MEAT & LIVESTOCK AUSTRALIA

Fit to Join

Improving ewe and lamb survival through pre-joining assessment

Fit to Join

Main menu

Acknowledgement

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How to use these resources

Fit-to-join toolkit

A suite of tools has been developed to help sheep producers assess whether ewes are fit to join or not. The resources include this guide, and a series of four short instructional videos, including:

1. Ewe assessment overview
2. Udder assessment
3. Lameness assessment
4. Assessing older ewes.

All of these fit-to-join resources are available on the MLA website and producers can use them as either standalone resources, or as a combined resource when assessing ewes as fit to join. For example, we suggest watching the videos first and then using this guide when you're actually assessing your ewes.

In each video, consulting veterinarian Andrew Whale talks through the decision-making process around whether or not to retain or cull a ewe based on the assessment process. This guide contains a handy one-page printable flow chart that will guide you through this decision-making process in the yards.

Interactive support

This guide is an interactive PDF, which means clicking on links on pictures or text can take you to different sections of the document or to specific images or short video clips. Clicking on the 'Main menu' box at the top of each page will take you back to the Main menu at the start of the tool.

This document can be accessed on your mobile device (phone or tablet) and used in the yards to look at images or check the notes while you are learning to assess ewes.

For those who prefer to use a hardcopy, it can be printed out in A4 format as a whole booklet, or individual pages can also be printed.

1.

Project background

Key messages

- Reproductive success in any sheep operation is a combination of conception rates and lamb survival.
- An opportunity exists to improve lamb and ewe survival outcomes through a simple, yet effective, ewe assessment and selection process pre-joining.
- The key risk factors that impact on ewe and lamb survival include: udder health and structure, body condition, lameness, teeth and age.
- Ewes assessed as ‘fit to join’ are more likely to rear healthy lambs, increasing marking percentages, enterprise profitability and animal welfare outcomes.
- Analysis on three commercial sheep operations indicated unfit ewes were four times more likely to scan empty and three times more likely to die between joining and scanning. Lambs from unfit ewes had a 21% higher risk of dying.
- The economic benefit for classing and culling ewes as unfit to join was modelled at between $4 and $8 per ewe.

1. Project background

Reproductive success – more than best practice

Often sheep producers are frustrated they cannot achieve their marking percentage goals, even though they're implementing industry best practice in the lead up to, and during, lambing. An underlying reason for this may be they are joining ewes unfit to rear a lamb.

A review of existing literature and industry information, and ewe selection case studies, carried out on three commercial operations (self-replacing Merino, composite and first cross), confirmed an opportunity to improve ewe and lamb survival outcomes by identifying and culling unfit ewes before joining.

Project methodology

Ewes were classed pre-joining and then followed through scanning and lamb marking. Ewe and lamb mortality, lamb marking and scanning percentages were analysed, along with the economic cost-benefit of ewe assessment pre-joining.

The results

The investigation found that ewes assessed as 'unfit' were over four times more likely to scan empty and three times more likely to die between joining and scanning. Lambs from unfit ewes had a 21% higher risk of dying (Table 1). These impacts translated into significant modelled economic benefits for classing and culling ewes as unfit to join of between $4 and $8 per ewe.

Table 1: Average ewe mortality and marking results by ewe class.

	Average ewe mortality (%)	Average marking percentage (%)*
Fit to join	2.2	137
Unfit to join	2.7	123

** marking percentage is calculated as lambs marked from ewes joined*

Assessing ewes as 'fit to join' offers sheep producers an opportunity to increase ewe and lamb survival rates, productivity and profitability while improving animal welfare outcomes. On top of that, the process is fast, efficient and cost-effective.

1. Project background

Risk factors

The range of risk factors that impacts ewe and lamb survival include: udder health and structure, body condition, lameness, teeth and age.

While many producers routinely assess body condition as a key management tool, fewer producers routinely assess and address issues such as udder health and structure, lameness and age-related risks.

The ability of a ewe to successfully conceive, carry a pregnancy to full term, give birth and successfully raise a lamb can be broken into two key areas of focus: conception rate and lamb survival.

Research indicates that ewe body condition leading up to and during pregnancy is a key driver of conception rate and in terms of the ewe, following a successful birth, the ability of the lamb to feed from the ewe is a key driver of lamb survival. It is worth keeping these two key factors in mind when assessing ewes as fit to join.

Udder issues

Udder health and structure are key indicators of a ewe's ability to successfully rear a healthy lamb. Ewes with unsound udders are not fit to join as they are unlikely to raise a healthy lamb, which has significant animal welfare and productivity implications. Producers can assess udders quickly in the race through physical palpation and visual assessment.

Body condition score

Ewes in optimal condition are more likely to conceive, carry a pregnancy to full term, experience a successful labour and provide adequate nutrition to newborn lambs than ewes in poor condition or overfat ewes.

Foot health

Foot health plays an important role in fitness of ewes to join, with significant production losses attributed to lameness, including loss of body condition and predisposition to metabolic disease during late pregnancy. Identifying and addressing foot-related conditions in ewes prior to joining will increase animal welfare outcomes and improve productivity and profitability of the sheep enterprise.

1. Project background

Mouth and teeth

While there is insufficient evidence to supporting culling ewes based solely on broken or gummy mouths, loose and/or uneven incisors are likely to impact body condition and reproductive performance. Following an initial assessment of body condition, investigating the mouths and teeth of ewes with a BCS 0.5 less than the mob average could identify issues that exclude them as fit to join (such as damaged or worn teeth). It is generally worth focussing on the mouths and teeth of older ewes (>five years) as younger ewes in good condition (BCS ≥3.5) are unlikely to have loose, broke or uneven teeth, unless they have been subject to prolonged drought conditions.

Left: Investigate the mouths and teeth of ewes who are a BCS 0.5 less than the mob average to identify issues that exclude them as fit to join (such as damaged or worn teeth).

Risks associated with age

The standard industry practice of 'cast-for-age' culling is not supported by evidence. When assessed on their merits, with age as one, but not the 'overriding', factor in the mix, healthy and sound older ewes offer a valuable breeding proposition to any sheep enterprise, particularly for producers trying to build their breeding flock.

Older sheep with no other underlying issues (body condition score, feet, teeth) can have the same reproductive performance as sound, younger ewes, providing risk factors are well managed.

While older ewes can be at increased risk of mortality (e.g. hypocalcaemia), this can be largely addressed by improving nutrition and monitoring for symptoms of declining health (e.g. condition score).

2.

The ewe assessment process

When to assess

Acting early (a few weeks before joining) to assess ewes leads to substantial productivity, welfare and economic benefits, through a combination of strategic, targeted management or culling. After adopting the following assessment and it becomes standard practice, you can expect the numbers of ewes likely to be culled in a pre-joining assessment each year to reduce. However, this reduction may depend on how strict and on what variables ewes have been culled at weaning.

How to assess effectively

Using the following assessment approach, with two people and two dogs, up to 2,300 ewes can be effectively assessed per day.

Watch a short video of the assessment process here or scan the QR code.

Producer tip

Engaging the support of your consulting veterinarian or experienced livestock consultant for the initial ewe assessment will streamline the process and build confidence in the decision-making process around culling ewes that may appear ambiguous.

Have a policy in place

Before initiating the assessment process, it is helpful to have a policy in place to support decisions around keeping or culling individual ewes.

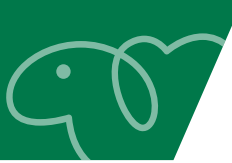
Any ewe with an udder abnormality is an immediate cull. The decision to keep or cull can be less clear for ewes subject to other risk factors (e.g. lower-than-average body condition, lameness, unsound mouth). A useful rule of thumb to guide decision making for ewes with sound udders, but secondary issues is the 'two-strike' policy. For example, if an older ewe has a sound udder, is more than half a BCS lighter than the mob average and her teeth are poor, then cull her. Whereas a younger ewe, with a sound udder, but more than half a BCS lighter than the mob average could be kept (if her nutrition can be increased to boost her BCS).

Below: immediately cull any ewes who have abnormal udders.

Click on the image below or scan the QR code to hear Andrew Whale explain the 'two-strike' policy.

Fit to Join

Ewe assessment process



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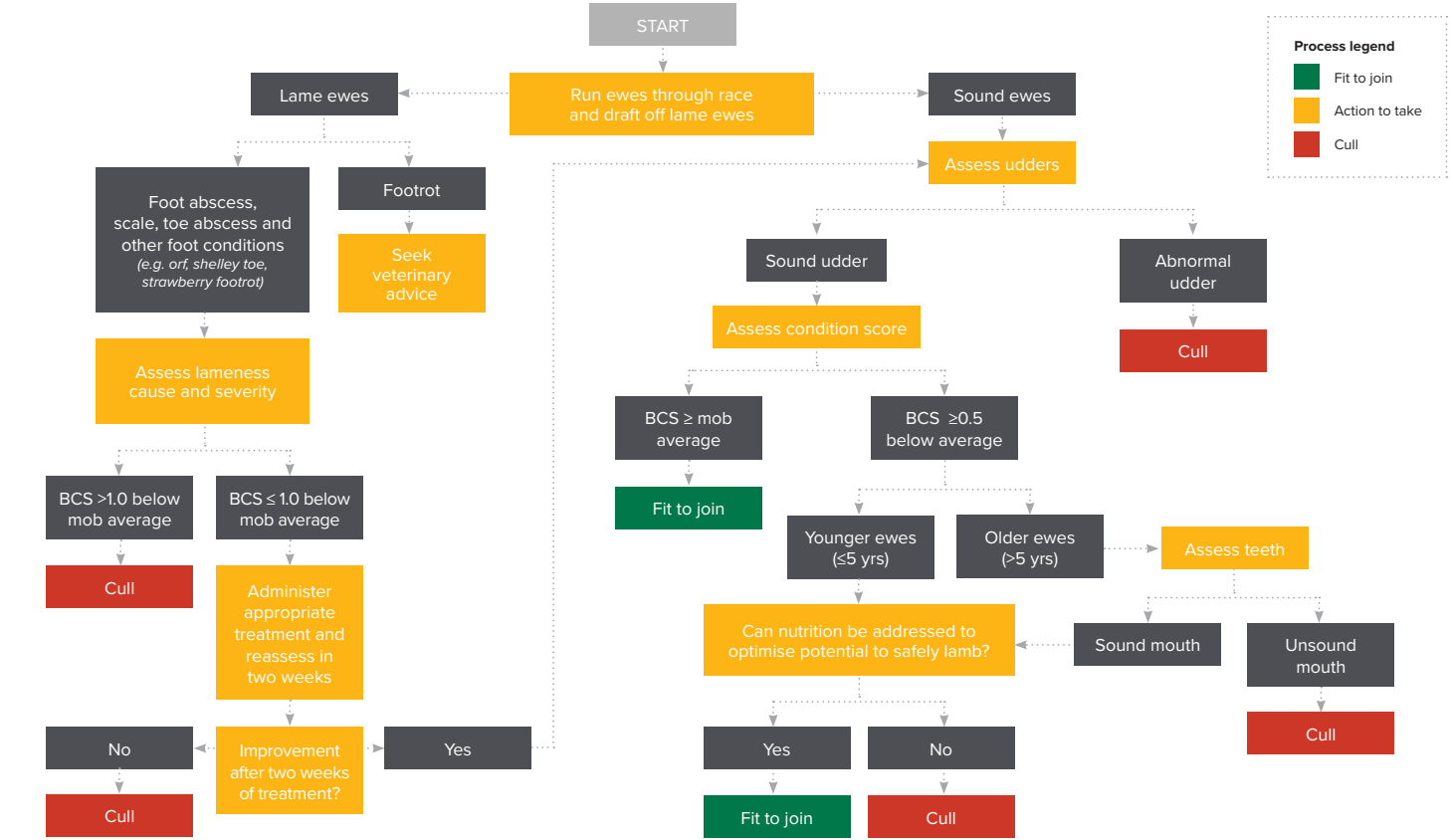


For more information on managing nutrition leading up to joining, go to **https://www.wool.com/sheep/reproduction/ewe-nutrition/** or enrol in a Lifetime Ewe Management (LTEM) Course.

2. The ewe assessment process

Step one: draft off lame ewes

Run ewes up the drafting race and draft off any lame ewes, which can be revisited when the remaining ewes have been assessed.

Producer tip

Setting up a 'long-range draft capability' allows ewes to walk naturally up the race and be drafted off if they are lame. Normally when a person stands at the draft ewes will run quickly towards it, but by standing approximately seven metres away, and having a spring-loaded drafting gate with a rope on it, allows you to thoroughly assess ewe movement and separate lame ewes easily.

Click on the image below or scan the QR code to see a short video clip of the long-range draft in action.

2. The ewe assessment process

Step two: determine mob average BCS

Before assessing the udders, fill the first race with sound ewes and assess the body condition of each ewe in the race to determine a mob 'average BCS'.

Ewe condition score is the major predictor of a successful conception. For optimal reproductive performance, ewes should be BCS 3.0 at joining.

Step three: assess udder health and structure

After determining the average mob BCS, assess the udder of each ewe. Feel udders from behind, palpating the whole udder, including teats, for signs of abnormality.

Cull any ewes with compromised udders — see Udder assessment for more details.

Step four: assess body condition score

Assessing body condition score is focused on picking up the outliers. After determining a mob average from the first race (Step two), consider any subsequent ewes half a body condition score lower (0.5BCS) as moderate risk and those a full condition score lower (1.0BCS) as high risk. Depending on any other issues found with the ewe, this could determine whether they are 'fit' or 'unfit' for joining.

Take particular note of the condition of older ewes (>five years). Check the mouths and teeth of older ewes who fall more than 0.5BCS below the mob average. Look for loose teeth and uneven wear, which could impact on the ability to maintain sufficient condition to successfully rear a lamb.

Unless subjected to severe drought, or her condition is ≥0.5BCS below the average of the mob, there is no need to assess the mouth of any ewe under four years of age, as the risk of poor teeth is negligible.

2. The ewe assessment process

Step five: assess lame ewes

Assess the lame ewes previously drafted off on their own, paying attention to the cause of lameness and BCS.

Cull any severely lame animals >1.0BCS below the mob average, or where treatment is unlikely to be an option.

Following treatment, any lameness resulting in the ewe not bearing weight needs to be reassessed in two weeks. If there is no improvement after two weeks of treatment, cull the affected ewe.

Consider identifying lame ewes and reassess their fitness at pregnancy scanning.

Lame ewes not assessed as culls need to go through the udder assessment process outlined on the previous page.

***Note:* Ewes assessed as sound do not require an in-depth foot assessment.**

! **To gain a deeper understanding of the ewe assessment process and its benefits, watch the Ewe assessment overview video.**

Click on the image above to watch the Ewe assessment overview video.

3.

Assessing ewe udder health and structure

Key messages

- Udder health and structure is a key indicator of a ewe's ability to successfully rear a healthy lamb.
- Udders can be assessed quickly in the race through physical palpation and visual assessment.
- Ewes with unsound udders are not fit to join as they are unlikely to raise a healthy lamb, which has significant animal welfare and productivity implications.

3. Assessing ewe udder health and structure

Background

Research from New Zealand[1] indicates around 5% of ewes in a mixed-age flock can have udder defects, which can impact lamb survival and growth rates. Lambs born to ewes with udder defects have a reduced chance of survival – their death rate is 3–4 times higher than lambs whose dams had a normal udder. Lambs that do survive grow an average of 25g less per day, with an average weaning weight around 2kg lighter than lambs whose dams had normal udders.

Because of these effects, ewes with udder defects will wean around 11 less kilograms of lamb compared with ewes with normal udders.

When to assess

Checking ewe udders a few weeks before mating (rather than at weaning) is a better predictor of how udders will affect lamb survival and growth for the coming season. Check udders at least 4–6 weeks after weaning to find the maximum number of affected ewes, while leaving time to finalise ewe numbers before mating.

How to assess effectively

Visually assessing udders, during crutching or shearing for example, is not effective for identifying abnormalities in affected ewes. You need to palpate (feel) each udder.

It is easiest to palpate udders while ewes are standing in the race, by feeling and gently squeezing both halves of the udder and, if possible, rolling the teats between your fingers to identify any ewes with a thickened core down the centre of one or both teats (like a pencil lead).

What to look for

A healthy udder feels soft and consistent in texture and size between the two halves. Healthy teats will also feel soft throughout and will be small and consistent in size and texture on both sides of the udder.

Signs for concern include: generalised or localised hardness (lumps), misshapen or scarred tissue and teats.

[1] beef+lamb New Zealand (2020) *Examining ewes' udders factsheet*. Accessed April 2022. https://beeflambnz.com/knowledge-hub/PDF/examining-ewes-udders

‘Wet and dry’ vs ‘fit to join’

Assessing ewes at marking or weaning as ‘wet or dry’ remains an important ‘measure-to-manage’ tool for sheep producers in addition to assessing udders for soundness before joining.

A wet-or-dry assessment allows producers to identify ewes that did not raise a lamb and make decisions as to her future in the flock. Quite often dry ewes will be fat, so these animals could be drafted off and assessed as wet or dry instead of assessing every ewe in the flock.

For more information on assessing ewes as ‘wet or dry’, download the NSW DPI factsheet: Sheep udder assessment at lamb marking.

Common udder irregularities and issues

Generalised hardness

Generalised hardness of the udder is often referred to as mastitis. Recent infections may still be hot and swollen, but more commonly the infection has been there for some time and the udder half or halves will simply feel hard all over.

If the affected udder half is ‘milked’ by gently squeezing the teat, a recent infection can produce a watery, bloody or clotted secretion. However, if the udder has been infected for some time the secretion could be thick and discoloured. There may be no secretion at all in older infections.

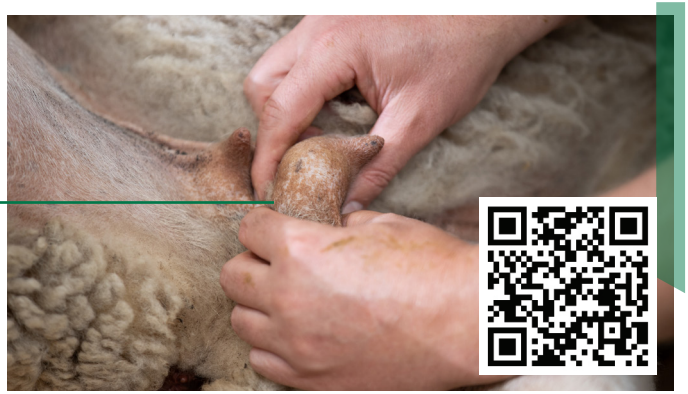
Typically, generalised hardness is a longstanding infection and treatment is unlikely to be satisfactory. Cull any ewes with generalised hardness in one or both udder halves.

Any ewes with gangrenous mastitis (‘blue-bag’) require immediate treatment or euthanasia.

Lumps

Lumps within the udder tissue can range from one to many and from small to large. They are usually only found in one half of the udder but can sometimes be found in both sides. It is normal for some ewes to have lumps just in front of, or just behind, the udder. These are attached to the udder but are not within the udder tissue. At weaning about 3% of ewes normally have these lumps in front of, or just behind, the udder. By 4–6 weeks after weaning on average about 1.5% of ewes have them – as they are normal, these ewes do not need to be culled.

There is currently inadequate data to know whether the number and size of lumps found within the udder tissue is important, so the safest option is to cull any ewes found with lumpy udders. If you are short of ewes then keeping those with only one or two small lumps might be fine provided the lumps are not near the teats.



Click on the images or scan the QR codes to hear veterinary consultant, Andrew Whale, talk through the issues relating to these udders.

Top: small lump above the udder. Ewe does not need to be culled.
Below: lump within the udder tissue. Ewe will be culled.

Burst abscesses

Scar tissue resulting from burst abscesses can be felt or seen on the outside of the udder and is usually a result of infection within the udder tissue, which has burst out. Generalised hardness, or lumps, often (but not always) can be felt in the affected half of the udder. If this is the case, cull the ewe.

There is insufficient data on the effects of a small burst abscess with no other obvious udder defect, but the safest option is to cull.

Right: scar tissue from an abscess within the udder.

Click on the image or scan the QR code to hear veterinary consultant Andrew Whale talk through the udder assessment process for this ewe.

Teat defects

It is normal for ewes to have abrasions or scarring on their teats due to damage from suckling lambs. This is unlikely to cause any problems. Cull ewes with missing teats or excessively damaged teat ends.

Cull any ewes with a thickened core down the centre of one or both teats (like a pencil lead).

Research indicates the thickened core is not important if it is present at weaning, but is problematic if it is still there 4–6 weeks after weaning.

Misshapen (poorly structured) udder

Some ewes may not have udders affected by any of the other conditions listed, but the structure, shape or tone of the udder can prevent lambs from suckling. Many of these udders are easily identified in the paddock post lambing, and ewes can present as dry at weaning, as lambs have not been able to successfully feed from the misshapen udder and subsequently died.

A healthy udder

At pre-joining assessment, a healthy udder will have an even ‘tone’ in each side of the udder, it will be fully contracted and feel moderately springy.

Click on the image below or scan the QR code to hear veterinary consultant, Andrew Whale, describe the features of a normal udder.

4.

Assessing ewe condition score

How to assess body condition score

To assess the body condition score, place your thumb on the backbone just behind the last long rib and your fingers against the stubby ends of the short ribs.

Randomly score 25–50 sheep from the first race of ewes to determine the mob average.

See diagram on following page.

4. Assessing ewe condition score

Condition Score 1

Source: Lifetime Wool

Backbone

The bones form a sharp narrow ridge. Each vertebra can be easily felt as a bone under the skin. There is only a very small eye muscle. The sheep is quite thin (virtually unsaleable).

Short ribs

The ends of the short ribs are very obvious. It is easy to feel the squarish shape of the ends. Using fingers spread 1cm apart, it feels like the fingernail under the skin with practically no covering.

Condition Score 2

Source: Lifetime Wool

Backbone

The bones form a narrow ridge but the points are rounded with muscle. It is easy to press between each bone. There is reasonable eye muscle. Store condition – ideal for wethers and lean meat.

Short ribs

The ends of the short ribs are rounded but it is easy to press between them. Using fingers spread 0.5cm apart, the ends feel rounded like finger ends. They are covered with flesh but it is easy to press under and between them.

Condition Score 3

Source: Lifetime Wool

Backbone

The vertebrae are only slightly elevated above a full eye muscle. It is possible to feel each rounded bone but not to press between them. Forward store condition is ideal for most lamb markets now. No excess fat.

Short ribs

The ends of the short ribs are well rounded and filled in with muscle. Using four fingers pressed tightly together, it is possible to feel the rounded ends but not between them. They are well covered and filled in with muscle.

Condition Score 4

Source: Lifetime Wool

Backbone

It is possible to feel most vertebrae with pressure. The back bone is a smooth, slightly raised ridge above full eye muscles and the skin floats over it.

Short ribs

It is only possible to feel or sense one or two short ribs and only possible to press under them with difficulty. It feels like the side of the palm, where maybe one end can just be sensed.

4. Assessing ewe condition score

Condition Score 5

Source: Lifetime Wool

Backbone

The spine may only be felt (if at all) by pressing down firmly between the fat covered eye muscles. A bustle of fat may appear over the tail (wasteful and uneconomic).

Short ribs

It is virtually impossible to feel under the ends as the triangle formed by the long ribs and hip bone is filled with meat and fat. The short rib ends cannot be felt.

Condition score Merino vs maternals

While current recommendations for the optimal condition score for Merino ewes vs maternal ewes vary, when making decisions to retain or cull ewes the principles remain the same. If a ewe is BCS≥ 0.5– 1.0 below the mob average investigate the underlying factors associated with her condition (e.g. nutrition, illness, lameness, teeth). If you cannot address these factors in order to optimise her potential to lamb safely, then cull her.

5.

Assessing lame ewes

Main menu

Key messages

- Foot health plays an important role in fitness of ewes to join, with significant production losses attributed to lameness, including loss of body condition and predisposition to metabolic disease during late pregnancy.
- Identifying and addressing foot-related conditions in ewes prior to joining will increase animal welfare outcomes and improve productivity and profitability of the sheep enterprise.
- Where an existing foot condition can be treated effectively and ewe body condition managed appropriately the decision to cull will be based on the presence of any other risk factors. Lameness in isolation of other risk factors does not mean a ewe needs to be culled.

Footrot

Footrot is a highly contagious infection of the skin between the claws of a sheep's foot. It varies in severity, depending on the virulence (capacity to cause disease) of the bacterial strain responsible for the infection. Symptoms can present as mild interdigital lesions to underrunning of the hard horn of the sole and wall of the foot. Culling on the basis of the presence of footrot lesions is not recommended, unless it is part of a structured footrot management program, as sound sheep may well become infected later.

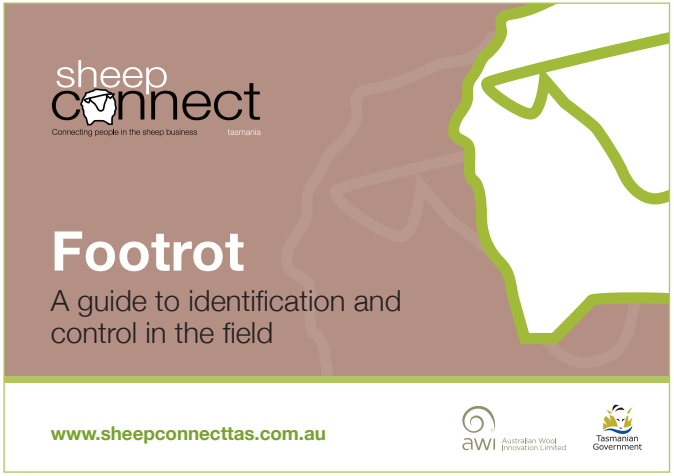
Implementing a planned footrot control program (e.g. footbathing, vaccination and the possible use of antimicrobials) will reduce the severity of existing lesions. Consider a combination of footbathing and vaccination to maintain a low prevalence of footrot leading up to and during lambing. Consult your sheep veterinarian to develop a suitable footrot management program, culling, retention and joining strategy.

***Note:* Regulations with regard to the diagnosis and management of footrot in sheep vary between states. In some states, footrot is a notifiable disease.**

Managing footrot

For flock-specific information on managing footrot contact your consulting veterinarian. For more detailed information relating to footrot and other foot conditions download:

Footrot: A guide to identification and control on the field



Footrot scoring system

A scoring system has been developed to describe the signs and progression of footrot. Score 1 is the mildest stage of the disease through to Score 5, which is the most advanced stage. Consult with your veterinarian to confirm the presence of footrot and determine the virulence status of any footrot infection. A prompt, accurate diagnosis will help to determine the best treatment program and reduce the impacts of the disease.

***Note:* The following scoring system is from Tasmania. However, a similar scoring system exists within each state.**
Click here to find your state scoring system.

Score 1

The infection is confined to the interdigital skin and the inflammation is only mild to moderate (this stage maybe referred to as foot scald). The surface layer of skin is reddened, moist and there is hair loss from the skin.

Source: AWI Sheep Connect Tasmania

Score 2

The inflammation of the interdigital skin is more severe and may involve part or all of the soft horn on the inside wall of the toe, but there is less than 2mm of under-running of the sole.

Source: AWI Sheep Connect Tasmania

Score 3

The inflammation of the interdigital skin is more severe and may involve part or all of the soft horn on the inside wall of the toe, but there is less than 2mm of under-running of the sole.

Source: AWI Sheep Connect Tasmania

5. Assessing lame ewes

Score 4

There is under-running of all the sole right out to the wall of the hoof including the toe area.

Source: AWI Sheep Connect Tasmania

Score 5

There is under-running of the hard horn of the wall of the hoof, sometimes including the hard horn flap on the inside of the toe.

Source: AWI Sheep Connect Tasmania

Foot abscess

Foot abscess (heel abscess) is a relatively common condition, where the *Fusobacterium necrophorum* bacteria infects the interdigital skin and may then invade the deeper foot structures, eroding bones and leaving disfigured claws and permanently lame sheep.

The disease is most common when heavy, late-pregnant ewes are yarded in muddy conditions. Treating clinical cases early with antibiotics often cures infections. Chronic cases do not respond to antibiotics. Transmission can be slowed by walk-through footbathing (12–15% $ZnSO_4$) when late-pregnant sheep are yarded for routine treatments.

The decision to cull affected animals will depend on how lame they are. Cull severely lame animals in poor condition. Retain and treat mildly lame animals that are maintaining weight. Chronic cases — those with swollen and misshapen feet — respond poorly to treatment. Regardless of their BCS, be mindful of the animal welfare implications of keeping chronically lame sheep.

Right: foot abscess — infection is breaking out above the coronet (hoof line) showing hair loss and swelling. Inset: swollen foot with infection breaking out between the toes.

Source: AWI Sheep Connect Tasmania

Toe abscess

Toe abscess is an infection of the sensitive lamina of the toe. Clipping the points of the toes of the affected foot provides diagnosis and allows pus to drain, offering a cure.

The decision to cull affected animals will depend on how lame they are. Cull severely lame animals in poor condition. Retain and treat mildly lame animals that are maintaining weight.

Top: typical site of infection entry point at toe. Below: infection has progressed along the toe and broken out above the hoof.

Source: AWI Sheep Connect Tasmania

Ovine interdigital dermatitis (scald)

Ovine interdigital dermatitis (OID, or scald) requires a clinical diagnosis. Many different agents can cause OID, including early footrot infection, a range of other bacterial infections, mechanical trauma and constant grazing on wet pastures.

Most forms of OID respond well to walk-through footbathing with a solution of zinc sulphate ($ZnSO_4$) and moving to drier pastures.

The decision to cull affected animals will depend on how lame they are. Cull severely lame animals in poor condition. Retain and treat mildly lame animals that are maintaining weight.

Above: ovine interdigital dermatitis — laboratory tests using smear samples are the only way to get a definitive diagnosis for OID. Source: AWI Sheep Connect Tasmania

Other foot conditions

Shelly toe

Shelly toe is rarely a cause of lameness per se, but can be confused with the underrun caused by footrot. It is a separation of different layers of hard horn towards the points of the toe. Paring away impacted horn material will cure any lameness. There should be no need to cull animals suffering from this condition as long as they are treated appropriately.

Above: shelly toe — note elliptical shape of separation and relatively smooth, dry surface exposed by paring. Source: AWI Sheep Connect Tasmania

Contagious pustular dermatitis (orf: scabby mouth)

Lameness due to orf virus is rare, but can severely affect large numbers of animals in individual flocks. It occurs when unvaccinated sheep graze infected paddocks containing plants capable of causing interdigital skin damage (thistles, stubbles). Lesions are typically seen as scabs and shallow erosions between the toes and on the back of the pastern. Infection is self-curing. There should be no need to cull animals suffering from this condition as long as lameness is not affecting body condition.

Strawberry footrot

Strawberry footrot is caused by the dermo (lumpy wool) bacteria *(Dermatophilus congolensis)* infesting the skin of the pastern, fetlock and lower canon.

Signs vary from moist dermatitis to a proliferative skin growth (reminiscent of a strawberry). The infection is most common in wet conditions. Most cases respond to footbathing. Repeat bathing may be needed to cure all cases. There should be no need to cull animals suffering from this condition as long as lameness is not affecting body condition.

Above: strawberry footrot — all classes of stock can be affected by strawberry footrot and infection is usually above the foot, up to the knee. Source: Andrew Whale

6.

Assessing ewes for sound teeth and mouths

Main menu

Sound mouths support optimal body condition

It is most important to check the mouths of older ewes (>five years) if they are light in condition (BCS≥0.5 below the mob average). Older ewes in good condition (BCS ≥ the mob average) are unlikely to be suffering from issues that are impacting their ability to eat and maintain weight.

Unless subjected to severe drought, or her condition is ≥1.0BCS below the average of the mob, there is no need to assess the mouth of any ewe under four years of age, as the risk of poor teeth is negligible.

Having a working knowledge of sheep mouth and teeth structure and health will help you assess whether the conformation of an individual ewe's mouth is impacting on her fitness to join as well as offering a guide as to her age.

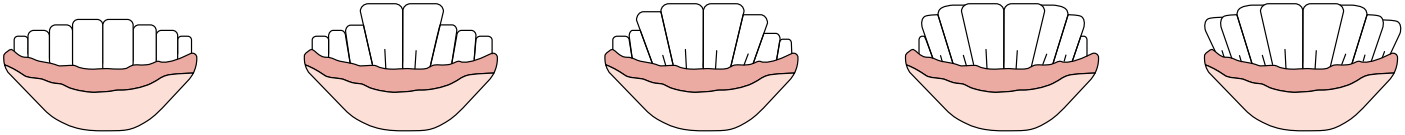
Below: when checking ewes' mouths, focus on the integrity, soundness and wear of the teeth. Signs for concern include loose teeth or teeth showing signs of uneven wear.

Telling the age of sheep

Teeth are a useful indicator of the age of a sheep. Sheep only have front teeth in their lower jaw. They are born without teeth, but most have eight milk teeth by the time they are two months old. As sheep get older, these milk teeth are replaced by permanent teeth in the same way our milk teeth are replaced by permanent teeth.

In sheep, as in humans, permanent teeth replace the milk teeth in pairs — first the two front teeth, followed by one either side until they have eight incisors (permanent front teeth). Adult sheep also have 24 molar teeth at the back of the jaw, with six each side on both the top and bottom.

From 1 July 2019, the definition of 'lamb' is: "an ovine animal that is under 12 months of age, or does not have any permanent incisor teeth in wear".



Milk teeth
(lamb)

Two-tooth
(12–18 months)

Four-tooth
(18–2 years)

Six-tooth
(2–3 years)

Full-mouth
(adult)

Source: AWI Learn About Wool

Older ewes present missed opportunity

Risks associated with age

When assessed on their merits, with age as one factor in the mix, but not the over-riding factor, healthy and sound older ewes offer a valuable breeding proposition to any sheep enterprise, particularly for producers trying to build their breeding flock. Older sheep with no other underlying issues can have the same reproductive performance as sound, younger ewes, providing risk factors are understood and well managed.

While older ewes can be at increased risk of mortality (e.g. hypocalcaemia), this can be largely addressed by improving nutrition and monitoring for symptoms of declining health (e.g. condition score).

When assessing older ewes as fit to join, pay particular attention to body condition. If all other risk factors are low (i.e. udders, feet and teeth), ewes who are equal to or above the average mob condition score are fit to join. If the older ewe falls 0.5BCS below the mob average, you need to determine whether you can address nutrition sufficiently to ensure a safe lambing. If not, then culling may be the most appropriate option.

When all other risk factors have been considered, selecting older ewes on the basis of their lifetime reproductive performance can be an efficient decision-making process for sheep enterprises.

Click on the image below to watch the Assessing older ewes video.

7.

Economic benefits of assessing ewes as fit to join

Ewe selection case study

Coordinated ewe selection case studies were carried out on three commercial farms as part of this project. Ewes were classed pre-joining and then followed through scanning and lamb marking. Ewe and lamb mortality, lamb marking rate and scanning percentages were statistically analysed, along with the economic cost-benefit of ewe selection pre-joining.

The statistical analysis confirmed an opportunity to improve lamb and ewe survival outcomes by rigorous ewe assessment and selection before joining. The economic cost-benefit of the pure composite (prime lamb) operation is outlined on the following pages.

Producer case study

The following information summarises the key findings from two of the three producer case studies carried out with this project.

Farm one

Location	Strathdownie, Victoria
Enterprise type	Prime lamb production
Flock size	12,000 first-cross ewes crossed to composite rams
Age of first joining	Seven months
Joining period	Five weeks
Lambing date	5 June–10 July
Feeding regime	Pasture supplemented with low levels of grain during late autumn.
Culling policy	Prior to the project, this producer did not 'wet and dry' or cull for age. Culling decisions were based on teeth and body condition.

Farm two

Location	Nareen, Victoria
Enterprise type	Prime lamb production
Flock size	7,000 composite ewes
Age of first joining	Seven months
Joining period	Five weeks
Lambing date	20 June–23 July
Feeding regime	Pasture supplemented with silage and grain. Confinement feeding during late autumn with silage and grain.
Culling policy	Prior to the project, this producer routinely assessed ewes as 'wet or dry' and focused on retaining a 'younger' flock as a matter of course.

Selection pressure on ewes from farm one has been limited during recent years due to a goal of increasing ewe numbers. Culling has only been done through visual assessment and an assumption that a ewe wouldn't handle another 12 months in the production system.

Selection on ewes in farm two was highest of all three farms studied. There are limited ewes over six years of age and ewes that failed to rear a lamb have been culled. However, udders of ewes that have raised lambs have not been assessed. All ewes in both flocks were older than two years.

Research approach

On each case study farm, between early December and early January, project veterinarians assessed each of the case study flocks for age, body condition score, udder health and teeth. Body condition score was not assessed as an absolute (i.e. CS 3 or 2.5) but in terms of comparing condition against the mob average. A classing system was developed to enable objective assessment of the ewes and animals that accumulated more than five points were classed as high or very high risk to join (i.e. 'unfit') and identified using eID tags and branded with marker along their backline.

Following the pre-joining assessment and up until pregnancy scanning ewes were run together, regardless of their 'risk' profile. Average body condition was assessed monthly and details of any supplementary feeding was recorded.

Flocks were scanned during March–April and split into mobs of dries, singles, twins and triplets (if this was the farm practice), or multiples (where twins and triplets were scanned separately). For the dry ewes, the pregnancy status of fit and unfit ewes was recorded and the total number of dry ewes counted. This provided data on the proportion of fit vs unfit for dry ewes (Table 1).

Table 1: Proportion of unfit ewes from each farm at classing

Farm	Fit	Unfit	Unfit (%)
1	6799	1573	19
2	3700	913	20

Following pregnancy scanning, up until April/May, when lambing mobs were established, all ewes were run as normal (i.e. those classed as fit and unfit were run in mobs as normal for the case study business (e.g. age groups etc). When ewes were split into their lambing mobs (May) the 'unfit' ewes were

separated from ‘fit’ ewes to be lambed down separately. This enabled easier tracking of ‘unfit’ ewe performance during lambing. Where appropriate, ewes were also separated into mobs of similar pregnancy status (i.e. twins, singles, etc). Mob size for each ‘unfit’ parity group was the same as for ‘fit’ ewes, lambed down onto the same feed on offer (FOO) and provided with similar shelter. Depending on numbers on each farm, ewes with different problems within the unfit mob were split (e.g. the older ewes run as one mob and the ewes with unsound udders were run as one mob) to demonstrate the impact on performance of these risk ractors.

Key findings

The key results from the statistical analysis of the three case study farms were:

- Ewes are more than four times more likely to scan empty if they are classed as unfit compared with fit.
- Unfit ewes were three times more likely to die between joining and marking compared with fit ewes.
- Ewes assessed as unfit were less likely to successfully raise live lambs, from scanning through to marking.

Lamb marking results for fit and unfit ewes from the two case study farms are shown in Table 2.

Source: Catriona Nicholls

Table 2: Summary of marking results by ewe class (unfit vs fit) and litter type (twin/single/triplet)

Ewe class	Litter type	Ewes in	Ewe mortality (%)	Foetus' scanned	Lambs marked	Marking %
Farm one						
Fit	single	2515	1.2	2515	2267	90
Fit	twin	4172	1.5	8344	6989	168
Unfit (age)	twin	180	1.7	360	281	156
Unfit (udder)	twin	266	3.8	532	356	134
Unfit (other)	twin	415	2.2	830	653	157
Unfit (N/A)	single	492	0.4	492	467	95
Farm two						
Fit	single	972	0.3	972	962	99
Fit	twin	2443	1.3	4886	3950	162
Fit	triplets	277	4.3	831	625	226
Unfit (low BC/lame)	single	92	0.0	92	82	89
Unfit (low BC/lame)	twin	135	0.0	279	228	169
Unfit (udder)	single	75	2.7	75	58	77
Unfit (udder)	twin	220	0.0	440	274	125
Unfit (other)	single	72	1.4	72	65	90
Unfit (other)	twin	188	2.7	376	275	146
Unfit (N/A)	triplet	69	10.1	207	104	151

Cost:benefit

The economic cost:benefit for these enterprises is shown in Table 3. Note that in the market at the time the case studies were conducted (late 2021) the difference between lamb price and mutton price (the money received for cull ewes) was quite small. This reduced the modelled economic benefit of proactive culling. Should changes in the market conditions occur, associated changes in returns also will occur.

The base assumptions for the economic analysis were:

1. Pasture utilisation was held constant across all treatments for each farm. Through stocking rate, pasture utilisation is the single most important driver of profit on livestock farms.
2. The income and costs associated with the case studies are as close to the actual figures as possible since the relative price received for lambs and ewes (mutton) is a critical driver (i.e. the bigger the difference in favour of lamb price the better the profit response to classing ewes).
3. The cost of assessing ewe fitness to join was assumed to be $0.40/ewe.
4. The replacement rate (i.e. the ewe lambs required to replace the ewes culled as unfit to join) is the main cost of classing out unfit ewes prior to joining. However, ewes that die must also be replaced. The replacement rate was assumed to be X + unfit ewes + ewe deaths + scanned dry ewes + ewes that did not rear a lamb (not measured). Where X is a baseline replacement rate of 10–15% for each individual case study farm.

Table 3: Summary of cost:benefit for culling ewes classed as unfit to join.

	Farm one			Farm two		
	All	Unfit	Fit	All	Unfit	Fit
Replacement rate (%)	18	21	17	26	27	26
Net profit ($m)	1.04	0.75	1.09	1.83	1.52	1.87
Return on capital (%)	4.2	3.0	4.4	4.4	3.7	4.5

The economic return from culling ewes classed as unfit aligned with the statistical analysis. The marginal return (i.e. the cost of assessing the ewes and the return from culling them and running the higher replacement rate) is outlined in Table 4. The magnitude of the return will depend on each individual business and relative performance in several areas (e.g. the higher the scanning rate or fertility of the flock the more you stand to lose by not culling).

Table 4: Marginal return on capital invested in culling ewes classed as unfit to join

	Farm one	Farm two
Gross return ($)	51,600	47,413
Return per ewe ($)	8.32	4.31
Return on marginal capital (%)	2081 (20x)	1078 (10x)

The difference in economic performance between farm one and farm two in Table 4 reflects the more proactive culling program on farm two prior to the project (hence fewer ewes were culled during the project). It highlights that financial returns are primarily associated with proactively culling ewes for being unfit to join, rather than joining them and having higher ewe and lamb mortality. For a fixed level of resource (pasture or energy) this results in improved business performance.

Impacts of udders

Of the variables associated with ewes being classed as unfit, udder function was the only one found to be statistically significant. The impact of classing out just for udder function was assessed for farm one. The comparative results are summarised in Table 5.

Table 5: A comparison of the returns associated with culling based on udder soundness alone versus udder soundness plus condition score, age and feet

	Farm one (unfit all factors)	Farm one (unfit udder)
Gross return ($)	51,600	67,086
Return per ewe ($)	8.32	10.82
Return on marginal capital (%)	2081 (21x)	2705 (27x)

Sheep reproduction resources

General

Meat and Livestock Australia and Australian Wool Innovation, Making More from Sheep. http://www.makingmorefromsheep.com.au/wean-more-lambs/index.html

Australian Wool Innovation, *Ewe nutrition.* https://www.wool.com/sheep/reproduction/ewe-nutrition

Udder assessment

Beef + Lamb New Zealand (May 2020), *Examining ewes' udders factsheet.* https://beeflambnz.com/knowledge-hub/PDF/examining-ewes-udders

Beef + Lamb New Zealand (December 2020), *Examining ewes' udders to identify possible problems.* https://www.youtube.com/watch?v=tqQXpMnhCxE

NSW Department of Primary Industries (2013), *How to check ewes for wet and dry udders.* https://www.youtube.com/watch?v=ceL3i5IdOxo

Condition scoring and ewe nutrition

Meat and Livestock Australia and Australian Wool Innovation Making More from Sheep, *Condition scoring.* http://www.makingmorefromsheep.com.au/wean-more-lambs/tool_10.1.html

Australian Wool Innovation (2021), *Change makers episode 4: Ewe condition scoring.* https://youtu.be/2RggkRZr15k

Foot health and structure

Australian Wool Innovation, *Footrot.* https://www.wool.com/sheep/welfare/footrot/

Older ewes

Meat and Livestock Australia (July 2020), *What you need to know when retaining older aged breeding ewes Dr John Webb Ware.* https://www.youtube.com/watch?v=44Xt9Jmo8xM

Removing 'unfit' ewes from the flock is the next step towards increasing reproductive rates across all sheep enterprises. Increased conception rates, followed by increased lamb survival rates improve the profitability of individual sheep enterprises and whole-of-industry animal welfare outcomes.

This fit-to-join suite of resources offers a range of simple, yet effective, decision-support tools to help improve the reproductive outcomes of sheep enterprises across Australia. The tools provide a step-by by-step guide to identifying ewes that are draining valuable resources and pose an animal welfare issue in otherwise productive operations. This tool is designed to be used in conjunction with producer workshops.

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Fit to Join

Improving ewe and lamb survival through pre-joining assessment

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