too small to farm but too big to garden. This makes a useful area for small groups of sheep such as the rams or ewe lambs.

Sometimes farmers or local authorities want sheep to clear ground, reduce weeds or improve fertility. They offer grazing on areas such as reservoir banks, playing fields, orchards and woods. Again, bear in mind closeness for shepherding and the need for good fencing, handling equipment and transport.

A local land agent specializing in agricultural matters is a good source of advice on buying, renting or grazing land.

Equipment

Fencing and basic handling equipment are the two most important items to have before buying sheep. The former can be a portable electric fencing system (*see* Chapter 2) and the latter some lightweight hurdles.

Borrowing or sharing equipment with other flocks is an option but frequently both parties need it at the same time. A lamb weigher and a turnover crate – both expensive items – may warrant sharing.

Information

It is important to get adequate information before setting up a flock. Agricultural colleges offer practical shepherding courses and training in specific skills. Spending time observing or helping on a sheep farm is ideal.

Fig 2 Basic sheep husbandry kit. From the left: wool shears; foot shears; antibiotic spray; worm drench and gun; digital thermometer; syringe with disposable needle; wax marker for temporary identification; tagger and tags.

Sign on with a local veterinary surgeon – preferably one with a sheep specialist in the practice – and pick his brains. Other sheep producers are a major source of help, as are farming organizations – especially ones that have regular local meetings.

There are numerous organizations, farming magazines and Internet sites which can answer queries (*see* Further

Information). Drug companies, fertilizer and feedstuff manufacturers, seed merchants and equipment makers will give advice.

Local and regional agricultural shows involve all aspects of the sheep industry and are exceptionally useful for viewing different breeds and for advice and information. Go with a list of queries to avoid being sidetracked and remember that every breeder believes that his breed is the best.

The Purpose

Sheep are adaptable animals and can be kept for a variety of purposes. Keeping them because you like them is a good enough reason. But the sheep is a working animal and thrives best when it has a job to do. When deciding on a purpose, bear in mind:

- The environment. Early lamb production is not suited to hill farms.
- The market. Make sure there is one.
- Finance – setting up pedigree or dairy flocks is more expensive than prime lamb commercial flocks.
- Labour and time. Running dry sheep (sheep which are not being bred) for wool or mutton needs less than a breeding flock.
- Satisfaction. Pedigree breeding may be more interesting than producing slaughter lambs.

Producing Meat

This is a major reason for keeping sheep. Lambs are easily sold through markets, direct to abattoirs or slaughtered for ‘farm gate’ sales or home consumption.

The downside can be high marketing costs when selling small numbers and, for some small flock owners, the emotional difficulty in selling lambs for slaughter.

Pedigree Breeding

Pedigree breeding suits the small flock because attention to recording, breeding and showing is important.

A pedigree flock is, however, an expensive entry into sheep keeping, requiring good foundation stock, some specialized equipment, extra time and expense for recording, travelling, preparation, showing and advertising. It is said that the work involved in one pedigree ewe is ten times that of a commercial ewe. On the plus side, once the flock is established and successful it can be quite lucrative.

One way to get established is to set up a cheap commercial (non-pedigree) breeding flock for the experience, then introduce some pedigree ewes and a ram. The pedigree ram can also be used on the commercial ewes to upgrade them and to make better use of him.

Wool

Keeping ‘dry’ (unbred) sheep, is popular for home spinning, selling fleeces or building a cottage industry on woollen products. Young unbred ewes and male castrates, which are not stressed by breeding, give the best fleeces and are simple to manage.

The system could involve a breeding flock of pedigree or purebred specialist wool breeds at the core, with the best offspring kept for wool production and others sold for slaughter. Specialist wools include the fine wool from the Merino, coloured wool from rare breeds such as the Shetland and lustre wools from the Wensleydale. In the UK, you may need to register with the British Wool Marketing Board.

Dairying

Sheep milk and products such as cheese, yoghurt and ice cream are popular and give added value to the flock. This is an enterprise which requires a large investment in stock, housing and equipment and must comply with health, hygiene and other regulations. Being a shepherd is not enough; dairying and marketing skills are essential.

A small flock is unlikely to be viable because of the overhead costs but as a trial, some early-weaned ewes could be hand-milked and products made for home consumption to see if expansion is feasible. Ewes' milk freezes successfully and can be frozen and then sold to a manufacturer for processing. The British Milksheep and the Friesland are popular milking breeds.

Visitor Attraction

Few people can resist the appeal of ewes and lambs so a small flock attached to a hotel, bed and breakfast or camping establishment will earn bonus points. The flock must be tame, clean and attractive.

The downside is that where the general public are involved there may be mandatory health and safety requirements – especially concerning zoonoses (the transmission of disease between sheep and humans) – and special insurance. The flock programme may have to suit the visitor season – such as lambing just before the season starts.

Integration

Integrating a flock with another enterprise is a smart way to take two crops off one area. Sheep will integrate with orchards, trees and vineyards and can maintain wildflower meadows, cliff tops and heath land. A flock will also utilize low-cost housing that can be used for turkey rearing and other purposes for the rest of the time. Polytunnels, for example, may be used for lambing in the winter and horticultural crops in the summer.

Rare Breeds

The sheep industry is littered with breeds that are out of fashion – sometimes for genuine farming reasons and sometimes because of the vigorous marketing of new breeds. Minor, rare and endangered breeds – such as Manx Loghtan, Hebridean and Soay – can be used in most systems to produce meat, breeding stock, wool and for land management. A number of different breeds make an interesting zoo but to conserve them it is better to select one breed.

Many can be flighty and difficult to shepherd and may not adapt to new conditions; but they are hardy, need less attention than modern breeds and are light to handle.

Finishing Store Lambs

Not all slaughter lambs are sold at weaning because they would flood the market and because not all of them are ready to sell. Therefore weaned lambs, especially those born late to hill and upland flocks, are grown very slowly (stored) then fattened for sale in winter and early spring – often on grass and forage crops on lowland farms. This is a natural way to spread marketing and provide fresh lamb for twelve months of the year. Those sold in the following spring are usually called hogget.

Buying and finishing store lambs is not an attractive enterprise for the small flock. The lambs are usually difficult to handle and the profit is the difference between the buying and selling price minus transport, food, veterinary costs and any deaths. It is more an exercise in buying and selling than in shepherding.

On established farms they utilize break crops and surplus grass or cereals. Suitable female store lambs can be grown on to make relatively cheap breeding ewes (*see* Chapter 10).

Rearing Ewe Lambs

Similar to finishing store lambs, rearing ewe lambs involves buying in young ewes (ewe lambs) and rearing them for a year before selling them or retaining them for breeding. Again this may simply be an exercise in buying and selling but on the plus side it gives hands-on experience in stock rearing, handling and marketing.

Organic Lamb

Most lamb is only a step away from being organic. The regulations allowing it to be labelled organic are based on normal welfare considerations plus restrictions on feed type, fertilizers and medicines.

Organic lamb is compatible with late lambing (*see* box 'Lambing Periods') because late lambing flocks have a low demand for bought-in feed. Alternatively, many hill-bred lambs are naturally organic and could be identified and finished on organic lowland farms. The downside is that although inputs are low, so too are outputs because of low stocking rates; and not all abattoirs are registered to slaughter organic lamb.

A useful halfway stage – especially for local markets – is to call it 'naturally reared'. Never call it 'hormone free' because all animals have hormones.

Mutton

Mutton comes from older sheep – typically four to five years old – or at the end of their breeding life. As an introduction to keeping and marketing sheep, some younger ewes with breeding or udder problems could be bought from a local flock and run on grass for sale to the quality mutton trade.

Sheepdog Training

Small flocks are sometimes kept for training sheepdogs. About twenty-five to thirty is the minimum size of flock needed and these, primarily for welfare reasons, should be dry sheep. One approach is to buy a flock of ewe lambs, keep them growing on grass, sell them for breeding a year later and then buy a new flock.

Lambing Periods

Lambing periods should be chosen to:

- Suit the market and prices (Fig 108).
- Suit the resources – late lambing does not need housing.
- Match grass growth or other feed to pregnancy and lactation.
- Avoid clashing with other events, such as spring cultivations.
- Suit the weather conditions.
- Suit the breed – some breeds have late breeding seasons.

Autumn Lambing

Usually confined to lowland flocks where grass and other forage crops are available during the winter. Can graze winter grass when dairy cows are housed. Utilizes early lambing breeds such as the Poll Dorset. Lambs grow slowly over the winter on their mothers and are ready for the high-priced (European) Easter market. Lambing percentages may be low but so, too, are production costs. The bulk of the work is during the winter. Warm weather at tupping may affect the fertility of the rams.

Early Lambing

Lambs are born in late winter. Often housed for lambing and reared on forage crops and concentrates. Has high feed costs and needs to catch early prices with fast-growing, top-quality lambs. Can stock the dry ewes heavily in the summer and would suit a farm with limited, rough or droughty summer grassland and which grows forage crops and cereals. Bulk of the work is in late winter and early spring. Lambs are sold at 10–16 weeks of age and could be weaned at six weeks and finished indoors on concentrates while ewes are stocked heavily outside. May suit pedigree flocks which need lambs well grown for sales. Suits quick-maturing breeds.

Spring or Mid-season Lambing

This is the traditional system which matches lamb growth with grass growth and suits an all-grass farm. Requires good grassland management to ensure there is grass for tupping, grass for lambing and lactation, and grass for finishing lambs in summer. Unfinished lambs can be sold as stores or held over and sold in the spring as hoggets. Where there is plenty of grass it suits organic and low-input systems. Usually has good lambing percentages and suits most breeds especially large crossbreds.

Late Lambing

Lambing in early summer on grass produces low-cost quality fresh lamb during the following winter for a rising market. Late pregnancy and lambing are at a pleasant time of the year and no housing is necessary. Feed costs are low because grass is available before and after lambing. Can achieve good lambing percentages and suits most breeds. Possible problems include prolapsing and becoming cast (getting stuck on their backs) – both due to getting too fat on grass – predators and deciding when to shear. Lambs can finish on grass or be sold as stores.

Frequent (Accelerated) Lambing

The ewes are lambed every eight months – typically, winter, autumn and spring. In the UK the system is usually based on the Poll Dorset because of its long breeding season but other breeds can be induced to mate out of season with hormonal treatment (*see* Chapter 4). It requires very tight management, synchronized mating and reliable supplies of feed and labour. Small flocks can increase annual production without needing more ewes, and produce prime lamb throughout the year.

Management

Sheep are adaptable and can be bred, reared and sold at almost any time of the year. Normally flocks are managed on an annual cycle with the same activities at the same time each year. When setting up a flock it is essential to establish an initial plan – even though this will be revised and adjusted in subsequent years.

First, draw up a simple annual cycle (*see* Table 1) based on the following:

- The supplies of grassland (or other feed sources).
- When the products are to be sold.
- A feasible lambing date to meet this market (*see* box Lambing Periods).
- Other demands on labour and resources.

Flock Size

The number of sheep to keep is influenced by the amount of land available and how productive it is. The average number of adult sheep supported by a hectare (2.5 acres) of land for one year is called the stocking rate. For example, ten hectares of grassland supporting and rearing thirty ewes and their lambs for a year has a stocking rate of three ewes per hectare.

A stocking rate of twelve to fourteen ewes per hectare is not uncommon but keeping four or five ewes per hectare is a safe starting point on average lowland pasture. It may not sound many but there will be little grass during the winter and there will be lambs – perhaps two from each ewe – demanding grass in the summer. In upland conditions it could be four or five hectares per ewe.

Start with 20 per cent less than seems feasible. Disease builds up on heavily stocked grassland and the ideal is to have enough land to be able to rotate the flock and ‘rest’ their grazing areas every two to three years by grazing it with cattle, cropping it or cutting it for hay or silage.

Breeds

When choosing a breed the considerations for the small flock are:

- The shepherd likes the breed.
- It suits the environment.
- It suits the system.
- It provides an acceptable end-product.
- Docility.
- Cost and availability.
- Size. Small sheep are light to handle.

There are at least eighty-five pure breeds and recognized crosses in the UK alone and 200 worldwide. Most suit a range of systems and environments. And there is often as much variation within breeds as between breeds.

A ewe of any breed or cross will produce a slaughter lamb especially if it is bred to a Down ram (Fig 3). A safe bet is to choose a local breed or one from a similar environment. For other purposes such as wool production, rare breeds, pedigree flocks or dairying the choice of ewe breed is more specific.

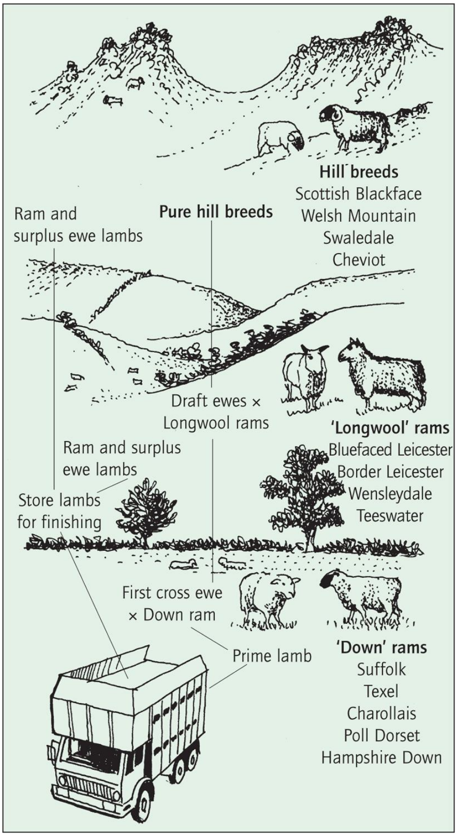


Fig 3 This illustrates the basic stratification of the UK sheep industry with a few examples of the numerous breeds and crosses. New breeds and breeding schemes have dulled the distinction between types of breeds, and Longwool rams (crossing sires) can sire prime slaughter lamb, while Down rams (terminal sires) produce ewe lambs suitable for commercial breeding. Prime lambs can also come from dairy, specialist wool and rare breed flocks. Some examples of 'first cross' ewes are:

North of England Mule (Bluefaced Leicester × Swaledale)
Scotch Halfbred (Border Leicester × North Country Cheviot)
Welsh Halfbred (Border Leicester × Welsh Mountain)

Table 1 Annual Cycle of Sheep Production

Months	Activity	Feed	Labour
1	Rams in with the ewes	Moderate demand	Minimum demand
2,3,4	Ewes in lamb	Moderate demand	Minimum demand

5	Ewes in late pregnancy	Increasing demand	Increasing demand
6	Lambing	High demand	Peak demand
7	Ewes rearing young lambs	Very high demand	High demand
8,9	Ewes rearing lambs	High demand	Moderate demand
10,11	Wean/sell lambs	Moderate demand	Moderate demand
12	Prepare for breeding	Moderate demand	Moderate demand

This table is a guide to the month-by-month activity plus the feed and labour demands in a flock. Details of feed requirements are in *Chapter 5**.*

Rams are basically of two types – terminal sires for producing a prime slaughter lamb and crossing or maternal sires for producing breeding ewes. Terminal sires are well-muscled with a fast growth rate to produce fast-growing meaty lambs. Crossing sires will impart milkiness, prolificacy, hardiness and a good fleece in their female offspring. However, many breeds are dual purpose, capable of producing good breeding stock as well as slaughter lambs.

Commercial flocks producing prime lambs and breeding ewes will normally put rams of a different breed over the ewes. Rare breeds, pedigree, wool and dairy flocks will normally select rams of the same breed as the ewes.

Small, quick-maturing breeds produce lambs which reach slaughter weight quickly (ten to fourteen weeks) and are suited to early lambing flocks. Large, slow-maturing breeds can be used in later lambing flocks where lambs may not need to grow quickly.

Buying Sheep

The golden rules when buying sheep are:

- Buy the best you can afford.
- Make sure they are healthy.
- Buy from a known source.
- Get as much information about the flock as possible.
- Examine well before purchase.
- Buy ewes of similar type and age.

There are a number of sources of sheep. The important ones are:

- Direct from an established flock.
- From a market or specialist sales – usually in the autumn.
- Through a dealer/buyer who will source and transport them.

Buying Direct

Buying direct from a farm is best because the buyer sees the sheep in their environment and can discuss their management and health care. The larger the flock, the better the choice. Some flocks have annual reduction sales when they auction their surplus breeding stock.
Look for advertisements in the local papers.

Breed societies have the names of pedigree breeders with stock for sale. When buying quality sheep – especially pedigree or dairy sheep – the records of the ewe should be available. These might record the amount of milk each dairy ewe gives in one lactation, how many lambs a ewe has had each year and how fast the lambs grow.

Pedigree stock may have a fixed price according to age. Commercial ewe prices are often published in the farming press, or the local market auctioneers can advise. A factor in determining price is the number of lamb crops the ewe will have – on average five–seven crops. So younger ewes may cost more but will give more back. Ewe lambs, however, tend to cost less because they are unproven and still have some growing to do.

Fig 4 Specialist markets sell breeding sheep in matched lots. Here, Charollais in-lamb shearling ewes come under the hammer at Shrewsbury Market. Photo: Tim Scrivener.

Markets and Sales

Local papers and national farming publications will advertise markets in late summer when the major breeding sheep sales are looming. These auctions help to establish prices.

Stock sold at specialist sheep sales are often inspected by veterinary surgeons and come with some assurances that they are capable of breeding and have no important defects. Identifying the farm from which they come is useful as it may operate a health scheme and offer sheep which have been accredited (free from certain diseases).

Stock is penned in groups matched for size, appearance or age and are normally sold as a group (Fig 4).

Dealers

Auctioneers may recommend a dealer to select, bid for and transport sheep on behalf of a buyer. Some may advertise in the farming press or will be found at the markets. The dealer needs to be clear about what the buyer wants and how much he is prepared to pay. A good dealer is worth knowing, but a bad dealer can bring disease and disaster to the unwary.

What to Buy

Draft Ewes

Many flocks are established from draft ewes. These are older, surplus ewes that are still capable of breeding. They may have come from hill flocks where conditions become too hard for them but they will thrive on lowland farms.

Draft ewes are experienced lambers, cheap producers of homebred stock and will eventually have a carcass value. They may be at least a full mouth (*see* Appendix I, Fig 116) and possibly older. Draft hill ewes tend to be genuine. Check the reason for the sale of surplus ewes from lowland flocks and remember that few vendors will sell their best stock. Physical defects are obvious but rejects from a health scheme, barreners (who have failed to have a lamb), non-breeders and problem lambers are not.

Young Ewes

Ewe lambs are around a year old and may be ready for breeding. They are the cheapest of the young ewes, cost more in feeding because they still have some growing to do and may not be easy to manage at lambing. An inexperienced shepherd may not want inexperienced ewes.

The next category of young ewe is the two-tooth (*see* Appendix I, Fig 116). They cost more than the ewe lamb, especially if they are proven breeders and are well grown.

Pregnant Ewes

Ewes may be sold 'in-lamb' or described as having 'run with the ram'. In-lamb ewes should have been identified as pregnant by a pregnancy scan. Those merely running with the ram are not guaranteed as pregnant. Pregnant ewes make a quick introduction to sheep keeping but it is vital to have accurate lambing dates otherwise their management and feeding both before and at lambing will be chaotic.

Ewes with Lambs

Ewes with lambs at foot (sometimes described as couples) are often sold at local markets. The ewe is probably useless and the lamb it is suckling may not be her own. But they give instant experience in sheep rearing, handling and marketing.

Cade Lambs

Cade lambs (often called orphans) are surplus lambs from flocks whose ewes produce more than they can rear. Cades for sale should have had adequate colostrum (*see* Chapter 9), dry navels and be a few days old. They are sold at livestock markets but buying direct from a large flock is better. They are often available quite cheaply to avoid the bother of having to hand rear them. Rearing these lambs will cost time, milk powder and lamb feed but they give experience in rearing and marketing or may make a tame breeding flock.

Rams

The ram is a problem in small flocks. He is needed for only a few weeks but must have feed, care and companionship for the rest of the year. If his daughters are kept for breeding, inbreeding becomes a possibility long before the end of his working life – which may be around six years.

For getting started, a cheap option is a good-looking uncastrated slaughter ram. He will have hybrid vigour and cost no more than slaughter prices. Another option is an older ram from a commercial flock where rams will be routinely culled at a certain age. Beware if buying in a livestock market that he is not a vasectomized 'teaser' ram.

Rams from breeders may be performance-recorded for growth rate and leanness, have high health status and should come with some guarantee of fertility. A small flock would need to share or be a serious breeder to justify the cost of a ram of this calibre.

Sharing two rams with another flock solves the problem of companionship, is an insurance against one becoming infertile and delays inbreeding. Another scheme would be to buy two ram lambs, breed from them and sell them on as two-tooth.

Borrowing is an option, but introducing disease is a risk for both borrower and lender. Clarify who is responsible for any veterinary treatment or if the ram dies. Check for obvious signs of transmissible diseases such as orf or footrot.

Pedigree breeders may hire rams but increasingly only to flocks with a high health status. Clarify the period and terms of hire such as veterinary costs, insurance and fertility guarantees.

In breeding terms, rams are half the flock – so buy the best you can afford. And try to find one which is docile and easy to handle.

Selecting Sheep

Judge sheep on:

- Health.
- Physical appearance.

Usually, sheep look either healthy or dead; judging which is which is not that difficult. Commonsense says that a healthy sheep does not normally limp, hang its head, have droopy ears or dull eyes and does not have abnormal discharges from orifices.

Those which are carriers of infectious or chronic diseases are not obvious, so buying from flocks which are involved in health schemes is a reasonable safeguard. Vendors should divulge the flock's vaccination and worming programmes.

The main physical health checks are on teeth, feet, udder or testicles and penis. They can be done with the animal on its feet, but for close inspection sit them up.

Checking the Ewe

1. The udder (*see* Appendix I, Fig 122) should be neat, soft and pliable, showing no signs of hardness or lumpiness.

A dry ewe which has suffered mastitis may have lost the ability to produce milk but may not show signs of the disease. Feel carefully for a tell-tale lump at the base of the udder just above the teat.

2. Teats should be neat without cuts, warts or hard scar tissue. In maiden ewes and lambs the teats should be a sensible size. Very small teats – sometimes found on lambs from multiple births – can indicate a non-breeder.

Four teats are not unusual but two of them will be supplementary and small. They frequently discharge milk but are rarely sucked. Alexander Graham Bell (of telephone fame) bred four-teated sheep to rear litters of more than two lambs and many breeders have continued his work.

Fig 5 The circumference of the scrotum is a good indication of the fertility of a ram. Measure it at the widest part.

Checking the Ram

1. There should be two testicles (*see* Appendix I, Fig 121), both descended and of roughly equal size. They should be as firm as a clenched bicep and slip up and down freely in the scrotum, where there should be no swellings, cuts or lesions. The larger the circumference of the scrotum the greater the capacity of the testicles to produce sperm. The average circumference at the widest point in adults just before mating is 36–38cm. The average for ram lambs at eight months is 30cm.

2. Push the testicles to the bottom of the scrotum and feel the tail of the epididymis at the base of each one. This is where sperm is stored and should be firm and the size of a walnut.

3. The sheath (prepuce) around the penis should have no lesions or ulcerations and the penis should move freely within it. Check that the vermiform appendage (worm) is intact.

4. Semen tests are available through veterinary surgeons but they only show the fertility of the ram at the time of the test.

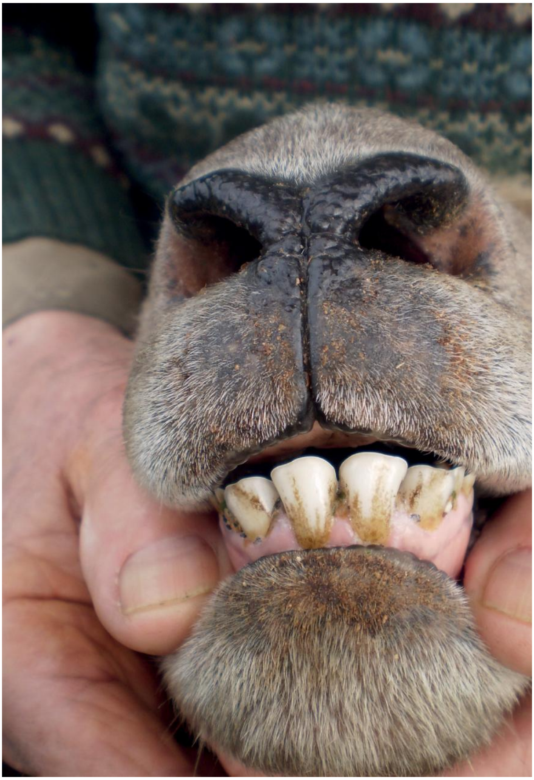


Fig 6 Checking the teeth.

Teeth

Inspecting the teeth is important (Fig 6). Incisor teeth (*see* Appendix I, Figs 115 and 116) should be correct for the age, sound in their sockets and aligned with the gums. Incisors should meet the pad within 5mm of the front edge. In sheep not expected to eat root crops or graze closely, missing teeth (broken mouth) need not be a problem; although broken or pointed teeth can cause pain. Ewes which have lost all their incisor teeth (gummers) can do well on grass and could be a bargain if they are otherwise good sheep.

Damaged or loose molars (*see* Appendix I, Fig 116) mean ewes cannot cud properly and derive less from their food. A green stain around the lips is a tell-tale sign, otherwise feel their condition through the cheeks. Upper molars normally overlap the lower jaw and the overlap should feel smooth and curved.

Deformed jaws – overshot or undershot (Fig 7) – should be avoided especially if replacement ewes are to be bred from them.

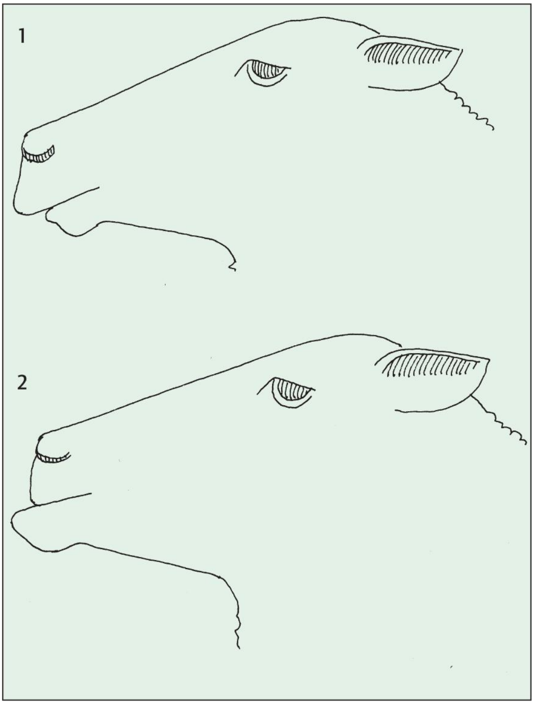


Fig 7 An undershot jaw (1). The front teeth do not line up with the pad in the upper jaw and eating may be difficult.

Also avoid the opposite – the overshot jaw (2) where the lower jaw extends beyond the upper jaw.

Feet

Never buy sheep with bad feet. It is buying trouble. Foot care is hard work, sheep with problem feet suffer pain and the problem may be hereditary. They should look neat and not be overgrown or down on the pastern. Turn up each sheep, if possible, and check feet individually for signs of separation, soft or pussed tissue, distortion or overgrowth (*see* Chapter 8).

Physical Appearance

Pedigree sheep will have appropriate breed characteristics, such as face colour, and the relevant breed societies will advise new buyers what to look for. Otherwise appearances are relatively unimportant. Some crossbred ewes may look odd but they have the advantage of hybrid vigour.

Do not fear thin sheep; unless they have problem teeth or diarrhoea they have probably given everything to their lambs. Equally, never be wooed by fat sheep. They may be poor milkers or even barreners.

Bringing the Sheep Home

Do not bring sheep onto the property until you have the basic facilities in place. These may include:

- Movement records and holding number.
- Insurance – primarily third party against straying, trespass and accidents.
- Adequate grazing or feed, plus one bale of hay per head.
- Stock-proof fencing in all fields.

- Clean water supply.
- Sound gates.
- Shelter from the elements.
- Tags and tagger.
- A holding pen for the whole flock.
- Basic foot trimming equipment.
- Dosing gun and wormer.
- An airy building and a few bales of straw for a sick bay.
- A good torch.
- Waterproof clothing.
- Contact with a veterinary surgeon.
- An identified knackerman for casualty stock.

The golden rules when they arrive are:

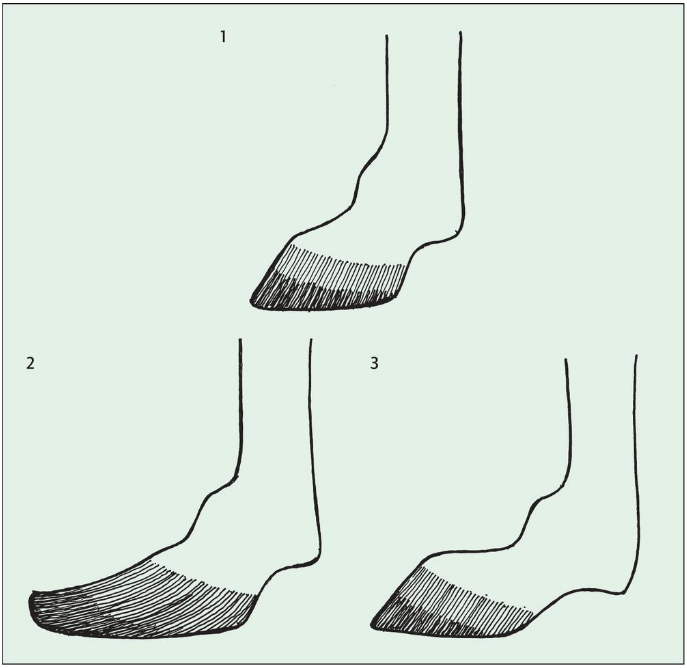


Fig 8 Start off with neat, trim hoofs and straight legs (1). Avoid overgrown hoofs (2) and weak pasterns (3).

- Isolate them from other sheep or stock for at least three weeks.
- Give them a worm drench (*see* Chapter 8).
- Treat them against external parasites if possible. Otherwise be vigilant about sheep scab.
- Have the veterinary surgeon check them. This also gives him the opportunity to see the stock and the set-up.
- Check their feet and either walk them through a footbath or spray their feet with a foot spray before putting them on grazing land.
- If appropriate, give any vaccinations that the previous owner may have used. Delay this for a week to reduce stress.
- Keep a close eye on them until they have settled.
- Make sure any electric fencing is working well – especially if the stock are not used to it.

2 Fencing, Shelter and Housing

Fencing

Fencing has two main purposes:

- To keep sheep on the property.
- To control their grazing within the property.

Sheep-proof fencing must have priority when setting up a flock. Few things cause flock owners more aggravation than straying sheep. They are dangerous, a waste of time, an embarrassment and could land the owner in court. Should sheep stray into other flocks there is the risk of spreading disease plus the problem of recovering them. On roads the owner is liable for any death or damage they cause.

Once sheep have found weaknesses in hedges and fences they rarely forget them. Gaps cannot be hidden by stuffing bedsteads or old netting in them. Once switched on to escape mode (usually activated by boredom or shortage of feed), only good fencing will stop them. Bodged gaps can be dangerous – lambs can hang in loose netting and wire.

When sheep stray they like to return to their field by the route they used to escape – because that is what they remember – not by the route that their shepherd wants them to use. Always work with sheep and not against them.

Stone walls and hedges may look stockproof but sheep will graze them, worry the parts where they can get a foothold and eventually create gaps. So fencing is often used alongside hedges and walls to protect their integrity.

Because hedges and walls also provide shelter, the fence can be erected close to a well-trimmed hedge which can then be allowed to grow through the fence, but beware that sheep can damage the fence when they feed on the vegetation. If trimmed hedges are preferred, the fence should be built 1m away to give a mechanical trimmer room to trim behind it, but on small properties and those with small fields this wastes grazing area.

The two main types of fencing used to control sheep are galvanized netting and electrified wire.

Barbed wire should not be used for sheep – they get tangled and injured but rarely restrained, especially when they are frightened. However, strands can top a fence to heighten it against cattle or horses and also protect against humans climbing over. Barbed wire wrapped around the top bar of a gate serves the same purpose.

Stock Netting

Post and galvanized netting (Fig 9) is a permanent system which, if erected properly using quality materials, will give at least twenty years' service with minimum maintenance. The initial cost is high but running costs are low. It is suitable for all fencing situations, especially boundaries. Lightweight, cheaper versions can be used in semi-permanent situations. Choose the correct version for sheep and lambs because the mesh is designed to prevent them pushing their heads through and getting stuck.

Sheep were badly designed; their ears fold back and allow the head through tight spaces, but prevent it from being withdrawn. Netting with oblong rather than square mesh is safer and note that in most designs the mesh gets smaller towards the bottom. Plenty of netting has been erected upside down; although on shooting estates it is sometimes done deliberately to give the pheasants an easy passage.

Wire netting (Fig 10) is a lightweight and cheaper version of stock netting and is versatile. It is used as permanent or temporary fencing for boundaries, strip grazing, subdividing pastures for rotational grazing, rented grazing or temporary handling pens. It can be made vermin-proof by burying the bottom edge.

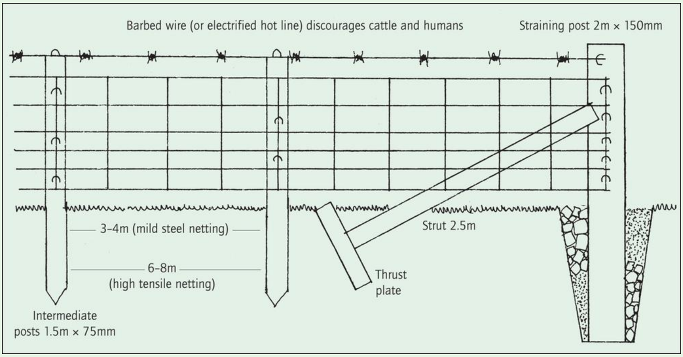


Fig 9 Permanent stock netting fence. The illustration shows the basic construction and materials. From this it should be possible to work out the quantities and costs. Advice on building the fence is usually available from the manufacturers of fencing materials, but the following is the basic sequence.

Set straining and any turning (change of direction) posts.

Set struts. Use as long a strut as possible and fix it halfway up the fence. A short, steep strut can lift the post out of the ground.

Use the top wire or netting, rolled out and secured tightly at each end, to give the line.

Set intermediate posts.

If using a top wire, fix it in place.

Secure netting to end posts.

Strain netting.

Staple netting at every other wire from the bottom.

Straining and turning posts are set in holes to lean slightly away from the strain and earth and stones tamped in firmly. Intermediate posts can be hammered into holes made by a crowbar. (Not to scale.)

Electric Fencing

Electric fencing (Fig 11) is versatile, lightweight and controls all types of stock on all terrains. It is used as a permanent, temporary or portable system and is ideal for fencing rented grazing. The initial outlay can be half that of post and netting fence and, set up correctly and using good materials, it can last for at least ten years. Permanent systems use insulated timber posts; the temporary and portable systems use plastic or insulated metal posts. Good earthing – usually with galvanized iron stakes – is essential in all systems.

Electrified systems are attractive to the new flock owner not wanting to commit too much money to the project; redundant equipment retains a good secondhand value. Because sheep are naturally well insulated by their wool it is essential to invest in good equipment.

Permanent systems (Fig 12) are usually run from mains-powered energizers. They can be sited indoors, have low running costs and no battery to keep charged. Temporary fences (Fig 13) and those on off-lying land can be run from batteries (wet cell and dry cell). Leisure (deep cycling) batteries are best; dry batteries are light but are an expensive source of power. Old car batteries are suitable for wet cell energizers but always have two available – one working and the other charging.

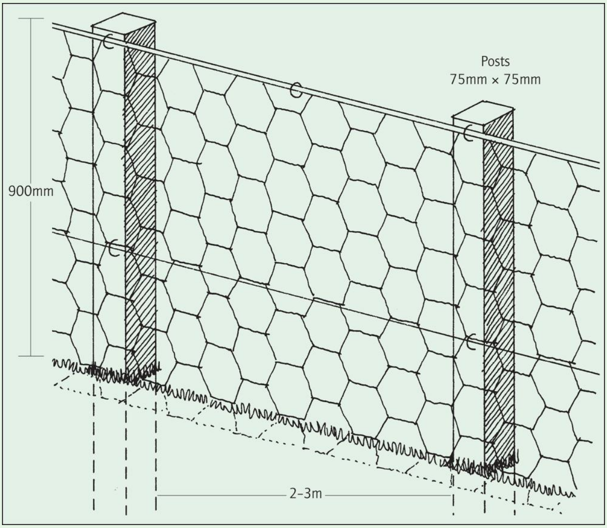


Fig 10 The wire netting fence. High tensile wire can support the netting and allow wider post spaces. The bottom can be buried to prevent predators from getting underneath. (Not to scale.)

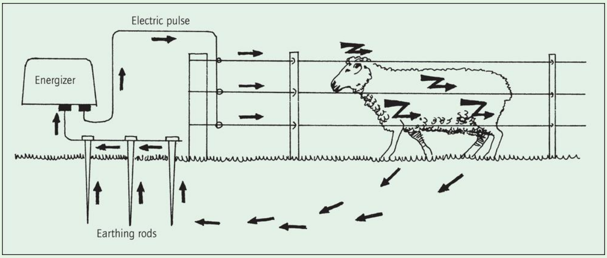


Fig 11 How the electric fence works. When the ewe touches the fence – especially with her nose or ears – she completes the electric circuit and gets a short shock.

Solar panels keep batteries charged *in situ*, but select one which will not overcharge the battery – around 10W is a good starting point.

Modern energizers can belt out 10,000V and power 100km of fence line but are not hazardous because the electricity is pulsed to give a short sharp shock from which the victim recovers. The pulses last for 350 millionths of a second and are spaced about one second apart. Never incorporate barbed wire in an electric fence and never power one fence with two fencers – they could give a potentially lethal continuous shock.

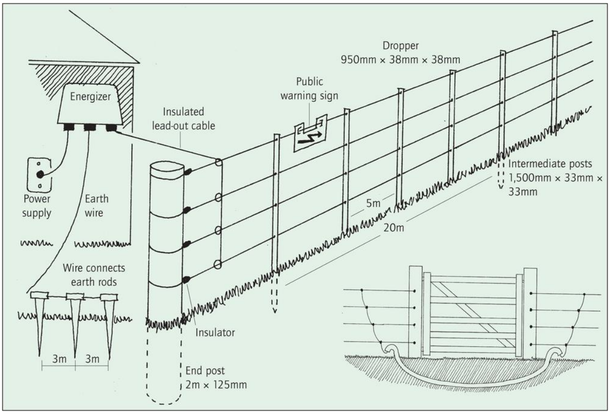


Fig 12 The permanent electric fencing system. Use high tensile 2.5mm galvanized wire. Electric fencing need not be tightly strained, so end posts do not have to be strutted. Wood posts and droppers need insulators unless they are self-insulating material in which case the wires can go through them. Droppers keep the lines evenly spaced and just rest on the ground. End posts are set in a dug hole and then earth and stones tamped firmly around them. Intermediate posts have a sharpened end and are sledge-hammered into a pilot hole made with a crowbar. The inset shows how to take power across gateways and troughs. Bury polythene water pipe about 0.3m underground to carry under-gate cable (available from electric fence manufacturers). Turn down the ends of the pipe to prevent it from filling with rainwater. (Not to scale.)

Keeping the power on permanently – even when there are no sheep in the field – burns back invasive vegetation and deters rodents from eating any plastic components.

When sheep have been trained to respect electric fencing, just a single line at nose level, alongside a wall or hedge, can suffice. Sheep are led by their noses and damp noses are the most vulnerable to shock. A flock which is unused to electric fencing can be trained by putting a temporary fence 300mm from a secure fence or hedge and putting feed close to it to lure them to touch it. Homebred lambs learn from birth.

Stone walls can be sheep-proofed with a single 'hot line' projected about 300mm from the wall (Fig 14).

Although it may deter foxes, electrified fencing around lambing paddocks is not a good idea. Lambing ewes like the privacy of field perimeters and, in the oblivion of birth, can lamb up against them or have the new-born lamb get to the wrong side.

Electric fencing is not a good physical barrier so, where fields are subdivided or strip grazed, electrified poly netting (Fig 13) is often used because it is a visual barrier. It also has the advantage of being effective against most predators and rabbits, but must not be used with horned sheep.

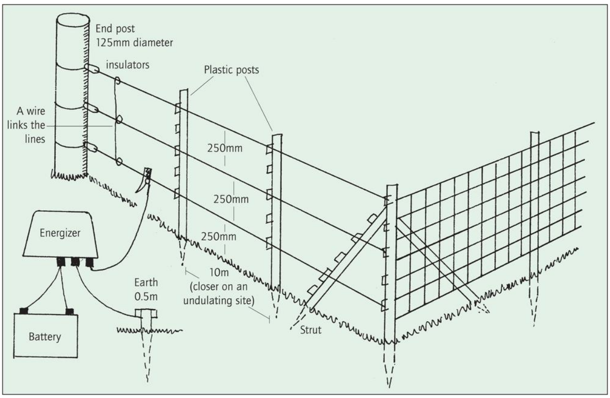


Fig 13 A portable or temporary electric fencing system. This shows two systems – polythene

wire and polythene netting. Electric netting is usually supplied with its own posts. Plastic posts for the wire system have multiple lugs to hold the wires at variable heights. Metal posts have adjustable insulators. Having the bottom wire too close to the ground can lower the voltage. Polythene wire has a high resistance to current flow and should only be used for fence lengths up to 1km. Use seven-strand galvanized wire for longer temporary fences. Wires should be linked electrically every 400m.

Building a Fence

Fencing is a skill. The stock netting system that requires considerable straining, or the permanent electric fencing that needs to be reliable and secure, should be erected by a skilled fencer. However, temporary electric and wire netting systems need fewer tools and suit the first-time fencer.

Temporary fencing is useful to subdivide a large field to make grazing and stock handling easier. Changes can be made to the layout and, when perfected, can be replaced with permanent fencing.

The fencing illustrations in this chapter show only the basic components and construction of a range of sheep fencing systems; manufacturers of fencing equipment usually publish booklets describing fence building in detail.

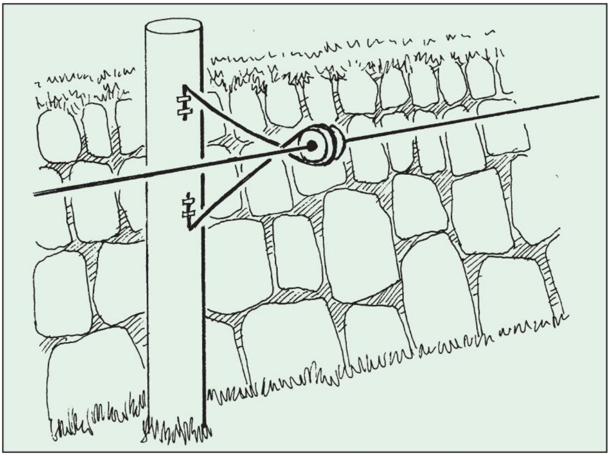


Fig 14 The hot line is a simple way to reinforce walls, hedges and fences. The line should be supported about 300mm from the wall.

There are variations in the quality of products – some timber posts are better preserved than others and some wire is better galvanized, so check for the correct British Standard or equivalent. In general terms the costs of erecting a fence are around one-third for wire, one-third for posts and one-third for labour; so quality in all departments makes sense.

The steps to fencing are:

- Decide what types of fencing are needed.
- Design it to be as adaptable as possible.
- Take into account any other species it may have to control because this can affect design and construction.
- Pace out the fence lines (straight fences use fewer materials).
- Check that boundary lines are correct to avoid encroaching on neighbouring land.

- Draw a sketch map of the fence lines showing gateways and water troughs and where the posts and other components will go. Also take account of public rights of way such as footpaths and stiles.
- Calculate how much of each component is needed.

Maintenance

Fence maintenance is an important part of the shepherd's routine. Fence lines should be checked regularly before the sheep discover any weaknesses.

Look for signs of rust or broken strands in the wires (especially where they attach to the posts) and rotting or loose posts. Staples are used widely in fences and fence repairs. Use galvanized ones of the correct sizes and angle them so that both points do not go into the same grain of timber and split it. Do not drive them in tight because this breaks the galvanized coating on the wire and accelerates rusting. Fence repair may also involve connecting broken wires for which proprietary connectors are available.

Check electric fences daily. Sheep appear to sniff when the power is off without actually touching the wire. Also, poorly maintained electric fences may interfere with phone and Internet connections and radio reception.

Where an electric fence is not giving a shock there are several fundamental reasons:

- Poor earthing accounts for the majority of problems.
- The power is not connected, or the battery is flat.
- A wire has broken (therefore breaking the circuit). Metal strands in polythene wire may be broken but the plastic is still intact. This is not easy to see. Strands often burn at joins, which may be visibly scorched.
- A wire has shorted out on some metal. Often found where electric fencing is installed alongside old wire fences.

Heavy vegetation, especially in wet conditions, may short it out and flatten the battery. Some users like to trim or spray under the bottom line.
- The insulators have broken down.
- There is a poor connection somewhere in the system.

Fence testers are available and those with a digital read-out are recommended. Alternatively, push a metal fencing stake into the ground within 5cm of the fence wire, hold it by an insulator and push the stake against the wire. The length and sound of the spark that jumps to the earthed stake gives an idea of its efficiency. To test if the fence is working, touch it with a blade of grass; this reduces the shock to a comfortable level.

Safety

There is also a safety element to fencing. Dangerous areas such as sheep dips should be fenced off, especially against children and trespassers. Chain link fence is recommended as the least climbable and if less than 2m high should be topped by two strands of barbed wire. Electric fences, especially where there are public rights of way, should have warning signs attached. Fencing companies can give up to date advice on the law.

Stockproof Hedges

Hawthorn (*Crataegus monogyna*) and blackthorn (*Prunus spinosa*), are most suited to stockproof hedges. Both have thorns to deter browsing sheep but the blackthorn puts out invasive suckers so a mix of one blackthorn to every two or three hawthorn is usual. For variety some holly, willow, oak and crab-apple can be added. Such hedges need to be well maintained after establishment to prevent gaps at the base. New hawthorn and blackthorn hedges respond to trimming along the sides and the top to produce fresh bushy growth, but beware of spiny cuttings getting into hoofs.

Unless reinforced by fencing, hedges are probably best used around internal fields where strays may cause fewer problems, rather than as farm boundaries. Cultivate and then fallow the site for one season and plant in late autumn through a black polythene mulch strip to control weeds and conserve moisture.

Fig 15 Light and easy to handle, plastic windbreak material has numerous uses for shelter, temporary penning, cladding the open sides of buildings and for attaching to the bottom of gates to stop lambs escaping.

Shelter

Sheep must always have access to shelter from the elements. Lack of shelter increases their demand for food and shelter is vital at lambing time. It is also important at tupping (mating) time when extremes of weather can reduce conception rates.

Sheep unable to find shelter from the sun often stand in a huddle shading their heads under each other's flanks or, typically, they stand in a circle like the spokes of a bicycle wheel with their heads at the centre in the shade. Apart from distress and reduced grazing, excessive heat can cause hyperthermia and will reduce fertility, especially in rams.

Shelter from wind, rain, snow and heat may be provided by a belt of trees or shrubs, a hedge or wall, or artificial windbreak material.

Shelters must be secure otherwise they will cause more harm than they seek to prevent. Equally, sheltered areas can result in a build-up of mud and disease.

Where there is no natural shelter, artificial windbreaks can be constructed from plastic windbreak material which has 50 per cent permeability and is designed for livestock (Fig 15); it can keep wind speeds down to below 7mph. On the sheep farm a roll of this material has many uses, serving as temporary penning, ventilation in buildings and shelter belts in fields.

The main purpose of a windbreak is to reduce the wind rather than stop it. Useful shelter is found for a distance of twenty times the height of the barrier downwind, but often sheep stand happily on the upwind side of a hedge. This is because the wind strength reduces at their level as it lifts to go over the hedge – giving some shelter for about three times the height of a barrier.

Woods or shrub shelter belts should be reasonably dense otherwise they are draughty at the base. Plant them across the prevailing wind – or the wind direction for a crucial time of year such as lambing – and just over the brow of an elevation. Use a variety of trees and shrubs with taller trees, broadleaves and conifers in the centre and shrubs and smaller trees towards the edge to give shelter at ground level and an aerodynamic profile.

Choose species which grow well in the locality, get small specimens (large trees have lower survival rates) and plant from autumn to early spring. Coppice the small shrubs and trees to maintain dense cover.

Housing

Some form of basic housing is important if only to protect the flock and shepherd during routine work such as shearing and vaccination and some housing space is vital for nursing sick animals. A sheep house merely protects against the elements and need not have a higher temperature than outside.

In long-term housing the standard period is from eight to twelve weeks before lambing until ewes and lambs are turned out – which normally covers the winter and the lambing period. Temporary or short-term housing may simply house ewes while they lamb and for a couple of days afterwards until they have mothered-on.

The advantages of housing are:

- Increased stocking rate because the flock is not limited by winter grazing.
- Keeps the flock off the grass in the winter to give extra grass in the spring for ewes and lambs. Grass growth is delayed and reduced by 15–20 per cent if swards are grazed during January to March.
- Easier shepherding during the winter and at lambing.
- Cleaner grass because it has a break from winter worm burdens (*see* Chapter 8).

- Better performance because nutrition, health care and lambing are better supervised. There are claims of increases in lamb survival of 30 per cent.
- Less food waste.
- No losses from predators.
- Older ewes can be retained and flock replacement costs reduced.

The disadvantages are:

- Cost – such as the cost of the house, equipment, bedding and services.
- Risk of a build-up of disease.
- Disposal of manure.
- More expensive maintenance feed in the form of hay or silage.

Costings usually show that housing is economically viable in large flocks; in smaller flocks it can at least cover its own costs provided the building is kept low cost.

As a first step to housing, sheep can be wintered in open yards but must have shelter, excellent drainage and low rainfall. Temporary buildings constructed from big bales are another option but are better suited to arable areas where the bales are available at low cost. A compromise is a shed which opens onto fields from which the flock has free access. The problems here are condensation from wet fleeces and muddied access.

Stone buildings and lean-to barns will convert cheaply to sheep housing but attention must be given to hygiene and ventilation. Windbreak cladding can be used on almost any building to provide weather-proofing and good ventilation, and timber from secondhand wooden pallets makes pen barriers and feed troughs (Figs 18 and 19). When planning a building consider:

- The numbers to be housed.
- Length of housing period.
- Feed system.
- Type of floor and bedding.
- If planning permission is needed.
- Any other uses for the building.
- If lambing indoors, ensure there is enough space to hold ewes and lambs if the weather is too bad for turnout. Ewes with lambs need twice the space of unlambed ewes (*see* later).

The main considerations when building or adapting a sheep house are:

- Siting – preferably naturally sheltered; easy access which is hard underfoot; protected from rainwater running inside.
- Ample draught-free ventilation.
- Fixtures and fittings can be kept clean and cannot cause injury.
- Shape should allow suitable penning, working and storage area.
- Roof should have 3–4m clearance.
- Walls solid to at least 1.2m high.
- Floor porous, free-draining and dry. Concrete is suitable and easy to clean but will need extra bedding.
- Materials non-toxic.

A lean-to or mono-pitch pole barn (Fig 16) is a basic and versatile sheep house. Fronting onto a concreted yard it can be the centre of a sheep enterprise. The lower portion of the walls should be a solid construction of blocks or galvanized sheeting to at least 1–1.2m above the final level of the bedding. Eaves should be not less than 3–4m above ground with ventilation gaps between the eaves and lower wall and at the gable ends. Ventilation may be provided by timber space-boarding or plastic windbreak cladding, both of which reduce the draught and protect from rain and snow.

Open barns can be converted to sheep housing by constructing secure bale walls to 1–2m and topped with plastic windbreak cladding.

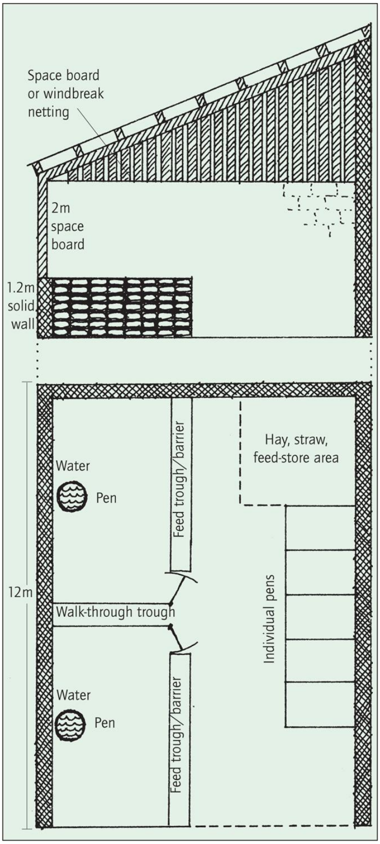


Fig 16 A simple lean-to shelter for winter housing or lambing, with a plan of a suitable layout. Pens can be subdivided, for smaller

groups, by walk-through troughs. By using hurdles, basic feed barriers and troughs, the shed can be cleared and used for other purposes.

Polythene Tunnels

Polythene tunnels (Fig 17) are one of the cheapest forms of stock housing. Specialist stock tunnels that incorporate ventilation systems are necessary for large flocks but for the small flock a 10–12m horticultural tunnel – open at both ends for ventilation – is ideal for lambing and other short-term housing needs such as rearing lambs and shearing. Windbreak netting or wooden barriers inside protect the polythene and the frames from sheep and sheet shades are available to reduce the temperature on sunny days. An earth floor is ideal provided it is sited on free-draining soil.

When not needed for sheep they provide a storage area (beware of condensation dripping off the roof), fertile soil for growing horticultural crops or space for rearing turkeys in the run-up to Christmas.

Tips for getting the best from a polytunnel are:

- Site it where it is sheltered from sun and wind, but not under trees because of the risk from falling branches.
- Build it on a warm and windless day.
- Use insulating foam on the frames to protect the polythene against heat and protrusions.
- Tension the polythene very firmly to prevent chafing.
- Secure the frames and the edges of the polythene very firmly.

- Keep a roll of mending tape handy to cover small holes. Birds damage the polythene by pecking at insects that they see on the inside and cats use them for scratching posts.
- Do not wash off any greening on the roof; it extends the life of the polythene.
- Galvanized frames have a long life but, if they become corroded by dung, treat them with bitumen paint.

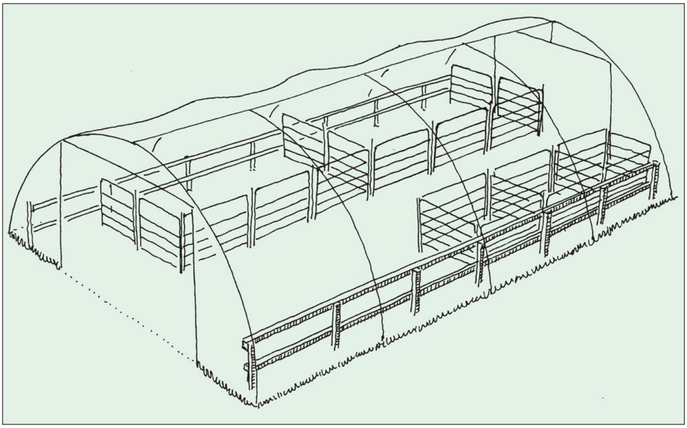


Fig 17 A polytunnel makes low-cost sheep housing and can be used for many other purposes. Basic horticultural tunnels suit small numbers of sheep for temporary housing but need a low barrier around the sides to protect them. For flocks housed for long periods, specialist stock tunnels incorporate ventilation systems.

Ventilation

Ventilation is the single most important consideration. A sheep house must not be stuffy, suffer condensation or smell of ammonia; the more simple the building and the less internal obstructions the better the ventilation.

Ventilation should be at a high level and never create a draught – especially in the lambing area. Natural methods need an open ridge plus high-level ventilation gaps in all walls. The inlet ventilation at the eaves
should be equal to twice the outlet ventilation at the apex. The eaves should be at a minimum height of 3m.

Check ventilation with a smoke pellet, usually available from builders' merchants. If the smoke clears completely within two to three minutes, the ventilation is good.

Flooring

Concrete is an expensive surface for housed sheep, but a concreted working area and concrete floors for mothering-on pens help with hygiene. A concrete floor should have a 1:100 fall for drainage. Slatted floors are widely used for large flocks but are rarely relevant in small flocks where they can double the cost of a building and reduce its versatility.

Ideal floors are porous with 150mm depth of chalk, gravel, rubble, hardcore, round pebbles or stone (50mm to dust grade) but must not be sharp or awkward to walk on and should be on free-draining soil.

Straw is the best bedding for sheep, who use around 1–1.5kg per head per day. On porous floors allow one bale of straw per ewe per six-week period – more if on concrete. Spread a third of the estimated needs at housing then top up daily. Sawdust and shavings are not suitable at lambing because ewes do not like licking lambs covered in sawdust. Peat or horticultural alternatives have been used successfully in small flocks.

Space

Housed sheep should have enough space to practise normal behaviour and to have exercise. They can be housed in pens of twenty-five to forty with around 1.5–2sq m of floor space per ewe. Ewes with lambs need about 2.5sq m. Store lambs need up to 1 sq m per head and six-week-old lambs about 0.5sq m.

Layout

Trough space usually dictates the shape and size of pens. Sheep are flock feeders and pens need to be long and narrow to allow enough trough space along one side for all the flock to feed at one time. Troughs on opposite sides can result in ewes dashing dangerously from one side to the other. Allowing 500mm per ewe requires a pen 12m × 3m for twenty-five ewes, but any other permutation to suit the shape of a building is possible provided the principles are met.

Ensure that sheep can flow easily between areas (*see* Chapter 3).

Pens can be constructed from wooden rails and be 1–1.2m high. Sheep and shepherds must be able to move in and out of the pens easily, so site easy-to-open gates or hurdles in the corners.

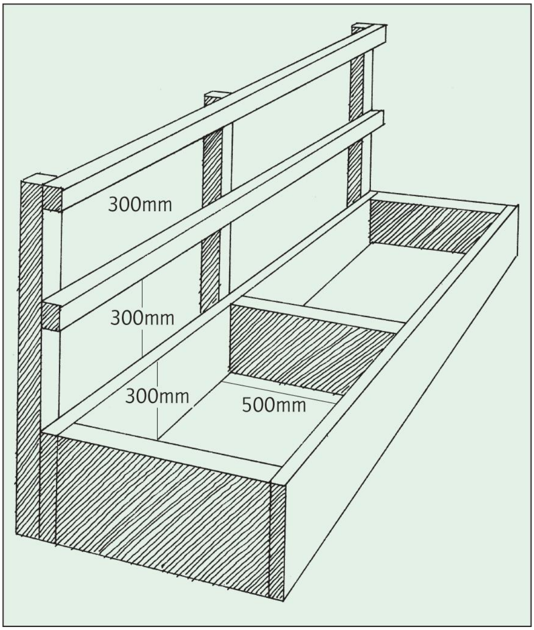


Fig 18 Wooden feed barrier. Uprights and rails are 50mm × 50mm timber and the planking is 25mm thick. Small breeds may need a slightly lower trough. The trough is not essential because sheep can feed through the barrier and direct from the floor the other side. (Not to scale.)

Putting the feed outside the pen so that ewes eat through the barriers is a simple system. The passage outside the pen needs to be at least 1.25m wide (excluding the trough) for hand feeding and using a barrow. Troughs and barriers (Fig 18) can be metal or wood and must not have rough edges. Design them to be removable so that the building can convert to other uses and also be easily cleaned.

Where smaller groups are preferred the pen can be subdivided by walk-through feed troughs (Fig 19) which double as barriers and feeding troughs – especially for hay and silage – and an observation area.

When feeding hay, silage or straw *ad lib* allow 120–150mm space per head. Feed at as low a level as possible because sheep eat with their nose to the ground and have difficulty in swallowing when the head is up. When they pull a mouthful from an overhead rack they lower their head to eat it – wasting some of it and shaking debris and seeds onto the fleece and in the eyes, causing contamination and inflammation.

Other provisions include an area for individual mothering-on pens for newly lambed ewes. The standard ratio is one pen per six to eight ewes (*see* Chapter 9). It saves labour if the building also stores bedding, hay and other feeds but they should be protected from vermin and birds.

Water

Sheep must have twenty-four-hour access to clean fresh water and need at least 5ltr a day during lactation. They are fastidious drinkers and will stop drinking rather than drink dirty water.

Water can be supplied to the small flock in troughs or buckets which should be emptied regularly to avoid clean water being added to soiled water; white buckets show up any contamination. Standard bowl drinkers which are plumbed into the water supply are the easiest system, but need regular cleaning.

Important points for a water supply are:

- Troughs should be raised so that sheep have to stand to drink – preferably on a wood or concrete block platform –

to avoid fouling. A lower supply is necessary for lambs but make sure they cannot fall in and drown.

- Sheep prefer to drink from open troughs rather than bowls.
- Hill sheep in particular prefer running water which can be supplied through guttering along the length of the house.
- Troughs should be sited away from the risk of freezing and away from corners where bully sheep may block them.
- Containers must be easy to keep filled.
- Sheep are messy drinkers so the area must be kept dry to avoid foot problems.
- Water should be sited where it cannot be contaminated by feed.

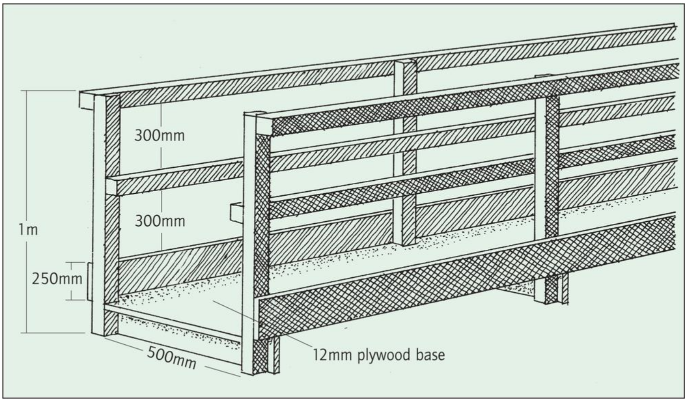


Fig 19 The walkthrough feed trough is a double-sided feeder for hay, silage and concentrates. It also subdivides pens and is a good observation area. Uprights and rails are 50mm × 50mm timber and the planking is 25mm thick. Make sure that timbers are smooth. (Not to scale.)

Health

Under good stockmanship where stress is kept to a minimum, housed sheep suffer few health problems. Those which may arise are pneumonia, footrot, external parasites and prolapse.

Pneumonia is triggered by poor ventilation and by stress, so as a rule:

- Do not house when the fleeces are wet.
- Do not feed or bed on dusty hay or straw.
- Avoid sudden change by introducing their 'housed' diet at least two weeks before housing.
- Inspect and treat the whole flock for footrot (*see* Chapter 8) before housing. Infection spreads in wet bedding and can cause deadly liver abscesses in young lambs.

Behaviour

Most sheep adapt well to being confined although close-flocking breeds like the Romney may be happier than the more individualistic breeds like the Scottish Blackface.

Ewes which are bullied by dominant sheep cannot escape so avoid mixing different ages and breeds where size and behaviour might vary, and avoid mixing polled and horned sheep.

Housed sheep should be able to lie or stand when they choose and in the orientation they choose (usually parallel to the pen sides) and drink and eat when they wish (usually when the rest of the flock want to drink and eat). They should not be subjected to extremes of temperature, noise, bullying, damp bedding or food and water deprivation.

Wool-biting is peculiar to housed sheep, although rare. Lower-ranked sheep are the victims and they cannot escape their biters. It is not stopped by the provision of fibrous food and it seems to induce higher stomach worm burdens in victims – probably involving stress-induced immunodeficiency.

Electricity

Housed sheep should be clearly seen and need a general lighting level of 50 lux. A few translucent roof sheets and open ends usually give enough daylight. It is best to have a system whereby some lights can be left on at night so that the flock is not spooked when all the lights are suddenly switched on, but, where possible, housed sheep should be allowed natural hours of darkness.

Sockets should be available for an infra-red lamp in a mothering-on pen and for a kettle for hot water. Keep all wiring out of reach of sheep. Weather-proof electrical fittings are essential in livestock houses because of the dampness in the air and the use of hoses when cleaning out.

Safety

Stock houses which combine straw, hay, electricity, infra red lamps and humans are dangerous. Make sure that electrical wiring is safe and that there is a quick exit for all animals in the event of a fire.

3 Moving, Handling and Transport

Moving, penning and handling sheep are the most physical and stressful jobs on a sheep farm. Good handling – which is essential if some husbandry jobs are not to be neglected – is the ability to control sheep and persuade them to do what you want them to do with minimum fuss.

It is vital that, once under control, neither the flock nor an individual is allowed to escape. Penned sheep that break out, or an individual that has escaped the clutches of the shepherd, will be trebly hard to get back under control.

The key is to:

- Use carrots, not sticks.
- Work with the sheep – not against them.
- Understand their behaviour.
- Plan ahead.
- Have secure handling equipment.

A typical sheep handling sequence would be to mob them in a field; drive them to a handling area; pen, handle and work on them; return them to the field or load them into transport.

Mobbing

Sheep have a natural instinct to flock and follow, which is why one person can handle large numbers.

Sheep are alerted by what they can hear, but tend to respond to what they can see. Because sheep are preyed upon, they have developed panoramic vision – allowing them to see moving objects at a distance but not in detail; thus they respond to a moving object but not to a stationary one. As a result, sheep will rush together to form a flock when they are startled by noise or movement. The flock may then stand facing the 'danger' or, if the disturbance is friendly, such as a shepherd with food, will rush towards him.

A flock can be controlled by utilizing its flight zone – the personal space immediately around it – because it will react to anything that enters that space. The more tame an animal or flock, the smaller the flight zone. By finding this zone a shepherd can keep the balance between the flock fleeing and standing still and can move them in the direction he wants. He can direct it with an arm or outstretched crook; a loud or abrupt sound will make them move but a softer, prolonged sound can immobilize them.

He can judge the risk of fleeing by the proportion of sheep looking at him. The more that face away, the closer they are to flight.

Driving

If a flock is mobbed and ready for driving, check that none has been missed either by counting or by checking the field perimeter.

Sheep on the move need something to aim for and provided they associate the shepherd with food and not fear they will move towards him.

Sheep prefer to follow rather than to be driven, so flocks are more easily moved if the shepherd walks ahead with a pocketful of sheep feed and accompanied by a friendly 'lead' sheep.

Always work quietly, patiently and with vigilance so that any plan to break away can be anticipated and stopped. Sheep behaviour is predictable, but frightened sheep become unpredictable. Running sheep are usually out of control.

Sheep prefer to move uphill or along the flat and towards the horizon and freedom. So gateways should be sited so that they are obvious and show open space beyond. Gateways sited in the corner of a field have the added advantage of funnelling the flock and making a useful temporary penning area (Fig 20).

Sheep are inquisitive and baulk at changes in the surface under foot. They are reluctant to go through a gateway where grass changes to mud, ruts or puddles. Sheep are nervous of water and lock their front legs stiffly as an instinct against falling, which stops the flow of sheep. They creep around the edges of puddles or leap from hard patch to hard patch. Levelled-off hardcore in gateways is invaluable and deep ruts and mud should be avoided.

When in doubt sheep try to go back the way they came, so as they go through a gate there is a risk that they will turn and run back. If a flock is being driven through a gateway, follow about three body lengths behind to allow enough distance to stop and turn them. Make sure that gates open back tight against a hedge or fence to prevent sheep getting behind them.

A route which takes them alongside hedges, fences or buildings helps to direct them. Take care going downhill, particularly if they are pregnant; most of their weight is over their rear legs and they find it less easy to go downhill than to go uphill.

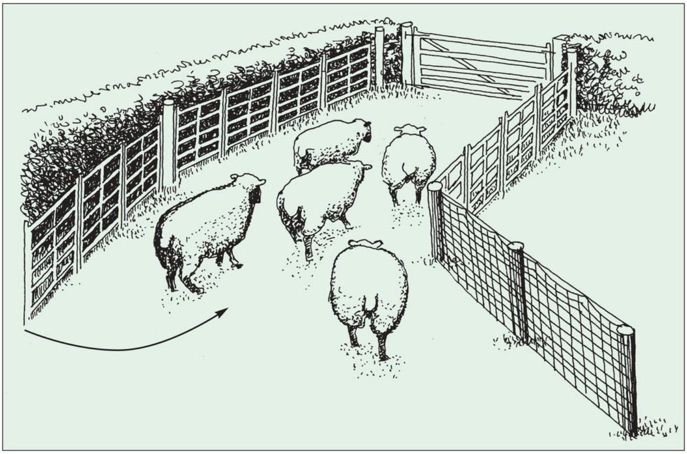


Fig 20 A temporary pen, utilizing a few hurdles, can be taken to the flock rather than taking the flock to the pen. A corner gateway makes a good site. On a regularly used site a few permanent posts add strength and some posts and netting can be left permanently for a funnel. Once the sheep are confined the hurdles can be closed up behind them to form a catching pen. The sheep can exit through any convenient hurdle. Spare hurdles can make a second pen to hold separated sheep.

Sheep are unhappy walking in strong winds and heavy rain and may seek shelter or even refuse to move.

Moving ewes and young lambs is an exercise in patience. The mob rotates and makes very slow forward progress as ewes and lambs try to keep in contact. A lamb, separated from its dam, instinctively runs back to the field where it last saw her. When this happens there is usually no alternative but to return the whole flock to the field and start again.

To avoid the problem, make sure that all the ewes and lambs are mobbed, walk them very slowly and do not follow too close behind so that the shepherd has time and room to

react to a lamb turning back. At gateways and in lanes, follow with a length of netting between two people to block their escape. Make sure gates are
low to the ground or have netting on them to prevent lambs getting out or running back through after they close. A young lamb's homing instinct is remarkably strong and will persist for the whole journey.

When ewes and lambs are weaned and separated it is best to leave the lambs in the field, until they have settled, and move the ewes. This is partly because it leaves the lambs in familiar surroundings, but also because a group of weaned lambs is not cohesive and is difficult to drive.

Heavily pregnant ewes need to be moved slowly but are quite manageable. The ones rushing ahead are probably barren.

Dry ewes are lively and quite often have a silly hour at dusk when they play.

In the small flock there are not usually enough rams to form a flock, so they need to be treated as individuals.

Penning

Sheep get used to routine handling and if penning is not associated with pain or fear (for which they have very good memories) they can be penned quite easily. Again, a bucket of feed and a lead sheep will encourage most of the flock in. If the pen is adaptable, make it as large as possible for getting them in and then reduce it to allow at least half a square metre per sheep.

A rectangular shaped pen is better than a square one because they flow to one end rather than around the sides and back out again; and they should be able to see through the sides so that they do not feel trapped. Again, they are wary of a change of surface and do not like going from light to dark – such as into a building.

Do not open the gate into the pen until the sheep are well mobbed up, otherwise the first ones decide they do not like it and run out, turning the followers; they tend to stop 3–5m from a dead end and retrace their steps. Get them well mobbed and, provided they are not pregnant or have baby lambs, rush them at the last moment by shouting and waving. If used strategically, such as at pens or gateways, noise and action work because sheep flee from noise.

Finally, have a gate which closes quickly and securely behind them.

Handling

Sheep are easier to catch and handle if they are closely penned. The traditional way is to fill a smaller pen – a catching pen – from the holding or gathering pen (Fig 22).

They need a reason to go into the catching pen; for example they are tricked into seeing an exit ahead of them or they follow a feed bucket. Decoy sheep and mirrors have been used as lures, but both have the drawback that the oncoming sheep see faces; this is a sign of aggression and will halt them. Normally they will only follow another sheep when they see its rump ahead.

Although sheep like to move in a straight line, their flow through a penning system can be maintained by having curves or slight corners which give the illusion of the sheep ahead disappearing out of sight.

If an individual sheep turns in a restricted area and faces against the flow there is normally nothing to be done except physically turn it to face the right way.

Once penned, sheep are handled as individuals or small groups and other behaviour patterns come into play.

Groups of sheep of less than four do not act as a flock and are difficult to control.

Individual sheep always try to maintain visual contact with at least one sheep. If they lose contact they try to restore it quickly – even to the extent of knocking down anything standing in the way.

Sheep innately fear isolation and need companionship. Where an individual needs to be isolated (unless it is sick) it should have a companion. Fear, measured by levels of the appropriate hormones, has been found to be higher in sheep which are on their own than in sheep that are in sight of a slaughtering area.

Loading

Loading is the most stressful part of transporting sheep. It is against their nature to be forced into a dark, confined space. Encourage the group with food or with a decoy sheep which must face away from the following group. A view of freedom through the front of the vehicle encourages them. The back of the vehicle must close quickly and securely.

Low trailers may not need a loading ramp if sheep jump on and off freely and safely but it may be required by law if the trailer is more than 310mm off the ground. With high vehicles such as pick-up trucks sheep can be lifted in and out, but a non-slip loading ramp with a gradient of around 1:2 makes life easier.

Eliminate gaps between the ramp and vehicle or between the lowered tailboard and vehicle because they break legs.

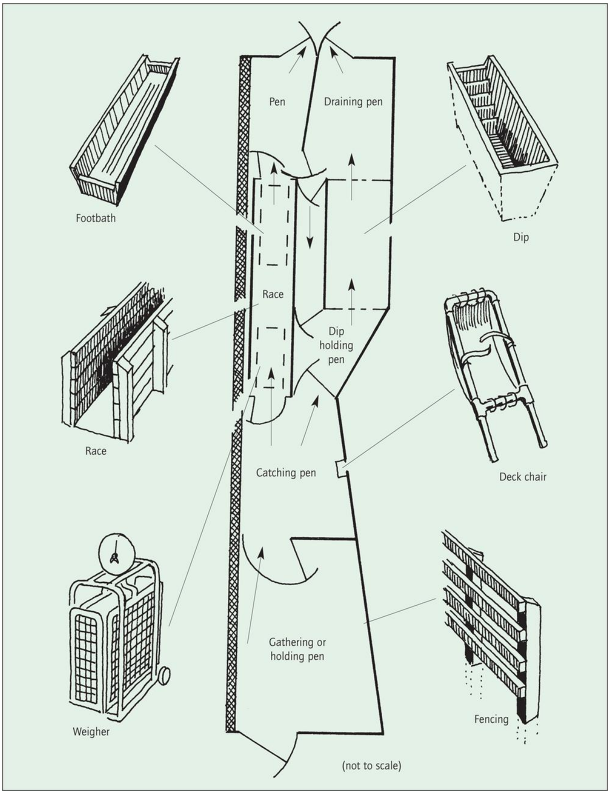


Fig 21 The layout and flow for a basic permanent handling and treatment system. The layout can follow a straight line or may go around the corner of a building to utilize the walls and to add curves and bends which help the flow of the sheep. The dip system can be omitted. The flow (shown by the arrows) gives the facility to recycle sheep. Hurdles may be used in the system, especially as gates.

The footbath can be stand-in or walk-through and may be permanent or removable. The race should be 900mm high. Internal width is 0.5m. The sheep weigher may be sited at either end *of the race. A turnover crate can be sited at the exit, or a deck chair placed in the catching pen. A small fibreglass plunge dip, sunk into the ground, is adequate. Smooth timber rails 75mm × 50mm and posts 1.5m × 100mm × 100mm set 1.5m apart and at least 600mm in the ground make a strong permanent external fence. Four rails are sufficient, but at the bottom the gaps between them should not exceed 100–125mm to prevent lambs from escaping.*

Fig 22 Restraining a sheep. One hand under a slightly raised chin will keep most sheep in check. They have more power when their head is down.

Holding and Lifting

For most operations individual sheep are restrained on their feet. A hand under the chin is very effective in restraining a sheep and is one of the tricks of the shepherding trade (Fig 22). To handle a sheep:

1. Keep the group tightly mobbed.

2. Approach an individual from behind, where it has a blind spot.
3. Cup one hand under its chin and lift the head slightly above normal.
4. Grip the rump firmly with the other hand.
5. Walk it (preferably backwards) to the side of the pen and restrain with a hand under the chin and a knee against the flank.

Gently squeezing the tail encourages a sheep to move forward.

A sheep can be caught by grabbing the hind leg above the hock and lifting the leg off the ground, but this encourages a struggle.

Fig 23 Turning a light sheep. A. Stand with both knees behind its shoulder and hold it under the jaw and by the flank.

B. Lift the hind leg and roll it over the knee.

C. Sit it upright on its rump.

Fig 24 Turning a heavy sheep. A. With one hand turn the head back to lie alongside its side and press on the rump with the other hand.

B. This unbalances the sheep and it collapses. It can sit up on its rump or be left lying on the ground for treatment.

Lifting

For trimming feet, shearing and sometimes dagging and crutching, sheep need to be upturned into a sitting position and it is essential to do this correctly to avoid back injuries. Light sheep are turned by lifting and heavy sheep by unbalancing.

Sheep should never be picked up by the horns, fleece or legs and never grabbed by the wool. Try to avoid handling them when they have full rumens.

One way to turn a light sheep is (Fig 23):

1. With one hand under the jaw, stand close with both knees behind its shoulder.
2. Grasp a fold of wool and skin low down on the far flank with the other hand.
3. Lift that hind leg off the ground, lean back and roll it over the knee onto its rump.
4. Turn it to sit between the handler's knees.

The shearers' catch is another way to turn a light sheep:

1. Approach from behind and grasp with the left hand around the neck and brisket.
2. Walk backwards lifting the front end quickly so that it rears up on its back legs.
3. Cross the right hand under the right foreleg and grasp the left foreleg above the knee.
4. Walk the sheep backwards to where it is wanted.
5. Take a longer backwards step, lift a bit more on the front and it will overbalance and sit on its rump.
6. Sit it up against the handler's knees but do not let its hind feet push against anything solid.

To unbalance a heavy sheep the technique is (Fig 24):

1. Hold the sheep against the legs with one hand under the chin and the other on the rump.
2. Turn the head to look backwards along the shoulder and at the same time press down on the rump.
3. As it goes off-balance it sits down. Let it take a few steps backwards as it collapses.
4. Leave it on the ground or hold both upper forelegs and tilt it into a sitting position against the handler's legs.

The upturned sheep is held at an angle of about 60 degrees – further forward and it gets back on its feet, further back and it struggles. Let the head fall to the right to give the rumen room to expand. It should not have anything to push against with its feet and because it is not comfortable sitting on its tail it should be eased onto a rump.

In some situations sheep can be left lying on the ground for working. A knee firmly on the neck and a sack over the head quietens them, but beware of flailing legs.

Fig 25 Carrying a lamb.

To carry a lamb, put one arm behind the forelegs and the other around the hindquarter (Fig 25).

Handling Aids

Fig 26 A turnover crate.

There are turnover crates (Fig 26) on the market which are excellent, but if they are not part of a handling system it is difficult to get sheep into them. A simple alternative is the deck or race chair (Fig 27), which can be home-built. The sheep is walked backwards towards it, then tipped on to its rear legs until it overbalances, sits down and is restrained by a strap.

Fig 27 The deckchair – a useful item which can be home built.

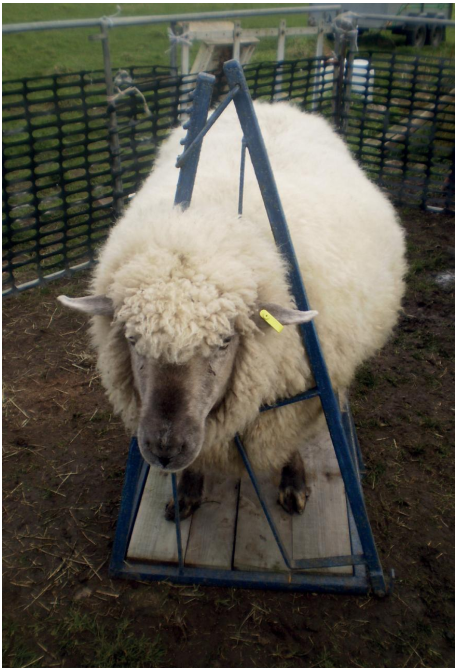


Fig 28 A yoke holds a sheep firmly by the neck and is an extra pair of hands for the single-handed shepherd.

Also available are yokes (Fig 28), which hold sheep by the neck for crutching and trimming and immobilizers (Fig 29) for using in the field.

Fig 29 A New Zealand invention, the immobilizer can be carried in the pocket and will restrain a sheep calmly in the field while the shepherd attends to it or goes for help, equipment or transport.

Handling in the Field

Catching an individual sheep in the field is useful for on-the-spot treatment. Tame sheep are no problem but wary sheep can be difficult. Sheep depend on flight for survival and at least one sheep in a resting flock will remain alert, so it is almost impossible to creep up on them. Some may be caught from the rear at the feed trough. Alternatively, a group may be cornered at a gate and temporarily contained by a length of wire netting secured at one end to the hedge or fence. If the netting is unrolled around them quietly and slowly the sheep are not frightened because they can see through it. Once the sheep are contained it is possible to catch a single sheep.

The Crook

The crook is the shepherd's badge of office and is the ultimate in stock control because it is an extension of the arm. The neck crook is better on shorn sheep but works on fleecy sheep and captures them safely and in a relatively immobile position. Take care when catching an animal alongside a fence that the crook does not catch the fence and the momentum of the sheep destroys the crook.

The leg crook is shorter than the neck crook with a smaller jaw but it must be used carefully to catch high on the hind leg to avoid breaking or twisting the leg and at the same time avoid trapping the udder.

Dogs

Sheepdogs are synonymous with shepherding. But having a sheepdog for the sake of it is a mistake because in most small flocks it is not necessary. The new shepherd who really wants a dog should buy a ready-trained five-year-old who knows the ropes; but remember that small flocks may not provide enough work to keep a dog in good working condition.

Handling Systems

In its simplest form a handling system must allow a flock to be held and treated with minimum fuss. In the small flock the emphasis should be on easy handling rather than speedy handling. It should be designed to avoid the need to push, drag and carry sheep; they have legs and can walk.

The Site

Preferably choose a site which has:

- Free-draining soil.
- Easy access and exit.
- Shelter and some shade.
- Level or slight slope.
- An existing wall or building alongside.
- Power and water available.
- Vehicle access.

Design

The design should be simple and take into account:

- The total number of sheep likely to be handled.
- The jobs for which it will be used.
- The ability to be extended if the flock increases.

Behaviour in handling systems is controlled by vision, so the design should take account of this to encourage them to enter the pens and flow through them.

Their preference is to:

- Go uphill.
- Go towards light.
- Go towards an opening or open space.
- Follow another sheep.

The gathering or holding pen is the reception area for the whole flock and is also used to hold sheep for long periods while waiting for the shearer or after veterinary treatment; on these occasions they should have access to water. It should be as large as practicable to make penning easy. Allow at least 0.5sq m per ewe, bearing in mind that a twenty-five ewe flock may include fifty lambs at certain times of the year.

The catching pen is the working area in which to dose, vaccinate, check udders, check teeth, condition score, treat an injury, tag, dag and trim feet. Catching pens should allow around 0.3sq m per sheep. Dimensions will vary with the size of the breed, but capacity should be limited so that all the sheep are tightly constrained but there is room to move and work.

A crush is a long and narrow (about 1.2m wide) version of the catching pen and holds sheep two abreast for easy working.

Avoid square pens – rectangular or funnel-shaped ones encourage the flow of sheep.

Pens are normally built from rails, netting or hurdles and the only solid divisions are where sheep move in opposite directions or in the 'race' (*see* later) to prevent them from being distracted.

All surfaces and edges must be smooth and rails and any cladding should be on the inside, with posts on the outside.

It should be possible to recycle sheep through the system for additional treatment or sorting and there should be a separate exit. Gates must operate easily and securely.

Temporary Handling System

Often the time and effort taken to move a few sheep through an elaborate penning system may not be worthwhile. Most jobs can be done by having a holding pen which can be reduced in size around the flock to become a catching pen (Fig 20).

By using hurdles a pen can be taken to the sheep and erected on temporary sites. The layout should be similar at each site because sheep like routine.

The pen should incorporate a gateway which offers a view of freedom and encourages the flock in.

Where a site is used regularly, a permanent funnel is useful and some strategically placed wooden posts to support the hurdles give extra security. Portable hurdles may lift off the ground or be forced apart when under pressure from a flock. The hurdles should connect to each other at the top and bottom and be easy to uncouple because, in this system, they operate as gates.

There is a range of lightweight mobile handling systems on the market which incorporate a trailer, race and gates and allow customized layouts.

Basic Permanent System

A basic permanent handling system (Fig 21) comprises:

- A gathering or holding area.
- A catching pen or a crush.
- A race.
- A second holding pen.
- Perhaps a dip.

Construction

A free-draining hardcore base is all that is needed for most handling areas. Topsoil should be removed to a depth of about 200mm and refilled with stones to ground level. The first 125mm can be filled with clean hardcore or coarse gravel then covered with 75mm of 20mm rounded chippings or gravel screenings.

For concreted areas, such as the dip draining pen and some working areas, top soil should be removed, 150mm of hardcore laid and finished with a 100mm concrete mix of 1:2:4 (cement, sand, gravel).

Blocks can be used for solid walls but should be plastered and have no sharp corners. Timber posts and rails make secure fencing for the pens.

All gates should have sturdy latches and hinges to ensure their quick operation. Where gates are under pressure the latches should be at about half height.

The Components

The race holds sheep in single file, has solid sides and is 900mm high. It may incorporate a footbath, weigher or a drafting gate through which the sheep can be sorted into groups, or a turnover crate sited at the exit. Vaccinating, drenching and checking mouths are done by leaning over the top.

If the sides slope – around 0.6–0.8m at the top, narrowing to 0.3m at the ground – the race can accommodate sheep of mixed sizes while preventing them from turning around. However, a straight-sided race is easier to build and more versatile when incorporating equipment. The entrance should be disguised if possible by a slight curve or corner and the exit should be clearly seen as open space. To keep them flowing, the race should hold at least six sheep at a time. It can open into a second holding pen for holding treated sheep or for sorting into groups.

A fibreglass removable footbath is easy to clean, but if a concrete one is incorporated it can be covered with non-slip wooden boards when not in use. Footbaths are usually 150–200mm deep and where they touch the sides of the race there should not be a ledge for sheep to tiptoe along. A piece of old carpet on the bottom reduces splashing. Where there is no race, a stand-in footbath (Fig 30) can be accessed from the catching pen.

Sheep Dip

Small fibreglass plunge dips take one sheep at a time and have a capacity of around 650ltr. There should be a concreted holding pen at one end and a draining pen at the other. A wet fleece can hold as much as 35ltr of liquid so the draining pen should hold sheep for five to ten minutes and have a 1:20 slope to allow liquid to drain back into the dip. There must be a water supply and a safe way to empty and dispose of spent dip wash.

Transport

Transport is essential on a sheep farm. It is usually cheaper to take a sheep to the veterinary surgeon rather than have him visit and the sheep benefits from an equipped surgery. Sheep may also be transported to off-land grazing or in small numbers to market.

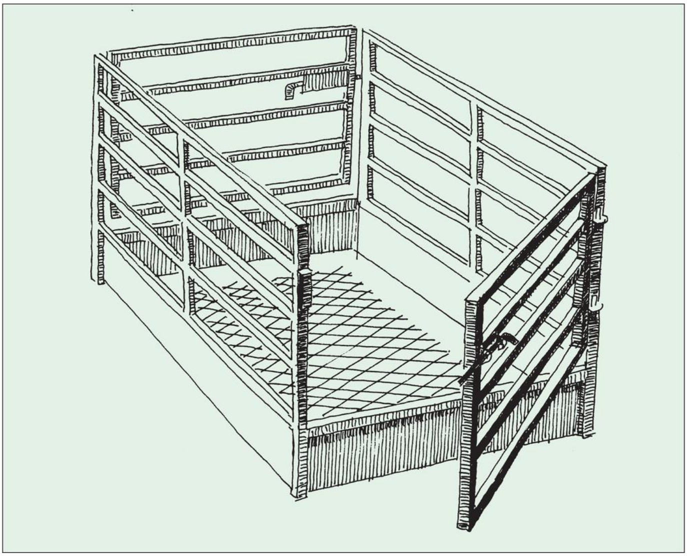


Fig 30 The stand-in footbath holds groups of sheep in the footbath chemical. Some controls and treatments for foot problems require the sheep to stand in the solution to give it time to penetrate the hoof.

A small car or van with a tow hitch and a trailer are invaluable. A flat-bed trailer which converts to carrying stock (Fig 31) has many uses on a sheep farm. One measuring 1.2m × 2.4m can hold about eight ewes. When moving ewes with baby lambs put the lambs behind a low partition at the front of the vehicle; they encourage the ewes to get into the trailer and are protected from being trampled during transit.

The general rules for transporting sheep are:

- Sheep travel best with an empty rumen.
- They are safer when reasonably closely packed.
- Larger vehicles may need a partition to reduce crowding or prevent falling.
- Have a non-slip, draining floor. Sand or an old carpet improve grip.
- Have plenty of ventilation but protect from the elements.
- There should be no exhaust fumes invading the area.
- They must not be able to fall or jump out.
- The transport must be covered.
- There must be no projections or sharp edges.
- There must be no gaps to trap limbs.
- There must be adequate headroom.
- Sheep of different sizes should not be mixed.
- Keep watch in case any fall and risk suffocation.

Fig 31 A stock trailer can be made by adding a top to a low-sided trailer. A one-piece demountable top leaves the trailer available for general use. The back hinges down to provide a ramp. Sides should be solid, with ventilation gaps at the back and front just below the roof. If the ramp is shiny and spooks the sheep, cover it with a piece of carpet. A low, removable partition can be sited at the front of the trailer to keep small lambs separate from ewes.

Regulations

Flock owners transporting their own sheep locally will be subject to road transport regulations, welfare codes and common sense but may avoid the extra regulations which come into force when stock is transported for long distances.

Check the following basics:

- Sheep must be fit to travel.
- Journey times kept to a minimum.
- Sufficient floor space and height.
- No gaps or protrusions to cause injury.
- Trailer is secure and clean.

- Drivers may need to carry movement documents.
- A veterinary certificate may be needed to accompany an injured animal to the slaughterhouse.

Long distance transport is subject to extra regulations and it may be advisable to employ a professional haulier. Breeders who take their stock long distances to shows and sales will need to check the regulations.

These may include the above, plus:

- A portable ramp and side gates for loading and unloading.
- Restrictions on journey time or distance.
- Maximum length or size of pens in the vehicle.
- Rules on resting and feeding.
- Veterinary papers to accompany the load.
- Journey plan for the trip.
- Special training for drivers and assistants.
- Specific standards for the vehicles and trailers.

4 Breeding

Breeding from the small flock needs planning and preparation.

The time to breed depends on:

- When the ewes and rams are sexually active.
- When the lambs are wanted – to suit the market, the shepherd, the climate and the feed supplies (*see* Table 1 and Fig 108).

In temperate regions of the world sheep are seasonal breeders and will not mate until the daylight hours begin to shorten. With a gestation period of around five months (147 days) this ensures that there is spring vegetation when the lambs are born.

The breeding season (when ewes are receptive to the ram) averages four months, starting in autumn and ending in winter. It is thought that it begins when the number of daylight hours fall below fourteen.

The seasonality is more pronounced in hill sheep than in lowland sheep and is stronger in the higher latitudes. Hill sheep may be sexually active for only two months while lowland sheep may breed for six to eight months. Some breeds, notably the Poll Dorset and Merino, are sexually active for at least eight months of the year and, when crossed with another breed, will pass on this trait. Rams are less seasonal than ewes in their breeding.

Ewes may be mated (tupped) any time when they are sexually active but their fertility is greatest during the middle of the breeding season. Fertility is also influenced by breed (the Finnish Landrace, Romanov and Cambridge are prolific lambers), by feed (good nutrition will stimulate ovulation) and by age (older ewes tend to be more fertile than young ewes). Peak fertility is reached at three to five years.

Preparation for Breeding

In the new flock, preparation for breeding should begin at least eight weeks before tupping. In an established flock, preparation begins at weaning, which should be at least two months before tupping in the lowland and three months in the hills.

There are four stages:

- Selection and culling.
- Feeding.
- Veterinary treatments.
- Preparing the ram.

Selection

Selection is the choice of parents for the next generation. Stock for the new flock is selected at purchase, but in subsequent years some ewes will be culled and others brought in as replacements.

Selection should start well in advance of breeding so that culled stock can be sold and selected stock can be prepared.

Unless a flock is being expanded it is usual to cull from the oldest, bringing in youngsters to maintain mixed ages. A

10–15 per cent culling rate is normal in an established small flock.

Ewes to be retained in the flock are selected on:

- Physical soundness.
- How they perform.

Selection on physical soundness such as teeth, feet and udder are the same as described in Chapter 1 when buying ewes. However, the decision can now be modified by knowledge of the sheep. A ewe with a pendulous udder and an undershot jaw, but which reared fast-growing twins with no complications, could be worth keeping.

Provided the farming system is suited to elderly ewes (plenty of feed and personal attention) there is no need to cull on age. Ewes can breed to fifteen years.

A basic rule for selection is to keep ewes which produce a high total lamb weight at weaning. This selects for twins, milky mothers and good survival rate.

Reasons that breeding ewes may be culled include:

- Barren for two years.
- Vaginal prolapse at lambing.
- Damaged udder or suffered mastitis.
- Faulty teeth.
- Difficulty in rearing lambs.
- Slow to conceive.
- Persistent dystokia (difficulties at lambing).
- Persistently lame.
- Bad mother.
- Poor milker.
- Poor fleece.

Reasons for culling a ram include:

- Suspect fertility.
- Health problems – especially bad feet and teeth.
- Risk of inbreeding.
- Age.
- Aggressive to humans.

Fig 32 Crutching a ewe before mating. Trimming the wool from around the tail is also important in the summer to prevent fly strike, before shearing to keep the wool clean and before lambing so that the lambing process is visible.

Selecting Replacements

Culled ewes will be replaced either by bought-in ewes or by young ewes bred in the flock.

Keeping replacement ewe lambs from the flock has the advantage that their history is known, they are conditioned to the environment and they will not introduce disease. The disadvantage is that they need separate management from the adult flock until after their first lambing, which can complicate grazing management. It also complicates the use of rams to avoid ewes being bred to their own fathers.

Lambs kept for breeding should be identified early so that those not selected can be sold for slaughter.

Select on:

- Genetic quality.
- Physical quality.

Selection for genetic traits will depend on the purpose of the flock and will be based on the performance of the dam and any older siblings. Dairy flocks will look for high milk yields; wool flocks for fleece weight, colour and freedom from defects; meat flocks for lean, fast growing lambs with good conformation (*see* Chapter 11). Pedigree breeders will also be guided by the rules of their breed society.

Avoid lambs whose dams prolapsed, were poor milkers, had bad feet or suffered persistent dystokia.

Physical qualities include good feet, sound jaw and teeth and a good fleece. Small teats and vulva in ewe lambs suggest breeding problems (hermaphrodites) and should be avoided.

Preparing the Ewes

About three weeks before tupping the ewes should be crutched (Fig 32), their feet trimmed, dosed for internal parasites (if appropriate) and vaccinated against clostridial diseases or other health problems (*see* Chapter 8).

Trace elements and vitamins such as vitamin E, selenium, manganese, zinc, iron and cobalt are important to reproduction. Where reproductive problems are experienced discuss feeding supplementary minerals with the veterinary surgeon.

Early lambing flocks, which are mated in the summer, should be shorn well in advance of tupping or at least two months afterwards.

Preparing the Ram

The job of the ram is to get ewes pregnant.

Semen takes six to eight weeks to produce, so rams must be prepared for tupping at least eight weeks in advance. This should be borne in mind when they are hired or borrowed. Where appropriate they have the same veterinary treatments as the ewes, plus a physical check as described in Chapter 1.

Rams should be condition scored and fed similarly to the ewes. They must be in good condition at tupping (CS3.5–4) because they lose condition while working. In hot weather the wool can be carefully clipped from the belly and scrotum to keep the testicles cool, otherwise their fertility may be reduced. Treat any sores on the brisket.

Between preparation and tupping, the ram should not be stressed and after mating he should not be banished and neglected until the next time he is needed. If rams are allowed to get fat, their libido and quality of semen is reduced – fat in the neck of the scrotum interferes with temperature regulation.

Tupping Management

A successful tupping should result in:

- All the ewes in lamb.
- A compact lambing period.

- Accurate lambing dates.

Tupping should be on good pasture because it is vital that sheep do not lose weight during and immediately after tupping. Grass height should be kept at around 6cm (*see* Chapter 6). A useful figure to assist planning is that an 8cm high pasture will carry twelve ewes per hectare for two breeding cycles (about a month).

Rams may need 450g of an 18 per cent protein concentrate each day to maintain stamina and libido and the whole flock may need feeding if there is persistent heavy rain or if grass supplies become short. Hand feeding the ram gives a chance to check him, but some shepherds are opposed to this because it distracts him.

Tupping Timetable

At weaning	Select ewes for breeding.
8 weeks before tupping	Condition score ewes and rams and adjust feeding. Check ram fertility, prepare feet, give veterinary treatments.
3 weeks before tupping	Veterinary treatments for ewes. Flush adult ewes and rams.
About 2 weeks before tupping	Synchronize with teaser ram or hormonal sponges (if appropriate).
7 days before tupping	Fit ram harness (if appropriate).
2 days before tupping	Remove sponges (if appropriate).
Tupping	Remove teaser ram, put in raddled ram.
	Flock on good grass and left undisturbed.
15 days after tupping	Change raddle colour (earlier if 50% of the flock has mated).
30 days after tupping	Change raddle colour.
5 weeks after tupping	Change raddle colour or take rams out.

12–14 weeks after tupping	Pregnancy test by ultrasonic scanning.

In hot weather there should be shade because heat depresses sexual activity.

In a flock which has not been synchronized to bring the ewes on heat at the same time, one mature ram can serve forty ewes.

Ewes come on heat (oestrus) every fifteen to seventeen days, it lasts for twenty-four to thirty-six hours and ovulation occurs at the end of the heat. Sheep are not demonstrative when they are on heat and the only indication will be the attention of the ram. Typically he will check out ewes for mating by sniffing their urine and then show his interest by pawing their flanks and curling his upper lip (the flehmen response). Approximately 6 per cent of the flock is served each day during the first seventeen days – although it can be more erratic and there may be a slow start. About 80 per cent of the ewes should be pregnant at the end of this time.

Tupping Records

Number of ewes in group:

Identity of ewes:

Identity of rams:

Ram to ewe ratio:

Weather conditions:

Date ram in:

Date ram out:

Date and colour of raddle change:

1st

2nd
3rd
4th

Dates when rams changed/substituted:

The identity (and dates) of the ewes marked for 1st service:

The identity (and dates) of the ewes marked for 2nd service:

The identity (and dates) of the ewes marked for 3rd service:

The identity of any unmarked ewes:

Number and percentage holding to 1st service:

Number and percentage holding to 2nd service:

Number and percentage holding to 3rd service

Date for pregnancy scanning:

Predicted start of lambing:

Lambing dates for individual ewes if available:

This is the basic information that a small flock keeper should record during and after tupping

Ewes that are pregnant after the first ovulation are described as having ‘held to first service’. Those that do not hold to first service but get pregnant at their next ovulation will have ‘held to second service’.

Rams stay in the flock for around six weeks so that every ewe can have two or three ovulations and therefore two or three chances of becoming pregnant. If a second group of ewes, such as ewe lambs, are tupped after the main flock then any adult ewes that have failed to get pregnant can be put in with them for another chance. A record of tupping (*see* box) is vital to identify fertility problems and for flock management.

Raddling

To indicate what is happening at tupping, a ram wears a coloured marker (raddle) on the brisket so that when he mounts a ewe she is marked on the rump and identified as being mated. The colour of the raddle is changed at least every fifteen days, thus when a marked ewe is marked for a second time it is clear that she did not hold to the ram at the previous mating. It is acceptable for around 15 per cent to fail to hold to their first service and a few may go to three matings. Where a high proportion of ewes are re-marked every seventeen days it will cast suspicion on the fertility of the ram and he should be replaced immediately.

The final mark will indicate when the ewe was successfully mated and, therefore, when she will lamb. The lambing date will be about 147 days after the service (*see* Table 2). A ewe that is unmarked at the end of tupping is not necessarily barren; in wet or cold weather the crayons may fail to mark. Or she may already be pregnant from a precocious ram lamb before weaning or from a ram which has broken into the flock. The latter can result in 10 per cent conception overnight.

In the small flock it is possible to keep a daily record of the ewes being tupped so that their expected lambing date is accurate – a bonus at lambing time.

Table 2 Gestation Period for Ewes

Tup	Lamb	Tup	Lamb	Tup	Lamb	Tup	Lamb	Tup	Lamb	Tup	Lamb
Jan	May	Feb	June	Mar	July	Apr	Aug	May	Sept	Jun	Oct
1	28	1	28	1	26	1	26	1	25	1	26
2	29	2	29	2	27	2	27	2	26	2	27
3	30	3	30	3	28	3	28	3	27	3	28
4	31	4	Jul 1	4	29	4	29	4	28	4	29
5	Jun 1	5	2	5	30	5	30	5	29	5	30
6	2	6	3	6	31	6	31	6	30	6	31
7	3	7	4	7	Aug 1	7	Sep 1	7	Oct 1	7	Nov 1
8	4	8	5	8	2	8	2	8	2	8	2
9	5	9	6	9	3	9	3	9	3	9	3
10	6	10	7	10	4	10	4	10	4	10	4
11	7	11	8	11	5	11	5	11	5	11	5
12	8	12	9	12	6	12	6	12	6	12	6
13	9	13	10	13	7	13	7	13	7	13	7
14	10	14	11	14	8	14	8	14	8	14	8
15	11	15	12	15	9	15	9	15	9	15	9
16	12	16	13	16	10	16	10	16	10	16	10
17	13	17	14	17	11	17	11	17	11	17	11
18	14	18	15	18	12	18	12	18	12	18	12
19	15	19	16	19	13	19	13	19	13	19	13
20	16	20	17	20	14	20	14	20	14	20	14
21	17	21	18	21	15	21	15	21	15	21	15
22	18	22	19	22	16	22	16	22	16	22	16
23	19	23	20	23	17	23	17	23	17	23	17
24	20	24	21	24	18	24	18	24	18	24	18
25	21	25	22	25	19	25	19	25	19	25	19
26	22	26	23	26	20	26	20	26	20	26	20
27	23	27	24	27	21	27	21	27	21	27	21
28	24	28	25	28	22	28	22	28	22	28	22
29	25			29	23	29	23	29	23	29	23
30	26			30	24	30	24	30	24	30	24
31	27			31	25			31	25		
Jul	Nov	Aug	Dec	Sep	Jan	Oct	Feb	Nov	Mar	Dec	Apr
1	25	1	26	1	26	1	25	1	28	1	27
2	26	2	27	2	27	2	26	2	29	2	28
3	27	3	28	3	28	3	27	3	30	3	29
4	28	4	29	4	29	4	28	4	31	4	30
5	29	5	30	5	30	5	Mar 1	5	Apr 1	5	May 1
6	30	6	31	6	31	6	2	6	2	6	2
7	Dec 1	7	Jan 1	7	Feb 1	7	3	7	3	7	3
8	2	8	2	8	2	8	4	8	4	8	4
9	3	9	3	9	3	9	5	9	5	9	5

Table 2 Gestation *(continued)*

Tup	Lamb	Tup	Lamb	Tup	Lamb	Tup	Lamb	Tup	Lamb	Tup	Lamb
Jul	Dec	Aug	Jan	Sep	Feb	Oct	Mar	Nov	Apr	Dec	May
10	4	10	4	10	4	10	6	10	6	10	6
11	5	11	5	11	5	11	7	11	7	11	7
12	6	12	6	12	6	12	8	12	8	12	8
13	7	13	7	13	7	13	9	13	9	13	9
14	8	14	8	14	8	14	10	14	10	14	10
15	9	15	9	15	9	15	11	15	11	15	11
16	10	16	10	16	10	16	12	16	12	16	12
17	11	17	11	17	11	17	13	17	13	17	13
18	12	18	12	18	12	18	14	18	14	18	14
19	13	19	13	19	13	19	15	19	15	19	15
20	14	20	14	20	14	20	16	20	16	20	16
21	15	21	15	21	15	21	17	21	17	21	17
22	16	22	16	22	16	22	18	22	18	22	18
23	17	23	17	23	17	23	19	23	19	23	18
24	18	24	18	24	18	24	20	24	20	24	20
25	19	25	19	25	19	25	21	25	21	25	21
26	20	26	20	26	20	26	22	26	22	26	22
27	21	27	21	27	21	27	23	27	23	27	23
28	22	28	22	28	22	28	24	28	24	28	24
29	23	29	23	29	23	29	25	29	25	29	25
30	24	30	24	30	24	30	26	30	26	30	26
31	25	31	25			31	27			31	27

Gestation period for ewes averages 147 days (five months) and can vary from 142 to 150. Breed of ewe rather than sexes or size of litter seem to govern the period. Spring-born lambs may be carried longer than autumn-born, and pregnant ewes that are winter-shorn may carry lambs for one day longer than those that are not shorn. Make an allowance for Leap Years.

Markers may be applied as a paste, painted on the brisket each day. The ram must be easy to catch and if he is shorn some wool should be left on the brisket to hold the paste. Alternatively, a harness (Fig 33) is buckled around the chest to hold a coloured crayon. Harnesses should be fitted up to a week before tupping and should be watched carefully for chafing, especially under the forelegs. The straps may need tightening as they bed into the wool and as the ram loses weight during tupping.

Use crayons suitable for the likely weather conditions (hot, cold or all-weather) and check them regularly to make sure they are not caked with mud or manure.

Raddle colours are used in sequence starting with the lightest (white or yellow) and progressing through the darker colours from orange, red, blue, green and black. When running two or more rams together it helps to identify any that are not very active by raddling them with different colours, but it will not identify the sires of the resulting offspring because most ewes will have been served by all the rams. It is a characteristic of the ewe that she can be fertilized by more than one ram and give birth to two lambs with different sires.

Ram Behaviour

There is a saying that rams should be run in threes – two to fight and one to get on with the job. Rams will fight over ovulating ewes and reduce the chances of successful matings. A dominant ram will get all the business, but it will be a disaster if he is infertile.

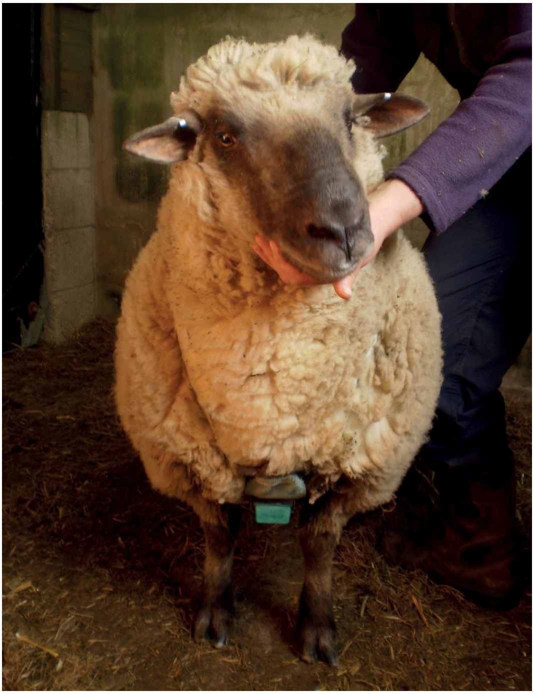


Fig 33 A crayon in a ram harness will mark the ewes as they are mated and is

a reliable indicator of what is happening during tupping. Harnesses should be tight but not chafing and be checked regularly. Attaching a harness to an unwilling ram is less of a puzzle if the buckles and straps are pre-marked to indicate which goes where.

Where two rams are used it is best to split the flock and run one ram with each group. They can be swapped every few days in case one is infertile or is concentrating his attention on a favourite ewe. The flocks should be out of sight of each other otherwise each ram will be distracted by the other.

It is thought that unshorn ewes are more attractive to rams than shorn ones because wool carries pheromones (odours to attract a mate). Sheep which have been recently dipped may not be readily mated. When given a choice, rams show a preference for ewes of their own breed. They may also create harems.

Rams can be aggressive, especially during the mating season. Beware of turning your back on them, especially in a field, and be cautious about putting them in fields where there are public rights of way. Persistently aggressive rams are dangerous and should be culled.

Strange rams may fight each other to the death, even through fences – leading to court cases between neighbours.

When strange rams are run together they should first be confined for a day in a space too small for them to run at each other. An American trick is to hang old tyres at ram shoulder-height to prevent them getting a clear run at each other.

Ram Lambs

Rams reach sexual maturity by six to nine months and can be used as yearlings. They should be run with small groups of mature ewes – about one ram lamb to twenty to twenty-five ewes – and not used with young ewes. They should not have to compete with older rams.

Ewe Lambs

Ewe lambs need good management if they are bred in their first year because they are growing their own bodies as well as those of their lambs.

There are, however, the following advantages:

- They subsequently make better mothers.
- They do not get too fat.
- The first lamb is a financial bonus.

Ewe lambs do not usually start their breeding cycle until they are eight to ten months old and in some breeds eighteen months. Puberty in many breeds is also influenced by weight. There is a saying that 'if they are big enough they are old enough', but they should be around 70 per cent of their mature weight before breeding. Mature weight is half the combined adult weight of dam and sire. Around 30 per cent may not breed in the first year.

Ewe lambs are unresponsive to the ram and need a persistent, active adult ram. The ram to ewe ratio is usually 1:30 and ewe lambs may be tupped a month after the adults to give them extra time to grow, have extra attention at lambing and to extend the use of the ram. Rams should be run for only two oestrus cycles (about five weeks) to reduce the lambing period. If adult and young ewes are tupped at the same time they should be kept in separate groups.

Shearing ewe lambs in late summer can improve their growth rate and there is a theory that ewe lambs which are sheared a month before tupping will produce a high proportion of female lambs – this is believed to be a survival mechanism. To discourage large litters they should not be flushed but kept growing steadily on good feed.

Compact Mating

A short mating period means a short lambing period. Short lambing periods may not be welcome in a large flock where resources will be stretched, but in a small flock the advantages are:

- Easier to feed the pregnant ewes accurately.
- Less wasted time and sleepless nights waiting for ewes to lamb.
- More chance of fostering lambs on to newly lambed ewes.
- Lambs are easier to market because they are similar ages.

A compact mating is the result of the flock being synchronized so that the ewes come on heat at the same time. Two common aids to synchronize a flock are:

- A teaser ram.
- Hormone-impregnated sponges.

A teaser ram is an active ram which has been vasectomized by the veterinary surgeon to make him infertile but still produces the male pheromone to stimulate the female – what is known as the 'ram effect'. His role is to synchronize oestrus in the flock by stimulating ewes to come into heat. He can also bring forward the breeding season by about three weeks.

Teaser rams must be strong, active rams with good libido. A vasectomized old ram which is past his sell-by date is unlikely to be effective. A young entire ram lamb that missed the market or may have been a hand-reared favourite could be a candidate. Some pedigree breeders vasectomize and sell rams that they do not want to breed. Vasectomized rams physically mate with ewes so must be disease-free.

The ewes should be out of sight, sound and smell of rams for at least six weeks prior to the teaser going in. The teaser is introduced suddenly about seventeen days before the planned mating. One teaser per fifty ewes is adequate. He is removed after sixteen days and replaced by the fertile ram. Most ewes have their first true heat and are mated during the first week.

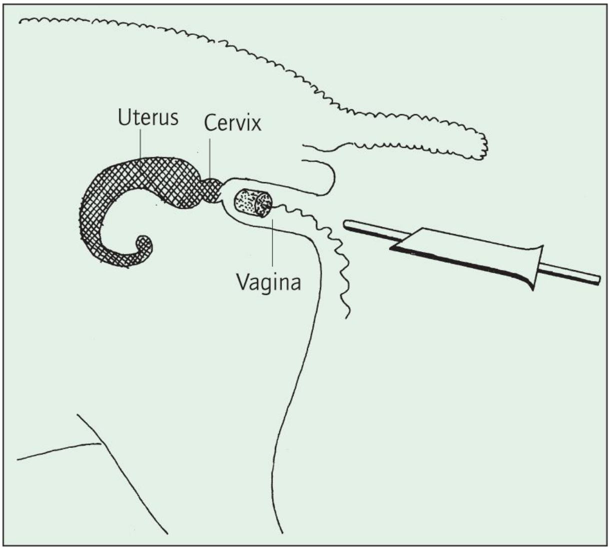


Fig 34 Sponges are inserted in the vagina for synchronized mating. The sponge is loaded into an applicator which is inserted into the vagina and the sponge deposited against the

cervix. The sponge is held in position with a rod while the applicator is withdrawn and the strings are left exposed so that the sponge can be pulled out two weeks later.

Sponges

Teaser rams give only partial synchronization. A more accurate system is the use of progesterone-impregnated sponges that are inserted in the vagina of the ewe sixteen days before mating (Fig 34). Progesterone is the hormone which is released naturally during pregnancy to inhibit the breeding cycle. The hormone (or an analogue) is released by the sponge and arrests ovulation. When the sponges are withdrawn after fourteen days the body reacts to the drop in progesterone and starts to cycle; the result is that all the treated ewes come into heat at the same time. Similar treatments using injectable hormones are available.

Rams are put in forty-eight hours after sponge removal and tupping lasts for about three to four days. To make his life easier the ram is not raddled for the first heat period but raddled for the second; any unmarked ewes are assumed to have held to first service.

With this technique there is extra demand for ram power because they are used at a ratio of one ram per eight ewes. Ram power can be reduced to one per twelve ewes by operating a 'hand mating' system. In this the ram and his ewes are penned together forty-eight hours after sponge removal (timed to be in the morning) and as each ewe is seen to be correctly served she is removed from the pen. At the end of the day, or when all the ewes have been served, they are all run together. The system prevents rams from concentrating on a favourite ewe and improves the percentage of ewes holding to first service.

Ewes holding to first service (around 60–80 per cent) will lamb down over a six-day period followed by a break of about ten days before the ewes holding to second service start lambing. This break gives the shepherd a chance to catch up on sleep and to attend to the first group of lambs.

After Tupping

Up to 30 per cent of eggs shed at ovulation may fail to develop into lambs.

This loss is due to:

- Eggs failing to be fertilized.
- Fertilized eggs failing to implant.
- Foetuses being reabsorbed.

Stress – due to rough handling, poor nutrition, changes in nutrition, dogs or extremes of weather – is the main cause of these losses.

After fertilization the egg (ovum) floats in uterine fluid until it attaches (implants) to the uterine wall to become a foetus about three weeks after conception. During this period nutritional or physical stress can prevent implantation and the ovum is lost.

After a successful implantation, stress in the early stages of pregnancy can cause the ewe to reabsorb a foetus. If this occurs early in the mating period a ewe can still re-mate. To minimize these losses the flock should remain on good grass and not be disturbed from the time that the ram is put in to at least one month after he is taken out.

Pregnancy Testing

Ewes can be tested to see if they are pregnant. Ultrasound scanning not only indicates pregnancy, but also the number of lambs each ewe is carrying. This allows accurate feeding and management during pregnancy, identifies barreners early and is useful information at lambing.

The job is done by contractors, ideally twelve to fourteen weeks after the beginning of tupping. Although it is a useful tool, scanning may not be economic for the small flock.

It is possible, with experience, to check for pregnancy at six weeks by gently poking the area in front of the udder with the fingers – it should feel tight. And at fifteen weeks, foetal movement may be felt in this area.

Aids To Breeding

Ewes can be persuaded to breed outside their natural breeding period, usually in order to produce lambs for the early market, to advance lambing so that it does not clash with other farm activities, or to have pedigree lambs well-grown by sale time.

A natural way to advance the breeding season is to introduce a breed with a long season such as the Dorset Horn and Poll Dorset; just a quarter of their blood in another breed can extend its breeding period.

Another technique involves the use of melatonin, a naturally occurring hormone produced by the pineal gland. It is also used to combat jet lag in humans.

In sheep it is administered as a subcutaneous implant that creates a chemical darkness, convincing the ewe that the daylight hours are shortening. It can bring the breeding season forward by up to six weeks. Teaser rams are put in thirty-five days after implantation and the entire rams seventeen days after that. Peak mating occurs around fifty-eight days after implantation.

The breeding season can also be advanced, by up to six weeks, by an injection of Pregnant Mare Serum Gonadotrophin (PMSG) after the withdrawal of progesterone sponges used for synchronization. This also stimulates ovulation, sometimes resulting in large litters.

Artificial Insemination

The small flock owner, especially the pedigree breeder, could consider artificial insemination (AI). It is not an easy alternative to natural mating but it allows breeders to use top rams without the expense of owning them. However, it may not eliminate the need to keep a ram because one could be necessary to run with the flock after insemination to serve ewes that did not conceive to AI.

AI involves taking semen from a ram and depositing it into either the cervix or the uterus of the ewe.

Semen is collected from a ram in an artificial vagina while he is mounting an on-heat ewe. Best results come from using it fresh but frozen semen is more convenient. The cervix of the ewe is tortuous (see Appendix I, Fig 120) and the semen cannot be deposited right into the uterus – only into the first fold of the cervix. Best results – 70–75 per cent conception – come from laparoscopic AI (LAI) in which the semen is deposited surgically into the uterus. Unlike cervical AI this must usually be done by a veterinary surgeon.

Ewes must be inseminated at the right stage of oestrus and commonly they are synchronized using progesterone sponges.

Embryo Transfer

The elite of all the breeding techniques is embryo transfer (ET) where eggs from superior ewes are fertilized by sperm from top rams and implanted in recipient ewes who give birth to the offspring. The technique accelerates breed or flock improvement and is only appropriate to serious pedigree breeders.

Breeding For Improvement

The quality of a flock is maintained or raised by selecting and breeding from the best stock.

Success is influenced by:

- The number of sheep.
- The generation interval.
- The accuracy of flock records (to identify the best sheep).
- The heritability of the traits (Table 3) being selected for.

Flock owners need a clear vision of what they want to achieve and should select for a minimum number of traits at one time. Traits should also be compatible; there is no point in selecting for multiple births without selecting for milkiness.

Some traits are more heritable than others and it is difficult to identify whether differences are due to genetics or to environmental influences such as nutrition or climate. For example, Table 3 shows that in a group of lambs of the same breed the differences in birthweight are 30 per cent inherited. The other 70 per cent is due to environmental factors such as ewe nutrition and size.

The table also shows that multiple births, with an average heritability of 15 per cent, are not highly influenced by genetics. It is quicker to use a ram from a prolific breed such as the Cambridge or Finnish Landrace and breed prolific progeny in one generation.

Table 3 Average Percentage of Heritability

Birth weight	30
Eight week weight	18
Weaning weight	30
Mature body weight	40
Growth rate	25
Fleece weight	30
Fleece quality	45
Multiple births	15
Milk production	20
Carcass conformation	35

Growth rate is a more heritable trait. It can be influenced by selection and justifies the use of a high growth rate ram. Wool quality is also readily heritable but is also influenced by nutrition and climate.

Introducing a new breed or just a new breed of ram is a quick route to genetic improvement but the breed must be suited to the environment and farming system. The improvement must also be beneficial; breeding for prolificacy on a harsh hill farm would be a disaster.

Crossbreeding

A quick way to improve a commercial flock is to introduce crossbreeding. This is the mating of animals of different breeds.

Crossbreeding is used to:

- Introduce new or improved characteristics into a flock – such as conformation, improved wool or milkiness.
- Create hybrid vigour or heterosis.

The performance of the crossbred animal is usually superior to the performance of each purebred parent. Crossbred ewes such as the Mule, Masham, Scotch Half-bred and Welsh Halfbred represent more than half of the UK breeding flock.

The hybrid vigour generates fast growth, disease resistance and larger lambs which reach sexual maturity sooner. It usually promotes the traits which are least responsive to selection, such as lamb survival. Mating crossbred ewes to a third breed to produce slaughter lambs gives maximum benefit from hybrid vigour and ewe lambs from this third cross make good breeding stock.

Crossbred rams also benefit from hybrid vigour. It has been shown that the combined effect of breeding crossbred rams with crossbred ewes was a 20 per cent increase in the number and weight of weaned lambs.

Inbreeding

Inbreeding is the mating of closely related animals and is used to improve or to eliminate certain characteristics. Closebreeding and linebreeding are types of inbreeding.

It can produce the uniformity sought by pedigree breeders but a common effect of inbreeding is to reduce fertility and growth rate and to increase lamb mortality. It may occur in numerically small breeds where unrelated stock is difficult to find and in breeds which become popular and are bred quickly to meet demand. A flock which sees an unexplained increase in defects plus a decline in production may be suffering from inbreeding.

Intentional inbreeding should only be done in flocks which are already superior and are large enough to stand the necessary hard culling. Average or below average purebred flocks make better progress by introducing an unrelated superior ram.

Genetic Improvement Schemes

The genetic improvement of sheep is permanent, cumulative and cost-effective.

Schemes to identify and improve the genetic superiority of individual breeding sheep offer prospective buyers the chance to buy superior rams.

Sire Reference Schemes or Group Breeding Schemes are run by groups of breeders who get together and agree to use the same sire or sires (usually through AI) to breed from a portion of their flock. This provides a genetic link between flocks to identify superior rams and breeding females for increased lean meat, growth rate and better mothering.

Performance Recording Schemes identify genetically superior sheep and create Estimated Breeding Values (EBVs). These estimate the genetic ability of an animal irrespective of how well it was fed and managed, or the environment it came from. Values include growth rate, muscling, leanness and worm resistance as well as maternal traits such as prolificacy and milkiness.

5 Feeding and Nutrition

Nutrition is the single most important aspect of flock management. Not only does feed account for around 70 per cent of the total costs of a sheep enterprise, but poor nutrition underlies most of the common disease and performance problems affecting sheep.

Sheep derive 90 per cent of nutrients from forage, but most flocks need some supplementary energy, protein and minerals at specific times.

Sheep are ruminants and their digestive system comprises four stomachs (*see* Appendix I, Fig 119) which enable them to perform two important functions:

- To swallow food quickly then withdraw to safety to regurgitate and chew it (cud) at leisure.
- To digest and derive energy from the fibrous cells of plants.

The swallowed grass goes into the rumen/reticulum and, at a convenient time, is regurgitated as a cud and chewed into smaller pieces. This process stimulates and incorporates saliva in the food (a sheep can secrete around 10ltr of saliva a day) to aid digestion. It is estimated that a sheep spends a third of its time chewing its cud.

Cudding usually starts about half an hour after the animal has finished eating and sheep should be allowed two hours' rest after feeding to allow cudding to complete, otherwise disturbance and exertion can cause stomach disorders.

The cuds go back into the rumen and are broken down and fermented by microbes to produce a mixture of fatty acids; these are an important source of energy. A by-product of this process is gas – primarily carbon dioxide and methane – which must be expelled from the rumen by belching; otherwise it can result in the potentially fatal condition of bloat. This is where froth in the rumen, often caused by excess protein from legumes, prevents the gas from escaping.

The liquefied rumen contents then go to the reticulum and on to the omasum which can grind any remaining fibre and absorb water. The processed feed passes to the abomasum – often called the true stomach – where enzymes are produced to digest sugars and starch, and acidity kills any surviving micro-organisms. The material then moves to the intestines where remaining nutrients and water are absorbed.

The practical implications of this system are:

- Feeding the sheep is an exercise in feeding microbes.
- The microbes need time to adapt to new feed– so this must be introduced gradually.
- Sheep must always have fibre (roughage). It is needed for the mixing action of the rumen and to stimulate the production of saliva.

Energy

The major nutritional requirements are carbohydrate (for energy), protein, minerals, vitamins and water.

Low energy is the most common nutritional problem. Energy is used for maintenance – to keep the body working – and for production such as growth, pregnancy and lactation; it is stored as fat. An insufficient energy supply will result in the ewes using up their fat reserves and losing condition.

Roughage, like grass, hay, silage and root crops, meets most energy needs; concentrate feeds (*see* later) are generally high in energy and are fed to supplement low-energy rations.

Energy is expressed in megajoules (MJ), but not all the energy in a feed is used by the sheep. The amount which is used is expressed as the Metabolizable Energy (ME) and this is defined as the number of megajoules per kilogram of dry matter (MJ/kgDM). The dry matter is the material left after all moisture has been removed by heating.

The ME of good quality pasture, for example, (Table 4) is 12.5MJ/kgDM; this means that every kilogram of dry grass contains 12.5 megajoules of available energy. The higher the ME figure the more dense or concentrated is the energy in the feed.

Table 4 Composition of Common Sheep Feeds

	Dry Matter %	ME MJ/kgDM	CP g/kg/DM	% CP in DM	Av. degradability of protein %
Barley	86	13	120	12.0	90
Oats	86	12.1	105	10.5	90
Molassed Sugar Beet Feed	90	12.5	128	11.0	75
Soya Bean Meal	90	13.3	520	52.0	70
Fodder Beet	13	12.5	60	6.0	85
Swedes	12	14.0	91	9.1	90
Molasses	75	12.8	44	5.5	80
Average hay	85	9.0	145	10.0	75
Barley straw	86	7.0	38	3.8	80
Baled silage	35	11.5	145	14.5	80
Good pasture	25	12.5	156	15.6	75
Poor pasture	40	8.0	80	8.0	75

This table gives an indication of the energy and protein values of various feeds as well as the degradability of the protein.

High energy feeds are usually necessary for:

- Ewes in late pregnancy and lactation.
- Lambs needing to grow quickly to catch the market.
- Improving the condition of ewes and rams before mating.

The energy needs of ewes double in late pregnancy and treble in early lactation. As a guide the requirements of a 60kg (small) lowland ewe are:

Maintenance	8	MJ per day
Late pregnancy*	16	MJ per day
Early lactation*	26.5	MJ per day

** Expecting or rearing twins and losing 0.5 condition score (CS).*

A dry ewe gets enough energy from grass to maintain her, but the same sheep carrying twin lambs will not (Table 5). By knowing both the ME of rations and the daily ME requirements of a ewe, she can be fed the appropriate amount of feed.

For example, a shepherd has bought a load of fodder beet. From Table 4 the ME of fodder beet is 12.5 and the dry matter 13 per cent. How much should he feed to a ewe which needs 10 MJ ME per day? The formula is:

$$\frac{\text{MJ/day x 100}}{\text{ME/kgDM x DM\%}} = \frac{10 \text{ x } 100}{12.5 \text{ x } 13} = \frac{1000}{162.5} = 6.2$$

He needs to feed 6.2kg of fresh fodder beet. A ewe's average daily appetite is around 1.0–2.0kgDM and, at first sight, 6.2kg of fodder beet may seem a lot to feed; but at 13 per cent DM it is only 0.8kgDM. On a practical note, fodder beet should not comprise more than 60 per cent of a ewe's daily dry matter intake (*see* Chapter 6).

This is a useful guide when planning how much foodstuff to grow, buy or feed but it has to take into account that a ewe has a limited appetite and may not be able to physically consume enough low dry matter (watery) feeds such as roots, or low ME value feeds such as poor hay, to get enough energy.

Protein

Protein builds tissue and is vital to the pregnant and lactating ewe and the growing lamb. Unlike energy, sheep do not store protein to draw on in times of shortage.

Table 5 Basic Feeding Guide

Month	Activity	Energy needs MJ of ME	Feed: *Roughage*	Feed: *Concentrates*	Ideal CS
1	Flushing	12.5	Good grass 7cm	For thin ewes only	3.0
2	Tupping	12.5	Good grass 7cm	For rams	3.5
3	1st month pregnant	12.0	Good grass 7cm		3.5
4	2nd month pregnant	8.5	Grass 4–5cm		3.5
5	3rd month pregnant	8.5	Grass + 1.5kg hay	150g/head/day starting 8 weeks before lambing	3.5
6	4th month pregnant	15.0	1.5kg good hay or 4–5kg silage	and increasing by100g weekly to peak at 900g	3.5
7	Lambing	19.0	1.5kg good hay or 4–5kg silage	at lambing. Decrease after lambing until 6	3.5
8	Lactation	24.0	Grass 4cm plus 1.5kg good hay	weeks or when adequate (7cm) grass	3.0
9	Lactation	16.0	Good grass 7cm		2.5
10	Lactation Weaning	16.0	Good grass 7cm		2.5
11	Dry	8.0	Stale grass		2.5
12	Dry	8.0	Grass 5cm		2.5

This is for 70kg spring-lambing lowland ewes likely to be carrying twins and will be modified for: small ewes, ewes with singles, where good quality silage is fed, and whether the flock is outside or housed. A housed ewe may need 1.2MJ per day less than an outside ewe. In late pregnancy and early lactation, concentrates will need to be around ME 12.5 and 16–18 per cent CP. Roots can replace up to one third of concentrates on a dry matter basis up until two weeks before lambing.

The protein content of feeds is described as the percentage of crude protein (CP) in the dry matter. For maintenance a ewe needs a feed which contains about 12 per cent CP in the dry matter and growing and pregnant sheep need 16 to 18 per cent.

Again, when feeding protein it is the rumen organisms which are being fed. There are two types of protein – Rumen Degradable Protein (RDP) and Undegradable Protein (UDP). The former, such as proteins in grass, is broken down quickly to ammonia in the rumen and used by the microbes. When the microbes die this microbial protein is absorbed by the animal. In food which is rich in UDP, such as soya bean meal, the protein escapes being broken down in the rumen and goes direct to the intestines where it is absorbed as amino acids.

In simple terms RDP feeds the rumen organisms and, indirectly, the sheep; UDP supplies protein to the sheep direct. Microbial protein can maintain the animal and UDP is only needed for growth and production in late pregnancy and early lactation. It also improves wool growth.

Minerals and Vitamins

Mineral deficiencies in grass are usually the result of deficiencies in the soil. If there is a local problem the veterinary surgeon will know and advise on correction. Symptoms of mineral deficiencies are often chronic rather than acute, such as poor growth and wool, poor fertility, loss of appetite and diarrhoea – all of which can have other causes. Soil and herbage tests will reveal deficiencies as will blood tests on the animals.

Major minerals needed are calcium, phosphorus and magnesium. Those needed in smaller quantities, known as trace elements, include iodine, cobalt, selenium, iron, manganese, molybdenum and zinc. The availability of some of these elements can be affected by the acidity of the soil (*see* Chapter 6).

Minerals are usually fed direct to the animal via mineral licks or in the feed. Injections or boluses may be advised by veterinary surgeons where a specific deficiency has been diagnosed. Deficiencies can be complex because an excess of one mineral may prevent the uptake or the utilization of another and for this reason blanket feeding a cocktail of minerals may not solve a particular problem.

Generally sheep are intolerant of copper. Pig and poultry manures high in copper (originally added to the feed) should not be put on sheep grassland. Cattle and calf feeds normally contain added copper and must not be fed to sheep.

Calcium and magnesium are especially important around lambing and lactation (*see* Chapter 9) and cobalt and selenium are important to the growing lamb.

Vitamin deficiency is uncommon in grazed sheep but vitamin A which is derived from green feed can be low when sheep are not on grass or are on old hay. Both vitamins A and D may need to be fed to housed sheep. Vitamin E is important to pregnant ewes to reduce lamb mortality. Most concentrate feeds which are formulated for sheep are balanced for vitamins and minerals.

Water

Sheep must always have access to clean water, as this is vital for digestion. Fresh grass can provide enough for dry sheep, which means that water troughs may become stagnant and need regular cleaning. Allow 5–8ltr of water per sheep per day in hot weather (sheep control their temperature by sweating and panting) and during pregnancy and lactation. The ideal temperature for water is around body temperature of 39°C because very cold water can have an adverse effect on the rumen bacteria and affect digestion.

Concentrate Feeds

At certain times in the production cycle, grass products cannot provide ewes with enough energy or protein. Peak demands are in late pregnancy and early lactation.

Fig 35 Ewes eating concentrates from a home-made trough constructed from fibreglass pipe.

To correct shortages, sheep are fed a daily ration which includes energy feeds such as cereal grains (barley and oats), sugar beet feed and by-products with added protein and minerals. These ‘concentrates’ are high in energy but relatively low in fibre so must be fed with roughage.

Ready-mixed concentrates which are pelleted (compounds) and have a range of energy and protein levels are sold by agricultural merchants. They are available in 25kg sacks and for the small flock this is generally the best way to buy them. Compounders always declare the analysis and usually declare ingredients of a feed. Typical ewe compounds have an ME of around 12.5MJ/kg DM and CP 16–18 per cent.

The ingredients in purchased compounds can vary between batches. Because the sudden introduction of a new ingredient may upset the digestion of a ewe in late pregnancy a new ration or new batch should be bought before the previous one is finished so that the old and new can be fed as a mix for a few days.

Organic producers who feed bought-in concentrates will need to source ones which are grown organically, although under some regulations it is permissible for a proportion of the total feed to be non-organic.

Farms which grow cereals can mix their own concentrates and a good basic 14 per cent crude protein ration is:

Whole barley	825kg
Soya Bean Meal	150kg
Min/Vit supplement	25kg

This blend will have an energy content of 12.5MJ/kgDM.

These rations can be simplified by replacing the protein and mineral fractions with a single mineralized high protein supplement available from most agricultural merchants.

Cereals are usually fed whole (uncrushed) so that the fibrous husk slows the digestive process and reduces the risk of acidity in the rumen (acidosis). A proportion of the cereal can be substituted by sugar beet shreds or pellets which have four times the fibre content of barley, are popular with sheep and reduce the risk of acidosis. Trials have shown an improvement in the performance of ewes that are fed sugar beet feed in addition to cereals.

Rations must be thoroughly mixed, otherwise sheep can select the bits they like and have an unbalanced diet.

Feeding Concentrates

Concentrates are fed as a supplement to forage and not as a substitute. They must be introduced into the diet slowly, otherwise the rumen microbes cannot adapt, their activity is depressed and the ewe will stop eating. In late pregnancy this risks pregnancy toxaemia, weak lambs and poor colostrum and milk supplies.

Concentrates are usually fed in troughs (Fig 35) and should be given routinely and as early and late as possible each day. Between feeds the troughs should, where possible, be turned upside down to reduce fouling, especially by birds. Calibrate a bucket so that the rations can be measured accurately at every feed.

An advantage of trough feeding is that ewes can be inspected and caught if there is a problem and ewes which are off their feed can be identified. But trough space must be adequate to eliminate competition and reduce bullying, otherwise some ewes can eat up to five times as much as others – risking acidosis – and weaker, older and more timid ewes go short of feed and risk pregnancy toxaemia.

The disadvantages of trough feeding are that greedy ewes barge and risk abortion when they are heavily pregnant and it encourages gorging and choking. Some concentrates are manufactured as larger ‘cobs’ which can be put straight on to the ground with minimal soiling.

Other Feed Systems

Concentrates are also fed in the form of self-help blocks and liquids which give twenty-four-hour access to feed, without regular daily feeding and allow little and often feeding in contrast to twice daily gorging.

These systems can cost more than the pelleted compounds but there are some advantages:

- Convenient to feed.
- Reduce barging and gorging.

- Less prone to loss from rodents and birds (in store and when feeding).
- Changes in intake are a guide to how much grass they have.
- Little and often feeding is better for the digestion.

Disadvantages are:

- Individual feed intakes are difficult to monitor and control.
- Less opportunity to inspect and catch sheep.

Fig 36 A circular feeder is ideal for feeding hay, silage or straw. Where ewes have lambs, it may need to be slightly raised to prevent lambs from jumping inside.

Fig 37 Self-feed blocks. Ewes will readily help themselves to salt, mineral or concentrate blocks.

Blocks (Fig 37) are usually cereal-based and contain a full range of energy, protein and minerals. They are a convenient way to supplement nutrients in grassland and also improve the digestibility of grass and hay.

Fig 38 Ball feeders, made from 20ltr containers, dispense liquid feed. The ball system can be bought separately for home construction, or commercial feeders are available.

Liquid feed is usually derived from molasses and by-products of the distilling industry and is fed from simple ball feeders (Fig 38). The ball revolves and coats itself in liquid as the ewes lick it. Two small (20ltr) feeders are adequate for thirty ewes. Liquids are better than blocks for old ewes with few teeth but the protein source is more often an RDP (urea) than a UDP. The sugars in molasses aid microbial digestion in the rumen and some liquids may be poured over hay or straw bales to improve intake and nutritive value.

Feed troughs, blocks and liquids should be rotated around the grazing area to encourage the flock to graze widely and to avoid poaching and a build-up of disease around the feeding area.

Feeding Roughage

Sheep get most of their roughage from grass or from conserved grass such as hay and silage. On arable farms the straw from barley and pea crops is a good source.

Conserved roughage is fed to housed ewes (Fig 36) or to supplement pasture. Hay is convenient to feed to small flocks, but silage is suitable. Sheep need about 1.5kg of good hay or 3.5kg of grass silage per head per day for maintenance.

Good silage may be too high in energy for ewes in early pregnancy and make them fat, so it should be rationed.

Spring barley and oat straw are the best cereal straws and can be bought in standard bales for easy handling. Ewes take a while to adapt to eating it so it should be introduced early in pregnancy and should not be preceded by hay or silage. About 1.5–2kg per day should be offered fresh, letting them pick out the best and using the rest as bedding. From mid-pregnancy onwards it should be balanced with a high-energy concentrate of at least 12.5 ME and include high levels of a digestible fibre such as sugar beet feed plus 18 per cent CP. Beware of mineral deficiencies such as calcium on this system.

Targeting The Feed

Because sheep get most of their nutrients from forage, in a spring lambing lowland flock a ewe may need only 50kg of compounds and 50kg of hay or 300kg of silage as supplementary feed.

The rule of thumb is that any concentrate feeding should start six–eight weeks before lambing and be introduced at 150g per ewe per day and increased in 100g weekly increments to reach 750–900g per day by two weeks before lambing. Around 1kg per day is probably a safe maximum for most sheep.

Feeding should continue after lambing until there is adequate grass or forage (*see* Chapter 6). To avoid over-feeding the rumen, the daily ration should be split into two feeds (morning and evening); when the total exceeds 700g per day it may be advisable to split it into three feeds.

To ensure that the feed is targeted accurately, ewes are usually grouped and fed according to their lambing date; these groups may also be subdivided into groups carrying twins and those carrying singles. Where ewes have not been pregnancy tested, assume that in flocks with a lambing percentage of more than 150 most of the ewes will have twins and in flocks below 150 assume that most will have singles. Then monitor their condition (Table 6) and feed thinner ewes extra and fat ewes less.

Ewes carrying single lambs may cope satisfactorily on good forage only. Extra feeding is not only expensive but may result in large lambs and dystokia.

Ewe lambs should have a lower daily ration of concentrates than their adult counterparts (around 600g as a maximum) and it should be introduced and fed over a longer period – starting ten weeks before lambing.

At this stage ewe lambs may be changing their teeth (Appendix I, Fig 116) and this can affect their ability to eat root crops or silage.

Nutritional Calendar

The key to successful supplementary feeding is to target it accurately at peak production periods.

There are seven periods in the ewe's nutritional calendar.

- Weaning to flushing (dry period).
- Flushing (ovulation).
- Tupping and the first month of pregnancy (ovum implantation).
- Mid pregnancy (placental growth).
- Late pregnancy (foetal growth and milk).
- Early lactation (milk).
- Late lactation to weaning (maintaining milk).

Dry Period

The dry period can last up to ninety days. After weaning, ewes can scavenge short pastures while their milk dries up but beware that they are not forced to eat poisonous plants from the hedges.

Ewes that are too fat or too thin (Fig 39) when they go to the ram may be barren or have fewer lambs and have health problems later in pregnancy, such as pregnancy toxaemia. At the start of tupping, lowland ewes should be in condition score (CS) 3–3.5, upland ewes 2.5–3 and rams 3.5–4 (*see* Appendix II).

At eight to ten weeks before tupping, any thin ewes with CS2 or less should be put on good grass and fed up to 450g of concentrates per head per day. Those at CS2–2.5 should improve on good grass alone. An improvement in condition from CS2.5 to CS3.5 represents a gain of about 6kg in body weight.

Fat ewes that are CS3.5 or higher should be kept on poor grass. Very fat ones (CS4–5) can be slimmed on a straw diet with protein pellets.

Splitting the flock into groups for separate feeding is not easy on a small farm but it is worthwhile. It is important to handle the ewes regularly during this period to monitor their condition.

Flushing

Three weeks before tupping the ewes should be in ideal body condition and the whole flock put on good grazing for flushing. Avoid swards with high legume content (especially red clover) because the high phytoestrogens can affect fertility.

Flushing (improving the nutrition of the flock) has the effect of increasing the ovulation rate in the ewes – possibly because it suggests to them that times are good and they can risk having extra lambs. But if extra lambs are not wanted – such as in hill ewes or ewe lambs, they should not be flushed but simply kept on continuous good feed. Some breeds are more responsive to flushing than others.

Flushing can be achieved on grass of around 6cm high and supplementary feeding is only necessary for thin ewes or when grass height is less than 4cm. No ewes, not even fat ones, should be allowed to lose weight during this period. Rams also need flushing.

Fig 39 Condition scoring a ewe. Feel the transverse processes (see Appendix 11) to identify how much fat she is carrying.

Mid-Pregnancy

In mid-pregnancy the foetus is only 15 per cent of its final birth weight but the placenta – which nourishes the foetus – makes 90 per cent of its growth and is vulnerable to under-nutrition. The placenta provides all the nutrients for the unborn lamb, so poor placental development will result in small lambs. Ewes at condition score 3.5 can be maintained on grass or on a diet giving an ME of 8MJ/day and used to tidy up winter pastures, but bad weather can increase maintenance demands by 50 per cent. A loss of 0.5 in condition score can be tolerated by ewes (but not by ewe lambs) but it is better practice not to deplete fat reserves. If ewes are to be housed this is a good time to introduce them to hay.

Late Pregnancy

In late pregnancy there is fast foetal growth – putting on some 70 per cent of birth weight in the last six weeks. This is when both energy and protein demands are at their highest to grow the foetus and the mammary tissue. Inadequate feeding now can result in pregnancy toxaemia, small lambs, high lamb losses, poor colostrum (thin and pale) and milk supply and poor mothering instincts.

The uterus – filled with the foetus, placenta and fluids – is competing with the rumen for space and the rumen is the loser. The uterus can fill 60 per cent of the abdominal space, so the ewe is restricted physically in the amount she can eat. She will need a highly concentrated energy source such as a compound of ME 12.5MJ/kgDM and CP 16–18 per cent.

In the last three weeks of pregnancy high-quality concentrates that include UDP should be fed. A ewe supporting multiple foetuses cannot eat enough energy to meet her demands at this stage and must mobilize her own body fat to produce energy; the UDP supplies protein for foetal and metabolic development.

Ewes in late pregnancy have a loss of appetite and can quickly go off their feed, so it is important not to over-feed concentrates – a temptation when a heavily pregnant ewe looks a bit thin. Nor should low-quality roughage be balanced by over-feeding concentrates; improve the roughage instead. This is the time to feed the best hay or silage. If straw is the only forage, a compound that includes significant levels of digestible fibre (such as sugar beet feed) is necessary.

The key to feeding ewes in late pregnancy is:

- Increase feed steadily.
- Avoid over and under feeding.
- Improve quality of roughage.
- Try to maintain CS 3.5.
- Do not allow any to lose more than CS 0.5.

Early Lactation

Early lactation is the time when ewes may metabolize their own body fat and because of the huge energy demands of lactation they lose condition. In very productive sheep this phenomenon of 'milking off the back' is almost impossible to avoid and is acceptable.

Continue feeding the pre-lambing ration for three to four weeks, by which time the ewe's milk production will have begun to decline. Then, assuming the flock is on grass, roots or good forage, steadily reduce the daily ration of concentrates and discontinue after six weeks. Where there is adequate spring grass (7cm) supplementary feeding can be stopped earlier

Nutrition for lambs is covered in Chapter 10.

Table 6 Guide to Condition Score in Ewes

	Hill ewes	Lowland ewes	
		Outdoors	*Housed*
8 weeks before tupping	2.5–3.0	3.0–3.5	
Mid-pregnancy	2.5	3.0	
Late pregnancy	2.5–3.0	3.5–4.0	3.0–3.5

This is a general guide. There are variations between breeds.

6 Grassland and Crops

Grassland is the major source of food for sheep. Grazing is the cheapest way to use it and summer surpluses can be conserved as hay or silage for feeding in the winter. One hectare of good grassland can support, throughout the year, ten ewes and their lambs producing around 300kg of lamb carcass or around seventeen finished lambs.

The best pastures for grazing are those with the most leaf and least stem and those containing clover (Fig 40). The most leaf grows in the spring and early summer before the grass has gone to seed. The metabolizable energy (ME) of spring pasture can be 10.6 declining to 9.6 by late summer and to 8 during the winter. Winter grass is leafy because it does not seed, but it is not necessarily nutritious.

Measuring Grass

Grass survives by reproducing and once it has flowered (headed) and set seed the leafy growth declines. Management should discourage seeding by regular grazing and cutting to keep the sward at an average height of 4–6cm.

A simple management aid is to measure grass height with a ruler (Fig 41). The height of green leaf (ignoring stems and seed heads) is measured at forty random points in the field. The height indicates when stock should be moved (under 4cm), when a field is ready to graze (6cm), or when suckling ewes can have compound feed reduced (7cm). (*See* Chapter 5, Table 5.)

Target sward heights for grazing are:

Spring	
lambing	4–5cm to promote milk.
early lactation	6–7cm to reduce compound feeding.
Summer	6cm to prevent seeding and keep leafy.
Autumn	8cm for flushing; less risk of seeding.
Late autumn/	3–4cm to avoid
early	winter winter burn.

Controlling Grass Growth

Average grassland production is around 10–15t DM/ hectare/year, but sometimes more than half has grown by late spring; Fig 42 shows a typical growth curve. Grassland should be managed so as to flatten or utilize the peaks and to extend the grazing season. Ways to do this include:

- Resting the grazing area during the winter.
- Frequent grazing early in the season.
- Choosing an appropriate grazing system.
- Sowing a mix of grasses with different growth patterns.
- Inclusion of clover – which peaks in midsummer and remains digestible longer in the autumn.
- Conserve peaks as hay or silage.
- Bring in extra stock to graze surpluses.
- Put on fertilizers to encourage growth when it is wanted.

Fig 40 Good basic pasture with a mixture of ryegrass and clover. To get the full benefit from nitrogen fixation and feed value, some 30–40 per cent of pasture (when viewed from above) should be clover.

Fig 41 To measure grass height, stand a ruler on the ground, slide a finger down until it touches a green leaf – ignoring stems and seedheads – and read off the height.

The grazing area should be rested during late winter otherwise growth will be reduced in the spring by 20 per cent; so any grass needed for spring lambing should not be grazed after mid-winter. The flock can graze fields intended for hay until eight to ten weeks before the crop is cut (*see* Hay later).

Frequent grazing reduces the total quantity of pasture but improves the quality and encourages clover. The target height of 4–6cm should prevent overgrazing – which leaves bare patches for weeds to colonize – and under grazing which allows the grass to go to seed. As soon as grassland grows ahead of the flock it should be topped off mechanically with a mower or closed off for conservation as hay or silage.

The closer the pasture is grazed, the longer it takes to recover. In spring it can be grazed close because it grows quickly, but do not overgraze otherwise sheep will eat out the palatable plants and leave the less palatable to take over. As summer progresses it should not be grazed to less than 4cm. In early winter, grass that will be rested until the spring can be grazed hard to remove dead vegetation plus green leaf that would otherwise be burned by winter winds. After grazing it can be chain harrowed to spread dung and to remove debris and decayed grass.

Grazing Systems

Good grazing management should ensure:

- Sheep have a constant supply of grass.
- The palatable species do not get grazed out.
- The grass does not get too fibrous.
- The sheep are content.
- The grassland remains productive.

There are several systems for grazing sheep. The one selected will depend on many factors, including access to water, but, invariably, it will be a compromise among:

- Set stocking.
- Rotational grazing.
- Strip grazing.

- Forward creep grazing.
- Mixed grazing.

Sheep that are set stocked graze one area for the whole season. Any fertilizer is put on a different third of the area on three consecutive weeks – preferably when rain is imminent. Under this system, judging the quantity of grass and adjusting the stocking rate are difficult but swards should be kept between 4–8cm.

Rotational grazing involves a number of similar sized areas that the flock grazes in rotation (Fig 43). As each area is vacated it can be topdressed with fertilizer. Grass height (4–5cm) indicates when to move the flock and when to close areas for conservation. Sheep can get restless on this system, which conditions them to moving regularly.

Strip grazing is used in an intensive grassland system and where root and other forage crops are being grazed. Electric fencing is erected across a field to ration the grass and is moved each day to introduce a new strip. The grass can be grazed lightly to give the flock the best, or grazed hard to control it. Sheep get very restless on this system and it is labour intensive.

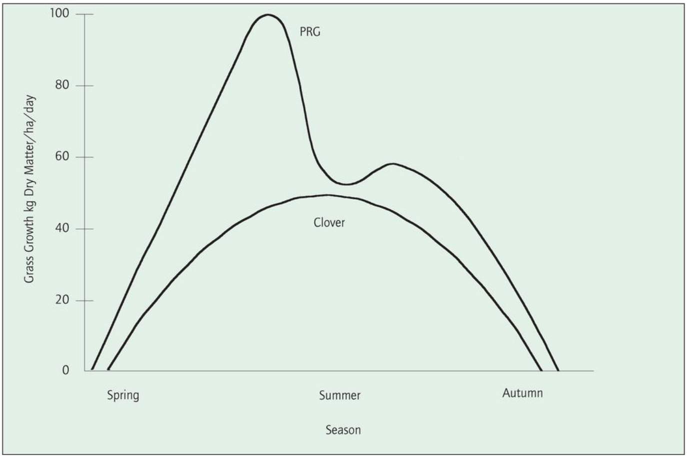


Fig 42 The seasonal production of perennial ryegrass (PRG) and white clover. Most of the grass growth is in the first half of the grazing season. The peak can be flattened by regular grazing (every fourteen to twenty-one days) or by growing varieties which have a range of heading dates (the date when the ear of the grass emerges) or removed for hay or silage. Clover growth peaks in the summer and complements the growth pattern of grass.

Forward creep grazing (Fig 43) gives lambs the pick of the grass ahead of the ewes. They access the next grazing area through a creep gate with vertical bars which admit lambs but not ewes. The gate must be sturdy otherwise the ewes destroy it. The system is intended to improve lamb growth rates but results tend to be mixed and it can cause restlessness and create mud around the gateway. Single lambs are said to creep graze more readily than twins; twins share their milk supply and are reluctant to stray far from their mother in case they miss an opportunity to suck.

Mixed grazing is practised under most grazing systems and conventionally means grazing beef cattle and sheep and also horses. Cattle graze by tearing with their tongues and prefer long grass whereas sheep graze by biting and prefer short grass. Therefore the two species complement each other and utilize more grass. They also graze each other's soiled grass.

Grazing Behaviour

Sheep graze eight to nine hours a day and up to a maximum of thirteen when feed is short. Grazing seems to be controlled by light and is concentrated around the first four hours after dawn and the last four hours around sunset. The implication is that if sheep are yarded at night they should be brought in after their evening session and let out before their dawn session.

Soil Fertility

The important nutrients for grassland include nitrogen (N), phosphorus (P), potash (K) plus magnesium, sulphur and sodium. The soil should be analysed every three or four years so as to correct any deficiencies or to avoid an over-use of fertilizers which is uneconomic and can cause an imbalance of nutrients. Fertilizer companies and agricultural advisors arrange soil analyses and recommend fertilizer policies. On grazed land most nutrients are recycled and only modest dressings are needed to replace nutrients removed in meat and wool; where grass is cut for conservation larger replacement dressings are needed.

Soil nutrient status is generally described by an index of 0–3; the lower the figure the less nutrient there is.

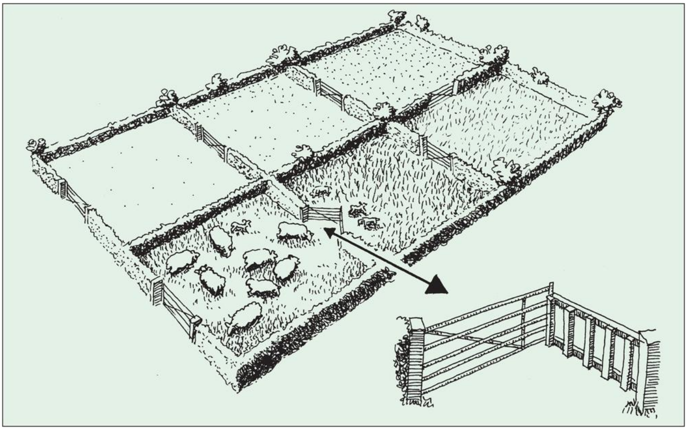


Fig 43 Rotational grazing and forward creep grazing. For rotational grazing the area can be divided into six, each one large enough to graze the flock for about four days – thus a complete rotation will take about twenty-four days. If needed, the last area to be grazed can be topdressed. Where grass growth is excessive, one area can be closed for conservation and the cycle changed to five days per area. Where areas are adjacent, forward creep grazing can be practised; creep gates are put in the fence or incorporated in a partly opened gate. About 25cm gaps in the creep gate are adequate for lambs of most breeds. Some of the small primitive and rare breeds may need smaller gaps to prevent ewes getting through. Creep gates must be strongly built and anchored to withstand determined ewes.

Liming

Soil acidity is described in terms of pH – the higher the pH figures, the less acid will be the soil. Very acid soil is pH 4.5 and neutral is 7.0. Most grassland needs a pH of around 6 and fertilizer put on low pH grassland is usually wasted.

Acidity is corrected by lime. Ground limestone and other liming agents are relatively inexpensive and soil pH tests are made by companies that sell and spread lime. The product is put directly onto grassland or on cultivated soil at any time of the year. As well as reducing acidity, lime will improve soil structure and biological activity and increase the availability of certain plant nutrients. Over-liming, on the other hand, can cause mineral imbalances and deficiencies.

About 5 tonnes of lime per hectare should raise the pH by 0.4 units, but there is no point in applying more than this in one season because it takes nine to twelve months for the pH to increase.

Some sources of lime, such as calcified seaweed, are popular with small farmers because they can be applied by fertilizer spreader, but these products are coarse and do not correct acidity so quickly as limestone and are best used annually to maintain pH. Yorkshire fog, lawn daisy, dandelion, moss, plantain, mayweed and sorrel in grassland tend to indicate acidity.

Using Fertilizers

The nutrient requirements of soil are expressed in terms of kg/hectare. The nutrient contents of fertilizers are expressed in percentages. It is necessary to reconcile the two in order to know how much fertilizer to buy.

A common grassland fertilizer is expressed as a ‘21:8:11’. The figures represent N, P and K content respectively, and their percentages. So this fertilizer contains 21 per cent nitrogen, 8 per cent phosphate and 11 per cent potash. If the bag holds 50kg the amount of soil nutrients in each bag are:

N (21 per cent of 50kg) = 10.5kg

P (8 per cent of 50kg) = 4.0kg

K (11 per cent of 50kg) = 5.5kg

This means that putting it on at the rate of three bags per hectare gives the grassland 31.5kg of nitrogen, 12kg of phosphate and 16.5kg of potash.

An average clover/grass pasture with average P and K reserves for a spring lambing flock carrying about ten ewes per hectare might need total annual dressings of 100–120kg N, 36kg P and 36kg K, per hectare respectively.

A basic programme for grassland could be:

Early spring 25–30kg/ha N for early growth (Some P could be applied now)

Late spring 25–30kg/ha N and 12kg P. N sustains growth. Grass responds to P in the spring because only the surface roots are active and they cannot seek out soil phosphate.

Early summer 25–30kg N, 12kg P, 18kg K. K is needed on conservation areas. N to sustain growth.

Late summer 25–30kg N to extend grazing for flushing and finishing lambs. 12kg P, 18kg K to top up soil reserves.

High nitrogen applications are not recommended for hay because the lush grass is difficult to dry, but where extra N is used it should be matched by the same amount of extra K.

Nitrogen

Nitrogen has a dramatic effect on grass. It behaves like a tap – turning grass growth on and off – and generating lush green leaf. An early application in the spring encourages grass for ewes at turnout but excessive use leads to sappy plant growth and scouring.

Nitrogen comes from four sources:

- Soil.
- Clovers and other legumes
- Recycled in dung and urine.
- Fertilizers.

Soil reserves are usually highest in land that is grazed.

Clover roots grow nodules containing bacteria that ‘fix’ atmospheric nitrogen for use by the clover plant. As the old roots die some of this nitrogen becomes available to companion grasses. Clover can fix up to 160kg of nitrogen per hectare.

Sheep recycle about 90 per cent of the nitrogen they consume – 60 per cent in the urine and 30 per cent in the dung.

Nitrogen is usually available in bags of a nitrogenous fertilizer, most commonly in the form of ammonium nitrate.

Grass begins to grow when the daytime air temperature reaches around 10°C or the soil temperature is 5.5°C at a depth of 10cm. The first nitrogen fertilizer can go on two weeks before this or, as a rule of thumb, six weeks before the expected grazing date. But because
nitrogen is wasted on grassland which is not growing, a more accurate way to time the first application is the Dutch T-sum method:

- Record the average daily air temperature in centigrade from 1 January (in the northern hemisphere).
- Ignore minus figures.
- When the figures add up to 200, nitrogen can be applied.

However, the decision to apply nitrogen should also take into account:

- The soil conditions (no good if waterlogged or damaged by tractor tyres).
- The weather forecast (no good if it is going to turn cold).
- When the grass is needed (no point in growing it too early).

Nitrogen is usually applied little and often on grazing land. The bulk is spread early to promote early growth and late to extend the grazing season for flushing.

Phosphate and Potash

Nitrogen is applied to give a quick response and any residue at the end of the growing season may be wasted. Phosphate and potash, on the other hand, are applied to maintain levels in the soil from year to year.

Both are necessary for root development and plant growth and can be applied with nitrogen in compound fertilizers that are formulated to provide a balance of nutrients (*see* box). The timing of phosphate and potash applications is less critical than for nitrogen. However, potash should not be applied in the spring on land that is being grazed by lactating ewes because it can reduce the availability of magnesium and trigger hypomagnesaemia.

Much of the phosphate and potash is recycled by the grazing animal – phosphate in the dung and potash in the urine – but hay, silage and growing lambs remove considerable amounts that need replacing. Around one hundred standard bales of hay can remove 85kg of potash.

Organic Fertilizers

Organic fertilizers tend to release nutrients slowly to sustain growth rather than produce dramatic growth. Because the nitrogen is less soluble than in inorganic fertilizers it is less easily leached (dissolved and removed) by rain. Most provide extra minerals and trace elements and promote bacteria and earthworm activity.

Where farmyard slurry is used, the timing and the quantities may be controlled by legislation to prevent water courses from being contaminated.

Grasses and Clovers

Grazing pasture contains a mixture of grasses and clovers (Fig 45) which can survive persistent grazing. They do this by having a prostrate growth habit (Fig 44) to protect the growing points from being eaten. They should also have a wide range of heading dates (date when the ear or seed head emerges) so that leaf production is spread throughout the season. Grassland for conservation, on the other hand, has a narrow range of varieties and heading dates because the crop is harvested at one time. Owners of small flocks will probably compromise and use a seed mixture that is suitable for both grazing and cutting.

Perennial ryegrass (PRG) is an important grass species and has a wide range of heading dates. It forms a dense sward, survives hard grazing and is suited to long-term pastures (*see* later). Italian ryegrass, on the other hand, has a shorter life, early growth and is best suited to early grazing and conservation in short-term pastures, usually associated with dairy cattle.

Timothy is winter-hardy and grows well in cool, wet areas; cocksfoot has a strong root system and thrives on light or droughty soils; meadow fescue tolerates a range of climatic conditions and low fertility.

Seed merchants are a good source of advice on grassland through their sales leaflets. They design grassland mixtures to suit the locality, the soil, the purpose, the grazing systems and the level of fertilizer inputs.

Clover

White clover is palatable, survives persistent grazing, is high in energy, protein, minerals and vitamins and it fixes nitrogen. Trials show that lambs gain weight 20 per cent faster on a clover sward than on pure grass, but sheep must have gradual access to swards with a high clover content to prevent digestive upsets such as bloat. It contributes up to 160kg of nitrogen per hectare and has a higher and more stable feed value than grass, but is more temperature-sensitive and grows later in the spring.

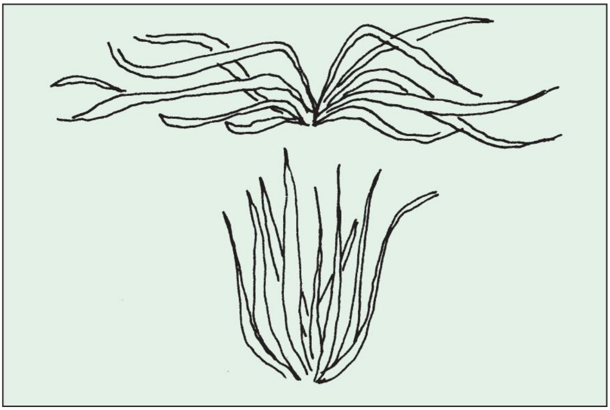


Fig 44 The growth habit of ryegrass. The prostrate varieties (above) are better for grazing; their growing points are less prone to being eaten than in the erect varieties (below) which are better for conservation. Seed

mixtures can include a range of ryegrasses which extend the grazing season and allow pasture to be used for both grazing and conservation.

Clover should comprise about 30–40 per cent of the sward when viewed from above. This can sustain ten ewes per hectare without extra nitrogen but for higher stocking rates, or to grow grass for conservation, the best compromise is to apply an annual total of 120kg of nitrogen per hectare in four equal applications during the season. High levels of nitrogen fertilizer reduce clover by encouraging excessive grass to shade it; grassland should be managed to keep clover exposed to sunlight, especially in the summer, while grass is kept at 4–6cm in the winter to protect clover stolons from frost.

Fig 45 Common species used in productive pastures in temperate areas.
*1. Timothy (*Phleum pratense*).*
*2. Cocksfoot (*Dactylis glomerata*).*
*3. Perennial ryegrass (*Lolium perenne*).*
*4. White clover (*Trifolium repens*).*

Getting the Best from Grassland

- Keep it leafy by grazing, conservation, topping or adjusting stocking rate.
- Keep at the optimum height.

- Encourage productive grass species and clover.
- Avoid overgrazing and poaching.
- Keep out weed infestations by maintaining a dense sward with no bare patches.
- Have regular soil analyses.
- Keep soil nutrients and pH at appropriate levels.
- Improve drainage if necessary.
- Adopt a grazing system that suits the sheep and benefits grass management.
- Make best use of the seasonal surpluses.
- Extend the grazing season at both ends.
- Do not graze too late in the winter.
- Keep field records.

Seed merchants formulate mixtures for high clover pasture. Those containing 20 per cent clover seed can give 30–50 per cent clover growth in the pasture, peaking in midsummer and sustainable for at least five years. Only one light dressing of nitrogen is needed in early spring to get the grass growing before the clover is active.

White clovers are classified by leaf size:

- Small – low yielding but persistent, giving good ground cover to keep out weeds.
- Medium – higher yielding and grows earlier in the spring.
- Large – high yielding but may not suit hard grazing.

Red clover is less tolerant of grazing and its high oestrogen content reduces ewe fertility and may induce udder development in dry sheep, although small quantities are unlikely to be a risk.

Other Grazing Crops

On acid soils, where clover will not thrive, trefoil – a member of the clover family – is finding a niche. It tolerates soils of pH 5 and less, fixes nitrogen and survives lax grazing. It needs a non-aggressive grass companion. Making a comeback is sainfoin, a highly palatable forage legume with a high protein content that produces quality grazing and hay. In a similar category is lucerne (alfalfa).

Perennial varieties of chicory, whose deep tap roots bring up minerals and moisture from the soil, are gaining popularity. The crop can be grown alone, with clover, or in a grassland mixture where it can remain productive for four to six years. Lambs grow well on the crop and it is thought to reduce parasitic gut worms. Trials indicate that it should be grazed at 20cm and sheep removed at 8cm.

Types of Pasture

Grassland is usually classified by life expectancy. Permanent pasture is normally found on an all-grass farm and is grassland that is not in an arable rotation. With significant perennial ryegrass content it is productive, can resist poaching and drought and is cheap to maintain, but needs good management to stay productive.

Long-term leys are expected to last for more than five years; medium-term for three to five years and short-term for one to three years. Short-term leys are used in rotation with other crops and are usually based on Italian ryegrass that gives early growth but are more suited to conservation than to persistent grazing.

Because ploughing and reseeding is expensive, long-term and permanent pastures have a cost advantage, but pastures that are in a rotation allow weed, disease and pest cycles to be broken.

Fig 46 Unproductive grassland with unpalatable dead grass. This is an ideal candidate for hard grazing then over-seeding with ryegrasses and white clover to improve productivity.

Improving Grassland

Grassland which is not very productive can be improved by:

- Management techniques.
- Over-seeding.
- Reseeding.

Neglected and under-grazed grassland (Fig 46) that contains around 50 per cent ryegrass is improved by topping or hard grazing – to remove grass stems and weeds – and by harrowing to remove matted grass and debris at ground level. Nutrient deficiencies and drainage problems should be corrected. Persistent weeds such as bracken, docks and nettles and creeping grasses and thistles that spread by underground or prostrate stems (rhizomes and stolons), will need regular topping or spraying with a herbicide.

After this, hard grazing will encourage ryegrass to tiller (produce new shoots), become dominant and replace unproductive grasses.

Over-seeding

Pastures which have less than 50 per cent ryegrass and are dominated by 'weed' grasses can be improved by over-seeding. So-called weed grasses, such as Yorkshire fog (*Holcus lanatus*), annual meadow grass (*Poa annua*), Crested dogstail (*Cynosurus cristatus*), common bent (*Agrostis tenuis*) and soft brome (*Bromus mollis*), are low yielding, have a high stem to leaf ratio, can be very invasive and are unresponsive to nitrogen; on the other hand they are useful on poor soils. Palatable weeds such as dandelions and young docks can provide variety and valuable minerals in the diet.

Small areas can be over-seeded by the 'scatter and tread' technique. Scatter a vigorous perennial ryegrass mixture on the moist surface after close grazing, preferably in late spring or autumn and let the flock tread it and graze for two to three days. The technique is a gamble because the seeds need quick treading followed by two weeks of continuing moisture – but not too wet – to allow them to establish. Grazing may be resumed after five weeks.

This system is also used to increase the clover content of a pasture – sowing small-leaved white clover. Use a high seed-rate (4kg/ha) and sow in moist conditions after the grass has flowered and has lost its vigour.

Over-seeding is also useful where weeds have been killed, leaving bare patches. Nettles and thistles shade productive grasses, take space and are unpalatable. They can be rogued (pulled by hand), or spot sprayed with a knapsack sprayer or watering can. Observe withdrawal periods for livestock on any treated areas and wear the recommended protective clothing when spraying.

Larger areas, which are difficult to cultivate or cannot be taken out of production, may be over-seeded using machinery. Early autumn and spring are suitable times; autumn-sown clover can be hit or miss, but it may go dormant and then germinate when the conditions are right.

Correct the soil pH and topdress with 12kg N, 60kg P and 60kg K per hectare and drill or broadcast the seeds. Bare soil is chain harrowed and seeds that are broadcast are rolled, but those that are drilled may not benefit from rolling because it closes the slot and delays germination. Continue grazing to tread the seed.

Over-seeding is best with quick growing species such as tetraploid ryegrasses but include some slower growing species in the mixture. Aim for a sowing rate of 22kg per hectare or two-thirds of the full reseed rate.

Pasture can also be renovated by sod seeding or direct drilling. This is usually done in the autumn by a specialist contractor who drills seeds direct into the pasture after it has been grazed short and perhaps partially desiccated by chemicals such as glyphosate.

Reseeding

New swards are established in spring or autumn because summer drought or winter cold will kill the crop if it is sown outside these periods. Old pasture is best ploughed in the autumn and left to break down over winter, but to destroy weeds and to break the cycle of disease it is useful to grow a break crop such as kale or rape (*see* later) before reseeding with grass.

Soil acidity should be pH 6 and the potash and phosphate levels should be corrected by topdressing the seedbed with around 60kg per hectare of each (depending on the soil analysis). The final seedbed must be fine and firm and the seeds can be broadcast with the fertilizer from a fertilizer spreader, or drilled. Graze lightly and quickly as soon as there is enough useful growth – after six to ten weeks, depending on the season – to encourage tillering, to bite off annual weeds and to consolidate the ground.

Field Records

Keeping field records is as impds. Some or all of the following information will help to plan grazing and identify the productive fields.

- Field name or number.
- Field area (hectares).
- Dates and duration of each grazing period.
- Sward heights and dates.
- Dates of first and last grazing for season.
- Number of sheep grazing days (Number of sheep × number of days grazed).
- Fertilizer applications – dates, analyses and quantities.
- Conservation – when closed number bales when aftermath available
- Date and results of soil analyses.
- Dates when cultivated and reseeded.
- Fertilizer, seed mixtures and quantities used in reseed.

Drainage

Poor drainage is no good for either grassland or sheep; neither will thrive when their feet are permanently wet. Minor water logging may be due to soil compaction by regular treading. Ploughing to the same depth for many years creates a hard pan under the soil surface that impedes the drainage of surface water and reduces root development.

Grass roots should be able to go down 30cm or more. Check it out with a spade. Dig a hole at least the depth of a spade where the soil is moderately damp and see how far down the roots and moisture extend. A specialist drainage company can advise on correcting any problems.

Conserving Grass

Excess growth in the summer is cut and saved as hay (dried grass) or silage (pickled grass) for feeding in the winter. This also keeps grassland under control and the aftermaths offer fresh grazing for finishing lambs or for flushing ewes.

Hay

Hay is easy to store and feed and one hectare can provide enough for a thirty-ewe flock for the year.

Sheep are taken off the grassland that is intended for hay about eight to ten weeks before the crop is cut. The best time to make hay is during the longest days, so in the northern hemisphere the grass will be ‘closed’ for hay in early April and cut during the third week in June.

The grass is cut when it begins to flower – that is, when it begins to shed pollen from the seed heads. If it is cut earlier the quality of the hay may be higher but the yield will be lower. It then needs five consecutive days of fine dry weather during which time it is turned two or three times to dry it evenly. It is baled when it feels dry, rustles and is easily broken (20 per cent moisture). After baling and storing, the hay continues to cure and heat slightly but if it is damp (24 per cent moisture) it heats up excessively and may cause a fire.

It is usually best to employ a contractor to do the job although a flock owner with a small tractor might reduce costs by investing in a hay turner and letting the contractor cut and bale the hay.

Haymaking is weather-dependent, very time consuming and unpredictable. Unless organic hay is wanted it is often easier to shop around and buy it. Normally it is cheaper to buy straight out of the hay field but check first how big the bales are; large bales are not very convenient. Beware of any that is made late in the season because it may contain weed seeds, thistles and poisonous ragwort.

The best hay has a high clover and leaf content, minimum stem and a green tinge. It should not be dusty or smell mouldy. Hay that has been made during a spell of wet weather will have had nutrients washed away and may be dark and dusty. This dust may contain spores of *Micropolyspora faeni* that, as well as affecting sheep, will cause a crippling condition in humans called Farmer's Lung.

Sheep eat about 1.5kg per head per day of hay (plus some waste) and although flocks that graze winter forage crops may need very little, budget for ten bales per head per year to provide for a hard winter, or for a dry summer when hay may have to be fed to supplement grass. Hay stores quite well and it is wise to carry some over from each year. Standard bales weigh 20–30kg (thirty-three to fifty bales per tonne) and large bales weigh around

500–600kg. An average crop of grass should produce around 250 standard bales per hectare.

Silage

Silage is grass that is pickled in acid produced naturally by fermentation in anaerobic conditions. Grass should be cut on a sunny dry day and wilted for twenty-four to forty-eight hours to reduce the moisture content. It is made either by compacting wilted grass in a clamp and excluding the air or compressing it into big bales that are made air-tight by being wrapped in polythene. Again, this is a job for a contractor. Quality silage has an ME of 10.5 and sheep eat it readily, but poor quality baled silage has been associated with listeriosis, probably due to soil contamination which introduces harmful bacteria.

For the small flock on an all-sheep farm, silage is difficult to justify because it is awkward to handle and once a store is open it deteriorates quickly. Silage is fed at around 3.5kg per ewe per day so a thirty-ewe flock would take several days to eat a 0.5 tonne big bale which, once open, may become inedible before it is eaten.

Owners of very small flocks ensile surplus grass in plastic bin bags. It should be made in the summer when it is warm and the sugar levels (important to fermentation) are high. Mow with a lawnmower then wilt until no moisture can be squeezed from it; pack into airtight dustbin bags, squeeze the air out of the bags and seal the ends with a tie or fold over and use a castrating ring and applicator.

Foggage

Foggage, also known as autumn saved pasture (ASP) or stockpiled grass, is a form of conservation which provides relatively cheap feed for out-wintered ewes. Traditionally, well-drained permanent pasture is topped or grazed hard and closed off just before the flush of autumn grass. Tall fescue, cocksfoot and perennial ryegrass are good species for the system and a moderate dressing of nitrogen may improve cold-resistance, yield and quality and may leave residual nitrogen for a response in the spring. It is best utilized by strip-grazing, leaving some 5–6cm of stubble. It is suitable for nonproductive animals or ewes in mid-pregnancy. Stock should come off when active grass growth begins.

Other Crops for Sheep

Root and forage crops such as swedes, fodder beet, stubble turnips and rape and kale complement grassland. They not only feed ewes and lambs during lean periods but provide a break in the grass to control weeds and disease.

Forage crops such as stubble or Dutch turnips, forage rape and kale are called 'catch' crops and give cheap forage within ten weeks of sowing. They are broadcast at any time from spring to late summer to provide grazing until mid-winter, or the land can be re-grassed in the autumn. One hectare can give six to eight weeks' grazing for sixty lambs but there is considerable waste due to trampling unless it is strip grazed.

Forage crops are grazed *in situ* but a 'run-back' area to grass or a yard must be provided to give a clean, dry lying area and to allow sheep to be introduced gradually onto the crop. They are best suited to free draining soils. Hay should be provided in racks to ensure that sheep have sufficient dry matter intake on these low dry matter feeds.

A local farmer may be willing to grow a forage crop on his land; it would provide a break in his rotation, improve soil fertility and give him a cash crop. Agree a price beforehand;

the yield cannot be guaranteed so paying a sum per head per week of grazing ensures that you get what you pay for.

Root crops such as swedes and fodder beet (Fig 47) provide winter and spring feed because they can be lifted and stored. A hectare of swedes can feed sixty lambs for eighteen weeks and 8kg replaces 1kg of barley. Fodder cabbages provide excellent winter feed and are either grazed in situ or cut and carried.

These crops occupy the whole growing season. Most are drilled in late spring, fed during the winter and the land prepared for reseeding in the following spring.

Fig 47 Fodder beet is an excellent crop for the small flock. High yielding and nutritious, it is a cross between the mangold and sugar beet. It lends itself to full mechanization or hand cultivation and can be grazed in situ or stored and fed from early winter through to spring.

Fodder Beet

Fodder beet is a perfect crop for the small flock. A close relation of sugar beet and mangold it is succulent, palatable,
high in energy, high yielding and can replace some of the concentrate ration for pregnant ewes and store lambs.

Sown in late spring in a good tilth with a soil pH of 6.5 they are usually lifted in early winter before being frosted and will store until the following spring or can be grazed *in situ* in mild regions. Sowing, weeding, lifting and storing can either be done by hand or can be fully mechanized.

At lifting the tops should be trimmed off to prevent deterioration in the store; tops can be fed to sheep but should be wilted for four days to reduce the oxalic acid content. The roots store well in a straw-covered clamp protected from the frost.

Fodder beet can be fed whole on the ground but young ewes that are changing teeth and old ewes with loose teeth may need them roughly chopped. Avoid soil contamination and feed them with hay, silage or straw at about 60 per cent of the total daily dry matter intake otherwise they may cause scouring.

Fodder beet will give a total yield of around 90t per hectare so, fed at 5kg per head per day, 0.25 hectares will feed a thirty ewe flock for more than twenty weeks.

The crop has relatively few disease problems but can be affected by eelworm.

Agroforestry

Agroforestry is the integration of trees and farming. Sheep, especially the Shropshire breed, integrate well with trees, despite their tendency to browse, and are often grazed in orchards, forests and vineyards They have been run successfully on Christmas tree plantations where they are introduced when the trees are two years old; the key to success is to avoid over-stocking or letting them run short of grazing.

Trees for agroforestry are planted at 5m or 10m intervals and protected by 1.5m plastic tubes; this spacing allows enough light to maintain good grassland. The sheep control the weeds, reducing the need for herbicides or regular cutting; the trees provide income and shelter.

7 Wool and Shearing

On many sheep farms the fleece takes second place to meat production. The development of man-made fibres has reduced the economic importance of wool worldwide.

One result is an interest in wool-less breeds. Easy Care sheep such as the Wiltshire Horn and Exlana have some wool but shed it naturally and Hair sheep, often tropical breeds, have virtually no wool. These types save the cost and inconvenience of shearing and reduce welfare problems such as fly strike, wool diseases, casting and docking.

However, as a natural resource, wool may regain its position in the global fibre industry and return to its economic importance. With that in prospect, sheep producers may find it worthwhile to make the most of their wool by:

- Managing and feeding to encourage wool growth.
- Selecting stock for fleece weight and quality.
- Breeding to eliminate kemp (*see* later), hair and unwanted coloured wool.
- Taking advantage of fleece assessment services.
- Protecting against skin and wool diseases.
- Keeping fleeces clean.
- Using a competent shearer.
- Careful storing to avoid damp.
- Good presentation of fleeces at marketing.
- Adding value through private sales or manufacturing.

Wool is a remarkable, renewable fibre. It is so elastic that it can be stretched repeatedly to up to a third of its normal length and still go back to its original length; this elasticity is the reason that wool garments hold their shape. It can absorb up to 30 per cent of its own weight in moisture but at the same time can repel liquid.

The fleece grows in small tufts (staples) of fibres (Fig 48) and each fibre is wavy (crimped) to give bulk and springiness to the wool. Wool is an excellent insulator because it traps air by this combination of crimp and fine fibre.

There are basically three types of fibre in the adult fleece – wool, hair and kemp. True wool fibres are the finest, kemp fibres are short and coarse and are shed seasonally and hair fibres are intermediate in size. Fig 49 illustrates the differences between wool and hair. Hair is not wanted in a fleece because it causes off-dyeing and will flatten under pressure.

All wool fibres are produced from structures in the skin called follicles (Fig 49) of which there are two types. The primary follicles grow the coarser wool and hair. They appear early in the life of a foetus and at birth are fully developed and are growing fibres. After birth no more follicles are formed, so the nutrition of the pregnant ewe has an important influence on the future wool production of her lamb.

Fig 48 Wool grows in staples and is crimped. Fibres should be even in length and thickness and without hair or kemp.

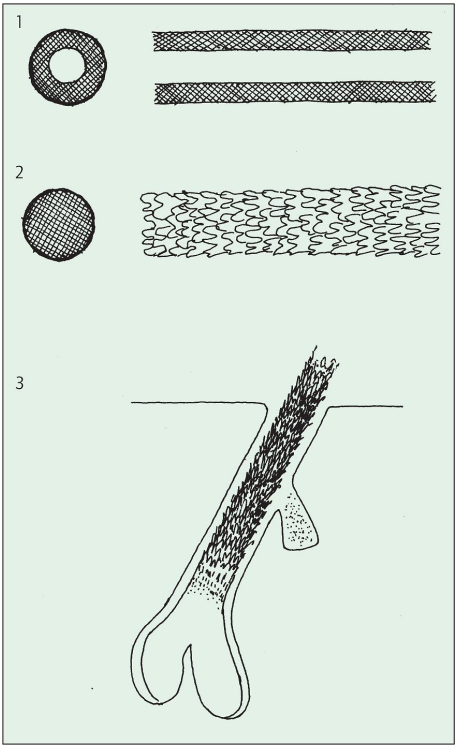


Fig 49 A section of hair (1) shows that it has a largely hollow centre and a smooth surface. Hairs are a problem in fleeces because they fail to dye properly and will collapse under pressure. Wool fibre (2) has a more solid centre and the surface is covered with scales much like roof tiles. Wool fibres are produced by follicles (3) in the skin.

The secondary follicles produce the finer wool. These are not fully developed at birth and continue developing during the first few months of life. This is why some fine-wool breeds are born almost bald and susceptible to hypothermia. They also take longer to complete fleece development. A coarse-wool Romney, for example, might complete follicle development at around one month of age but a very fine-wool Merino lamb could be five months old before all the follicles have developed.

The implication of this is that at birth some lambs have fleeces that are more coarse (stronger) and less woolly than their final fleece. Therefore breeding stock should not be selected for fleece weight and quality until it is at least a year old when the fleece has fully developed.

Wool Growth

Most sheep produce wool in excess of what they need for warmth. Wool grows continuously; even when an animal is starving it will grow wool at the expense of other organs and may continue to grow wool after death. Wool growth is very sensitive to nutrition and the wool follicle responds quickly to a shortage of feed by reducing the diameter of the growing fibres (Fig 50).

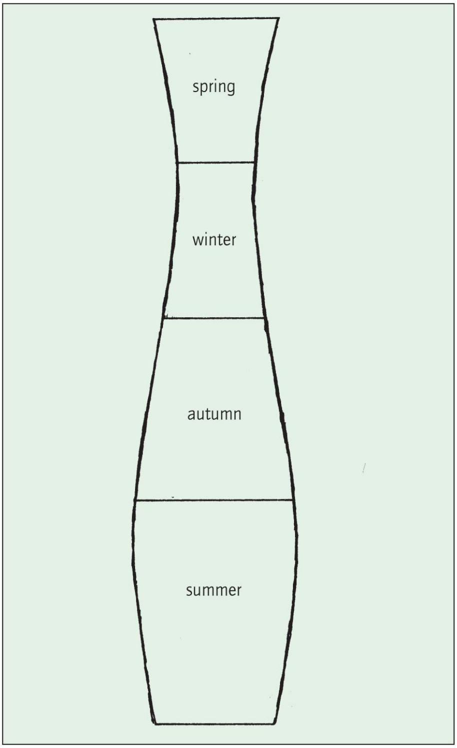


Fig 50 Typical growth pattern of a wool fibre showing seasonal variations in length and diameter. The fibre narrows at times of stress – usually in the winter and during pregnancy – and can result in a severe weakness or break in the fibre.

After a temporary food shortage there is a narrowing of each fibre at the same level throughout the fleece, resulting in a weak area or 'break'. This thinning weakens the wool and affects the manufacturing potential, downgrading the fleece. Some producers shear at around lambing time to ensure that a break caused by the stress of pregnancy will be at the bottom of the fibres and not in the centre where it would reduce the value. Breaks often occur in ewes which have been stressed, but if the problem is widespread in the flock it is possible to judge from the position of the break in the fibre when it occurred and, hence, what might have caused it. ‘Reading’ breaks is one way to monitor flock management.

Wool growth is seasonal and seems to be affected by daylight hours. In British hill breeds, winter growth may be as little as 30 per cent of summer growth.

Age also influences fleece growth; it increases to its maximum at four to five years and then declines – sometimes rapidly.

An increase in energy – as long as protein levels are sufficient – can increase wool growth in just a few days.

The back of the sheep is the area of highest wool production and anything damaging the fleece on the back – such as rubbing or weathering – reduces weight.

Wool Quality

Wool is sold by weight and the prices reflect the quality of the wool and the current market demand. Generally a heavy fleece will be worth more than a light fleece, but quality is important for two reasons:

- Quality attracts a premium price for the producer.
- Quality makes manufacturing easier and encourages a wider use of wool.

Quality is judged from a sample cut from the shoulder or side – the areas that are representative of the whole fleece. The features to look for are:

Good-quality factors:

- Springiness. Spring is due to crimp. A tight, uniform, well-defined crimp gives resilience, easier spinning and garments keep their shape.
- Softness. Is usually associated with fineness and is desirable.
- Staple length. Should be even.
- Colour. Unless coloured wool is wanted for specialist use, white is essential for dyeing a uniform colour.

Poor-quality factors:

- Breaks. Stretch the wool to check for weak areas.
- Kemp and coloured fibres. These restrict the dyeing process.
- Cotting. This is when the fibres become matted like felt.
- Discoloration. Caused by skin disease such as mycotic dermatitis and by weathering.
- Contamination. The whole fleece should be clean.

Managing for Quality

Man-made faults are the scourge of the wool industry and are usually the result of carelessness.

Contamination with synthetic string, excessive marking fluid, dags, earth and moiety (vegetable matter such as straw and hay) are common. In addition, cigarettes, tools, coffee mugs and bits of clothing have all been found in wool sacks. Moiety is difficult to avoid and is worse in housed sheep that are fed hay in overhead hay racks and in sheep outwintered on muddy root crops. In an extreme system of wool production Merino flocks are housed, protected by coats and fed a specialist diet to produce perfect, clean, fine wool.

Damp fleeces deteriorate, so sheep should not be shorn when wet and fleeces must be stored off the ground and away from walls.

Keep identification sprays and paints to a minimum and always use scourable brands. Avoid coloured dips used to tint sheep for shows and sales. Cotting is found on old ewes and those that have been ill.

Disease

Discoloured and damaged wool due to parasites and disease should be controlled by veterinary treatments. Skin diseases spoil the fleece, usually because of excessive itching and rubbing, and cause the animal considerable distress. Lice, for example, can reduce fleece weight by up to six per cent. Mycotic dermatitis, which is rife in wet areas, shows up at shearing as a yellow crust and
stains on the skin and at the base of the wool – usually along the back. In small flocks individual sheep can be treated by clipping the affected areas and rubbing in powdered alum – usually available from pharmacies.

Most skin problems, such as sheep scab, lice, ticks and fly strike are preventable and are covered in Chapter 8. Skins have a value when stock are sold for slaughter and should not be allowed to be damaged by disease, shearing, injections or barbed wire.

Breeding for Quality

Most characteristics of wool are highly heritable, so there is an opportunity to select breeding stock to:

- Raise fleece weights.
- Increase the fineness.
- Eliminate or reduce coloured fibres and kemp.

Wool comes primarily from the ewe flock so attention to fleeces when selecting ewe lamb replacements is important. But a change of ram will make the quickest progress. The British Wool Marketing Board and other organizations offer ram fleece assessment services so that ram breeders can provide a fleece assessment certificate with the animals they sell.

Fleece weight is moderately heritable in most breeds and through selection can be increased by 1.5 per cent a year; it takes eight generations to get a 12 per cent increase. By weighing the fleeces at shearing and then calculating a mean fleece weight for the flock or for individual age groups, individual sheep can be ranked as above or below the average for their group.

To produce fine wool, rams from breeds such as the Merino, Corriedale and Polwarth make quick improvements when used over most breeds of ewe. Generally, sires of a breed with a white face produce crossbred offspring with very white fleeces.

Grey fibres and kemp can be bred out quickly by using rams that do not have these faults. Irregular quality and length are often due to poor selection and too much mixed blood. First crosses give good wool, but mongrels are rarely satisfactory.

Selling Wool

In the UK the British Wool Marketing Board has a statutory obligation to market all the wool grown in the country and all new producers should contact the Board for registration. This system is a boon to the majority of growers, but producers of specialist wools, such as very fine or coloured wools, may find more lucrative outlets for their fleeces. They may need to agree this with the Board.

Once a producer has signed on with the Board they may be allocated a haulier, a supply of wool sheets or sacks and a depot. Producers can visit the depot to see their wool being graded and have any faults explained.

Fleeces that are sold direct to hand spinners must be uniform in length, clean, attractively presented and labelled with the weight and breed. Spinners prefer fresh fleeces and if they are stored they must be kept cool and dry. Some mills will spin small numbers of fleeces for customers to sell or to use in a cottage industry making woollen goods.

The Markets for Wool

Fibre length and fineness dictate the uses for wools and, therefore, the market.

Hill breeds such as the Scottish Blackface and Welsh Mountain have long strong fleeces of around 2kg, suited to making carpets, rugs and blankets. Longwools such as the Leicester, Wensleydale, Lincoln and Devon and Cornwall Longwool, found on grassy lowlands, are big sheep with long lustrous fleeces of 10kg suited to speciality fabrics.

Down breeds such as the Dorset, Hampshire and Suffolk have close, fine, short wool of 2-3kg that is good for knitting and for soft woollens.

Coloured breeds such as the Jacob and Black Welsh Mountain are popular with home spinners and the Merino, Southdown, Shetland and Charollais have some of the finer fleeces.

Shearing The Flock

Flocks are usually shorn annually in early summer for husbandry reasons as well as to harvest the wool. In some countries twice yearly shearing is practised, resulting in about 10 per cent more wool.

Shearing is easiest when the 'rise' has taken place. The rise is the point in the fleece where the previous season's growth has finished. Above that point the fibres may be matted and below it the new growth is clean and straight and easier to shear.

Pre-lambing or winter shearing of housed ewes is common. Shearing ewes at housing avoids contamination from straw and hay and can result in heavier birth weights (up by 0.5kg), better survival rates, less chance of lambs being smothered and higher weaning weights. Less space is needed (stocking rate can be increased by 20 per cent) and the ewes are less heat stressed.

Other advantages are that winter shearing is at a quiet time in the shepherd's year, ewe body condition and the lambing process are more visible and lambs find it easier to find a teat. At turnout the shorn ewes tend to seek shelter and take their lambs with them. However, shorn ewes eat more and may produce large lambs which cause dystokia.

Housing should be draught-free with plenty of bedding and the flock should be shorn at least eight weeks before turnout using a standard comb to leave 5mm of fleece; there should be 12mm by turnout and plenty of shelter – it takes up to six weeks for the fleece to grow sufficiently to provide effective protection. Restrict the practice to fit spring-lambing lowland ewes and avoiding older or thin ewes.

Shearing lambs in the autumn encourages growth and keeps them clean during the winter.

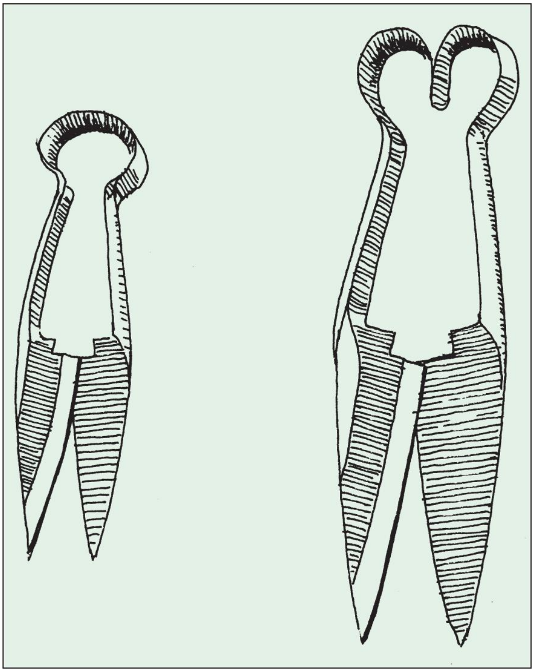


Fig 51 Blade shearers can shear more than 300 sheep in an eight-hour day. For the small flock a pair of shears is essential for dagging and for trimming around wounds, mycotic dermatitis and fly strike. There are different designs for use for shearing, dagging, trimming or showing. Two common ones are the single bow (left) and the double bow The double bow requires a lighter squeeze than the single bow. Recommended blade lengths are 13.5cm for dagging and 16cm for shearing or trimming. Trimming show sheep is best done with a special 'bent' shear. A small pocket shear (left) is handy for everyday

husbandry use. The blades should be kept dry and wiped with an oily cloth after use. When they are correctly sharpened, they should 'sing' and cut a hair or piece of paper cleanly.

Shearing is traditionally done by hand but chemical or bio systems have been developed in Australia. Sheep are injected with a naturally occurring protein which creates a weak zone in the fibre and the fleece can be peeled off by hand.

Electric shearing equipment is expensive, so the small flock owner could share or learn to shear with blades (Fig 51). Courses in all types of shearing are usually run by colleges and the British Wool Marketing Board. Professional shearers are usually available; they normally charge a flat rate to shear a small flock and make a charge per head to shear larger flocks.

Shearing should be planned well in advance because there is likely to be a lot of last-minute indecision especially when there is risk of rain. Professional shearers often need to be able to shear at a moment's notice. The shearing area should be ready and clean and with sufficient wool sacks available.

The aim of good shearing is to:

- Minimize stress on the sheep.
- Produce a clean fleece.
- Let the shearer work efficiently.

To minimize stress keep sheep off food or on bare pasture (with water) for at least twelve hours beforehand. Full stomachs during shearing can cause discomfort or even death.

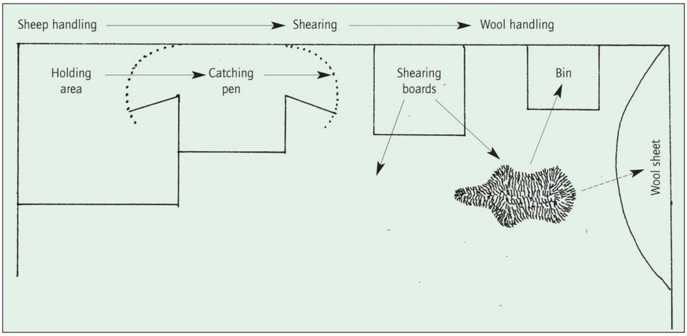


Fig 52 A simple shearing layout must ensure a smooth flow of sheep and fleeces. The shearing boards and the fleece rolling areas must be kept clean at all times. The wool sheet (sack) should be hung for easy access and a bin will hold any dags and contaminated wool. Lamb's wool comes off in loose bits and should be packed in separate sheets.

Before shearing and preferably before housing or penning, pick off any contamination such as vegetable matter and crutch any sheep which have dung or urine-soaked wool. The sheep must be dry; they can be held under cover prior to shearing but should be dry when brought under cover and should not be bedded on sawdust or straw which will contaminate the fleeces. Slatted floors or green bedding such as long grass and docks are suitable but bare concrete can produce a slurry soup which ruins fleeces.

Fig 53 Shearing time.

Ask the shearer well in advance what facilities and labour he wants. He may have a shearing trailer complete with catching pens and a shearing platform. In this case he will need only a holding pen from which to fill his catching pens, and a power supply.

If he does not have a trailer he will need a well lit, sheltered working area with a clean, level floor. The shearing area should be about 2m × 2m for each shearer, close to the catching pen and have a hook from which to hang the shearing machine – probably from a roof beam or a vertical wooden post. Have a secure holding pen (Fig 52) which can be reduced in size as the flock shrinks and an adjacent catching pen for about ten sheep.

Check in advance that the power – which may be a secondary supply to an outside building – is safe and dependable and does not blow trip switches or contact breakers.

He will appreciate a tea break during or after shearing and somewhere to wash. For his part, he must ensure that all his equipment is disinfected to prevent the spread of disease between flocks.

The basic job requirements are:

- Shearing.
- Catching: to catch and hand sheep to shearer (if there are no self-closing doors on the pen to enable him to catch them himself).
- Keeping the shearing boards swept of dung and bits of fleece.
- Keeping the catching pen full.
- Throwing, tidying, rolling and packing fleeces.

With planning, these jobs can be done comfortably by one shearer and two assistants.

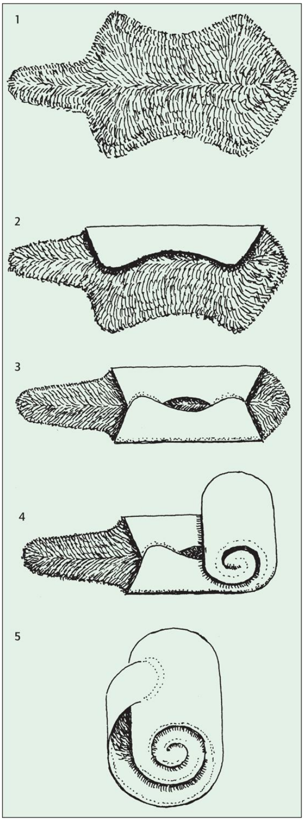


Fig 54 In the northern hemisphere fleeces are usually rolled and packed in wool sheets or sacks. In the southern hemisphere they are skirted (wool is taken from the edges to reduce variation in the fleece) and pressed into bales. The rolling method

consists of (1) throwing the fleece onto a flat, clean surface usually flesh-side down; (2 and 3) folding in the flanks and then (4) rolling firmly from the tail to head and (5) tucking the neck securely into the fleece.

Handling the Fleece

Once the fleece is shorn there is an art in 'throwing' it to land in the wool packing area the correct way up – and with the neck at one end and the crutch at the other. Unless it falls correctly it cannot be rolled correctly. The shearer may throw it himself or teach the flock owner.

The area for rolling and packing must be clean – beware of any hay or straw which may be stored nearby.

Pick off any damp or dirty wool and vegetable matter and then roll (Fig 54) and pack tightly into the sacks or sheets keeping breeds separate, white and coloured fleeces separate and fleeces from different classes of sheep – ewes, rams and lambs – separate.

Shearing Tips

- If a sheep goes into shock during shearing, throw a bucket of cold water over its head.
- Keep a marker handy to identify a sheep where you may have noticed a problem.
- Have a broom and constantly keep the shearing and rolling areas clean.
- Warn the shearer of any problems, such as a vaccination abscess and treat any cuts with an antiseptic spray. Small

cuts are common and are healed quickly by the lanolin in the skin. Serious cuts are not acceptable.

- Shear coloured sheep last and keep fleeces separate from white fleeces.
- Have a spring balance and identify, weigh and record individual fleeces for a breeding programme.
- Beware of wounds attracting flies. Treat with a repellent or cream.
- A sheep's appetite increases by 25 per cent after shearing, so ensure extra grass.

8 Health

Cynics say that a sheep's only ambition in life is to die. In fact, sheep are remarkably tough animals and, other than during an outbreak of disease or attacks by predators, adult sheep losses should not average more than about 4 per cent a year. Most of these losses occur around lambing time.

The job of the flock owner is to:

- Keep a flock healthy.
- Recognize a sick sheep.
- Diagnose the problem – a combination of experience, a veterinary surgeon and a veterinary book (*see* Further Reading).
- Nurse a sick sheep back to health.

Maintaining Health

The essentials for maintaining health are:

- Adequate nutrition.
- Minimum stress.
- Safe environment.
- Observation.

Nutrition

Nutrition is the single most important factor in maintaining a healthy flock. Loss of appetite indicates ill health but check that the sheep is able to eat. Look for sharp, broken or bleeding teeth or a wad of cud compacted inside the cheek. In these cases the ewe will probably need preferential feeding.

Stress

Many health problems are triggered by stress. Stress is anything that puts the body under strain, such as pregnancy, inadequate nutrition, extreme weather, rough handling and being chased by dogs. Many life-threatening organisms live harmlessly in the body and only cause disease when body defences are lowered by stress.

Observations have shown that weather affects health. In a wet, cloudy year with low sunshine hours, the rain reduces the feed value of herbage and the lack of sunshine affects general health. The results are often poor ewe condition, low lambing percentages, slow lamb finishing and reduced wool weight.

Environment

A farm is a dangerous place and sheep have ingenious ways of injuring themselves. Some common accidents include:

- Breaking limbs or getting a head stuck in netting fences.
- Getting entangled by the fleece in hedges, brambles and barbed wire.
- Pulling bale stacks over.
- Being stuck (cast) on the back.
- Cuts and injuries from fighting – especially rams.
- Injuries from bolting through hedges and barbed fences.
- Trapping a hoof or puncturing the sole with a thorn or nail.
- Hanging in a loop of baler twine.

• Falling in rivers and ditches.

Predators such as dogs are an environmental danger causing injury and stress. Sheep-worrying in the UK and losses from coyotes in the USA have encouraged the use of guard dogs – popularly the Komondor, Maremma, Pyrenean and Akbash. Other guard animals that run with the flock include the donkey that apparently dislikes dogs and kicks them, and the llama and ostrich. Anyone resorting to this method of predator control should check their insurance and be aware that some of these guard animals may fail to differentiate between predator and friend. The law is usually on the side of the flock owner when it comes to shooting predators, but the regulations should be confirmed.

Poisoning damages or destroys vital body tissues and organs. It can be caused by grass contaminated with a weedkiller, an excess of a medicine, an excess of copper, or when forced to eat poisonous plants such as rhododendron, yew or ragwort during a drought or feed shortage. Sheep find dried ragwort palatable, so ragwort in hay is a risk.

Sheep enjoy chewing, especially something toxic like lead painted woodwork. They choke on string, small potatoes and thistle heads and on concentrates eaten too quickly. Choking sheep usually foam at the mouth, cough and walk backwards.

Sheep become cast when skin parasites are an irritation, or in showery weather when drying skin causes itching. They roll over to rub their backs on the ground and cannot get up. Ewes in full wool and heavily pregnant are most at risk. Controlling skin parasites (*see* later) can reduce the problem as does a back scratcher such as an old trailer. Regular checking is essential as cast sheep rarely bleat and a heavily pregnant ewe can die quickly. Secondary danger comes from carrion birds which attack the soft tissue such as eyes and crutch. Ewes which have been on their backs for some time will be bloated and stagger when helped to their feet. They should recover, but pregnant sheep may abort later. Often it is the same ewes which regularly become cast.

Fig 55 Fat, pregnant and itchy sheep and those in full wool are always in danger of getting cast.

Observation

A change in behaviour is the first sign of a health problem. So it is necessary to:

- Recognize normal behaviour.
- Observe the flock regularly.
- Know the sheep.
- Know what problems to expect and when.

Recognizing normal behaviour comes with experience. It is important to see changes of behaviour in the context of the production cycle. A ewe that isolates herself from the flock during lambing time is likely to be having a lamb. At any other time of the year she is likely to be ill. By looking at the flock regularly – ideally twice a day in lowland flocks – changes in behaviour can be spotted early.

Knowing individual sheep is an aid. If a normally fat sheep becomes thin, or a normally nervy ewe becomes passive, suspect a problem.

Problems can be spotted quickly if the shepherd anticipates them. He should know the common diseases and the time of year or the conditions that favour them.
Classic changes in behaviour include:

- Staying apart from the flock.
- Recumbent or reluctant to move.
- Persistent rubbing and biting at flanks.
- Not eating or cudding.
- Grinding its teeth.
- Abnormally nervy or abnormally placid.

Classic physical changes include:

- Abnormal faeces (normal faeces are firm and pelleted) such as diarrhoea.
- Abnormal posture or gait.
- Eyes dull or crusted.
- Nose discharging.
- Salivation.
- Ears drooping.
- Swellings or sores.
- Wool loss.
- Shivering or convulsions.
- Breathing laboured or shallow – normal respiration rate is ten to twenty per minute.
- Temperature above or below the normal of 39.0–40.0°C. Put a veterinary thermometer about 5cm into the rectum

for up to two minutes. A high temperature suggests infection and a low temperature suggests shock and dying.

Preventing Disease

The best way to keep a flock healthy is to prevent disease getting into the flock.

Preventive medicine is any good husbandry or management that keeps sheep healthy. Health may be protected by vaccinating against specific diseases or simply by keeping fences secure so that neighbouring flocks cannot mix and spread infection.

Preventive medicine includes:

- Health schemes.
- Vaccination programmes.
- Hygiene.

National flock health schemes operate in most sheep countries to eradicate or control specific diseases and provide a register of accredited flocks. Target diseases include Scrapie, Enzootic Abortion and Maedi Visna. Flocks that are shown to be clear of a disease (usually through blood testing) benefit by improved productivity and by selling breeding stock at a premium.

A private flock health scheme can be drawn up with the veterinary surgeon. The box on p.90 is an example of a scheme that involves five veterinary visits to the flock each year.

Vaccination Programmes

Vaccination confers immunity on an animal by introducing specific pathogens – either live or modified – into the body. These stimulate the body to produce antibodies that react with the pathogens and suppress or kill them. Not all vaccines are used the same way; depending on the type of vaccine some are given as a single dose and some as a double dose (primary and secondary) a few weeks apart; some pass immunity via milk to lambs and some do not; some must be used at a specific time in the calendar; some are given as an injection and some as a scratch; some must not be given to pregnant sheep. Some are transmissible to humans and must be handled with care.

It is essential to read the instructions and write out a flock programme. The veterinary surgeon will advise on suitable vaccinations based on local experience. Top of his list will be a vaccination against a range of clostridial diseases and pneumonia. Clostridial diseases include tetanus, pulpy kidney and lamb dysentery. The clostridial bacteria are widespread in the environment and kill their victim by manufacturing toxins in the body; they have such good survival mechanisms that they cannot be eradicated. Other vaccines include orf, toxoplasmosis, enzootic abortion (EAE), louping-ill, footrot, blue-tongue and Johne's disease.

Hygiene

Hygiene is a major factor in preventing disease. Any facilities or equipment that are shared with other flocks – such as shearing, transport, dipping – should be cleaned between use. Needles should be sterilized. Housing and lambing equipment should be disinfected immediately after turnout. Working areas should be cleaned after use – such as clearing away foot parings. Cats should be kept away from feed stores and hay bales because they spread toxoplasmosis – one of the common causes of abortion.

Controlling Disease

Keeping disease under control requires:

- Prompt diagnosis and treatment.
- Good nursing.

When a shepherd sees a problem he does not recognize he should involve a veterinary surgeon or a more experienced shepherd.

Private Health Scheme

Five visits per annum by the local veterinary surgeon.

Visit 1

Eight weeks before tupping.

- Check ram fertility and condition.
- Condition score a selection of ewes.
- Take blood samples to check for trace element status and abortion agents.
- Faeces sample for worm count.
- Advise on a forage analysis for fibre, protein and energy.

Visit 2

Six weeks before lambing.

- Check condition of flock.
- Discuss feed and nutrition especially trace elements and protein source; treat any clinical cases.
- Advise on vaccination against clostridial disease, worming, etc.

Visit 3

Two weeks before lambing.

- Discuss veterinary needs for lambing and arrange for preventive medicines.
- Advise on or treat any problems.
- Discuss housing and lambing facilities.
- Check condition of ewes.

Visit 4

Peak of lambing.

- Check and advise on any problems.
- Demonstrate how to deal with some problems such as tubing, intraperitoneal injection, dystokia.
- Advise on hygiene and disease control such as E. coli, coccidia.
- Discuss worm-control programme.

Visit 5

Twelve weeks after lambing.

- Discuss post-lambing problems and check growth rate, mastitis cases, etc.
- Discuss vaccination programme for the year.
- Discuss worm-control programme, including dog tapeworms.
- Discuss footrot control programme.
- Discuss dipping and external parasite control.
- Review any conditions that arose such as metabolic problems, abortion, pneumonia and mastitis, for future control.

Provided it is fit to travel and the surgery is within a reasonable distance, it is better to take the animal to the surgery where there are appropriate facilities.

However, in a surgery the veterinary surgeon cannot see the animal's natural behaviour or environment, so it is essential to offer information such as:

- Age and breed.
- Stage in production cycle.
- Any history of illness – the individual and the flock.
- Symptoms.
- When they were first noticed.
- Any other similar cases in the flock.
- Recent treatments such as worming, vaccination, dipping.
- Recent changes in feed or pasture.
- Access to poisonous plants or other poisons.
- Routine nutrition such as free access minerals.
- Changes in environment – being housed, moved, weather.
- Stress such as transporting, being dogged, yarded, weaned.

When visiting the veterinary surgeon take the opportunity to ask questions and, after treatment, it is helpful to him to let him know the outcome.

A veterinary surgeon is responsible for the drugs he prescribes and may want to see an animal or visit the flock before giving a prescription. But once he has a good relationship with a client and trusts their judgement, he may be willing to supply some drugs without seeing the animal. Always involve a veterinary surgeon as soon as possible; the longer a problem is left, the less the chance of success.

Nursing

If the veterinary surgeon is the doctor then the shepherd is the nurse.

When a treated animal is returned to the flock it must be easy to catch for further treatment or inspection. Otherwise a sick sheep should be bedded on straw in a well ventilated, well-lit, draught-free area that can be disinfected.

A recumbent sheep should be turned regularly to prevent sores and discomfort and preferably propped up with bales to prevent bloat. Sheep need to be able to keep their head up for belching.

Water (warm and slightly salty) and food must be accessible – a recumbent sheep cannot drink from a bucket on the other side of a pen.

As soon as an animal shows signs of wanting to stand it is important to encourage it by lifting (not by the wool) and supporting it for short periods in an improvised sling or between bales. Sheep should be lifted onto their hind legs first because that is the natural way for them to stand up.

An animal off its food should be tempted to eat. Antibiotics may kill bacteria in the rumen which will upset the digestive system and depress appetite. There are veterinary products that put microbes back into the rumen to get it working.

Persuading a sick ewe to eat is a labour of love. Tasty morsels include molassed sugar beet feed and coarse molassed cereals but titbits out of the hedgerows, such as dandelions and ivy leaves, can bring a sheep back from the brink. It may be necessary to push a wad into the mouth to encourage chewing. Success has been reported with a dose of Guinness, a serving of Shredded Wheat with powdered glucose, or a mixture of a little table salt with black treacle.

A sheep that stops drinking must be given water or an electrolyte (commercially available mixtures of dextrose, sodium chloride and potassium) using a drenching gun. If the animal is conscious, water and even liquidized feeds can be given by stomach tube (calf-sized for a ewe) to save time, stress and the risk of choking.

If a sick ewe has lambs these can be kept with her but they may need hand feeding. Whether or not to take a sick lamb away from its mother depends on the situation at the time, but in the long term it is better to keep them together. A very sick ewe is unlikely to need company, but once she starts to fret she may be well enough to go back into the flock or may need a companion.

Managing Disease

Many health problems cannot be eradicated but they can be controlled through management. Three major worldwide conditions which blight most flocks and need systematic control are:

- Foot problems.
- Internal parasites (worms).
- External parasites.

Foot Problems

Footrot is an infectious and debilitating disease. It is caused by two bacteria which thrive in damp conditions when the air temperature is above 10°C. Physical signs are limping, grazing on the knees, reddening between the digits (Fig 56), pus in the hoof and a characteristic smell.

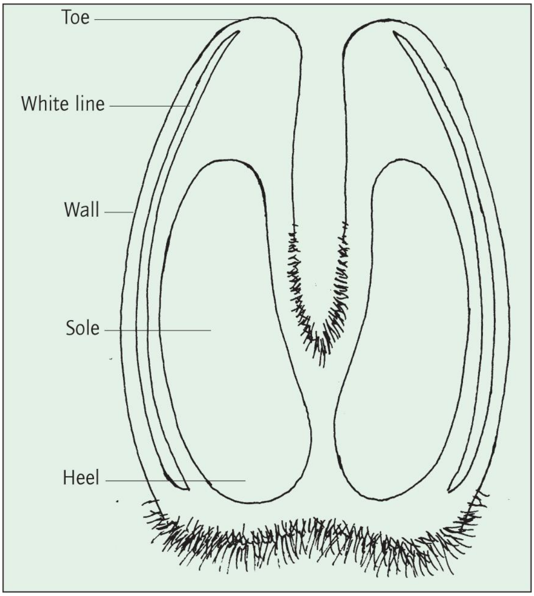


Fig 56 Sole view of a sheep's foot showing the points. Problems occur between the two halves (digits) such as scald, mud balls and stones. Or infection can get into the hoof causing the wall to separate from the sole at the white line.

Some sheep may be genetically susceptible to the condition so avoid selecting replacements, especially rams, from stock which are persistently lame.

Footrot may be prevented by regular foot care, preferably during dry weather.

Fig 57 Hoofs need to be inspected and trimmed regularly to prevent them from becoming overgrown. The aim is to maintain the natural shape of the foot, to leave enough wall to protect the sole and to prevent or cure any infection by removing overgrown horn. Trim cautiously, especially across the toe, to avoid cutting a blood vessel. Hoof shears are powerful and should be used with care. Where footrot is established, paring allows oxygen and the footbath chemical or antibiotic spray to reach the infection.

Over-trimming can leave a strawberrylike growth (granuloma or proudflesh) in the sole which rarely heals and needs veterinary attention. When the outer wall is loose (shelly hoof) and soil becomes impacted it may cause an abscess; any loose wall should be trimmed away.

Check and trim (Fig 57) the feet of each animal.

All those with sound feet should be turned onto dry pasture that has been free of sheep for at least fourteen days. The bacteria that cause footrot cannot survive outside the sheep for more than fourteen days, so this pasture should be clear of infection.

Where there is a footbath (Fig 30) these clean sheep should stand in it according to the instructions and then on concrete for two hours before being put on the pasture. Zinc sulphate products are widely used as a footbath chemical because they penetrate the hoof and reach any infection.

Fig 58 Footrot exposed and ready for treatment.

Those with suspect feet should have any infection exposed (Fig 58) and treated with an antibiotic spray. Cases which do not heal may need an antibiotic injection.

They should be kept separate from the first group. The group should be re-examined, treated three days later and then weekly until cured.

Cured animals should be footbathed and returned to the ‘clean’ flock.

Protection can be given by a vaccination used before the high risk periods but it is only effective when used in conjunction with regular trimming and inspection. Once eradicated from the farm footrot can only return with bought-in, borrowed or straying sheep.

Other Causes of Lameness

Not all lameness is caused by footrot and other causes should be suspected, especially diseases such as foot and mouth, bluetongue and arthritis. Or it may simply be mechanical such as a stone or ball of mud between the digits or a puncture from a thorn.

An abscess at the top of the hoof is common; it may not be visible but the hoof may feel warm. Where it is visible it should be cleaned and dressed with an antibiotic spray. Untended it can penetrate bones in the hoof and need antibiotic injections to clear.

Scald is an early stage of footrot and is common in lambs on lush grass that softens and abrades the skin between the digits and allows infection to enter. The earliest sign is a limp but if more than one foot is affected they walk as if they have arthritis. A look between the digits reveals moist pink skin or pus; a squirt of antibiotic spray heals it quickly.

Limping may also be the result of a leg injury rather than a problem with the hoof. It is also associated with mastitis when a ewe swings a rear leg to avoid a painful udder.

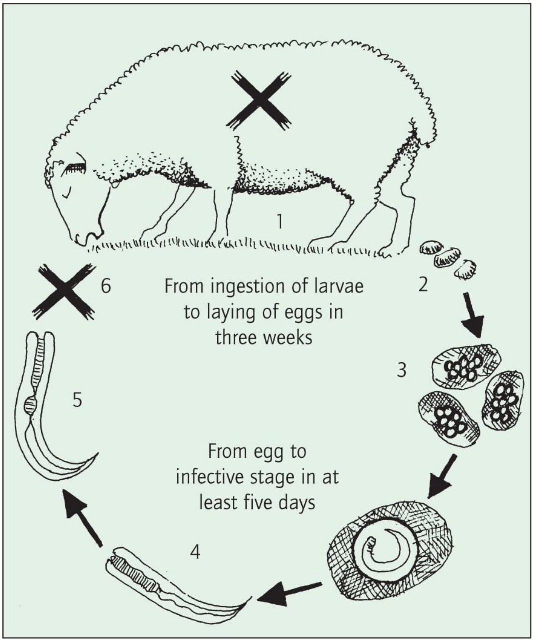


Fig 59 A typical sheep roundworm cycle:

1. Infective larvae in the sheep develop to adults and lay eggs.

2. Eggs voided in the dung.

3. Worms develop in the eggs in the dung.

4. Young worms (larvae) hatch.

5. Larva develops to infective stage.

6. Infective larva climbs up grass and is eaten by the sheep.

X Two places where the cycle can be broken: reduce infection in weaned lambs by providing 'clean' grazing; stop the adults laying eggs by worming the sheep.

Internal Parasites

Internal parasites, known as worms or helminths, are a major worldwide problem in the sheep industry. They include:

- Stomach and intestinal worms (roundworms or nematodes) that cause parasitic gastro-enteritis (PGE).
- Liver fluke that burrow in the liver.
- Tapeworms that cause cysts in the liver and brain (gid and hydatid disease) and are also dangerous to humans.

The main causes of PGE are the roundworms *Ostertagia circumcinta* that induce weight loss and scouring and *Haemonchus contortus* that suck blood and precipitate anaemia. They are a problem in late summer and autumn.

Nematodirus battus causes nematodirus infection in grazing lambs of one to four months old, most commonly in late spring and early summer. The onset of the disease is sudden, causing acute diarrhoea and dehydration manifest by excessive drinking. Ewes are not affected.

The natural pattern of worm infestation on pasture is illustrated in Fig 60.

In theory, roundworms can be eradicated by breaking their life cycle (Fig 59) either by killing the parasites inside the sheep with a wormer or on the pasture with a desiccant. In reality, neither is totally effective and where there are sheep there are worms.

The most alarming aspect of worms in the twenty-first century is the increasing proportion that are resistant to anthelmintics (wormers). A parasite is considered to be resistant if it survives exposure to the recommended dose of a wormer and the ability to survive is passed on to its offspring. This anthelmintic resistance (AR) is not only a worldwide problem and a huge threat to the sheep industry, it is also a one-way system from which there is no way back. It is thought that even if all worm treatments were discontinued, resistant worms would not revert to becoming susceptible.

The more frequently sheep are treated for worms, the faster a resistance to the wormer develops. The underlying principle of selection for anthelmintic resistance is that treatment gives the resistant worms a reproductive advantage over the susceptible worms for two to three weeks after dosing. This is because until the larvae ingested after dosing develop into egg-laying adults (Fig 59), the only eggs being passed in the faeces of the dosed sheep are from worms which survived (resisted) treatment. With frequent drenching, the population of worms which are susceptible to wormers are progressively replaced by resistant ones.

To slow down the progress of resistant strains, the advice is actively to maintain a population of susceptible worms which will dilute the number of resistant worms. In practice, this means either leaving some of the flock undosed or putting wormed ewes back onto grazed pasture which is already contaminated by worms.

Scientists are working to find new chemicals to which there is no resistance and at the Moredun Foundation in Scotland progress has been made in developing a vaccine against *Haemonchus contortus.* But in the absence of new products steps must be taken on-farm to control worms without increasing the problem of resistance.

These steps include:

- Establish if there is resistance on the farm.
- Quarantine all bought-in or returning stock.
- Target treatments.

- Use the correct wormer.
- Use the drench accurately.
- Aim to have some ‘clean’ pastures.
- Feeding and breeding.

Veterinary surgeons can check the level of resistance in a flock by making a faecal egg count (FEC) from dung samples taken before and after drenching to compare the number of eggs before and after treatment. If there are no eggs, then the drench worked and, at that time, worms were not resistant to that wormer. If worm eggs are present the veterinary surgeon will advise what steps to take to keep resistance under control. Kits for an FEC are available and small flock owners may find it useful to share one.

To avoid bringing resistant worms into the flock, any bought-in sheep (or sheep that have returned from grazing on another farm) should be yarded or housed for twenty-four to forty-eight hours and treated sequentially with macrocyclic lactone (ML) and levamisole (LM) wormers. This combination is likely to remove all worms, both resistant and susceptible. After twenty-four to forty-eight hours they should have voided any worm
eggs in the gut and can be turned out onto pasture where sheep have grazed recently – so that any eggs from worms surviving the treatment are diluted by eggs already on the pasture. The animals should remain isolated for at least three weeks.

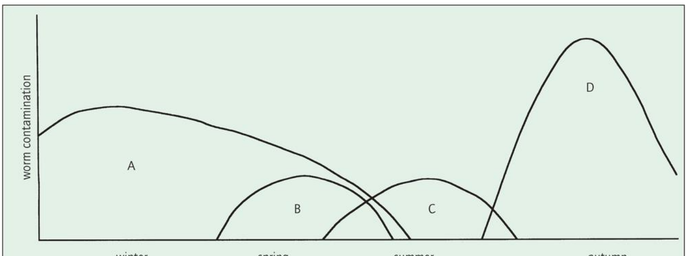


Fig 60 The pattern of natural worm infestation on pasture in the absence of a worm control programme. Eggs deposited in the first half of the grazing season are responsible for dangerous levels of infection in the second half.

A. Overwintered infestation on pasture. It remains inert until temperatures reach 10°C then becomes infective. Infestation will tail off in early summer as the larvae die.

B. Eggs shed by ewes at lambing time.

C. Eggs produced by lambs which ingested the over-wintered infestation earlier in the season.

D. Massive infestation in late summer caused by the development of worms from B and C.

Targeting Treatment

Targeting treatments to when they are most effective will not just reduce the risks of resistance, it will also reduce the expense of wormers. Mature ewes which are fit and healthy tend to have good immunity to most species of worms except *Haemonchus contortus* and twice-yearly drenching a selection of the ewes should be sufficient.

Recommended practice is:

- Tupping: as part of the pre-tupping preparation only treat young ewes and lean ewes.
- Lambing: the ewe's immunity to worms is reduced at this time, so a routine drench is recommended at or very soon after lambing. Leave 10–20 per cent of the fittest mature ewes undrenched.

Wormers should be chosen according to the parasite to be controlled – which can be identified by a veterinary surgeon examining a faeces sample.

The main parasites are coccidiosis and nematodirus, which affect lambs in the spring; ostertagia and haemonchus, which affect mature sheep in the summer and autumn; trichostrongylus and fluke which strike in autumn and winter.

The three main chemical families are the white drench (benzimidazole), yellow drench (levamisole) and clear drench (avermectin/moxidectin), all of which are broad spectrum and treat several of the major worms. But, where possible, it is advisable to choose a narrow spectrum product to kill specific parasites. Avoid combinations unless recommended and never mix wormers together.

Buy wormers from a reputable source, make sure the expiry date is appropriate and check the withdrawal period. Wormers have withdrawal periods ranging from four to seventy days, which means that dosed stock must not be sold into the food chain until after that period. Bear in mind the withdrawal times when dosing lambs which are destined for slaughter – otherwise some which are ready to be sold may have to be held back.

Under-dosing is a significant factor in the development of resistance and in the apparent failure of a wormer. Under-dosing is usually due to:

- Underestimating the animal's weight. Weigh the largest sheep in the group and treat them all with the dose recommended for the heaviest.
- Poorly maintained dosing equipment. Use a measuring jug or a syringe without the plunger to measure the accuracy of the drenching gun and always clean it after use.

- Poor drenching technique. Restrain the sheep; insert the nozzle between the incisor teeth and molar and over the back of the tongue so that it will go direct to the rumen (Fig 67). Make sure they do not spit it out.
- Not following the instructions. Observe the dose rate, storage advice and expiry date. Shake the container gently to avoid creating bubbles which will affect the accuracy of the dose.

'Clean' pastures are those with a reduced worm burden and are best reserved for weaned lambs. If treated ewes are moved to clean pastures it is best to either leave 10 per cent of the fittest untreated or treat them a few days before moving – these strategies will maintain the population of susceptible worms. Clean pastures are achieved by:

- Growing a new ley.
- Hay or silage aftermath which has not been grazed by sheep earlier in the year.
- Grazing pastures with cattle in alternate years.
- A three-year rotation – one year cattle, one year conservation, one year sheep.
- Growing short-term leys and forage crops in rotation.

There is some evidence that quality protein in the diet, such as soya bean, encourages immunity to worms in ewes. Trials have also suggested that the inclusion of chicory in pastures has an anthelmintic effect.

It is possible to breed selectively for sheep that are immune to internal parasites – usually identified through the use of faecal egg counts – and best progress has been made through breeding resistance in stock sires rather than selection in breeding ewes. It has been suggested that 20 per cent of ewes in a flock carry the bulk of the worms. Sheep with resilience to roundworms prevent the establishment of the ingested larvae and therefore shed fewer eggs.

Controlling Worms in Lambs

PGE does not normally strike lambs until midsummer and those born in late winter may miss the risk period – unless they are retained as replacements. The main risk to young grazing lambs is nematodirus infection. This is spread from lamb crop to lamb crop and the ewe plays a negligible role. The rule is to avoid grazing lambs on land that was grazed by lambs in the previous spring and, preferably, not for two springs. Land that has only grazed adults should be safe. The disease can also strike in the autumn.

The larval stage of the *N. battus* is unusual in that it stays in the egg and can survive on pasture for up to two years. They normally hatch after a cold spell followed by a mean temperature of at least 10°C. This means that eggs can accumulate on the pasture and an explosive outbreak is timed to coincide with the natural start of the lamb grazing system. After a dry spell the rain can trigger hatching and produce mass infection, but the lambs may have no immunity because of the low infection levels during the drought. The risk of an outbreak can be predicted from the weather conditions. A faecal egg count may be misleading at the start of the season because nematodirus can cause damage before laying eggs; include other factors such as lamb condition and clinical signs. As lambs get older, more reliance can be put on the results of the egg count.

Lambs are at risk when:

- Aged one–four months old (after this they may develop an immunity).
- Climatic conditions are right for hatching.
- Grass was grazed in the previous year by lambs.

The principal effect of nematodirus infection is profuse yellow-green diarrhoea and ill-thrift, although this may also be associated with other infections such as coccidiosis. Where nematodirus is confirmed, or where the pasture and weather conditions are known to be high risk, three treatments with an effective anthelmintic three weeks apart should control it. The timing of the first dose will be influenced by the prevailing temperatures. On lower risk farms, two treatments should be enough.

As a rule, fit, healthy, well-fed lambs are less affected by the challenge of worms. But the risk may vary with the lambing system:

- Early (winter) born lambs will not come into contact with worms if they are finished indoors or turned onto clean forage crops. If they are turned on to pasture there may be a risk from early hatching nematodirus. Drenching may be unnecessary, but female replacements will have had no exposure to worms and will need to be given some exposure in order to acquire a natural immunity.
- Late winter-born lambs on grass will be at risk from nematodirus, but the majority of lambs will be finished before the main risk period for ostertagiasis and drenching may be minimal.
- Spring-born lambs will be at risk from nematodirus and will also be on the farm when ostertagiasis becomes a risk. Monthly faecal egg counts may be necessary and weaned lambs should go onto ‘clean’ pasture. These lambs often scour when put on to fresh grass and this can be confused with a worm burden.
- Store lambs are at risk from high worm burdens on autumn grass. Faecal egg counting at regular intervals is invaluable in assessing treatment.

Liver Fluke

Liver fluke disease is caused by the flatworm *Fasciola hepatica* which invades the liver causing ill-thrift or death. Part of its life cycle involves a mud snail which lives in wet pasture, therefore the problem is associated with wet, reedy areas, slow-flowing streams and ditches and even areas around troughs and tractor ruts (Fig 61). Highest risk periods are after wet summers when the soil was consistently saturated – the more wet months in succession, the more severe the outbreaks. Current climate changes, such as higher temperatures and rainfall, are increasing the incidence of the disease and there is also a growing resistance to flukicides. So, as with other wormers, flukicides should be used specifically and correctly.

Disease is caused by both immature and adult flukes but not all flukicides are effective against both stages; immature fluke cause acute disease in the autumn due to the mass migration of large numbers of young fluke through the liver causing abdominal pain, anaemia and sometimes sudden death. Adult fluke, caused by ingesting fluke larvae from the pasture over a long period, result in chronic disease in the late winter to early spring and results in ill-thrift, oedema ('bottle jaw') and loss of appetite.

Take veterinary advice on flukicides and keep the disease under control by:

Fig 61 Even a wet area caused by tractor ruts can introduce liver fluke.

- Quarantine and dose all bought-in stock.
- Fencing off wet areas, streams and ditches or avoid grazing wet areas during the risk periods.
- Draining wet areas
- Strategic dosing with the correct flukicide once the problem has been identified. The disease has become a moving target and advice is to monitor the situation using faecal egg counts or blood tests and any forecast based on weather conditions.
- Spraying molluscicides to kill the host snail.
- Asking the abattoir to report any liver damage.

Tapeworms

The tapeworms that cause gid and hydatid disease in sheep and humans have the dog as an intermediate host. Dogs pass the infection to humans through licking. Cysts form in any organ, including the brain, but more usually in the liver.

Once a sheep has grazed the tapeworm eggs it is impossible to prevent the cysts developing and causing damage, which can result in the liver, or even the whole carcass, being condemned.

Control is to:

- Worm dogs regularly with a drug effective against cestodes.
- Never let dogs scavenge dead sheep.
- Avoid grazing land used for sheep dog trials or by hounds.
- Fence off public footpaths where they cross grazing land.
- Stop visiting dogs from accessing grazing areas.

External Parasites

External parasites such as lice, ticks and mites cause irritation, damage skins and fleeces and can spread disease. Most are preventable. Flystrike on cuts or soiled and damp wool is common in summer and autumn in humid weather and where trees and hedges harbour flies. The Greenbottle (*Lucilia sericata*) lays eggs on the soiled wool and the maggots (Fig 62), which can hatch within three days, feed off the skin. Their toxins, plus physical damage, will kill within a few days.

Struck sheep characteristically wag their tail, twist around like a banana, nibble and stamp a foot (where maggots have invaded a hoof). In the early stages the larvae may be hard to find, but if the behaviour and conditions suggest flystrike, keep looking. In the advanced stages sheep will isolate themselves, seek shade and there will be dark, moist patches on the fleece – usually around the crutch but it can occur on the shoulders and head.

Fig 62 The result of flystrike. Maggots invade the wool and flesh and the area looks characteristically moist and dark.

Clip the affected area and remove maggots, taking care that they do not escape to clean fleece. Treat the damage with insecticidal cream or oil to aid healing. Do not treat with neat disinfectant or antiseptic because these can be toxic in concentrated form. The damaged skin may need protection from sunburn.

Control the problem with good husbandry such as crutching, preventing scouring and footrot and treating any wounds. Dipping in an appropriate chemical or using a pour-on formulation (Fig 63) should prevent the problem but use them sparingly to slow down resistance. Never rely on preventive treatment – always watch for signs of strike.

Sheep Scab

Sheep Scab is caused by a mite that is specific to sheep and almost invisible to the naked eye. The condition is highly contagious and the mite is capable of enormous multiplication, especially in the winter. Symptoms are extreme itchiness, rubbing and wool loss, and prevention and cure are by dipping or injection.

Prevent infection by avoiding all contact with other flocks and, because the mite can survive away from the sheep for two weeks, beware of infection from shearing equipment, transport and market pens.

Fig 63 Pour-ons are sprayed along the backs and around the tails of sheep to control external parasites such as blowfly strike. This system has replaced dipping on many farms. Some contain a temporary dye to identify treated sheep. The withdrawal period and the mode of action vary between products; some

prevent blowfly attacks and others inhibit the development of the eggs and larvae.

Dipping

Dipping is an effective way to control external parasites but is subject to so many health and safety regulations that, to some extent, it has been replaced by injections and pour-ons. Dip chemicals are extremely toxic and handling them and disposing of them after dipping are major concerns. Dipping options include hiring a contractor with a mobile dip or sharing a dip with another farm.

General advice on dipping includes:

- Have at least three weeks' wool growth.
- Follow the instructions.
- Do not dip full, hot, wet or tired sheep.
- Wear protective clothing.
- Know the volume of the dip.
- Top up when recommended (sheep strip the chemical out of the dipwash with their wool).
- Soak for one minute and push the head under twice (scab mite hide in the ears).

Other Diseases

Some sheep diseases are an increasing threat and flock owners should be vigilant and ready to get advice if they have any suspicions. Some may be 'notifiable' diseases which, by law, have to be reported to government authorities.

Diseases which appear to be on the increase include:

Bluetongue – caused by a virus which is spread to sheep by wind-borne biting midges, usually in the summer. Climate change may have extended its territory. The symptoms are described as FFF – feet (often lame), face (may be swollen) and fever. It may be controlled by a vaccine.

Caseous Lymphadenitis (CLA) – a very infectious chronic bacterial disease. External abscesses are seen where lymph nodes are affected and internal abscesses can lead to breathing problems, ill-thrift and carcass condemnation. The bacterium persists in the body and may be resistant to antibiotics, but vaccines are being developed and a blood test is available. The disease can be spread through shearing wounds.

Foot and Mouth – a very infectious disease caused by a virus which is easily spread and can survive for long periods. It is not necessarily fatal but is extremely debilitating and there is no cure. Chief symptoms in sheep are sudden lameness and a reluctance to stand. When it does it will hold a half-crouching position with the hind legs brought right forward. Blisters may develop in the mouth and on the tongue. Control methods vary between countries.

Jaagsiekte (Ovine Pulmonary Adenocarcinoma) – a contagious lung tumour affecting only sheep. Symptoms are similar to pneumonia but there is no temperature and it does not respond to antibiotics. Currently the only way to control the problem is to cull infected sheep. In the future there may be screening tests and a vaccine.

Maedi Visna – a viral condition for which there is no cure or vaccine. The virus may invade the lungs (difficult breathing), the udder (poor milk production), or the nervous system (poor coordination). Transmission is from ewe to her lambs, or closely confined ewes can pass it direct to each other via respiratory secretions.

Pasteurellosis – caused by bacteria and is the most common form of pneumonia in sheep. It can be brought on by stress and sudden change. Initial symptoms include a slight cough with eye and nasal discharges. The bacteria occur naturally in the upper respiratory tract and cannot be eradicated. Control is by vaccination and reducing stress factors.

Scrapie – a fatal disease which damages the central nervous system and nerve cells in the brain. It has a long incubation period and the exact causal agent is not known. There is no treatment and no diagnoses before clinical signs appear. These signs are persistent rubbing and an unsteady gait. It is believed to be spread through eating infected material. Some sheep are resistant to it and selective breeding is possible.

Carcass Disposal

Even the healthiest flock will lose sheep and then carcasses must be disposed of safely and as soon as possible. In countries such as the UK where burials are generally prohibited, paying the local knacker's yard or asking the local hunt to collect it is the simplest system. Digesters and incinerators are available for on-farm use but may be too expensive for small flocks. Where burials are legal the soil should be sufficiently deep and away from water courses. Cover the carcass with quicklime or a powerful disinfectant before replacing the soil and cover it securely to avoid predators digging it up.

Shepherd's Health

Healthy sheep need healthy shepherds. Always assume that sheep are carrying infection and reduce the chances of transmission by good personal hygiene.

Diseases which are transmissible from sheep to humans (zoonoses) include infectious abortions, orf, salmonella, hydatid, Q fever and anthrax. Doctors should always be told when a patient has been in contact with sheep.

Injuries arise from treading, butting, lifting, wool and hoof shears and injecting as well as flailing legs and heads. Wear protective shoes and remember that knees are just the right height to be bashed by a sheep. A puncture wound from a hypodermic syringe should be treated seriously. Chemicals such as sheep dips, sprays, drenches and aerosols must always be handled with care and, when advised, used with protective clothing.

Environmental hazards include skin cancer, infected cuts, tetanus (keep inoculations up to date), Lyme Disease (transmitted by ticks in long vegetation such as bracken) and Weil's Disease (transmitted by rats via cuts).

Health Records

Keeping records of health problems and treatments will identify areas where health control programmes are needed. Brief details of health problems should also be included on individual sheep records to identify a weakness or to trace family susceptibility.

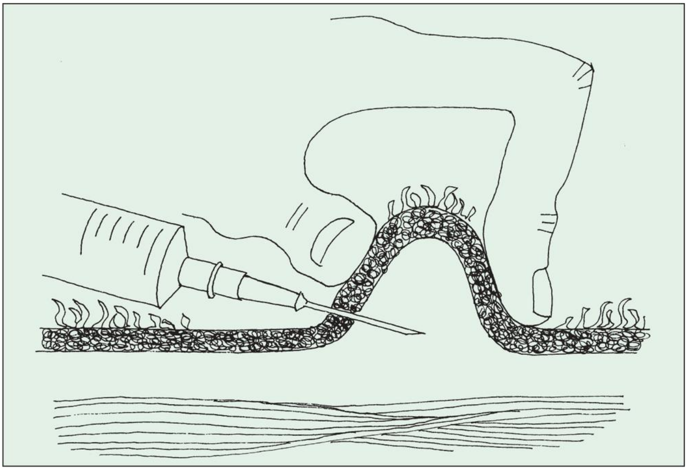


Fig 64 Subcutaneous injection. This route is usually used for vaccines and large dose medicines such as calcium borogluconate. Administer just under a loose area of skin with the needle parallel to the body to avoid the muscle. Beware of entering the fold of skin on one side and coming out the other side. Leaking may be a problem, so massage gently to disperse. A large volume should be warmed to blood temperature and divided between several sites. A veterinary surgeon may put some medicines directly in to a vein, but a layman should not.

Information to record includes:

- Date.
- Identity of animal.
- Symptoms.
- Diagnosis.
- Treatment.
- Outcome.
- Comments.

Giving Medicines

Medicines are primarily given orally (Fig 67) or by intramuscular (Fig 65) or subcutaneous (Fig 64) injection. Fig 66 illustrates the injection sites.

Always follow the instructions on medicines and observe and record the withdrawal period – this is the time that must lapse between giving a medicine and having the animal slaughtered for human consumption or drinking its milk. Where a number of treatments are involved it is safer to write out a programme.

It is usually essential that a course of treatment is completed, even if the animal has recovered.

Some medicines are not compatible, so mixtures of drugs, antibiotics or vaccines should not be used without consulting the veterinary surgeon.

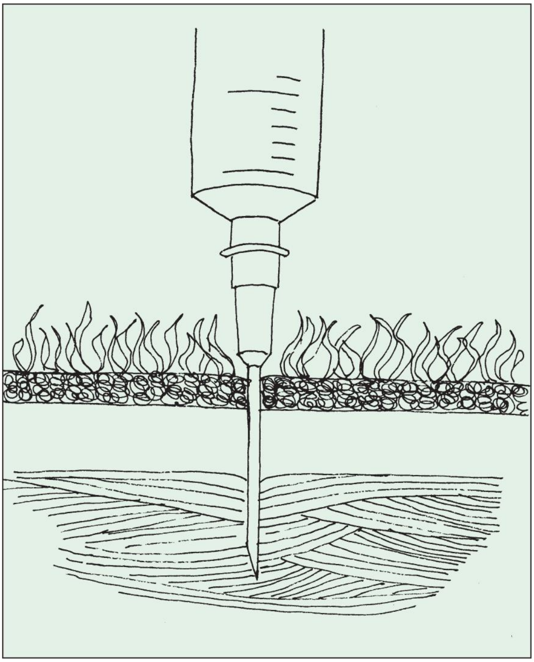


Fig 65 Intramuscular injection. This route is usually used for antibiotics. The substance is absorbed rapidly and distributed around the body. It should be given on a fleshy site, avoiding bones and on a different site each day during a course of antibiotics.

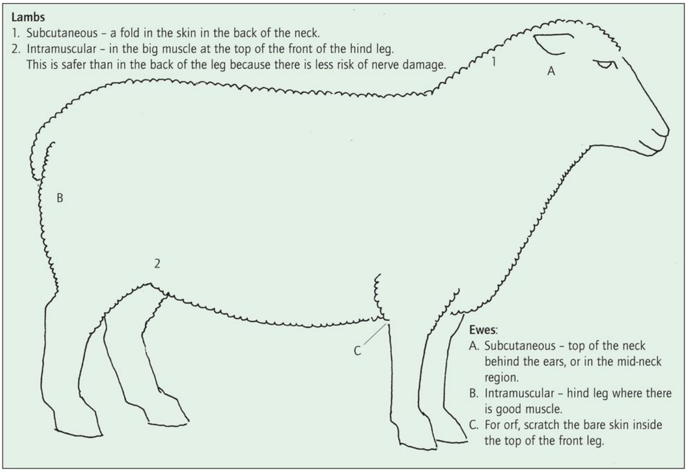


Fig 66 Injection sites. As a principle, subcutaneous injections should be made in loose skin areas – such as the neck region – and intramuscular injections where there is thick muscle. But the sites should be chosen to avoid nerves, tendons, veins and bones and not to damage expensive cuts of meat.

Part the wool to expose a clean area of skin. Do not contaminate the needle by dropping it on the wool. Expel air bubbles from the syringe.

Never vaccinate sheep when they are sick, wet or dirty and avoid combining vaccinating with too many other activities and treatments, especially during pregnancy, because the stress can be fatal.

Small quantities of injectable medicines are normally supplied in a disposable syringe with disposable needles. They should be stored safely and cleanly – usually in the refrigerator – and disposed of safely.

Most flock owners will need their own non-disposable syringes. The 10m, 20ml and 50ml sizes will cover most uses. Sheep needles are preferably 2.5cm × 18 gauge. For short-term treatments, such as a course of antibiotics, disposable needles are preferable and should not be used for more than six injections.

Fig 67 Drenching a ewe with an oral dose of medicine. Drenching guns are calibrated to deliver the precise amount and have a shaped nozzle to prevent injury. Tilt the head up very slightly and put the nozzle through the side of the mouth, behind the incisor teeth and dose over the back of the tongue. Oral worm drenches should go into the rumen to be

effective; if they go into the mouth, rather than over the back of the tongue, the drugs may by-pass the rumen and go direct into the other stomachs. Keep out of the lungs – pneumonia can be triggered by careless drenching.

Work slowly and keep animals well restrained in a race or tightly mobbed in a pen to restrict movement. Lambs, in particular, tend to jump forwards and injure their throats, sometimes with fatal consequences. For very small numbers, or for the infrequent dose, use a plastic syringe with the nozzle cut off. A 20ml size is suitable for adults and a 2ml or 5ml for lambs.

There are two risks with needles; they blunt and they spread disease. For repeated injections, such as flock vaccinations, a non-disposable needle should be changed after every twelve sheep. Where a product is being drawn from a bottle, keep one sterilized needle in the bottle during the session through which to fill the syringe.

Sterilize non-disposable needles and syringes in boiling water for ten minutes; wrap the needles in linen and aluminium foil to prevent blunting while boiling and leave them in the package until needed. Chemical sterilants are effective but can affect some drugs.

9 Lambing

During the six weeks before lambing there are a number of problems to look out for:

- Abortion.
- Metabolic disease.
- Prolapse.

Most flocks suffer abortion caused by infection, rough handling or barging at the feed trough. A normal incidence is 1–2 per cent.

Initially any abortion should be treated as infectious, which means isolating the ewe, handling her and the aborted material hygienically and seeking veterinary diagnosis. The veterinary surgeon will need the fresh foetus and foetal membranes. He will also need to know:

- The expected lambing date.
- The feeding regime.
- Any history of abortion.
- Affected age group.
- If any ewes have been bought in.

Enzootic (chlamidial) abortion and toxoplasmosis account for 80 per cent of abortions and both are controlled by management and vaccines.

Suspect infectious abortion where there are:

- Stillborn premature lambs.

- Abnormally dark-coloured stillborn lambs.
- A high barren rate.
- A high proportion of small and weakly lambs.
- A number of weakly lambs born several days early.

Pregnant women should never be involved with the lambing flock because they risk infection. Nor should aborted ewes be used as foster mothers until infection has been ruled out.

Metabolic Diseases

In the last six weeks of pregnancy the foetus makes some 70 per cent of its growth and metabolic diseases occur when the ewe has to provide for this growth faster than she can metabolize nutrients from her body. The problems are commonly

- Pregnancy toxaemia (twin lamb disease).
- Hypocalcaemia (lambing sickness).
- Hypomagnesaemia (staggers).

A ewe lagging behind the flock, staggering, reluctant to feed or showing signs of nervousness is suspect.

Pregnancy toxaemia usually occurs in the last few weeks before lambing. Hypocalcaemia strikes close to lambing or in early lactation and can be triggered by the stress of moving or transporting. Hypomagnesaemia is caused by magnesium imbalance and usually occurs in early lactation on fresh, heavily fertilized grass.

All are preventable by correct feeding and avoiding stress and can be treatable if recognized in the early stages.

Prolapse

Prolapse of the vagina may occur around three weeks before lambing usually in older, fat ewes on a high-roughage diet and carrying multiple foetuses. The first sign is the pink fleshy vagina showing through the vulva when a ewe is lying down. It may disappear when she stands and may never get any worse. If it stays visible and the ewe persists in straining, it may need a truss, plastic retainer (Fig 75) or stitching to hold it in place. Treated ewes need watching so that stitches or retainers can be removed at lambing, although some are able to lamb with them in place. Since the problem is likely to recur, vaginal prolapse cases should be culled and, because the weakness is believed to be heritable, their progeny should not be kept as replacements.

Checklist of Items Commonly Needed for the Lambing Season

General

Lambing record sheet

Phone number of veterinary surgeon

Lamb/afterbirth disposal system – Beware carcass disposal regulations

Disinfectant – For cleaning mothering pens, etc.

Strong plastic bags/sack – For collecting afterbirth, dead lambs and foetal material

Thermos flask/supply hot water – For making hot drinks or (cooled) for thinning thick colostrum for tubing or mixing dried colostrum

Shelter area for ewes and lambs – Cheap housing, hurdles, windbreak material, bales

Shelter area for shepherd – Caravan, hut

Bedded area ready for pet lambs – Pen, deep box

Notebook/pencils that can be used in the rain – For lambing data, reminders and lists

Fox deterrents – Electric fence, bells, flashing lights, etc.

Torch – Batteries if not rechargeable

Large dustbin with lid – Many uses including holding concentrates or for keeping foster and natural lamb during fostering

Very sharp knife – For skinning lambs when fostering

Baler twine and pocket knife – Invaluable

Plastic bags – For rubbish

Buckets – Can never have too many

Stock marker

For the Ewe

Food, water and hay dispensers – If penned after lambing

Prolapse retainer/harness

Medicines for pregnancy toxaemia, hypocalcaemia and hypomagnesaemia

Hoof and dagging shears, worm drench and gun, footrot spray – For routine treatment if practised

For Assisted Lambing

Long-acting antibiotic – For the ewe

Water, soap, towel and mild disinfectant – For clean hands and arms

Lambing lubricant – Pure soap flakes or proprietary type

Lambing ropes – Have several so that there is always one sterilized

Antiseptic and plastic containers with lids – To store sterilized equipment

Source of boiling water – For cleaning and sterilizing

Syringes – 5ml, 20ml, 50ml

Needles – 18–20 gauge. 12–25mm

Arm length poly gloves – For hygiene

Rubber gloves – For grip

For the Lamb

Iodine or antibiotic spray – To treat navels

Towels/absorbent material – For drying lambs if necessary

Thermometer – To check for hypothermia. If digital check the batteries

Scissors – To trim umbilical cord

Warming box and heat source

Colostrum – Frozen from ewe or cow or dried

Colostrum container – To milk and carry colostrum

Stomach tube and 50ml syringe – For tubing colostrum

Glucose solution – For intraperitoneal injection

Lamb jackets – In case of turnout into bad weather

Cardboard boxes – For transporting lambs, temporary home for a foster lamb, makeshift intensive care and 1000 other uses

Ewe milk replacer plus mixing utensils

Feeding bottle with teats – For topping up

Bucket feeder, teats, tubes – For artificial rearing

Thermos to carry warm milk for topping up, etc.

Glucose and electrolyte – For scouring lambs

Antiseptic/antibiotic spray – For wounds or injection site

Liquid paraffin or soapy water – Enema

Rubber or plastic gloves – For handling material which might be infectious

Castration and tailing kit – If practised

Lamb tags – For identification

Marker spray/paste – To identify lambs and dams

Fig 68 Mothering-on pens made with solid sides are the most secure and prevent ewes in adjacent pens from being distracted by a neighbouring ewe, lamb or food. Hurdles also make good pens but the lower

bars need to be close together or covered to prevent lambs from escaping. Attach any covering material carefully because loose material and twine are magnets to baby lambs. Pens can be made from straw bales but must be very well secured.

Preparation for Lambing

Good preparation is vital for a successful lambing. In the last six weeks jobs may include housing, clostridial vaccination, footcare, worming and crutching. Ewes should be grouped according to their lambing dates, if practical, so that feeding is targeted accurately. Very thin or very fat ewes may have separate groups for individual feeding.

In the last two weeks the lambing facilities and equipment (*see* box) should be in place. Mothering pens (Fig 68) should be under cover or in a sheltered area. Allow at least one for every six–eight ewes in the flock or one per three ewes in a synchronized flock, plus a pen for hand rearing surplus lambs. Pens must be secure, have easy access and be at least 1.5m × 1.5m and 1m high with no gaps where lambs can be trapped or escape, no projections and no loops of twine to ensnare lambs. Prolific flocks need larger pens to accommodate large litters. Old plastic feed bags (Fig 69) make effective individual hay feeders.

Shepherds in America use lambing cubicles (Fig 70) in housed flocks. Sited away from a busy area, the ewes go in voluntarily to lamb in privacy. The low threshold on one side lets the ewe in, but retains the lambs.

In countries where burials are legal, dig a disposal pit away from a water course for afterbirths and dead lambs and cover it with a heavy top that is considerably larger than the pit to prevent scavenging.

Fig 69 Old plastic feed bags make cheap hay feeders for individual ewes. Cut slots near the bottom, stuff with hay, tie the neck tightly and suspend it well clear of the ground.

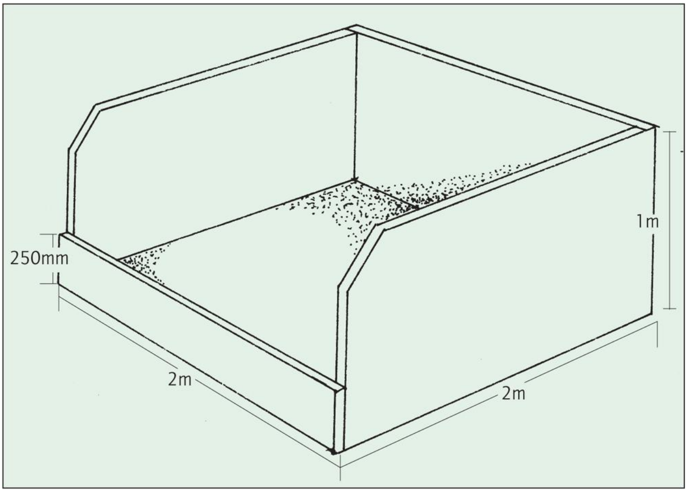


Fig 70 Lambing cubicles are used in America with confined or housed flocks where ewes have no privacy at lambing. They are sited on the perimeter of a pen, away from a working area and are well bedded. Ewes looking for a birth site go in voluntarily and lamb in peace. The low threshold on one side allows ewes in, but prevents new-born lambs from getting out. They will need to be well cleaned between occupations.

Outside Lambing

Ewes lambing outside should move to the lambing area at least ten days before lambing to allow them to settle. The area should have been sheep-free for a few weeks to let it freshen up. Provide shelter from all wind directions and check dangers such as fencing and gates that new-born lambs can get through but ewes cannot follow.

The Shepherd

Have light, warm clothes with loose sleeves for rolling up. Waterproofs are necessary for outdoor lambing and waterproof leggings indoors protect trousers from kneeling and handling sheep – but some waterproofs are noisy to walk in and can spook sheep. File nails, remove rings and have somewhere comfortable to sit.

Adopt a routine for bedding, watering and feeding. Look at the flock regularly – every two to four hours by day depending on the amount of activity. Lambing may last from three to six weeks so plan a sensible night routine such as taking a last look at midnight and a first look at 6am. In large flocks a twenty-four-hour watch (three eight-hour shifts) pays off in terms of lambs saved and reared.

In addition:

- Have easily available snacks, meals and hot drinks.
- Have easy access to a sink and hot water.
- Have all lambing equipment close at hand.
- Tell the veterinary surgeon when lambing starts.
- Have a list of expected lambing dates for individuals (if available) and, if scanned, the number of lambs expected.
- Have record sheets (Table 7) to keep up to date during lambing and a notebook and pencil to avoid relying on memory.

Lambing Times

Lambing is not spread evenly over twenty-four hours. In a large flock it will peak at 6–7am and 6–9pm with a lull from midnight to 3am. However, work in America and the UK suggests that flocks can be persuaded to lamb during the day; the theory being that a disturbance, such as feeding, inhibits labour.

Flocks which were fed at around 9–10pm resulted in 90 per cent of lambs being born during daylight hours. The key is to feed the ewes at the same time each evening, starting the routine three weeks before lambing to condition the flock.

Fig 71 The start of lambing. A ewe strains skywards.

Lambing

The ewe goes through several stages when she is lambing:

- Some twenty-four to forty-eight hours before lambing, the vulva is very pink and slackens as the muscles relax. The udder tightens and the teats distend.
- Within twenty-four hours she may become restless, distracted and occasionally paw the ground. She may steal a new born lamb from another ewe and cause confusion (Fig 72).
- Within four hours of lambing she will try to isolate herself, paw the ground and find a birth site – usually on the perimeter of the lambing area.

- Serious attempts to lamb begin when she lies on her side, characteristically lifting her head and pointing her nose skywards (Fig 71). The cervical seal appears from the vulva as creamy mucus and she gets anxious, bleats and gets up and down licking the ground where amniotic fluid has been spilled. Uterine contractions move the lamb towards the cervix – look for a hollow forward of the pelvis. This stage may last three to four hours.

Fig 72 A ewe close to lambing may begin to lick and then steal a lamb from another ewe – often when the lambed ewe is distracted by lambing a second. It is wise to prevent it happening because the 'pincher' can be distraught and disruptive when the lamb is removed.

Lambing Sequence

Lambing proper begins when she is visibly straining and membranes and mucus appear from the vulva. The major membrane is the water bag containing the foetal fluids (Figs 73 and 74).

She strains more urgently, the waterbag bursts to lubricate the birth canal and the lamb's nose and front feet should become visible. After a few minutes of serious straining (a lot longer if she is restless) she should expel the lamb.

The umbilical cord breaks naturally and the lamb shakes its head free of membranes and coughs and breathes.

The ewe licks it around the face to clear membranes and dry it; when the lamb tries to stand she nudges it towards a teat.

After nursing the first lamb she may become distracted, paw the ground and lie down to lamb another.

Time Scale

Predicting the time for the birth process is an inaccurate science because all sheep differ but it is useful to know what to expect.

From the:

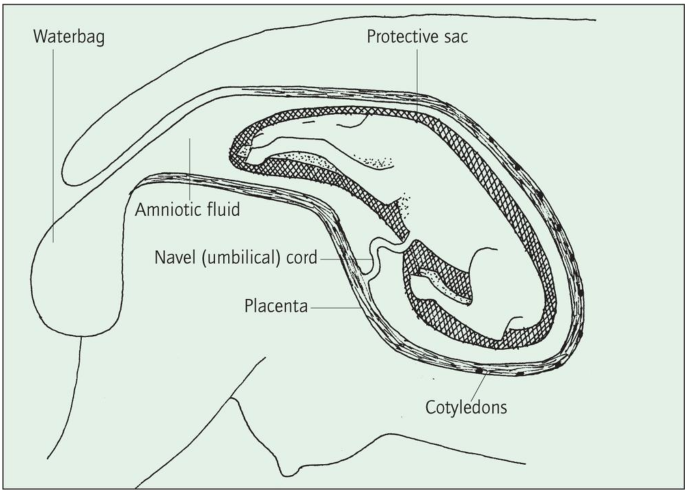


Fig 73 Early stages of birth. The lamb is attached to the placenta by the navel cord and the placenta is attached to the uterus by button-like cotyledons. There are two water bags – the first one containing the amniotic fluid and the second a protective sac around the foetus. As the lamb is expelled, the first water bag lubricates the way. Sometimes the second water bag remains around the lamb until it shakes its head free or the ewe licks it. The navel cord will break during birth or when the ewe stands up.

• Start of serious straining to the appearance of a water bag.	30 minutes
• Water bag to appearance of lamb.	20–30 minutes
• Birth to the lamb getting on its feet.	10–20 minutes
• Birth to sucking.	30 minutes
• From birth of first lamb to birth of second lamb.	30 minutes
• Birth of first lamb to the expulsion of afterbirth.	2–3 hours (half an hour to eight hours is normal)

Fig 74 The water bag is the first membrane to appear before the lamb is born.

Ewes lambing for the first time are likely to take longer than experienced ewes.

During the Birth

When a ewe starts to lamb leave her undisturbed and check her records to see if she has a history of problems. Make sure that the basic lambing kit (Fig 75) is handy:

- Lambing gel or solution of soap flakes as lubricants.
- Warm water and clean towel.
- Mild disinfectant.
- Lambing rope.
- Scissors and iodine.
- Have a mothering pen ready with water and clean bedding.
- Keep an eye on her. Lambs can be born in tough membranes which prevent breathing or they can come

backwards and suffocate in the cervix. Both cases need immediate action to free them.

Fig 75 Basic lambing kit. Clockwise from bottom right: tailing/castrating pliers plus rings; sharp knife for skinning dead lamb for fostering; prolapse retainer; syringe; lambing rope; scissors for trimming navels; iodine; lambing lubricant; disinfectant; bucket and towel; soap flakes to help lubricate; milk powder; frozen colostrum; feeding bottle and teat; stomach tube; digital thermometer.

Assisting a Birth

Some ewes need help at lambing – usually fat ewes with large lambs. Help will range from a gentle pull when a lamb is large, to full blown assistance where a lamb is wrongly presented. A reasonable goal is 10 per cent of ewes assisted. This means that on average 90 per cent of ewes do not need assistance, so it is not a major issue. Colleges or training organizations run lambing courses using simulators, and when a ewe with a lambing problem is taken to the veterinary surgeon he should be asked to explain what he is doing.

The skill is:

- To know when to investigate.
- To know when to assist.
- To know how to assist.
- To know your limitations.
- To seek veterinary help sooner rather than later.

If a lamb spends too long in the birth process it can separate from the placenta and die before birth. Therefore protracted births are risky.

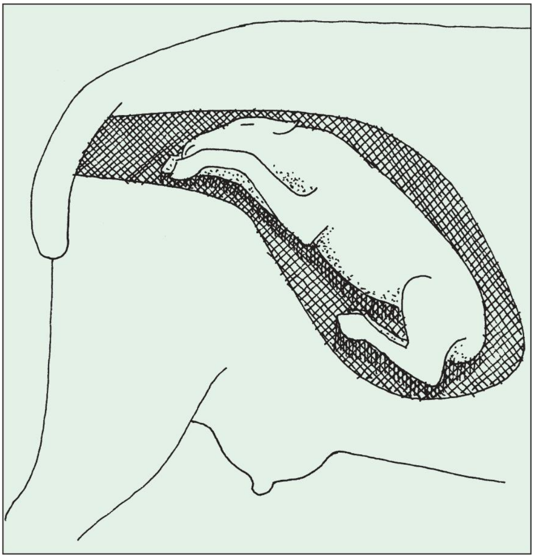


Fig 76 Normal presentation of a single lamb. If a ewe is straining unsuccessfully to deliver a normal presentation it is likely to be too large for her. Straighten the lamb's legs and draw the lamb while easing the fingers around the back of the head – using lots of lubricant – to pull it out. Pulling the legs alternately and rotating the lamb gently one way and then the other may help to release it. Wearing a rubber glove helps to grip slippery legs when they need a strong pull.

The consensus is that investigation should be left until:

- Around 90 minutes after the first signs of straining and no lamb is visible.
- Or 30 minutes after the water bag has appeared and no lamb is visible.

- Or a ewe appears to give up vigorous straining, loses interest or seems exhausted.

Have a system for quietly cornering and catching a ewe; they can be lured by a borrowed baby lamb or even by a towel lying on the ground. A quiet ewe can be approached while she is preoccupied with straining. Ewes can be restrained and investigated on their side or standing up.

Initially make a cursory check to see if the presentation is correct. If, for example, both legs are back (Fig 79) it is easier to correct it before the lamb is hung (Fig 80). With a scrubbed, disinfected and well-lubricated hand, cup the fingers and thumb to form a cone, slide it into the vagina a few inches and check the cervix. If the cervix does not seem to have dilated and there is no entry into the uterus, massage it gently for a minute and give it more time. If it refuses to open and the ewe is a maiden, it may be a condition known as ringwomb and will need veterinary attention.

If the cervix is open and a lamb can be touched it should be possible to identify instantly if it is normal presentation (Fig 76) by the presence of a nose and two hoofs. Consider drawing (pulling) the lamb if nothing happens for another fifteen minutes because it is likely to be large or she is tired.

Drawing a Lamb

A lamb can be drawn when the ewe is standing or is lying on her side.

The basic rules are:

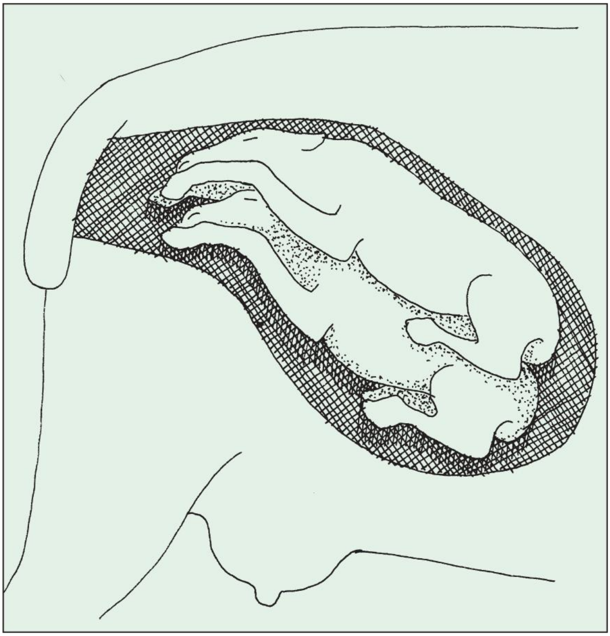


Fig 77 Normal presentation of twins. These would normally be lambed in an orderly sequence. If they come together and get stuck, ease one back and draw the other. They are less likely than a single to be too large.

- Disinfect and lubricate hands and arms.
- Ease a handful of lubricant into the birth canal and around the head of the lamb.
- Pull on as many parts of the lamb as possible – that is, both legs and the head. Straighten the lamb's front legs and draw them alternately. Always be gentle but firm. Only experience can teach how hard to pull.
- Normally draw slightly downwards towards the udder.
- Pull when the ewe is pushing (straining).
- To help free a tight lamb rotate it slightly, or roll the ewe onto her other side.
- Rubber gloves give a comfortable grip.

- If the feet are secured and pulled with a lambing rope make sure that the nooses are above the fetlock joints and not around the pastern joints.
- Be aware that the pelvis can trap a hand.

If there is no sign of a lamb or if part of a lamb is visible but is making no progress, gently, hygienically and with lots of lubricant investigate further into the uterus. Be gentle because the uterus lining is fragile. Feel along the back of the lamb to avoid disconnecting the umbilical cord.

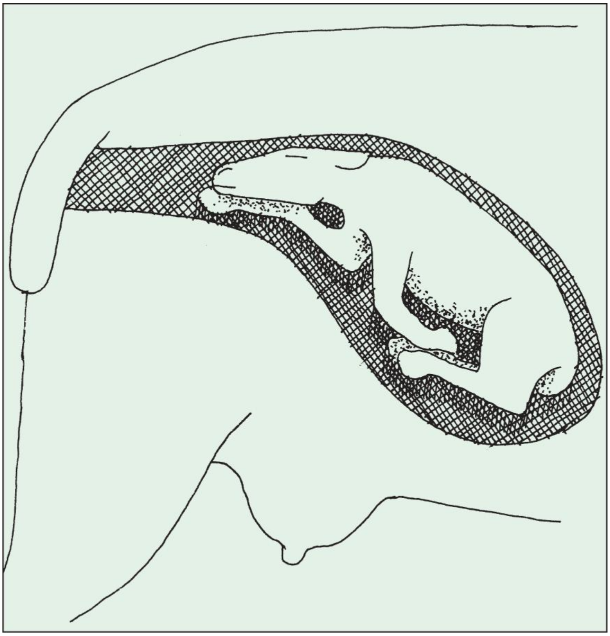


Fig 78 One leg back. This is a common problem. In the case of a small lamb or a 'roomy' ewe (not a maiden) it is possible to draw it with one leg back. Otherwise correct the situation as suggested in Fig 79 – the presentation of both legs back.

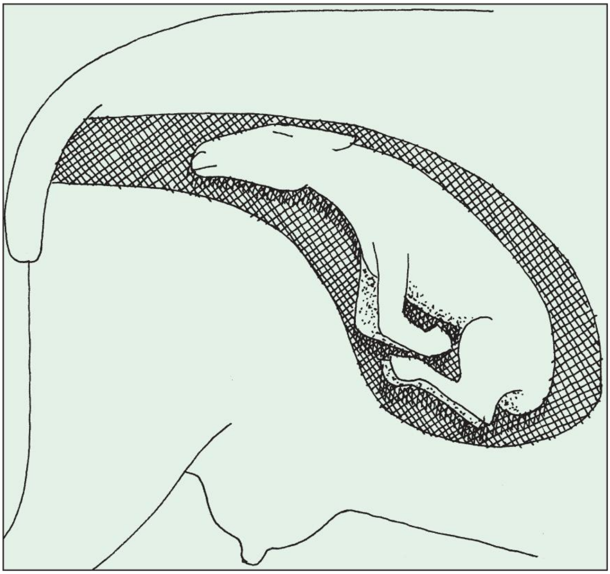


Fig 79 Both legs back. In this case the lamb loses its natural arrow-like shape and sticks at the shoulders. Ease the lamb back into the uterus, cup the feet in the hands and draw them forward individually and the lamb should be expelled in the natural lambing position. Early recognition of this problem will avoid a hung lamb (Fig 80).

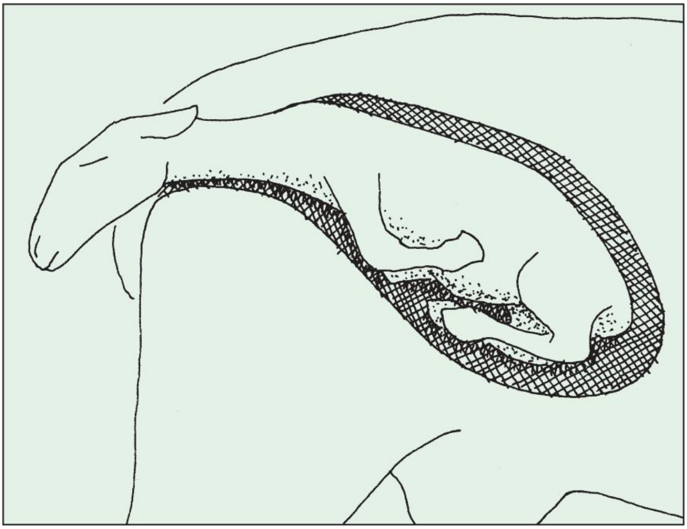


Fig 80 Hung lamb. This happens when both legs are back and the ewe has managed to expel the head. Often the head is swollen and the tongue blue, but this does not mean that the lamb is dead. If the head is soiled, wash it before returning it slowly to the uterus. This can be a tedious process because she will try to push against you – pause when she does. It helps to put the ewe on her back, lifting up her rear end and supporting it against a bale. It will take copious amounts of lubricant and patience. Correct and lamb as for both legs back (Fig 79).

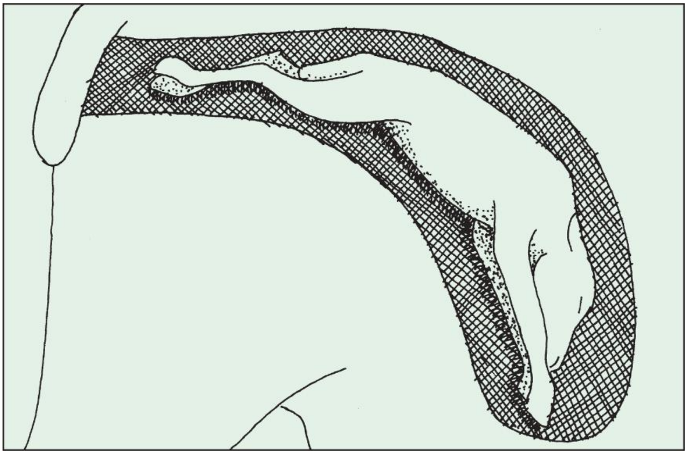


Fig 81 Backwards. This is common with multiples, where a ewe may give birth to a small lamb unaided. But if it gets halfway out and the ewe stops for a rest, it will suffocate. As soon as the whole tail is visible the lamb must be drawn as quickly as possible because the navel cord will be stretched and trapped against the pelvis. Another danger with a lamb being born backwards – especially a large one – is that the ribs can break. Pulling one leg at a time can narrow the lamb's pelvis and rotating it through 45 degrees may help. If the lamb is also upside down, draw it straight out and not towards the udder. Swing the lamb and clear the mucus from the nose and mouth.

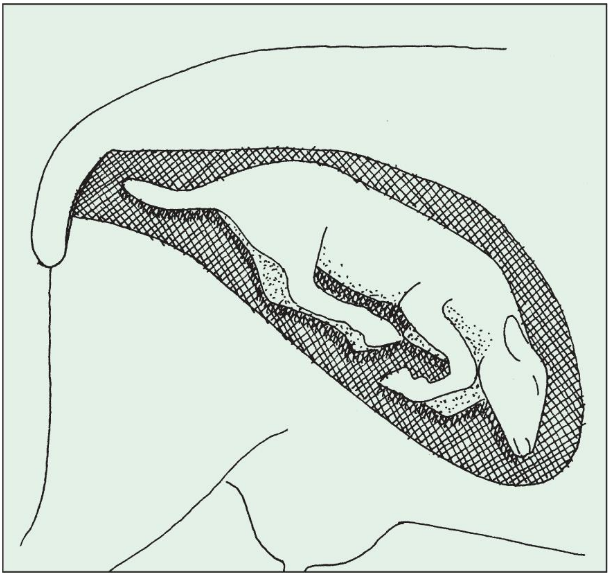


Fig 82 Breech. Usually identified quickly because the tail may be felt or be visible and often the ewe stands in a characteristically rumped position. Correct it to the backwards position (Fig 81) by holding one hock, pushing it gently upwards and forwards, then cup the foot and ease it into the birth canal. Do the same with the other leg and deliver the lamb in the backwards position.

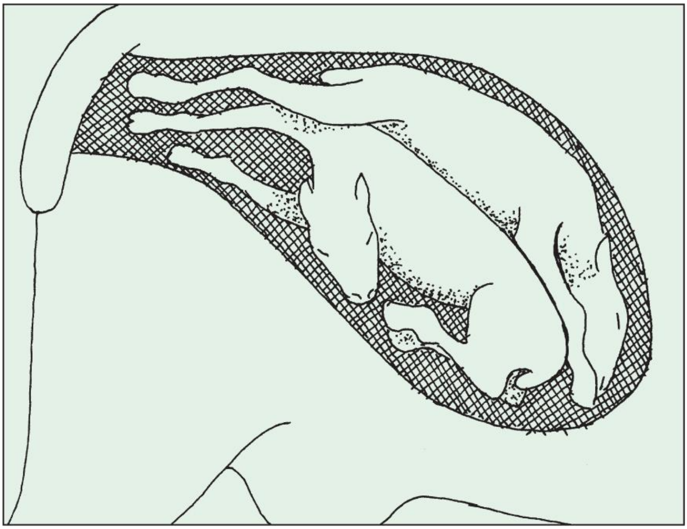


Fig 83 Wrong presentation of twins. In this case the backward presentation is likely to be the easier to lamb and is best drawn first if the lower lamb can be eased further into the uterus. The key is to match the legs with the lambs and identify the front and back legs (Fig 85) so as to distinguish which is the backward presentation.

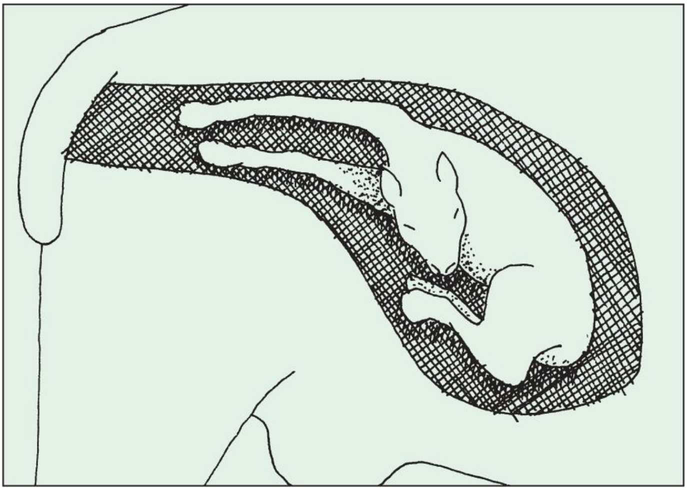


Fig 84 Head back. This is one of the most difficult to correct. Put ropes on the legs and return them to the uterus. Identify the head, straighten it to lie between the forelegs – then rope it or hold it because it invariably springs back to its original position. Ease head and legs into the birth canal and lamb as for normal presentation.

If the contents of the womb feel naturally lubricated and there are no brown unpleasant discharges, there is probably no urgency. Decide what the problem is (Figs 76–83) and correct it or seek help.

Birth is a clean activity so smelly mucus or membranes may herald a dead lamb or an abortion. A dry foetus also suggests a dead lamb. Withdraw it with care, feel for other lambs and treat as an infectious abortion.

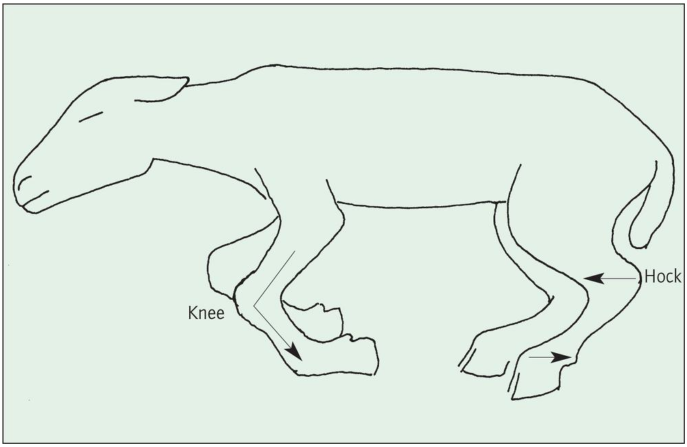


Fig 85 One problem with an assisted lambing is identifying the back and front legs. The drawing shows the essential differences; in the front leg the joints bend in the same direction; in the back leg they bend in opposite directions. The knee joint and the hock also feel different. It is vital to match a pair of legs; feel closely around the inside of one leg to make sure that it actually joins the second leg and that they both belong to the same lamb. Practise by studying and handling a small lamb.

Whenever a hand has been put into the uterus the ewe should have an antibiotic injection or pessary and the difficulty should be recorded so as to identify a recurring problem or persistent offender.

Professional Help

If the ewe is taken to the veterinary surgeon for lambing, take with her:

- The navel iodine (*see* later).
- A towel to assist drying on the way home.

- A shallow strawed box for the lambs.
- A stomach tube to feed colostrum if the journey is long.
- A foster lamb if dead lambs are suspected.

Fig 86 Swing a lamb if it is slow to breathe.

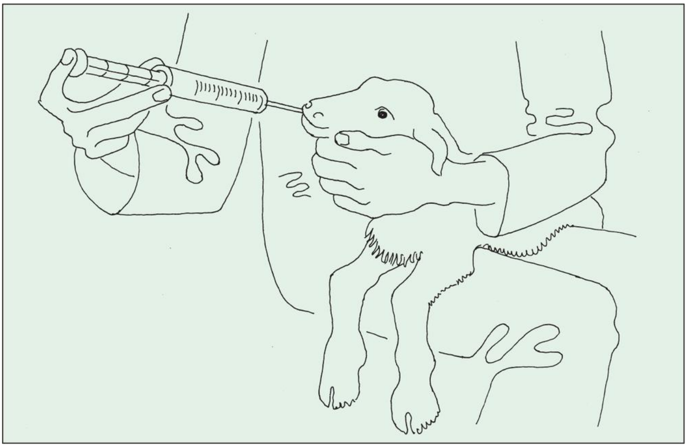


Fig 87 To use a stomach tube, sit the lamb comfortably on your knee, coat the tube with vegetable oil, let the lamb chew your finger then slide

the tube over the tongue and into the stomach until about 5–8cm are left. If the tube goes into the lungs by mistake the lamb will cough violently. Normally it will relax and chew the tube – but do not let it swallow it. Attach the syringe to the tube and empty gently. When finished, pinch the end of the tube and withdraw it slowly.

Colostrum

The new-born lamb is totally at the mercy of its environment. It has two enemies:

- Cold and infection.

The one defence against both is colostrum (first milk) that is high in both energy and antibodies.

At birth a lamb has to survive the transition from a temperature in the uterus of 40°C to the outside temperature that could be freezing. To do this it has a layer of brown adipose fat along the back and neck which metabolizes rapidly after birth to produce energy. However, it only provides enough heat to keep the lamb warm for about half an hour and after that it must get its warmth and energy from colostrum. This is the first reason why lambs must have colostrum quickly after birth.

Unlike other animals, antibodies from the ewe's bloodstream do not cross the placenta and a lamb is born exposed to disease. Bacteria enter through the navel cord and the mouth and the only defence are the antibodies in colostrum. Initially the stomach has a high pH so as not to destroy these antibodies, but equally it does not destroy bacteria.

The lamb's intestines are lined with cells that allow antibodies from the colostrum to pass straight into the bloodstream. These cells are slowly replaced after twelve hours and may be gone in twenty-four hours. Although the ewe continues to secrete antibodies for around four days after lambing, the lamb loses the ability to absorb them, which is the second reason why lambs must have colostrum quickly after birth.

Colostrum is also a laxative and is essential in getting the gut working to prevent watery mouth. So the rules are:

- Lambs should have some colostrum within half an hour of birth.
- Do not give ewe-milk replacer before colostrum because it reduces the time that the intestine can absorb antibodies.
- A lamb needs 200–250ml of colostrum per kg of bodyweight during the first fifteen hours. So a 5kg lamb will need more than one litre. Split feeds about four hours apart.
- Most healthy ewes will have enough colostrum for their lambs.
- If in doubt – for example a last-born triplet – feed extra by stomach tube.
- Feed 50ml per kg of bodyweight for a first feed to a maximum of 250ml. Do not overfeed if it is reasonably vigorous because it can make it drowsy and fail to suckle while it is still able to absorb antibodies.
- Have enough spare colostrum for 5 per cent of expected lambs at 200ml per lamb.
- Never be without spare.

Sources are:

- Colostrum milked from an older ewe with a single lamb.
- Goat colostrum (must be free from Caprine Arthritis Encephalitis).
- Cow colostrum. There will be no appropriate antibodies (unless the cow has a clostridial vaccine before calving)

and a slight risk of inducing anaemia. It is best to have a mixture from several cows.
- Commercially available dried colostrum.

Colostrum can be frozen in ice cubes or small plastic containers and kept for a year. Defrost gently in a container in warm water. Boiling or microwaving destroys antibodies. Feed at body temperature of 39–40°C.

Routine for the New Lamb

As each lamb is born there should be a routine to make sure nothing is forgotten.

- Clear mucus from nose and throat with finger and check that it is breathing by watching the chest expand and contract.
- If it is slow to breathe check for a heart beat (practise locating one in a live lamb first), then hold it securely by the back legs and swing it through 180 degrees three or four times (Fig 86). Other methods to encourage breathing include putting a piece of straw up a nostril; rubbing vigorously with straw or a towel; pinching the skin; using an oral spray that stimulates the heart and breathing. Sometimes it may take several minutes to get a lamb to breathe regularly.
- Shorten the torn umbilical cord to around 7cm with scissors. Never cut the cord before it has torn free because it can haemorrhage.
- Treat the navel immediately with veterinary iodine solution (preferably 10 per cent). The navel is an open wound and must be protected against disease organisms. It can be sprayed, or dipped in a small container; the latter is better because it surrounds and soaks the cord.
- Check for milk by gently drawing some from the teats. The plug in the teat canal (*see* Appendix I, Fig 122) will

offer some resistance. A ewe should be milked while she is standing.

- Watch to ensure that the lamb sucks – wagging tails and sucking noises are a guide but they may just be pulling on a staple of wool. Check the teat after suckling to see if it is soft and damp. It is normal for some ewes to be restless at this stage and keep circling the lamb, making it difficult for it to latch on. If a lamb is slow to find a teat, guide its head to it while nudging and pushing the base of its tail.
- It is normal for a ewe to paw a lamb aggressively to make it stand up. If a lamb is slow to stand it may be because the joints are weak or the legs are bent from having been in an awkward position in the uterus. The lamb may need to be held to suck but usually strengthens within a few hours.
- Let the lamb have its fill, but if it is small and siblings are expected, milk off some of the colostrum (*see* panel) into a clean container and share it among them later by stomach tube (Fig 87). Any weakly or small lambs should have colostrum by stomach tube within twenty minutes of birth.
- Make sure meconium (first content of the bowels) is expelled. It is very dark and sticky. If none is seen and after a few feeds the lamb seems to be limp or slobbering give an enema of glycerine, liquid paraffin, or up to 20cc of soapy water flushed slowly into the rectum at body temperature from a small syringe (without the needle). It should expel meconium almost immediately but if there is no improvement suspect watery mouth (*see* later).
- Check the lambs for in-turned lower eyelids (entropion), indicated by a weeping eye and cloudy cornea (Fig 88). Pull the skin below the eye to flip it out; correction at this stage may avoid surgery later. Note any cases because it is possibly inherited.

- Expect more lambs until the afterbirth (placenta) appears (Fig 89) then watch for it to be expelled. If no afterbirth is seen (she may have eaten it or it may have been scavenged) suspect it has been retained. Normally this is not harmful but keep an eye on her health and be prepared to give an antibiotic.

- Never pull afterbirth away, but if it is slow to cleanse it can be shortened by scissors to reduce the chance of infection. Once cleansed, dispose of it hygienically.
- Leave the family on the birth site for as long as feasible to improve bonding. Do not distract the ewe by feeding her until she has cleaned and fed the lambs. Offer slightly salty warm water immediately; ewes lose at least a gallon of body fluids at lambing and their thirst is immense.
- Put the family into a mothering pen. Most ewes follow their lambs readily if carried slowly and low to the ground. If contact is lost the ewe will run back to the birth site.
- If a lamb is taken away for treatment the ewe may reject it when it comes back, so keep the afterbirth to wipe on the lamb when it returns. It may take six to ten hours for a ewe and multiple lambs to bond, so there is a better chance that she will accept any which are taken away and returned during that period.
- Keep ewe and lambs in a mothering pen for twenty-four to forty-eight hours. Make sure that the lambs are feeding (especially any small, weaker ones) and free any tails which get stuck down over the anus with faeces.
- When a family is turned out from the pen it should be added to a small group to minimize the chance of mismothering.
- Clean and disinfect the pen, or if this is not possible bed deeply with more straw. Bedding can be sprinkled with granules of a chemical which vaporize and disinfect the material.
- Record the details of the lambing with particular emphasis on any lamb losses so that the reasons and

any trends can be identified and corrected (*see* box on losses).

- Never be surprised if siblings are different breeds. Ewes are capable of being fertilized by several rams and bear littermates with different sires. Twins can also be very uneven in size – possibly due to uneven placental development. Lambed ewes can also have a second lamb several days or weeks after the first; this is a well-documented but unexplained phenomenon.

Fig 88 Check for entropion

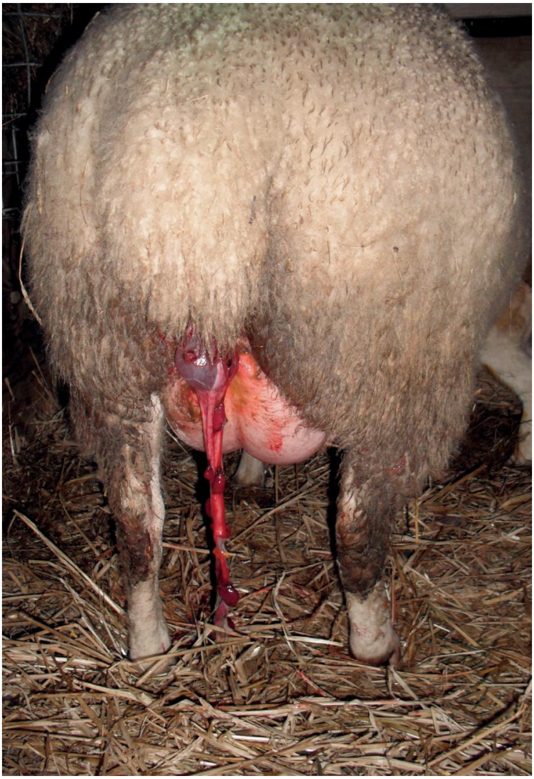


Fig 89 The afterbirth signifies that she has finished lambing. Characteristically it contains red buttons or cotyledons on the membrane.

Hungry Lambs

Once it has had colostrum for twenty-four hours a hungry lamb can be topped up with ewe milk replacer (not cow's milk) from a bottle. Various teats are available to fit most soft drink bottles.

Hungry lambs take a bottle quite readily – offer a finger first then substitute the teat. Feed little and often to keep them satisfied – around 50ml/kg body weight every three hours.

Candidates for topping up are any hungry lambs. Identify the reason for the hunger, such as a large litter, poor milk yield, sore or very large teats. If fostering is not an option leave the family together and continue to top them up. They learn to come for their bottle very readily and topping up may only be necessary for a few days. Where more than one lamb is being topped up it may be easier to put them on an artificial rearing system (*see* Chapter 10).

After twenty-four hours the ewe could be:

- Worm drenched (if appropriate).
- Foot trimmed.

And the lambs may be:

- Identified
- Tailed.
- Castrated.

Families should be identified before they leave the pen so that they can be matched up in the field from a distance. Write the same number or mark on one side of each *member* of the family with a scourable spray or paint. A spot on the back of the neck identifies a lamb as a single.

Pedigree breeders will also identify the lambs with ear tags or tattoos as required by their breed society.

Castration and Tailing

Castration and tailing are welfare issues and, where *possible*, should be avoided.

Ram lambs which are destined for slaughter need not be castrated unless they are likely to be kept after five months of age, when they mature sexually and become a management problem. The advantage of leaving them entire is that they are leaner and grow 7 per cent faster than castrates. However, there may be resistance to entire ram lambs in some markets. The rubber ring method (Fig 97) is widely used in small flocks. A *bloodless* castrator which crushes the spermatic cord is used on older lambs.

Lambs are tailed (Fig 96) for hygiene reasons and those kept for breeding will benefit as adults from not having long tails. Slaughter lambs need not be tailed unless they are destined for the store and heavy hogget market when they may get dirty during the finishing period. Very short tails, which are banned in some countries, may predispose prolapse in breeding ewes.

Lamb Losses

In every flock there will be losses and lambing is the riskiest time. Average ewe losses are around 2 per cent.

Neonatal lamb losses of around 5 per cent is a good target in a small flock; 10 per cent may be acceptable, but any higher suggests a problem that needs identifying. Hence a record of losses and reasons should be kept for analysis (*see* box p.124). Mortality rate increases with litter size.

About three-quarters of lamb deaths occur at birth and in the first four days, so this is the time to concentrate effort on caring for the lambs. More lambs die from management failures than infectious disease or dystokia.

Prevention

- Correct feeding of the ewe to produce viable lambs and good colostrum.
- Supervision at lambing.
- Adequate colostrum.
- Treat the navel.
- Hygiene – especially bedding.
- Shelter.

Birth Weight

Neonatal mortality increases as birthweight falls below about 3kg putting lambs at risk of hypothermia and starvation. At the other end of the scale large lambs are at risk from dystokia. Figures suggest that in modern breeds lambs below 2kg birthweight have a 90 per cent mortality rate while lambs at the optimum weight of 4–5kg have 10 per cent mortality.

Typical birth weights are:

• Single	5kg
• Twins	4kg
• Triplets	3kg

Where there are a number of small, weak lambs at birth get veterinary advice. They may be a result of infectious abortion, inadequate nutrition or a trace element problem. Vitamin E is thought to be particularly important to young lamb survival and some compounders are adding it to their ewe feeds.

Losses of Young Lambs

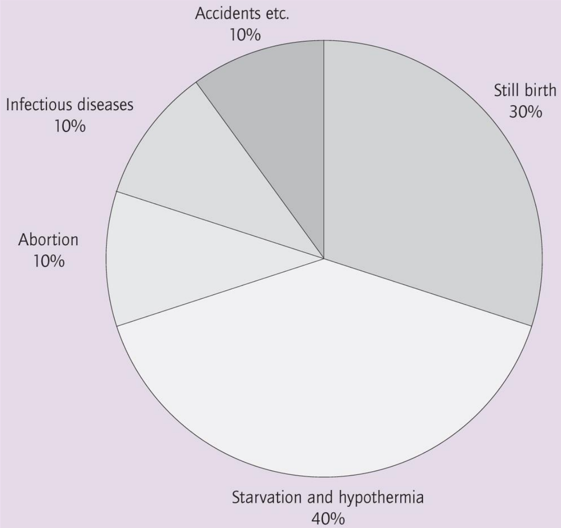


Fig 90 Statistics show that most neonatal lamb deaths are due to starvation, exposure and hypothermia – all preventable by good management. A common accident is ewes lying on their lambs.

Health Checks

Problems to look out for in young lambs include:

- Hypothermia (*see* box and Fig 91).
- Watery mouth.
- Scouring (diarrhoea).
- Joint-ill and navel-ill.
- Lamb dysentery.

In watery mouth (rattle belly) the mouth is cold and drools clear saliva, the stomach is distended by gases and the lamb listless. It is caused by *E. coli* bacteria, ingested from wool or bedding, that stop gut movement and then cross the wall of the gut and infect the whole lamb. It is treated with antibiotics, an electrolyte given by tube and an enema to get the gut working. Do not feed colostrum but try 20–40ml of natural yoghurt by stomach tube. Clean bedding and early colostrum should prevent the condition but in the event of an outbreak it can be controlled by oral antibiotics.

Yellow scours is likely to be caused by excess milk and may not be a problem, but grey or green watery faeces with a tinge of blood need veterinary treatment. An electrolyte given by tube will help to rehydrate a scouring lamb.

Fig 91 The onset of hypothermia – usually brought on by hunger.

A swollen navel suggests navel-ill and swollen painful joints suggest joint-ill and should be referred to the veterinary surgeon. Both are caused by bacteria (which may be spread by footrot) and need antibiotic therapy. They are usually the result of poor hygiene and inadequate colostrum.

Lamb dysentery (Enterotoxaemia) will kill young lambs suddenly as a result of a build-up of clostridial bacteria in the lambing area. It can be prevented by vaccinating the ewes who pass on immunity through their colostrum.

Problems to look out for in ewes include:

- Discharges from the vulva.
- Udder problems.
- Uterine prolapse.

Discharges from the vulva after lambing are not unusual. If they are not smelly, not excessive and the ewe is not off-colour there is probably no problem. Possible serious problems are the retention of a dead lamb, or metritis (inflammation of the uterus) after an assisted lambing; these will need urgent veterinary attention.

Hypothermia

Exposure and starvation resulting in hypothermia (lower than normal body temperature) is the biggest single killer of lambs.

The condition is preventable by providing shelter, ensuring that every lamb gets colostrum at birth and continues to get enough milk. All lambs are at risk – even those that appear to have been successfully suckled and mothered on.

Any lamb with an anal temperature of less than 39°C is suspect. Inactivity is an early sign. Always take the temperature of a suspect lamb. Mild hypothermia makes a lamb physically unable to suck and no amount of patience will persuade it; therefore, without a temperature check, there is a risk that it will be dismissed as not being hungry.

Risk periods and causes are:

- Birth to five hours due to loss of heat.
- Five hours onwards due to starvation.

Hypothermia is treated by giving warmth and food according to age and cause (*see* following table). For example, lambs over five hours old are likely to be hypothermic due to starvation and have a low level of blood glucose. Warming them before feeding them causes fits and death.

Warming a Lamb

Always dry a lamb with a towel before warming to avoid more heat loss through evaporation. Lambs wet with birth fluids are difficult to dry and can be washed in warm water first.

Follow by gentle heat such as a hair dryer, a fan heater or even a low temperature oven with the door open. Another trick is to put it in a bin liner with its head poking out and immerse it in warm water. Avoid direct heat and warm the air not the lamb. Cardboard boxes with a straw bed make excellent containers.

Check that lambs are not overheated and killed by hyperthermia. Air temperature around the lamb should be no more than 35–40°C.

Special warming boxes are available. With any warming system there is a risk of fire.

An infra-red lamp suspended 1.3m over a box is better for keeping a lamb warm, rather than warming it.

Aftercare

A consequence of treating a hypothermic lamb is that it may be rejected by its dam when it is returned to her. If possible it should be treated in the company of the ewe and bedded on straw over a hot water bottle or under an infra-red lamp. A low partition across the corner of a pen provides a safe area.

A lamb should not be returned until it is sucking vigorously, standing, and its temperature has returned to normal. Shivering is a sign of recovery – lack of shivering is a sign of cold.

Identify the cause of the hypothermia and make sure that it does not recur. A lamb is unlikely to survive it for a second time because its energy reserves will be very low. Look for poor milk supply, sore teats, an inattentive mother or a sluggish lamb.

Temperature	Age	Ability	Action
37–39°C	Any	Can swallow	Dry, feed colostrum by stomach tube, give shelter with ewe. Feed a proportion of their total daily requirement little and often, starting with 50–100ml.
less than 37°C	–5hr	Can swallow	Dry, warm to 39°C then feed colostrum and return to ewe and shelter.

(continued overleaf)

Hypothermia ***(continued)***

less than 37°C	+ 5hr	Head raised Can swallow	Feed colostrum by tube, dry and warm
less than 37°C	+ 5hr	Head down Cannot swallow	Give intraperitoneal injection of glucose (Fig 92) then warm. Tube colostrum when conscious.

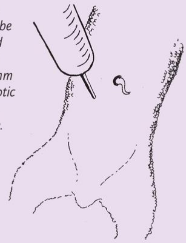


Fig 92 Intraperitoneal injection. This technique should only be used to revive hypothermic lambs which are unconscious and therefore cannot be fed with a stomach tube. Inject a 20 per cent glucose solution at blood temperature at the rate of 10ml per kg bodyweight. Inject with a 50ml syringe and a 2.5cm × 18 gauge needle. Identify the injection site 10mm to one side and 25mm behind the navel. Treat the spot with an antibiotic spray or iodine, hold the lamb by the front legs, insert the needle at an angle of 45 degrees (pointing towards the rump) and empty the syringe. The solution goes direct into the body cavity and is quickly absorbed. There should be no resistance – withdraw if there is. It is not unusual for the lamb to urinate.

Signs of udder problems, such as mastitis, are hungry lambs and ewes reluctant to suckle. Mastitis is a major reason for culling ewes. The average incidence in lowland ewes is 4–5 per cent and is usually predisposed by damaged teats, dirty lambing area, cold wet weather, orf or dirty hands when checking for milk. In acute mastitis the udder (or one half) is inflamed, hard and abscessed and the ewe may be off-colour and need urgent veterinary attention to save her life, although the udder may not be saved. In chronic mastitis the udder is hard, lumpy and unproductive, often with a lump in the teat and probably the result of mild infection in the previous year.

Sore teats from over-sucking or from sharp teeth need antiseptic cream, regular stripping and protection from sucking; the lambs may need bottle feeding until the teats have healed.

Pustules on the teats and on ewe and lamb muzzles will be orf, a viral infection that is highly contagious to sheep and man. There is no cure and it will run its course in four to six weeks, but can be sprayed with topical antibiotic aerosols to prevent secondary infection. Lambs may need bottle feeding.

Prolapse of the uterus can occur after lambing. The uterus is pushed out through the vulva. Keep it clean before returning it or while waiting for professional help.

Fig 93 Ewes will normally accept a foster lamb which is wearing the skin of her dead lamb.

Fostering

One job for the shepherd is to ensure that every ewe rears at least one lamb and that every lamb has a mother. There may be ewes without lambs because the lambs died. There may be lambs without ewes because the ewe died, had insufficient milk or had more lambs than she could rear (normally a ewe is expected to rear only two lambs). Any of these situations may mean that a lamb needs to be fostered onto a ewe.

In small flocks, recipient ewes and foster lambs are rarely available at the same time; one answer is to take a lamb from a ewe with twins. Another answer is to link up with other flocks, but always be aware of the risk of introducing disease.

In theory foster and natural lambs should be matched for size but in practice any strong lamb that is capable of sucking will do. Fostering a small triplet onto a ewe with a large single – which is a common situation – may look comical, but lambs adopt their own teat so it is unlikely that a large lamb will take the smaller one's milk supply.

Check that a ewe has milk in both quarters before fostering on a second lamb. Do not foster a second lamb on to a ewe lamb.

The principles of fostering are:

- Ewes are reluctant to accept a lamb from another ewe – so they need to be tricked.
- Ewes recognize their lambs by smell, especially around the tail and head – so the smell of foster lambs must be masked.

Methods of fostering include:

- Rubbing on.
- Skinning.
- Masking smells.
- Simulating birth.
- Adoption crates.
- Restraining the ewe.

Rubbing On

The most successful system is to 'rub on' or 'wet foster' a lamb while the recipient ewe is lambing. The foster lamb is soaked in the ewe's amniotic fluids and given to her immediately after, or even during, the birth. If it is an older lamb it may need to be restrained by having a front and diagonally opposite back leg tied together; this has the dual effect of making it look like a helpless new-born lamb and preventing it from gorging itself on colostrum. It may help to give it a good feed before joining the ewe.

Recipient ewes are those that are expected to end up with only one live lamb. If she subsequently has another lamb, the foster lamb can be taken away and nothing will be lost.

Skinning

Where a ewe has a dead lamb it can be skinned (Fig 94) and put on the foster lamb (Fig 93). Skinning takes practice but is usually successful. A ewe waiting for a foster lamb to become available may be penned (for a short time) with her dead one; this will stop her fretting and she will recognize the smell when the skin is put on a foster lamb. Skin it out of her sight.

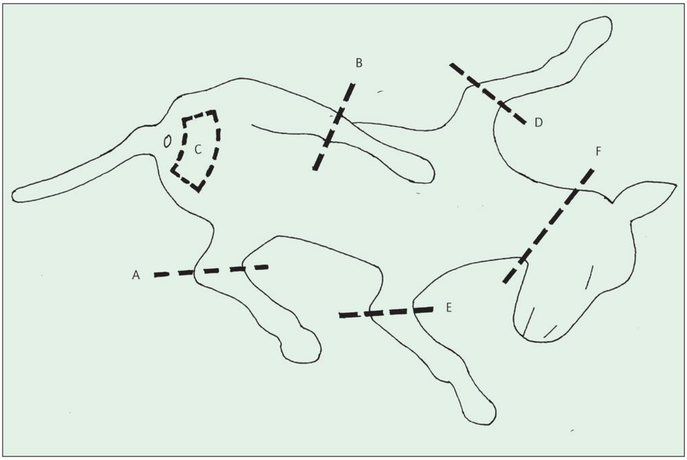


Fig 94 Skinning a dead lamb for use in fostering. The aim is to keep the skin in one piece. Use a very sharp knife.

1. Cut the skin around the hind leg hocks (A, B).

2. Cut a panel from the thigh skin (C).

3. Loosen the skin from the legs and draw them through C.

4. Cut the skin around the front legs at the knees (D, E).

5. Cut the skin around the neck (F).

6. Peel the skin off the lamb, working from tail to head.

7. Put the skin onto the foster lamb.

8. Leave it on for two to three days or until confident that the lamb has been accepted.

Table 7 Ewe Lambing Records

No ID	Date lambed	Litter	Sexes	Sire	Weight	Lamb deaths			Foster	Special treatment		CS	Comments
						Age	*Sex*	*Reason*		*Ewe*	*Lamb*		
24	1/3	2	R/E	Suff	4.5/4kg	2hr	E	Lain on	R from 22	None	None	3	Assisted breech

Fig 95 Adoption crates can be a no-fuss way to foster on lambs.

Masking Smells

Ewes identify their lamb by smell. If a lamb is being fostered on with a natural lamb the trick is to make them smell the same. The danger is that she might reject them both.

- Put both lambs in a dustbin with any afterbirth or foetal fluids. Some shepherds save foetal fluids from a ewe until a foster lamb is available. Put the dustbin in the ewe's pen for about an hour before releasing them. If there are no foetal fluids they may need to live there for a while and be taken out for suckling until the combination of binning, plus the smell of the ewe's own milk passing through both the lambs, make them smell the same.
- Proprietary sprays – or perfume – mask the smell of both lambs. This is often not successful because of the ewes' incredible sense of smell and again there is risk of her

rejecting both. A similar trick is to daub the heads and tails and her nose with molasses which she likes and licks off.

- Wash both lambs in warm salty water.
- Put a stockinette tube onto the natural lamb, cutting holes for the legs and making sure the neck and tail are well covered. After three hours remove it, turn it inside out and put it on the foster lamb. This system is reported to have been successful on foster lambs of up to twelve days old.
- Use a spray that anaesthetizes the ewe's nasal receptors.

Simulating Birth

Put a ewe on her side and gently dilate the cervix with a lubricated finger for a minute to simulate birth and convince the ewe that she has had another lamb. She should be given the foster lamb while her own lamb is taken away for half an hour. This technique has been successful several days after ewes have lambed.

Adoption Crates

These hold the ewe by the neck (Fig 95) and give her no choice but to suckle the lamb. They are invaluable in some flocks but may not be necessary in a small flock.

Restraining the Ewe

Where a ewe remains suspicious of her foster lamb and is reluctant to let it feed, restrain her regularly to let the lamb suck. When her milk has passed through the lamb she may recognize and accept the smell. Do not persist longer than about four days and do not leave a lamb with a ewe that might injure it.

Sometimes ewes that appear to dislike their lamb in the pen will become protective when turned out.

Analysis of Lambing

No. put to tup		25
No. lambed		22
% lambed		88
% lambing to first service		80
% lambing to 2nd service		15
% lambing to 3rd service		5
No. not lambing		3
% not lambed		12
Reasons for not lambing:	Aborted	0
	Barren	1
	Died	1
	Culled	1
Reasons for deaths:	Pregnancy toxaemia	1
No. lambs born alive		44
No. stillborn		2
Reasons for stillbirths	Dystokia	2
No. died in 48hr		2
Reasons:	Watery mouth	1
	Lain on	1
No. died 48hr to 2 weeks		1
Reasons:	Fell in trough	1
No. died 2 weeks to weaning		0
Reasons:		-
Total no. deaths/stillborn		5
Reasons for deaths:	Starved	0
	Lain on	1
	Foxes	0

Reasons for death:	Watery mouth			1
	Accident			1
	Stillborn			2
% of lambs dying				7
No. ewes assisted				3
% ewes assisted				14
No. lambs assisted				3
% lambs assisted				7
Reasons for assistance:	Large			1
	Breech			2
% lambs born per ewes lambing				200
% lambs reared/ewes tupped				164
Litter sizes:				
	Sets singles	6	% singles	13.5
	Sets twins	17	% twins	77.0
	Sets triplets	2	% triplets	9.5
	Sets quads	0	% quads	0
	Others	0		0
No. ram lambs		26	% ram lambs	59
No. ewe lambs		18	% ewe lambs	41
No. lambed ewes not rearing a lamb				1
Reasons:	No milk/mastitis			
No. lambs fostered		3		
No. lambs hand reared		0		

A separate record can be kept for ewe lambs

Fig 96 Tailing with rubber rings. Enough tail must be left to cover the vulva of the ewe and the anus of the ram. Putting the ring just below the base of the under-tail fleshy area is a standard guide – but err on the side of caution because some lambs can outgrow their tails and leave everyone embarrassed. In the UK the rings should not be used on lambs over seven days old.

The End of Lambing

When lambing has finished, clean the housing and equipment with a broad spectrum disinfectant. Remove bedding and soak the floors and walls, scrub troughs and hurdles and put in the sun to kill germs. Clean all equipment including water buckets. Do any repairs and make a note of any changes for next year.

Fig 97 Rings for castration should not be used after seven days of age nor should lambs be castrated within a day of birth otherwise it will interrupt colostrum intake. The ring cuts off the blood supply to the scrotum which drops off in ten to twenty days. Do not open the jaws of the applicator too wide because it weakens the ring, make sure the testicles are in the scrotum and do not apply it too high where it can trap the teats or urethra. The slow tissue death will eventually leave a wound for infection to enter; if possible treat the wound with an antibiotic spray.

10 Rearing

After lambing, when they have mothered on and the weather is suitable, ewes and lambs may be put onto sheltered grass or forage crops.

A combination of rain and wind results in windchill (loss of body heat) and the effect on young lambs should never be underestimated. Shelter can be provided by:

- Hedges.
- Windbreak material (Fig 98).
- Bales (Fig 100).
- Lamb jackets (Fig 99).

Lamb jackets offer good protection for the first few days, but choose a secure design otherwise they will litter the fields; fit them before they are turned out to make sure the ewe does not reject a lamb in a jacket.

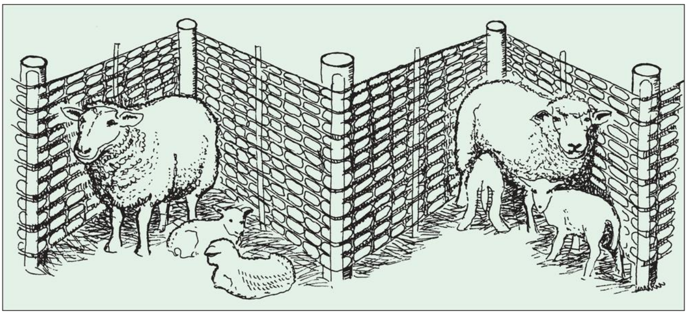


Fig 98 For sheep of any age a zigzag of plastic windbreak material will give protection from all weathers in all directions.

Before turning out:

- Make sure that ewe and lambs are easily identified.
- If foxes are known to be a risk take steps to protect the lambs. Possible deterrents include electric fencing, parrot bells around the necks of 20 per cent of ewes, ferret bells around the necks of lambs, a daub of Stockholm tar on the back of lambs' necks and rumps, flashing lights around the perimeter of the field, sonic repellents, or bright orange lamb jackets.
- Put stones in low water troughs to prevent lambs drowning. Where the trough is high, keep a bucket of water alongside for the lambs but make sure that the level in the bucket does not fall so low that the lambs cannot reach the water.

After turnout:

Fig 99 Jackets protect baby lambs from windchill. Orange jackets are said to deter foxes.

- Check regularly for mismothering or rejection – especially in bad weather when the flock congregates around shelter. During the first few days some lambs may look as if they have been abandoned. There is no need to panic. The ewes choose a place to leave lambs while they go off grazing and return to them regularly for suckling. Later on the roles will reverse and the lambs will seek out the ewes.
- Watch for lambs whose tails are stuck down over the anus with faeces.
- Look out for hungry lambs. They usually hang around their mother instead of going off to play or sleep. They walk backwards, sucking as the ewe walks forward to

graze, or pinch milk from between the back legs. Check the ewe for sore teats, mastitis or poor milk supply. The lambs may need to be topped up until the problem is corrected.

- Watch for hypothermia – full-fleeced ewes are unlikely to seek shelter and their lambs may be exposed.
- Watch for hypomagnesaemia – early symptoms are a stiff gait and facial twitching.
- Allow plenty of trough space to avoid trampling or mismothering and feed before nightfall to allow enough daylight for them to sort themselves out.
- If temporary shelter is used, move it regularly to avoid a build-up of disease and mud.

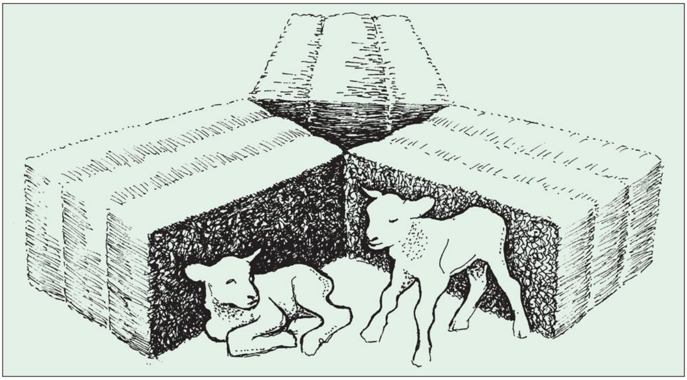


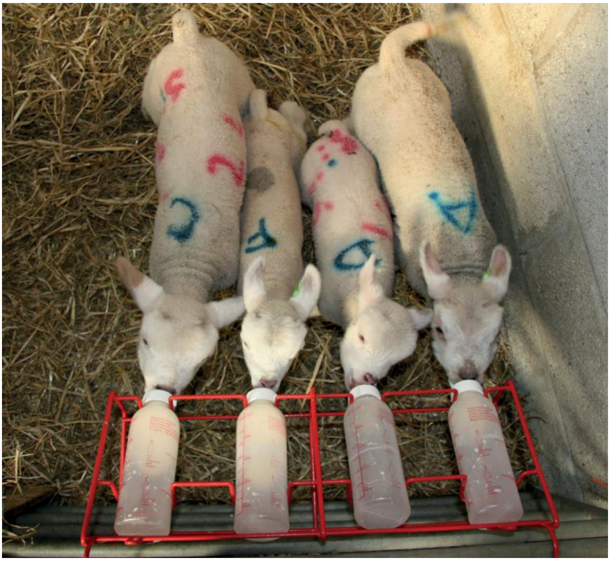
Fig 100 A simple arrangement of small bales gives shelter to lambs whatever the direction of the weather. They also love to play on them, so make sure they cannot fall down the gap in the middle.

Health

Once lambs are two weeks old the risks to their health diminish. However, losses from post-lambing to sale can average 3 per cent; problems to watch for include:

- Hunger and hypothermia. Lambs look as if they are standing on a sixpence.
- Open wounds when the tail or scrotum falls off. Treat with an antibiotic spray as a precaution.
- Lameness due to scald (inflammation between the digits), especially in damp weather and long grass. Treat with an antibiotic spray.
- Coccidiosis, caused by a parasite picked up from around feed troughs especially in intensive systems. Lambs of four to ten weeks are seen tucked up with diarrhoea.
- Nematodirus.
- Clostridial diseases – enterotoxaemia, tetanus and pneumonia. Vaccinate at ten to twelve weeks when colostrum antibody protection has worn off. Usually only necessary for lambs that are retained in the flock or not destined for slaughter during the summer.
- Flystrike/headfly.
- Pine, white muscle disease and swayback are the results of cobalt, vitamin E and copper deficiencies respectively and are manifest by unthrifty and unsteady lambs. May be prevented by treating the pregnant ewe, or corrected by treating the lamb.
- Orf.
- Urinary calculi (urolithiasis), associated with a mineral imbalance in intensively fed, usually castrated, ram lambs. Crystals form in the urine and block the urethra and may cause the bladder to rupture.

Problems to watch for in ewes include hypomagnesaemia, mastitis, footrot, orf and flystrike.



Figs 101 and 102 Lambs being reared artificially can be started on bottles and then transferred to bucket feeding.

Milk Production

Lambs are totally dependent on milk during their first four weeks so priority is given to feeding the ewe to maximize yield (*see* Chapter 5). Feed concentrates that provide 12.5 ME and 18 per cent protein from quality raw materials. A protein deficiency at this stage can trigger a dramatic fall in milk yield within three days. When the spring grass is 6–7cm high, concentrate feeding can be reduced or stopped – especially in ewes rearing singles.

Fig 103 shows a typical lactation curve for a ewe. Milk production peaks at three to four weeks and feeding in early lactation can increase total production by both raising and prolonging this peak

Lamb growth rate is a good indication of a ewe's milk yield. Multiplying the daily growth rate for the first four to six weeks of a single lamb by five (or the mean growth rate of twins by ten) will give the daily milk production within 90 per cent accuracy. For example, a ewe with a single lamb whose growth rate averages 450g per day is giving 450 × 5 = 2.25ltr. Conversely, a ewe would need to give 2.5ltr of milk per day for her twins to achieve a 250g daily growth rate.

After a lamb is six weeks old, grass gradually replaces milk in its diet but, because it takes 3.5–5.0g of grass dry matter to replace 1g of milk, the growth rate continues to be influenced by milk right up to weaning.

The Growing Lamb

Understanding the growth rate and growth pattern of lambs is important when planning their feeding and marketing.

Lambs grow fast and convert their food very efficiently during their first few weeks of life; they can double their birth weight in two weeks. When they reach puberty – at about half their adult weight – growth rate slows progressively to maturity (Fig 104). This means that it is effective to feed them well when they are young.

Food conversion ratio (FCR) is high in a young lamb. This is the measure of the amount of food needed to produce the same amount of liveweight. For example, a lamb eating a compound feed can convert 3.5kg of feed to 1kg of bodyweight – giving a high FCR of 3.5:1.

From birth to weaning the average daily liveweight gain (DLWG) of a lamb in a commercial flock is around 0.2–0.3 kg (1.5–2kg per week), although gains in excess of 4kg per week are possible.

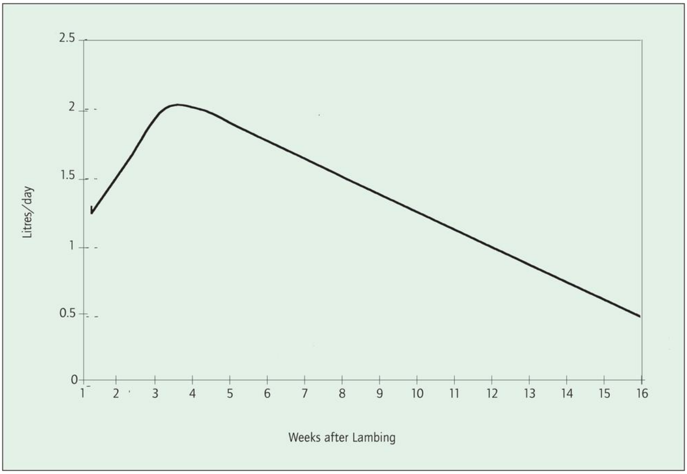


Fig 103 A typical lactation curve for an average ewe. Milk production peaks at three to four weeks after lambing. Good feeding both before and immediately after lambing should produce a high peak and slow its decline. After six weeks a lamb is deriving a

substantial proportion of its food from pasture and is less dependent on milk, so there is little point in continuing to feed concentrates to ewes. This curve also illustrates why leaving lambs with their mothers after fourteen weeks is of no benefit.

Ewes suckling twins give about 40 per cent more milk than similar ewes with singles but reach peak lactation earlier and decline faster. Ewes rearing triplets will produce about 10% more milk than those with twins. First-lambers usually give 75 per cent of their potential adult yield.

In early lactation a single lamb will grow almost twice as fast as a twin lamb. A single can put on 400–500g per day on milk and grass and be finished at ten weeks. The difference narrows as they grow older and depend more on grass, but twins rarely catch up. Early born singles can cause marketing problems in a small flock when they become heavy and fat while waiting to make up a group for selling.

There is a strong relationship between birth weight and weaning weight with every additional 1kg at birth resulting in an estimated 2–3kg extra at weaning. The age of the ewe is also a factor in growth, with young ewes having slower growing lambs; ewes of around five years of age will produce their heaviest lambs at weaning.

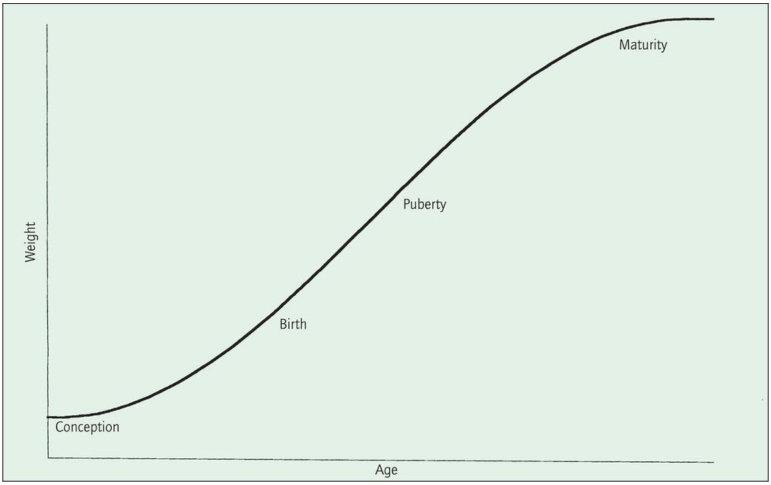


Fig 104 The growth curve of the sheep shows why lambs are usually slaughtered at around 50 per cent of their mature weight (at puberty) before their growth rate slows and before the percentage of fat in the carcass increases substantially (Fig 105).

Growth Pattern

The natural growth pattern for a lamb is bone first, then muscle, then fat. As lambs get older (Fig 105) their percentage of fat progressively increases to around 30 per cent of the carcass weight. Because the skeleton is early maturing and the fat late maturing, some growing lambs can lose their chubby look for a while and become rangy – giving the worrying impression that they are not thriving.

As a rule small, light breeds are early maturing; this means that they complete the growth process of bone, muscle and fat quickly and lay down fat at an early age. Conversely, large heavy breeds are late maturing and grow more bone and muscle before getting fat. They can be sold for slaughter at a later age than the light breeds. Breeding and selection programmes within some breeds have modified this trait but, generally, quick maturing breeds are suited to early lamb production and large slow maturing breeds are chosen for late lamb and store or heavy lamb production.

Feeding Lambs

Grass is the best and cheapest feed for sheep, and lambs can be reared on it without being fed concentrates.
However, in the real world, lambs often need some creep feed. Creep feeding is the practice of giving concentrates to lambs while they are still sucking.

Lambs are creep fed when:

- They need fast growth for the early market or shows.
- Triplets are being reared by their dam.
- There is a shortage of grass.
- They are reared artificially.

Creep feed is commercially available as small pellets and is fed where it is accessible to lambs but not to ewes (Fig 106) Intensive creep feeding can give an average growth rate of 400g per day and hastens the development of the rumen to digest roughage.

Creep feed should be formulated specifically for lambs. They should not be given feed or minerals that are formulated for ewes, although they readily pick feed from the ewes' troughs; urolithiasis is one of the risks of this practice. It should be offered *ad lib* from ten days of age but lambs eat very little until three weeks. Initially offer only a taster and make sure that it is always fresh, dry, clean and available. Birds are a menace, not only eating the food but also fouling it.

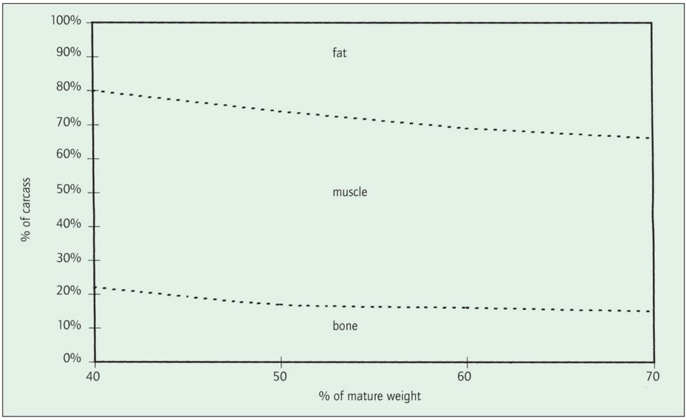


Fig 105 The growth pattern of lambs. As lambs get older the proportion of bone and muscle in their bodies decreases as they lay down an increasing proportion of fat.

Depending on the reasons for starting creep feeding it is best to continue through to sale or weaning, or until grass or forage crops are adequate, to prevent a check when it is withdrawn.

Table 8 shows typical home-mixed rations, but for small flocks it is probably cheaper to buy ready-mixed. Consumption depends on the milk and grass supplies; lambs can eat around 1kg per head per day of creep feed by eight weeks of age but once fresh grass is available they may lose interest.

Weaning

The process of converting grass into milk and then milk into meat is biologically inefficient at the tail-end of lactation and traditionally lambs are weaned at around twelve to fourteen weeks when, as Fig 103 shows, milk supply is minimal.

However, if slaughter lambs are very close to finishing at fourteen weeks it may pay to wait
and sell them 'off their mothers' to avoid a weaning check; and in small flocks, selling lambs off their mothers may be more convenient if there is not enough land to keep the weaned ewes and lambs apart.

Weaning too late risks the problems of:

- Ewes and lambs competing for grass.
- Entire ram lambs of four to five months old serving their own dams.
- Ewes having insufficient time to recover for tupping.

At weaning move the ewes and leave the lambs in their familiar field. Flocks should be out of earshot, although this is not easy to arrange on a small property. Housing the ewes helps to muffle their calls. Normally ewes and lambs call for about two days then they settle, but if given the chance they will mother back on again until at least three weeks after weaning.

As soon as the lambs settle, move them onto fresh, leafy, clovery 5–8cm pasture. When they have had the pick of the grass the ewes can clean up after them. Initially ewes can go on bare pasture or housed on straw (always with water) to encourage quick and safe drying-off. Watch for mastitis and physical damage as they fill up. The full udders may look uncomfortable but trying to ease them by hand-milking will stimulate production and risk introducing disease by keeping the teat orifice open (see Appendix I, Fig 122). Where mastitis is a problem after weaning, some veterinary surgeons recommend dry ewe therapy in which an antibiotic is inserted into each teat canal.

Fig 106 The principle of the creep feeder is to allow lambs in to feed but keep ewes out. The creep gate to this pen has 25mm spaces. Any fenced-off area can be used and may be covered. The system ought to be portable to avoid a build-up of mud and disease and to accompany the flock when it is moved. Encourage lambs to use the feeder by siting it close to the ewe feeding area.

Table 8 Simple Home-mixed Creep Feed

To make 100kg	
Rolled barley	77.5kg
Soya bean meal	20.0kg
Mineral/vitamins (lamb)	2.5kg

or:	
Rolled barley	60kg
Molassed sugar beet feed	20kg
Protein pellets	20kg

Early Weaning

Hand-reared lambs are usually weaned at around six weeks of age onto an intensive rearing system. (*see* Artificial Rearing box) but early weaning is also appropriate in the following situations:

- In housed flocks – where lambs are weaned at six to eight weeks, the ewes are turned out and lambs finished indoors.
- In a frequent lambing system (three times in two years) when ewes need time to recover.
- When there is a shortage of grass and ewes and lambs compete.
- For ewes with triplets.
- In hill flocks when twins are 'split' and one is taken away for finishing and the other left with its mother.

Slow-Growing Lambs

Lambs which grow more slowly than expected are a problem in any flock. They are usually the result of a shortage of feed caused by overstocking or drought, but may be the result of worms or a trace element shortage such as cobalt. The outcome is that they miss their market and the longer they hang around the more they become prone to worms and other diseases, compete with ewes for grass, have accidents and incur extra costs and cash flow problems. In the small flock, where space is a problem, they simply become a nuisance; more so if the ram lambs were not castrated.

In following years it may mean improving nutrition by changing the lambing date to match grass supplies or improving grassland or crops to match sheep demand.

In the meantime there are a number of ways to cope with them:

- Sell as store lambs – although entire ram lambs may not find a buyer.
- House or confine and finish on concentrates. Shearing them may stimulate faster growth.
- Store on a maintenance diet of grass or hay and finish them later (*see* Store Lambs later).

Artificial Rearing

Lambs that do not have a mother, lambs bought in from other farms and lambs from dairy ewes can be reared successfully on artificial milk (ewe milk replacer). Never use calf milk replacer.

Avoid rearing one lamb on its own – they are sociable creatures and need playmates. Leave a lamb with its mother, where appropriate, and top up with a bottle until it has a companion. Ideally lambs should be reared in groups of no more than eight and matched for age and size.

Ewe milk replacer powder is normally sold in 10kg bags – enough to rear one lamb. Mix and feed it accurately and according to the instructions. If the mix is too weak the lambs do not thrive and if too strong it can cause dehydration. The quantity to feed will be specified in the instructions, but as a rule of thumb feed about 50ml/kg bodyweight in four well-spaced feeds a day.

The lambs are penned on straw in a draught-free area with access to fresh water. Warm ewe milk replacer is fed by bottle for 3–4 days by which time they should be strong enough to use a feeding system.

With small numbers it is probably easier to continue to bottle feed three times a day until weaning. Larger numbers can use a cold milk feeder (Fig 107). Lambs are content on *ad lib*. feeding systems where the 'little and often' drinking pattern is natural; the cold milk deters them from gorging.

Feeders can be built from teats, tubes and non-return valves available from agricultural merchants. Introduce them to the feeder when they are clamouring for their next feed by filling it with warm milk and holding them to a full teat which has milk smeared on the end. Once they get proficient the milk can be fed cold. The feeder can be topped up twice a day with half their daily ration, and to make sure that all the lambs have the opportunity to drink, it should never be empty – other than for regular cleaning.

Lambs must always have access to clean water and, after a week, have hay and fresh creep feed. Water and feed containers should be supported off the ground so that they cannot be walked in or slept on. Keep pens and feeding equipment clean and move feeders around the pen to prevent a build-up of urine and dung.

The lambs can be weaned at 5–6 weeks of age, weighing around 15kg and when eating 200–250g per day of creep feed. Most milk manufacturers advise weaning abruptly. Slow weaning accustoms the lamb to eating less and they stop growing, whereas abrupt weaning leaves the lamb hungry and it eats something else.

Lambs can be finished on compound feed or put on worm-free, quality grass. Hand-reared lambs suffer a growth check when they first go onto grass and are very susceptible to worms.

Basic timetable for artificial rearing

Day 1	Feed colostrum.
Days 2–4	Bottle feed warm milk replacer.
Day 5	Introduce to the feeder.
Day 7	Introduce hay and creep feed.
Day 42	Wean.

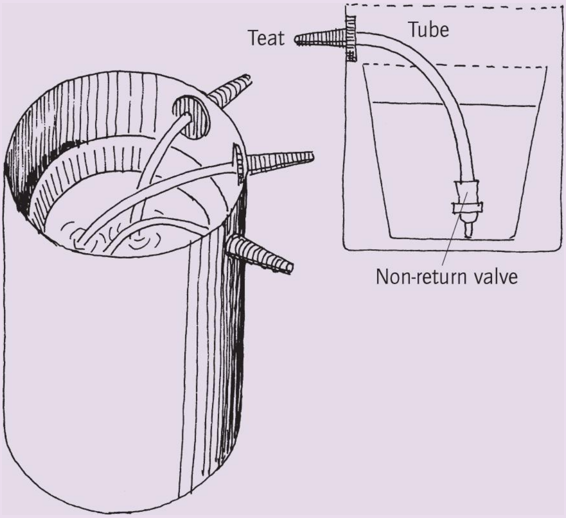


Fig 107 For ad lib *cold milk feeding, or for four-times-a-day warm milk feeding, a row of teats 30–38cm off the ground allows lambs to drink from a bucket via a tube and non-return valve. Once they are sucking strongly the valve is not necessary. Teats can be incorporated in a large container with a milk bucket inside, as shown. There are numerous systems and*

arrangements which can be customized to suit the flock.

Feeding for the Market

The way that lambs are fed and reared will depend on when they are born and the market for which they are intended.

Autumn-born lambs from Dorset Horn flocks and crosses, wintered on forage crops or grass, may not need extra feed to get them finished at around sixteen weeks for the early market. Decide the optimum weight and selling date and weigh them regularly, giving creep feed if necessary to keep on target. Like store lamb finishing, this system relies on controlling growth rather than hastening it; lambs must not be finished before the market wants them.

Early lambs, expected to finish at ten to fourteen weeks, may need some creep feed in order to grow at around 2.5kg per week to hit the early high prices (Fig 108). Some lambs are sold finished off their mothers (FOM) before weaning.

Spring lambs are weaned at fourteen weeks and then finished over the next few weeks on pasture or forage crops. They need to grow at around 1.8kg per week before weaning and 1.4kg per week from weaning to slaughter, which can be achieved on aftermaths and late summer grass.

Late lambs are weaned at fourteen weeks and, if prices are poor, kept or sold as store lambs for finishing during the autumn and winter. Concentrate feeding is probably only necessary for quick finishing in the winter.

Store Lambs

The practice of buying and selling store lambs (*see* Chapter 1) is a specialist sector of sheep farming and is not particularly suited to the small flock other than as an introduction to keeping sheep. The lambs are 'stored' on a restricted diet, followed by an improved diet; the result is compensatory growth, when sheep grow faster than would be expected on that diet.

There are 'short-keep' store lambs and 'long-keep' store lambs. As a general rule short-keep stores are bought within 7kg of their slaughter weight (*see* Chapter 11). Many will finish within six to eight weeks on autumn grass and some supplementary feed at twenty to thirty lambs per hectare, gaining weight at 1kg per week and sold at the end of the season (October to January in the northern hemisphere).

Long-keep stores are bought within 10–20kg of their slaughter weight and may be kept for up to five months. They are usually grown slowly (about 0.2kg per week) on a low-energy diet such as winter grass or arable and vegetable by-products so as to grow a large frame and are finished in the final four to six weeks on forage crops and concentrates.

Autumn grass and forage crops give weekly growth rates of around 0.75–1kg; a hectare of rape can graze sixty lambs for six weeks and a hectare of swedes will feed sixty lambs for eighteen weeks. Growth on roots tends to be slower than on forage crops and roots need protein supplementation. There is normally adequate protein in leafy forage crops (rape and kale). Lambs may begin to lose their milk teeth around nine months of age which can make it difficult for them to eat roots.

Waste is high in most forage crops that are grazed *in situ* although some producers claim that there is less trampling with set stocking than strip grazing. Lambs must have a grass run-back or dry lying area so that they do not have to lie in muddy fields, and be introduced to forage crops gradually over seven to ten days. Brassicas such as kale and rape can induce iodine deficiency so may need rationing, and copper deficiency can be induced in lambs on root crops if they ingest soil. Always offer hay when sheep are on these low dry matter crops.

Store lambs can be shorn in late summer in order to keep them clean, prevent them from tangling in hedges, increase their appetite so that they grow faster and take less space if housed.

11 Marketing and Business

There are several points to consider when marketing sheep and sheep products:

- Identify the market before going into production.
- Find out from the buyer exactly what he wants and when he wants it.
- Make sure the buyer knows at the outset the quantities and quality you are likely to have.

Scale is one of the disadvantages of small flock production. Small producers have very little clout when it comes to both buying and selling. It may help to get together for selling, join an existing co-operative marketing group or simply set up a meeting point and share transport to markets, sales or abattoirs.

Selling

Most stock can be sold through livestock markets or abattoirs, or advertised privately. When selling sheep for breeding or rearing make sure that details of breed, age, status (for example, in-lamb), purpose (for example, fine wool), management (for example, organic) and reasons for sale are made known to buyers. Make sure the buyer knows of any health schemes and vaccination programmes.

Match in groups according to type, breed, age or teeth. One odd one will spoil the pen. Stock going to market must be healthy. If sick, lame or diseased sheep are unloaded at an abattoir or market they may be destroyed on the spot and the owner fined.

Pedigree breeding stock can go to specialist breed shows and sales either locally or nationally or be advertised and sold privately. Flock and pedigree records should be available. Breed societies will be the source of information on suitable sales. Stock will need to be good examples of their breed and have all the attributes of good healthy breeding animals. They should be well fleshed but not fat; feeding to get them right on the day is both an art and a science, but over-feeding young stock can reduce their potential for breeding. They may need to be halter trained, washed and trimmed and the shepherd must also look tidy and well presented.

Cull ewes are sold for mutton through most livestock markets or direct to abattoirs. Some abattoirs offer an on-the-spot price for the live animals, but most pay on carcass weight after slaughter. Few producers market old ewes with the same care as lambs. The trend is to get them off the property as soon as possible, especially where land is limited. But mutton is not readily available through butcher’s shops and supermarkets so there may be a private or local niche market. Campaigns have been organized to put mutton on the menus of top restaurants where the demand is for sheep of at least two years old with reasonable fat cover and hung for a minimum of two weeks.

Store lambs are sold from the autumn onwards usually through the livestock market and should be well grown, clean and healthy and presented in even-sized batches. Vaccination programmes and wormers should be reported to the auctioneer who should announce them when the sheep are sold. The same applies to ewe lambs sold for breeding except that they should have a better finish so that the buyer can mate them successfully.

Wool marketing is discussed in Chapter 7.

Milk products are likely to be sold to local retail outlets, usually delicatessens, or the milk may be frozen and sold to a manufacturer for processing into cheese and yoghurt.

Slaughter Lambs

Most sheep flocks will sell some or all of their lambs for slaughter. Even pedigree breeders will sell a large proportion for slaughter which does not attain breed standards. There tends to be a pattern to lamb sales and prices (Fig 108).

Slaughter lambs have a number of outlets, but primarily are sold liveweight through livestock markets or deadweight direct to abattoirs and butchers. Outlets for organic lamb are restricted by the distance the lambs may have to be transported and by the number of abattoirs licensed to handle organic stock.

Liveweight sales are primarily through local weekly livestock markets and prices are expressed in pence per kilogram of liveweight (p/kglw). Livestock market prices tend to establish the prices for the whole industry. The advantages of the system are:

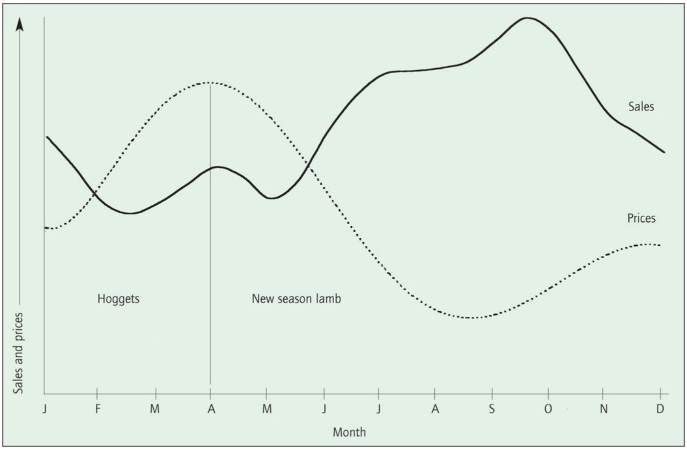


Fig 108 The traditional pattern of lamb prices and sales in Northern Europe. Prices tend to peak at the Easter period. Sales tend to peak in the autumn when lambs are finished off grass. Unfinished lambs are kept as stores and sold during late winter and early spring to fill the gap before new season lamb becomes available. Cull ewe prices tend to follow the same pattern as lambs.

- It is convenient for small batches at irregular intervals.
- If you do not like the price they can come home again.
- It is a good place to chat about the sheep industry and have a day out.
- Within reason poorer stock can be ‘dumped’ there. There will almost always be a buyer, at a price.
- Because it is competitive, the vendor feels that the price is fair.
- The markets are held regularly so marketing is easy to plan.

On the debit side there is normally more transporting and hassle involved for the sheep because they are unloaded at market, penned for much of the day and then reloaded and transported for slaughter.

In the deadweight system prices are paid in pence per kilogram of carcass weight or dead weight (dw) – not including the offal, pelt and fleece which the abattoir will keep. The advantages are:

- Carcass data from the abattoir provides information on the quality of the lambs.
- The producer usually knows the price in advance.
- Transport is kept to a minimum.
- Information on disease problems, such as liver damage, may be available.

On the debit side there can be uncertainty about when the buyer will take the lambs. If a carcass is rejected or marked down because it is not up to the standard that the buyer wants the vendor has to accept a lower price. Some abattoirs will return rejected carcasses to the producer; a freezer full of over-fat lamb is a salutary lesson.

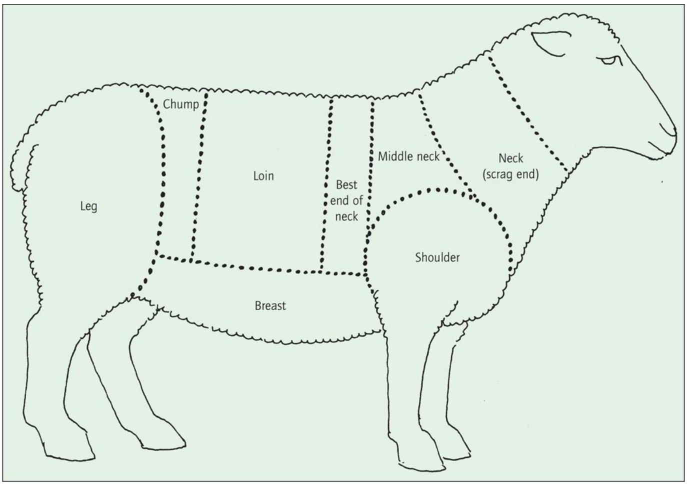


Fig 109 The various cuts of lamb have different values. Hind leg and loin represent at least 40 per cent of the value of the carcass and loin chops may be worth three times as much as breast. A lamb with good conformation is likely to have a good percentage of valuable cuts.

Having lambs slaughtered and butchered for private sales is a good scheme for owners of small flocks who find a niche market for rare breeds, organic lamb or just locally grown lamb. Local restaurants may be customers but probably want a regular supply. Private slaughter tends to be expensive because of the extra transport costs of taking stock to the abattoir and collecting the carcasses plus the slaughter and butchering charges. Private sales may be subject to hygiene and marketing laws to avoid meat going unlawfully into the food chain and to ensure that carcasses are fully inspected at the abattoir. Anyone considering private sales of meat should investigate the current regulations.

Mobile slaughtermen operate in some areas for producers who do not want to stress their animals by taking them to an abattoir. The service may be restricted to lambs for home consumption.

The Product

There is little point in growing a product if it is not what the market wants. What the meat buyer wants is:

- An optimum carcass weight.
- Ideal fat cover.
- Good killing-out percentage.
- A high percentage of valuable cuts.
- A clean, undamaged carcass with no faults.

What the consumer wants is:

- Good value.
- Ideal fat cover.
- A belief that the lamb was reared under good conditions of welfare.
- That the product is safe to eat.

All this may seem irrelevant to the small flock but the industry depends on the consumer buying lamb; if it is not to their liking they will buy something else. So every producer, however small, should consider the consumer.

Carcass Weight

The ideal carcass weight in the UK is 16–20kg (about half the live weight) although carcasses as light as 8–13kg – usually from hill flocks – find a market in southern Europe. There are outlets for heavier lambs in the processing and catering trades but big lambs produce big joints which cost more than the consumer is prepared to pay.

Lighter carcasses often attract a higher price per kilogram than the heavier ones but, as long as they are not fat, the heavier ones often earn the most money per head.

Fat

Modern sheep breeds have fat under the skin (subcutaneous) and within the muscles (marbling). Subcutaneous fat tends to be laid down before internal fat which makes it a good guide when selecting lambs for slaughter (*see* later).

Primitive and rare breeds tend to lay down fat internally around the organs and have lean flesh.

Subcutaneous fat is an aid to cooking but too much fat is a waste because most consumers do not want it; the producer of fat lambs pays a double penalty because it costs feed to produce it and then he is paid less money for the lambs.

Killing-Out Percentage

The killing-out percentage (KO percentage) is the percentage of the live lamb finishing up as meat, fat and bone (carcass) after slaughter and after the fleece and offal have been removed. The killing-out percentage of a modern breed of young lamb is usually around 45–50 and for older lambs (hoggets) it is 40–45.

Where lambs are sold deadweight the KO percentage is important because the producer is paid on carcass weight. Where lambs are sold through a live market the buyers estimate the KO percentage and bid appropriately. It is useful to have an idea of this figure by comparing carcass weights from the abattoir with the live weights of the animal before slaughter – bearing in mind that it is affected by gut fill, fleece weight and the loss of weight (around 1kg) during transport. The KO percentage is also influenced by breed, sex and age.

Value Cuts

Distribution of lean meat is important because various cuts (Fig 109) have different values. Hind legs and loin represent at least 40 per cent of the value of the carcass and loin chops may be worth three times as much as breast.

Generally there is a relationship between conformation (body shape) and high value cuts. It is thought that a lamb with good conformation – blocky with a long, wide back, well-fleshed rump, fine head and short legs – is likely to have a good KO percentage and a good percentage of valuable cuts. The depth and thickness of the top of the hind leg is a good indication of overall muscling. Sometimes, however, good conformation may simply be due to fat.

The size of the eye muscle (see Appendix II) is an important economic trait because it gives a meatier chop. Breeders of terminal sires select for it.

Faults

The main faults found in slaughter lambs are:

- Bruises.
- Abscesses.
- Dirty sheep (which contaminate the carcass).
- Taint.

Young lambs have soft skins and bruise easily, leaving areas of carcass that must be trimmed off and the producer is penalized by a deduction from the price he is paid. Pressing their backs while assessing fat level can leave a mark. Lambs should never be caught, handled or picked up by their fleeces, and penning and loading should be done with the minimum of crushing – avoiding all projections and snappy dogs. Take care that lambs do not get caught in brambles or barbed wire.

The value of the skin or pelt – known as the fifth quarter – is not usually paid to the individual producer but is part of the meat trader's profit and influences the price paid for lambs. Damage from barbed wire, injection abscesses and skin diseases all affect the quality.

Wet and dirty sheep will be turned away from markets and abattoirs. Keeping them clean is important and is a matter of good management – avoiding scouring and muddy fields and gateways. Older lambs with long fleeces on forage crops are most at risk; dirt around the tail and belly should be shorn or hand trimmed. Keeping lambs dry is a problem; even housing will not guarantee a dry fleece.

Taint is a subjective issue and some abattoirs refuse to take entire ram lambs because of a fear of odour. Tainted meat in ram lambs has never been conclusively proven and any taint may have as much to do with feed as with sex.

Selecting for Market

Lambs should be weighed regularly (Fig 112) from around eight weeks of age to monitor and record growth rates, to adjust feed and to estimate the time of the first sales. Once they begin to reach slaughter weight they should be weighed and handled weekly.

A weigher suitable for ewes as well as lambs is a crucial tool on the sheep farm. Check its accuracy by weighing an object of known weight, such as a bag of feed and make sure that it is sited so as to work freely. Set the weigher in a race so that lambs will be keen to escape through it.

At weighing, each lamb can be marked either on different parts of the back or in different colours to denote its weight. This gives a visual indication in the field of how close they are to selling and allows lighter ones to be ignored in alternate weeks to speed up the weighing. Record all weights regularly and work out the growth rate of individuals and the average for the flock for the records and to estimate when lambs will be ready for market. Try to weigh at regular intervals and avoid wet weather when wet fleeces increase the weights.

Lambs which are ready to sell can be marked on the back of the neck and returned to the flock. Even if they have tags, a mark is quicker to see when they are finally mobbed and drafted. A mark on the top of the head is sometimes advocated but if they fight they can mark the head of another lamb and cause confusion.

Selection for slaughter is a compromise between weight and fat cover, but fat must be the major criterion; a lamb should be sold as soon as it has ideal fat cover even if it is lighter than planned.

As a rule of thumb a lamb reaches slaughter weight at around half its mature weight – mature weight being half the combined average adult weights of the dam and sire breeds. For example: a Suffolk ram of 91kg mature weight over a Cheviot ewe of 65kg would produce a lamb with a potential adult weight of 78kg, or an optimum slaughter weight of 39kg, to give a carcass weight of around 18–19kg at fat class 3 (*see* later) and a KO percentage of 48.

Generally a lamb that is slaughtered 10 per cent below the predicted half adult weight will be fat class 2 and those that are 10 per cent over the weight will be fat class 4. Ewe lambs get fatter than wethers (castrated ram lambs) so to achieve the same level of fatness wethers should be slaughtered at 5 per cent above the average slaughter weight and ewes 10 per cent below. In other words, be prepared to sell ewe lambs for slaughter a bit earlier and a bit lighter than expected. Entire rams and hoggets usually go to heavier weights within the ideal fat class; intensively reared concentrate-fed lambs finish at lighter weights and must be checked for finish twice a week during the final stages of feeding.

When lambs are ready for market they should not be kept in the hope of getting better prices; they will get over-fat or lose condition, depending on the time of year.

Classification

The market requirements for lamb are usually described in terms of carcass weight, fatness and conformation. This classification is a language that allows buyers to tell producers what they want and producers to produce it.

The language, represented by a grid (Fig 110), has twenty-nine categories of classification. So a buyer might say that his preferred carcasses are 3LU 16–18kg carcass weight – that is a lamb in fat class 3L with conformation U. Some buyers pay extra for their ideal carcass and pay much less for carcasses outside their specifications, so knowing their requirements is vital.

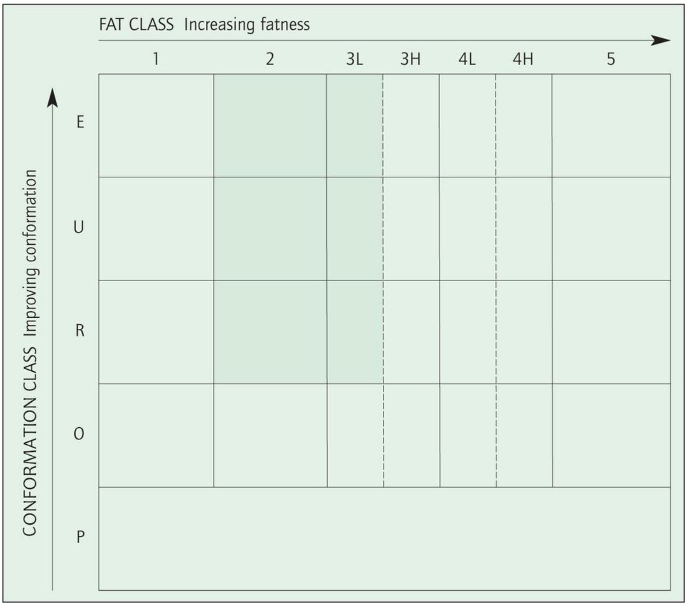


Fig 110 The classification grid tells the producer what the buyer wants in a language they both understand. The fat class is based on the assessment of subcutaneous fat (Appendix 2) on a scale of 1–5

(very lean to very fat) with categories 3 and 4 subdivided into L (low) and H (high). As the fat class increases, the percentage of saleable meat decreases. The five conformation classes (EUROP) are based on the thickness of the flesh in relation to the skeleton, judged usually by blockiness and fullness of legs. The range is from E for extra to P for poor. The target area for most producers is 2–3L E, U or R.

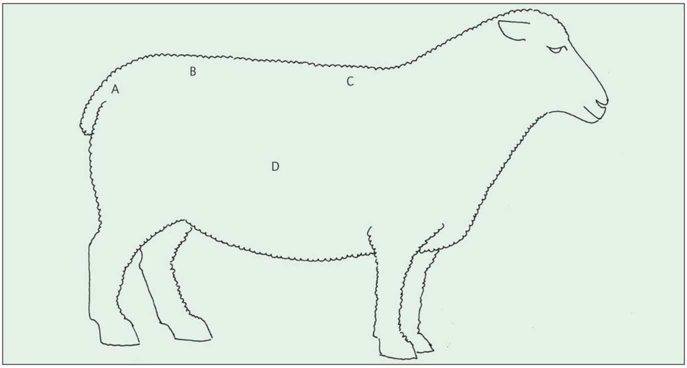


Fig 111 The fat level of a lamb is assessed on the same basis as condition scoring ewes (Appendix II). Handling points A (dock or tail root) and B (the backbone behind the last rib) are the most important, with C (shoulder) and D (ribs) used for extra information. Make allowances for wool and do not bruise by pressing too hard.

Currently, fat levels and conformation are assessed subjectively, but in the future they may be assessed objectively using probes and scans and video imaging.

Judging Fat

The amount of fat on a lamb is judged and described on the same basis as condition scoring ewes (Appendix 2) but expressed as fat classes 1–5. There is no muscle over the spinal vertebra – only skin and fat – so the back and the dock of the tail are the best areas for judging fatness along with the shoulder and the ribs (Fig 111). Visual assessment is no good – the lamb must be handled.

Livestock markets, marketing groups and other organizations often run practical courses on lamb selection at the start of the main marketing season. These are especially useful for the small flock owner with limited opportunity to practise.

Producers who sell deadweight can check their accuracy with that of the abattoir after the animal has been slaughtered. Most abattoirs can identify individually tagged lambs, but where live lamb and carcass cannot be matched, the data for the whole group will give an idea of whether lambs are being drawn too fat, too thin, too heavy or too light.

Business Records

Any flock will involve a degree of recording and bookwork, some of it required by law and some to monitor and improve the flock and its management.

Records that must be kept by law in Europe include Movement Records, Medicine Records and a Holding Register. Movement records are intended to make all sheep traceable in order to control disease in the national sheep population. Therefore each animal (ewe, ram or lamb) must wear an ear tag and, when moved off the property, it must be accompanied by a movement document to specify, among other things:

- Date of movement.
- Name and address of owner.

- Identification (flock) mark.
- Total number being moved.
- The holding from which they are being moved.
- The holding or premises to which they are being moved.
- Who is transporting them.
- Food chain information for slaughter sheep (a declaration that they are not diseased nor contain veterinary medicine residues).

Fig 112 Lambs should be weighed regularly

Medicine records are intended to ensure that drugs – particularly antibiotics and wormers – and any others requiring withdrawal periods, are correctly used.

A Holding Register is basically an annual inventory of every sheep on the holding and a record of their movements.

All official record books must be kept up to date and may be periodically checked.

There will be further book-keeping and recording for producers who sign up to national agricultural grant schemes such as the EU Single Farm Payment Scheme.

Sheep farmers will also have to maintain records if they join one of the various domestic grant schemes to conserve the environment, convert to organic production or to protect the landscape and wildlife.

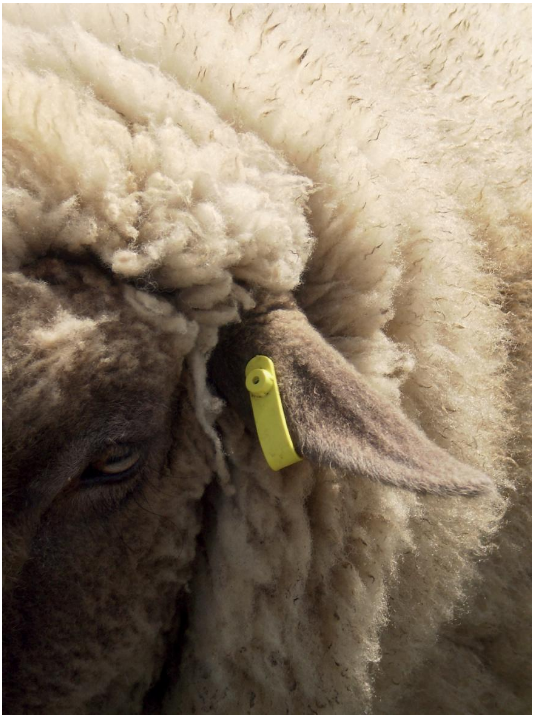


Fig 113 In Europe, laws demand the permanent identification of individual

sheep using plastic tags. Producers need to keep abreast of current laws which are complicated and liable to change; tag manufacturers can give advice. Tags must be applied hygienically, avoiding blood vessels and normally in the top of the left ear close to the head. Tags range in size from very small, for new born lambs, to large, for flighty ewes which may need to be identified from a distance. Most small flocks will have docile ewes which can be indentified by the shepherd without the need for tags – so smaller versions, which are less likely to snag and tear – are suitable.

Identification

Identification has two roles:

- To identify individual sheep for on-farm record keeping and breeding schemes.
- To make all sheep traceable, especially in the event of an outbreak of disease.

Most sheep are identified by ear tags and in countries such as the UK these are compulsory. The type, colour and number of tags may be governed by legislation, so producers need to clarify their needs either with tag manufacturers or on animal health websites.

Some tags store information about the individual ewe or lamb and can be read electronically.

Pedigree sheep, may, in addition to ear tags, have their identification tattooed inside the ear.

The basic rules for tagging are:

- Buy the appropriate tags.
- Follow the manufacturers' instructions, especially positioning and hygiene.
- Tag carefully to avoid ear damage or tag loss.
- Use the correct tagging pliers.
- Buy tags in plenty of time.
- Keep up to date with identification laws.
- Take spare tags with transported stock in case they lose any during the journey.

Flock Records

Records are essential for identifying any weakness in a flock or its management. Areas to record include:

- Physical performance (lambing percentage, wool weights, milk production).
- Financial performance (inputs, outputs, gross margins).
- Management records (tupping, housing, shearing dates and field uses).
- Sales of products (quantities, dates, prices and outlets).
- Individual ewes (breeding, health, production, wool weights).
- Health (flock and individual treatments).

Many of these can be combined and the information they contain will be tailored to the needs of the flock. Simple records are adequate but it is important to keep the information in the same format each year to make it easy to spot trends and make comparisons. They can also include target figures.

A record of flock lambing performance is a good example:

Ewes put to ram	25

Ewes died	1
Ewes culled	1
Ewes aborted	0
Ewes barren	1
Ewes lambed	22
Lambs born alive	44
Mean litter size	2
Lambs died	3
Number of lambs reared	41
Lambing percentage	164
Lambs retained for breeding	6
Lambs sold for slaughter	35
Average carcass weight	18.2kg

These figures indicate where improvements may be made such as increasing the number of ewes that lamb and the number of lambs that survive.

This example demonstrates that although the mean litter size was two, the flock did not achieve the magic 200 per cent lambing rate that many lowland flocks aspire to. The genuine lambing percentage (number of lambs reared per ewes put to the ram) was 164. The mean litter size or prolificacy (the number of lambs born per ewes lambing) indicates whether or not the ewes that have lambed are reaching their breed potential.

Financial Performance

The small flock is unlikely to make much profit unless it hits the big time in pedigree breed prices or adds value to its products. But most small flocks aspire to being large flocks and a record of financial performances highlights areas for improvement.

Gross margins are a traditional way of expressing the financial performance of an enterprise. The gross margin figure is simply the output of a flock less the variable costs. This is not the profit because it does not include fixed costs such as labour, rent, insurance and depreciation.

The value of gross margins is to allow a comparison of financial performance from year to year and to compare the performance of one enterprise with that of another. Gross margin calculations could demonstrate whether or not it is better to sell the sheep and use the land for growing vegetables.

Accurate gross margins require an accurate record of income and costs.

Table 9 Example Gross Margin Calculation

Income (Per ewe put to the ram)

Sales of lamb/valuation	_____
Wool	_____
Grants and other payments	_____
Total returns	_____

Variable costs (per ewe put to the ram)

Flock replacements (ewes and rams)	_____
Ewe concentrates	_____
Lamb concentrates	_____

Other purchased feed	____
Forage/grassland costs	____
Vet/medicines	____
Market/transport	____
Sundries (eg tags)	____
Total variable costs	____
Gross margin per ewe	____
Stocking rate (grass and forage) ewes per hectare	____
Gross margin per hectare	____

Table 9 is an example of the information needed for a gross margin calculation.

The figures highlight some of the areas where improvements may be made, but improvements in one area may be countered by added costs:

- Rearing more lambs. (Improved management or a more prolific breed. But high lambing percentages can be counter-productive by producing small lambs with high mortality rates and the expense of rearing surplus lambs.)
- Higher stocking rate. (As this increases, individual performance may fall as sheep compete for food. There is a compromise between performance per hectare and performance per animal.)
- Higher lamb return per ewe. (Better breeding, better marketing.)
- Lower feed costs. (Better use of grassland.)

Management Records

A record of the key dates in the flock calendar also form the basis of a blueprint for planning the year ahead.

- Flushing.
- Tupping.
- Start and finish of supplementary feeding.
- Housing.
- Lambing.
- Routine veterinary treatments.
- Weaning.
- Shearing.
- Dates and results of condition scoring.
- Stock sales.
- Wool sale.

Sales Records

A record of slaughter lamb sales will monitor and analyse the marketing side of the project and can be compared with target figures.

		Target
Draft number	3rd	
Date drafted	25 March	
Date sold	2 April	19 March
Where sold	Ashton	
Number sold	10	15
Average carcass wt	17.7kg	18kg
Average price/kg dw	______	______
Average price per head	______	______

Average classification	3LR	3E/3U
Comments	Very mixed weights One fat class 5	

Individual Ewe Records

Records for individual breeding animals are important in commercial as well as pedigree flocks. They monitor performance to identify the best and the worst ewes and include health and lambing details. Such records can identify families that may have an hereditary health problem. A card file is adequate and is an easy reference. Information to be recorded includes:

Identification of ewe	Red Tag 11	
Sire and dam	Suffolk Ben × Masham 108	
Date of birth	2 February 2010	
Litter size	3	
Reared as	Twin	
Birth weight	4kg	
Weaning weight	32kg	
Fleece weight	Year 1	3kg
	Year 2	3.5kg

Veterinary record

Date	Aug 2010	Aug 2011
Feet	Good	Good
Udder	Small teats	Good
Teeth	Temp.	2
Cond. score	3.5	3.0

Veterinary comments

12 June 2012	Treatment for orf	

Lambing

Date	16/2	
Service	1st	
CS	2.5	
Litter	2	
Reared	2	
Sexes	E	R
Sire	Suff.	Suff.
Assistance	None	Breech
Birth weight	3.5kg	4.1kg
Weaning weight	33kg	36kg
Sales	Retained	24/5 18kg

Notes	Nervous. Slow to milk

Disposal

Date	5/9/2012
Reason	Surplus
Method	Private sale to local flock

Simple paper-based records work well, but for computer buffs there is flock management software for basic or detailed records, costings, performance and analyses. These can incorporate whole-farm records, include data from electronic tags and take account of requirements for any assurance schemes, grants and legislation.

12 The Shepherd’s Year

Sheep production needs a routine. Small flocks inevitably have part-time shepherding and are fitted in with other enterprises or work, so forward planning is essential to:

- Avoid forgetting.
- Be timely.
- Avoid clashing with other activities.
- Keep production on schedule to meet the markets.

The easiest approach is to draw up a blueprint for routine tasks. The following calendar is basic and flock owners should draw up their own, adding extra reminders as appropriate.

Among these could be grassland management dates such as:

- Topdressing.
- Closing dates for hay or silage fields.
- Cultivation and reseeding.
- Sowing and harvesting root or forage crops.
- Soil analyses.
- Trimming hedges.

In Europe this calendar is adaptable to various lambing systems as shown in the table.

System	Lambing	Month 1 (Start of cycle)
Autumn lambing	October	April
Early lambing	January	July
Spring lambing	March	September
Late lambing	May	November

Especially important are dates for ordering and buying goods such as lambing equipment, ear tags, raddle markers, fertilizers, grass seeds, fencing posts, vaccines, wormers and supplementary feeds. Plus when to buy replacement stock such as rams and when to fill in and return any statutory forms.

Month 1

Preparation for mating

Check teeth, feet and udders.

Clostridial and pasteurella booster vaccination.

Crutch ewes.

Separate into tupping groups.

Flush on improved grass/supplementary feed.

Have marking crayons and raddle or paste ready.

If appropriate

Vaccinate against abortion.

Dip.

Vaccinate against footrot.

Start a dog worming programme for the year.

Synchronize by teaser or sponges.

Month 2

Tupping

Put in rams with raddle/paste.

Maintain level of nutrition of ewes.

Hand feed rams to maintain condition if working hard.

Change raddle/paste colour every ten to seventeen days.

Do not disturb the flock.

Note dates as ewes are marked, if possible.

Watch that rams are working and not lame.

Beware of high number of returns – suggesting an infertile ram.

If appropriate

Move rams around tupping groups.

Check harness in place and not chafing.

Month 3

Implantation

Maintain level of nutrition. Do not overfeed.

Keep eye on feet and general condition.

Do not disturb.

Check harness in place and not chafing.

Month 4

Early pregnancy

Remove rams (after five to six weeks).

Maintain nutrition but do not overfeed.

Check condition scores and adjust feed.

If appropriate

Prepare housing.

Vaccinate against footrot.

Month 5

Mid-pregnancy

Repair fence/hedges.

Introduce supplementary feed.

Condition score and adjust feed of individuals if necessary.

If appropriate

Pregnancy-scan ewes (twelve to fourteen weeks after rams go in for mating).

House.

Shear or crutch.

Month 6

Late pregnancy

Watch for metabolic problems and abortion.

Watch for footrot and lice in housed ewes.

Prepare for lambing.

Increase supplementary feed.

Prepare grassland or forage area for lambed flock.

Clostridial booster (vaccinate first and later lambers separately if prolonged lambing to give better protection to lambs).

If appropriate

House.

Month 7

Lambing

Prepare for turnout into sheltered fields.

Improve nutrition of lactating ewes especially if on short pasture.

Watch for mastitis, hypothermia, starvation and hypomagnesaemia.

Beware predators.

If appropriate

Creep feed lambs.

Worm ewes at lambing.

Check feet.

Month 8

Rearing

Clean out and disinfect lambing shed/area.

Watch for nematodirus and coccidiosis in lambs.

Beware cobalt and other trace element deficiencies.

If appropriate

Creep feed lambs.

Continue to supplement ewes.

Tag lambs.

Month 9

Rearing

Watch for fly strike and headfly in ewes and lambs.

Start weighing lambs to monitor growth.

Beware early born singles that are ready for slaughter.

Monitor for worms.

Month 10

Rearing and selling

Weigh lambs regularly and handle for finish.

Select ewe lamb replacements.

Tag lambs going for slaughter.

If appropriate

Protect against fly strike.

Plan shearing.

Plan dipping.

Month 11

Weaning and selling

Lambs on best grazing.

Ewes on poor grazing.

Watch for mastitis. Consider dry ewe therapy.

Start clostridial vaccinations for ewe lambs and for finishing lambs if likely to be kept beyond four months.

Monitor slaughter lambs weekly.

Identify, finish and sell cull ewes.

Plan good grass/forage for flushing.

If appropriate

Have a blitz against footrot.

Monitor worms in lambs but do not treat if close to slaughter.

Month 12

Dry

Condition score ewes and adjust feed appropriately.

Keep ewe lamb replacements growing steadily and bring into any vaccination schemes.

Give ewe lambs permanent tags.

Prepare rams for tupping.

If appropriate

Shear and dip. There should be at least three weeks' wool growth.

Buy in ewe or ram replacements. Worm, vaccinate and isolate for a month.

Fig 114 Lambs being reared.

Appendix I

Anatomy of the Sheep

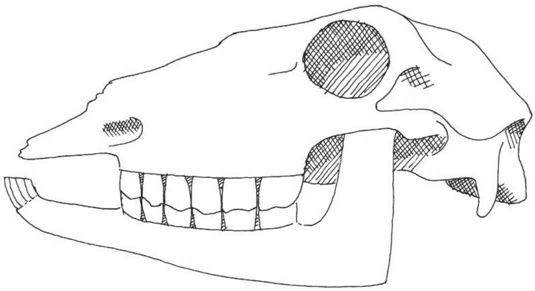


Fig 115 Side view of the skull showing incisor and molar teeth. The sheep has eight incisor teeth in the front of the lower jaw which meet a pad on the upper jaw to enable it to bite. There are twelve molars in both the upper and lower jaws.

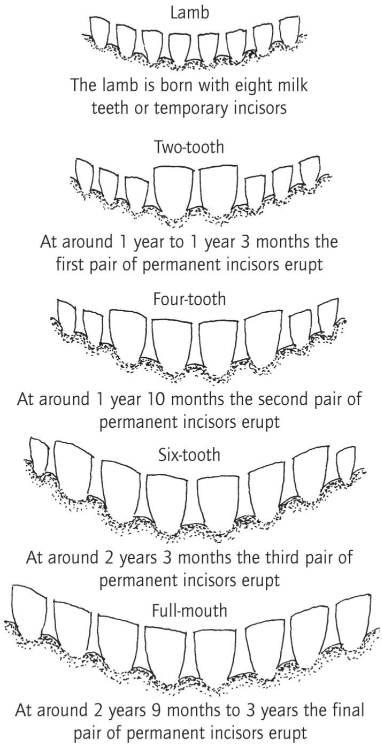


Fig 116 The age of a sheep is both assessed and described by the development of its incisor teeth which are on the lower jaw only.

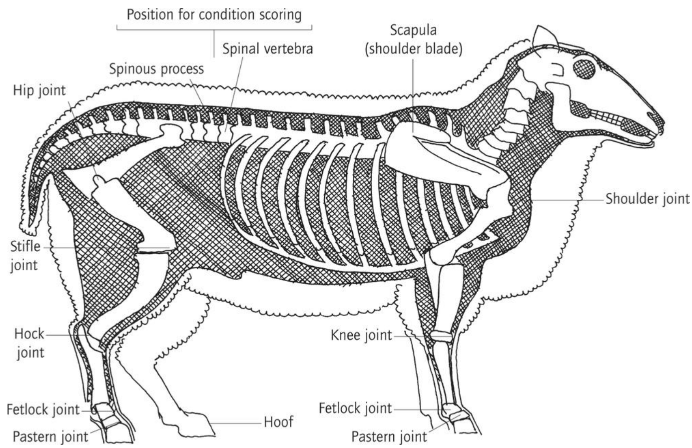


Fig 117 The skeleton.

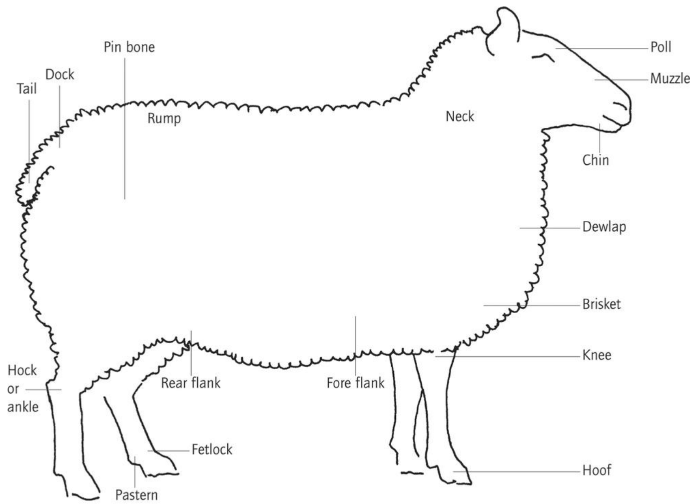


Fig 118 The external points.

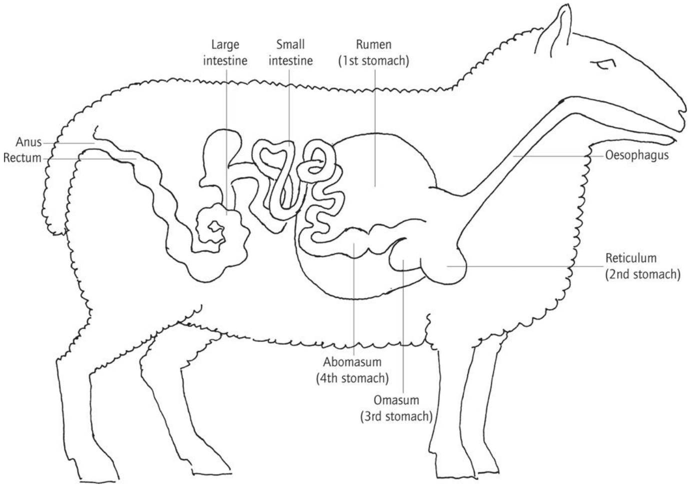


Fig 119 The digestive system.

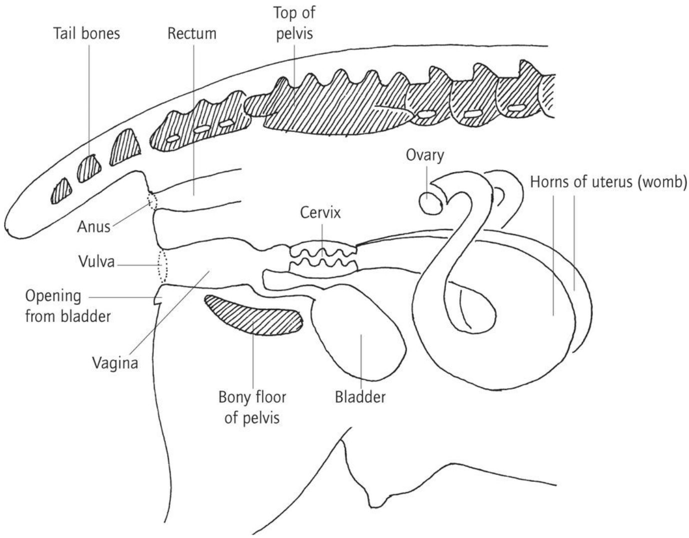


Fig 120 The reproductive organs of the ewe.

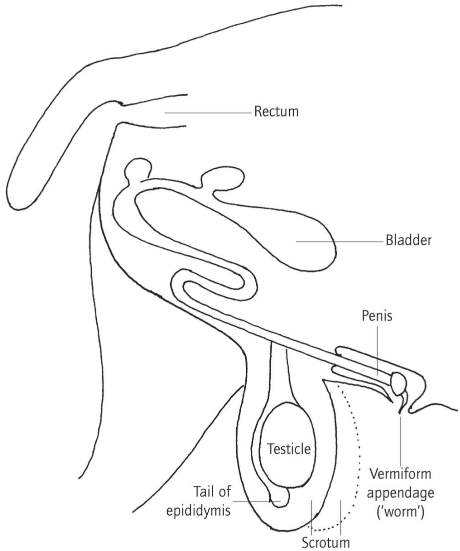


Fig 121 The reproductive organs of the ram.

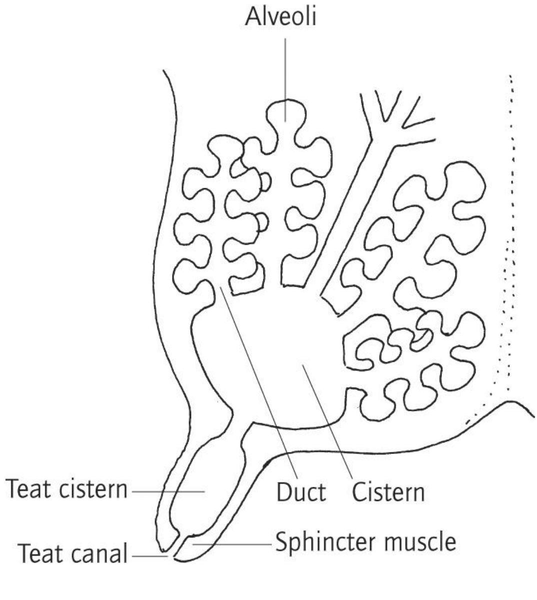


Fig 122 The ewe's udder is in two separate halves, each with a teat. A ewe can lose the use of one half (usually called a 'quarter') from mastitis or injury but continue to milk in the other half. Cells in the alveoli produce milk which goes via the ducts to the cistern, which acts as a reservoir. Milk production is continuous and the rate is controlled by pressure, so that when a ewe is weaned and the pressure of the milk builds up in the udder the rate of production slows down and stops. The sphincter muscle closes the teat against leaking and invasion by bacteria. After weaning, a plug forms in the teat canal to prevent the entry of dirt and disease, so it is often better not to strip a ewe (milk it by hand) after weaning even if her udder looks uncomfortable.

Appendix II

Condition Scoring

(and lamb classification)

Condition scoring measures the fatness of an animal and describes its condition. It is one of the shepherd's best management tools.

The system was devised in Australia and is used to monitor the condition of ewes, especially in relation to feeding. It is important to practise condition scoring regularly to get the feel for it; even if it is not very accurate it will give an indication of any changes in the condition of a sheep. With practice the condition can be assessed in half scores. The system is less effective with some rare and primitive sheep breeds which do not lay down external fat.

The score is assessed by finger pressure in the lumbar region (the backbone immediately behind the last rib – Appendix I, Fig 117) where condition is laid down first and lost first. Assess in order:

A. Prominence (sharpness or roundness) of the spinous processes.

B. Prominence of the transverse processes.

C. Amount of muscle and fat tissue under the transverse processes by the ease with which the fingers pass under the bones.

D. Fullness of the eye muscle and its fat cover between the spinous and transverse processes.

Assessing Lambs for Slaughter

The system is also the basis for selecting lambs for slaughter and describing the finish of carcasses (classification). See also Fig. 110.

Fat class 1: Fat cover very thin and bones easy to feel

Fat class 2: Fat cover thin and bones easy to feel with light pressure

Fat class 3: Individual bones felt with light pressure

Fat class 4: Fat cover quite thick and individual bones felt only with pressure.

Fat class 5: Fat cover thick and bones cannot be felt.

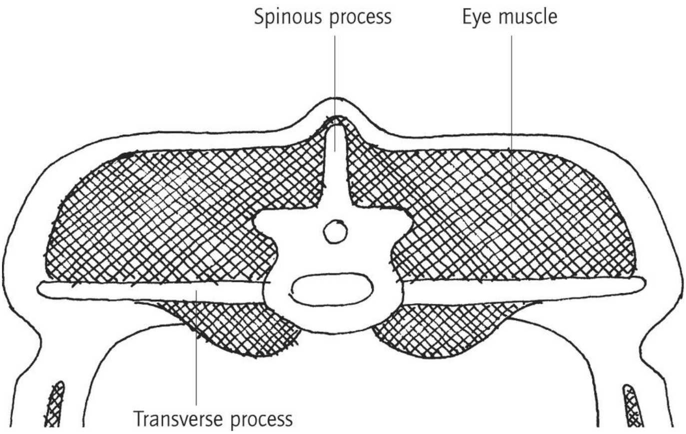


Fig 123 ***Score 1: very lean.***
Spinous and transverse processes are sharp and fingers pass easily under the ends. The eye muscle is shallow with no fat cover. Looks thin.

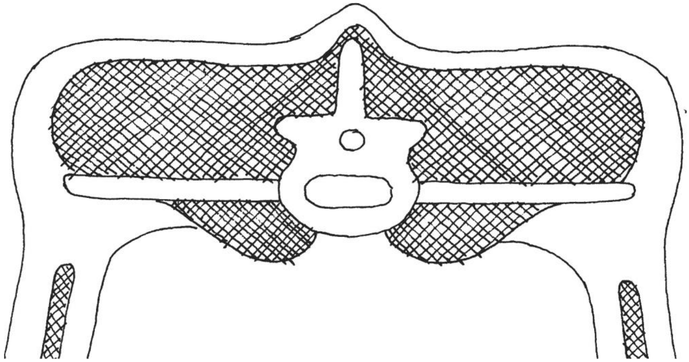


Fig 124 ***Score 2: lean.***
The spinous processes are prominent but smooth and feel like corrugations. The transverse processes are smooth and rounded. Fingers pass under the ends with a little pressure. Eye muscle depth is moderate but there is no fat.

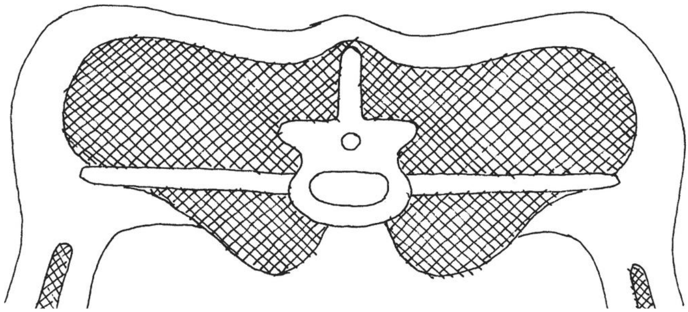


Fig 125 ***Score 3: good condition.***
The spinous processes have small elevations that are smooth and rounded and individual bones can be felt with pressure. The transverse processes are well covered and pressure is needed to feel the ends. Eye muscle is full with some fat cover.

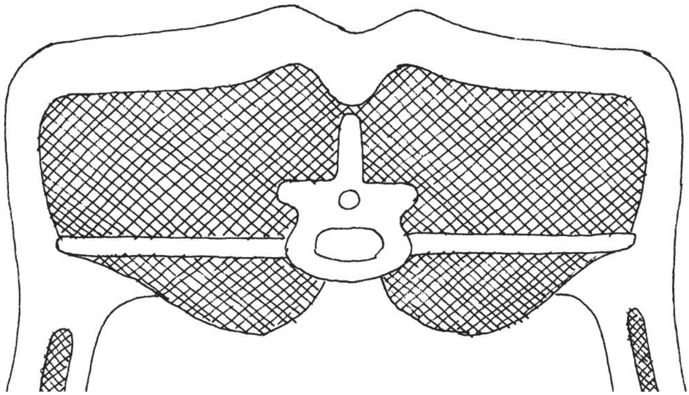


Fig 126 ***Score 4: fat.***
It takes pressure to feel the spinous processes and the ends of the transverse processes cannot be felt. The eye muscle is full and has a thick fat cover.

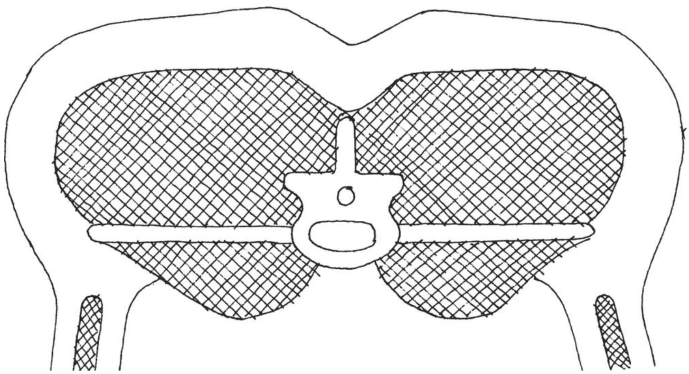


Fig 127 ***Score 5: very fat.***
Neither the spinous processes nor the transverse processes can be felt. The eye muscle is full with thick fat cover and there may be thick fat cover on the rump and tail. The animal will look fat.

GLOSSARY

Abortion – premature birth of a lamb that cannot survive outside the ewe.

Accredited flocks – ones which have been officially cleared of specific diseases.

Acidosis – acidity in the rumen usually caused by overeating cereals.

Acre – 0.4 hectare.

Aftermath – grass regrowth after cutting for hay or silage.

Agroforestry – integrating sheep with trees.

Anaerobic – without oxygen.

Anthelmintic – the drug used to kill worms/internal parasites/ helminths.

Antibodies – proteins produced in the blood to fight disease.

Artificial insemination – semen is collected from a ram and put into the reproductive tract of a ewe.

Barrener – ewe not in lamb.

Blind quarter – one half of the udder that is not functioning.

Break – a weakness in the fleece usually caused by poor nutrition or stress.

Break crop – a crop grown for a season to interrupt grass or another crop to break a cycle of weeds and disease.

Breed – a population of sheep that have obviously different characteristics from other sheep and that are genetically determined.

Broadcast – sowing seeds from above the surface as from a fertilizer spreader rather than drilling into the ground.

Broken mouth – an adult sheep that has lost some teeth.

Browse – eat the shoots and leaves of trees and shrubs.

Cade lamb – a hand-reared lamb.

Carrying capacity – the number of sheep that can live off a given area of land.

Cast ewe – cull ewe. Also ewe stuck on its back.

Clean grazing – grazing area free from internal parasites.

Cleats – two halves of the hoof.

Colostrum – first milk produced after lambing.

Compensatory growth – after a period of food shortage when growth is faster than would be expected from the diet.

Compounds – concentrates processed into pellet form by compounders.

Concentrates – high-energy, high-protein feed to supplement forage.

Condition – level of fatness.

Conformation – shape and muscling of the body.

Coronet – top of the hoof.

Cotted – fleece that is matted or felted.

Couples – ewes and lambs.

Creep feed – compound feed given to lambs before weaning.

Creep – special feeding or grazing area for lambs, inaccessible to the ewes.

Crimp – waviness in wool.

Crossbred – sheep with parents of two different breeds.

Crossing sire – ram used to sire breeding ewes.

Crutching – shearing wool from around the tail area of a sheep to keep it clean, and to aid mating and lambing.

Cuckoo lamb – born in early summer. Usually a late lamb.

Cud – food regurgitated for chewing.

Cull – a sheep removed from a flock because it is no longer wanted for breeding.

Dagging – trimming faeces from the wool.

Dags – dung attached to the fleece, usually around the tail.

Deadweight selling – lambs sold direct to abattoirs; the producer is paid for the carcass. Also called selling 'on the hook'.

Docking – removing the tail.

Dosing – giving a dose of medicine orally. Also called drenching.

Double – a twin.

Draft ewe – breeding ewe drafted from a hill flock for breeding on a lowland farm.

Drafting – separating sheep from the flock. Such as drafting lambs from their mothers at weaning or drafting sheep for sale.

Drawing – selecting lambs for slaughter. Also pulling a lamb from a ewe at birth.

Drenching – giving a dose of medicine orally. Also called dosing.

Dry ewes – ewes which are not lactating.

Drying-off – ewes drying up their milk at the end of lactation.

Dry matter – the component of feed left when all moisture is removed.

Dry sheep – sheep kept without breeding from them, usually for wool production.

Dystokia – difficult birth.

Electrolyte – a liquid that corrects dehydration in the body.

Entire – a male sheep that is not castrated.

Eruption – adult teeth coming through the gum.

Ewe – adult female sheep.

Faecal egg count – counting worm eggs in dung.

Fat lamb – once used to describe a slaughter lamb but now politically incorrect because fat is not wanted. Now called prime lamb.

Finish – the level of fat on a live sheep or carcass.

Finishing – getting a lamb to the correct weight and fat level suitable for selling for slaughter. The old term 'fattening' is politically incorrect.

Flushing – improving nutrition prior to mating.

Foetus – a lamb before it is born.

Foggage – pasture saved for winter grazing.

FOM – a lamb sold finished off its mother before weaning.

Forage – any plant material (except that used in concentrates) used as a food for sheep and other herbivores. Fibrous crops for ruminants.

Foster lamb – one reared by a ewe that is not its natural mother.

Gestation period – duration or length of pregnancy from conception to birth.

Gimmer – a young female sheep.

Grading – judging the fat and confor mation of a slaughter lamb.

Grassland – a plant community dominated by grasses and clovers.

Graze – to eat growing vegetation close to the ground.

Half-bred – traditionally a sheep sired by the Border Leicester.

Hay – grass preserved by drying for feeding in the winter.

Heading date – when the ear or head of a grass plant emerges. For a sward, the heading date is when 50 per cent of the ears have emerged.

Hectare – 2.5 acres.

Helminth – parasitic worm.

Hermaphrodite – animal with the characteristics of both sexes.

Hogget – heavy lamb sold at 8–12 months of age and after 1 January (UK). Also, between six months old and being shorn for the first time.

Hybrid vigour (heterosis) – improved performance of a crossbred over the performance of its parents.

Hyperthermia – higher than normal body temperature.

Hypothermia – lower than normal body temperature.

Inbreeding – the breeding of closely related animals.

In-bye – the best grazing on a hill farm, usually at lower altitudes.

Intramuscular – in the muscles.

Judas sheep – a tame sheep which follows the shepherd and leads the flock.

Kemp – coarse hair in a fleece.

Killing out percentage – percentage of the live lamb that ends up as a carcass.

Lactation – period when milk is produced and secreted from the udder.

Lambing percentage – number of lambs reared per one hundred ewes put to rams.

Lead sheep – a tame sheep which follows the shepherd and leads the flock.

Legume – plants bearing seeds in pods and which 'fix' nitrogen.

Ley – land temporarily under grass.

Lime – used to reduce soil acidity.

Liveweight selling – stock are sold through livestock markets or similar and are paid for on their live weight. Also known as 'on the hoof'.

Maintenance feed – a level of feeding to maintain body weight and health but not production.

Meconium – the first faeces passed by a lamb.

Metabolizable energy – the energy in feed that is used by the sheep.

Mismothering – lambs attaching themselves to the wrong ewe.

Mob – to get the sheep to flock together in a tight group.

Moiety – straw or other vegetable contamination found in fleeces.

Mothering-on – bonding a ewe and lamb.

Mule – traditionally a sheep sired by the Bluefaced Leicester.

Mutton – meat from older sheep.

Notch – an identification mark cut in the edge of the ear.

Nursing – a ewe which is suckling a lamb.

Oestrus – period when ewes are ready to mate.

Pasture – grass or other vegetation which is eaten by grazing animals.

Pathogen – an agent causing disease.

Periparturient rise – when internal parasites in ewes shed excessive numbers of eggs at around lambing time. Also known as the 'spring rise'.

Permanent pasture – long-term grassland that is rarely ploughed.

pH – a measure of the acidity of soil.

Pheromone – chemical substance that produces an odour to attract a mate.

Poaching – damage to soil and crops by animals' feet especially in wet weather.

Polled – hornless.

Pour-on – a veterinary treatment that is applied by pouring or spraying along the back of a sheep.

Prime lamb – first-class slaughter lamb. Used in preference to fat lamb.

Progeny – immediate descendants of a sheep.

Prolific – having large litters of lambs. A ewe who averages litters of three lambs or more would be described as prolific.

Quarter – one half of a ewe's udder.

Race – a narrow pen that sheep can walk through in single file for treatment.

Ram – adult male sheep.

Replacement – a sheep bought or bred to replace another culled from the flock.

Roughage – fibrous food (grass, hay, silage, straw) necessary for the function of the rumen.

Rumen – largest of the ruminant's four stomachs.

Ruminant – an animal that chews the cud.

Scanning – ultrasound scanning to identify the number of lambs in a pregnant ewe. Will also measure the depth of fat and muscle.

Scouring – having diarrhoea.

Selection – choosing sheep as parents of the next generation.

Shearling – young sheep between its first and second shearing.

Silage – grass preserved by ‘pickling’ for feeding in the winter.

Spring rise – see periparturient rise.

Staple – ‘bundles’ of wool fibres in a fleece.

Still-born – a lamb born dead and nothing can be done to save it.

Stocking rate – number of adult sheep that a hectare of land can support for a year.

Store lambs – unfinished lambs bought to finish later in the year. Those unfinished by 1 October (UK).

Strike – when affected by blowfly maggots. Fly strike.

Strip grazing – fencing pasture or forage crop temporarily so that animals graze a strip at a time.

Stripping – milking a ewe by hand.

Strong wool – coarse wool.

Subcutaneous – under the skin.

Supplement – food and minerals given in addition to the main diet.

Supplementary feed – any feed given to supplement the basal diet.

Sward – an area of grassland with a short, continuous cover of foliage.

Symptom – a change seen as a result of disease.

Synchronized – managed so that the flock will mate (and lamb) over a short period.

Tag – a form of identification put in the ear.

Terminal sire – ram which sires lambs for slaughter.

Tillering – vegetative reproduction of grasses when they send out new side shoots from their base.

Topdressing – spreading fertilizer.

Topping – cutting off the seedheads and weeds in grassland.

Topping-up – giving extra milk from a bottle to a sucking lamb.

Toxic – poisonous.

Tup – a ram.

Tupping – mating.

Turnout – when ewes are turned out to grass after winter housing.

Weaning – when a lamb no longer needs milk and is removed from its mother.

Wether – castrated ram lamb.

Windchill – loss of body heat caused by wind and rain.

Winter kill – death of plants in the winter.

Yeld or eild – barren ewe.

Yolk or suint – yellow substance secreted by the skin into the fleece.

Zero grazing – cutting fresh grass and taking it to the animals.

Zoonoses – disease that is transmissible between sheep and man.

Sources of Information

The most comprehensive and convenient source of information about every aspect of sheep production and marketing is the Internet. However, nothing beats direct contact with the people who have hands-on experience and specialist knowledge. So, other sources include:

- Sheep farmers.
- Veterinary surgeons.
- Agricultural colleges and research organizations.
- Feed, fertilizer and veterinary companies.
- Agricultural merchants.
- Market auctioneers and abattoirs.
- Farming magazines

Organizations and Internet Sites

General

Department for Environment, Food and Rural Affairs www.defra.gov.uk

Comprehensive site for EU and UK regulations and recommended best practices. Sheep welfare, health, diseases, movement controls, identification and payment schemes.

English Beef and Lamb Executive (EBLEX) www.eblex.org.uk Innovation, advice and research to enhance the profitability, sustainability and technical efficiency of commercial and pedigree sheep production and marketing.

National Sheep Association www.nationalsheep.org.uk Represents the interests of UK sheep producers at all levels. A source of wide-ranging advice.

Business Link www.businesslink.gov.uk

Business support, information and advice for sheep producers.

Sheep 201 www.sheep101.info/201

An online beginner's guide to rearing sheep. A no-nonsense, comprehensive and succinct website from Maryland USA. Well illustrated.

Breeding

Signet Breeding Services www.signetfbc.co.uk

Flock improvement schemes and genetic evaluation to identify sheep with superior breeding potential.

Dairying

British Sheep Dairying Association www.sheepdairying.com
National Sheep Association www.nationalsheep.org.uk

Environment

Farming and Wildlife Advisory Group www.fwag.org.uk Linking food production with the landscape.

Grassland and crops

British Grassland Society www.britishgrassland.com Current information on the science and practice of temperate grassland production and utilization.

National Institute of Agricultural Botany (NIAB) www.niab.com Field crop research and advice.

Agricultural Lime Association www.aglime.org.uk

Health and Safety

Health and Safety Executive www.hse.gov.uk

Advice on legislation and best practice.

Labour

National Association of Agricultural Contractors www.naac.co.uk

A directory includes specialist UK sheep and fencing contractors.

Marketing

Livestock Auctioneers Association www.laa.co.uk

Includes a directory of local markets and contacts.

Mutton

www.muttonrenaissance.org.uk

Promoting the wider use of mutton.

Organic farming

Organic Farmers & Growers www.organicfarmers.org.uk

Business Link www.businesslink.gov.uk

Sheep breeds

National Sheep Association www.nationalsheep.org.uk

Rare Breeds Survival Trust www.rbst.org.uk

British Coloured Sheep Breeders' Association www.bcsba.org.uk

Wikipedia Worldwide sheep breeds.

Sheepdogs

International Sheepdog Society www.isds.org.uk

Training

LANTRA www.lantra.co.uk

Provides UK agricultural training courses and advice on sources of courses.

Veterinary

Moredun Institute www.moredun.org.uk

Promotes animal health and welfare through research and education. World leader in parasitology and preventive vaccines.

DEFRA www.defra.gov.uk

An A–Z of animal diseases and fact sheets.

National Animal Disease Information Service (NADIS) www.nadis.org.uk

A network of veterinary practices in the UK who provide current information on sheep diseases.

Welfare

Humane Slaughter Association www.hsa.org.uk

Advice on the handling of slaughter animals and casualty slaughter.

Wool and skins

British Wool Marketing Board www.britishwool.org.uk

The Real Sheepskin Association www.realsheepskin.org.uk

British Coloured Sheep Breeders' Association www.bcsba.org.uk

Veterinary Books

A Manual of Lambing Technique

Cicely W. Hill and Agnes C. Winter

The Crowood Press Ltd

Written from experience.

Black's Veterinary Dictionary

Ed. E. Bowden

A. & C. Black Publishers Ltd

A comprehensive A–Z of every farm-type animal ailment and veterinary jargon and a bestseller for seventy years.

Lameness in Sheep

Agnes C. Winter

The Crowood Press Ltd

Covers one of the most important welfare issues in sheep farming.

Practical Lambing and Lamb Care

John Small, Colin Macaldowie, Andrew Eales

Blackwell Publishing Ltd

Buy this before you buy the sheep.

Sheep Ailments

Eddie Straiton

The Crowood Press Ltd

A classic.

Sheep Health, Husbandry and Disease

Agnes C. Winter

The Crowood Press Ltd

The Sheep Keepers' Veterinary Handbook

Judith Charnley and Agnes C. Winter

The Crowood Press Ltd

Keeping sheep healthy, recognizing problems and dealing with them.

The Veterinary Book for Sheep Farmers

David Henderson

Farming Press Books

Incredibly comprehensive and practical manual. Relates the veterinary side of sheep keeping to their management.

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