CHAPTER 2
Setting targets for sheep

This chapter outlines the methods used to assess stock, targets for production, implications of lower than ideal targets and monitoring to ensure your targets are being met.

Key messages

- **Assessing body reserves of sheep as Condition Scores (CS) can be used to set and monitor production targets, especially for pregnant ewes.**
- **Monitoring live weight is more sensitive for monitoring weight change, especially for young and dry sheep.**
- **Monitor regularly to ensure targets are being met.**
- **Set targets for the average AND minimum production of any mob, remembering that the lowest condition sheep will be more than half a CS lower than the average.**
- **Individual sheep with a CS of less than 2 are at higher risk of disease, health and welfare issues, and require regular monitoring and careful management. There are also consequences for production and mortality rates, particularly in reproducing animals.**

Condition score targets

Targets for sheep during droughts or long periods where pasture is limited:

- Dry sheep – CS of 2 or above.
- Ewes
  - Joining – ideal target is CS 3, sheep at lower CS will have lower conception rates.
  - Late pregnancy and lactation – ideal targets are CS 2.7 – 3.3 at lambing (2.7 for singles and 3.3 for twins) to support good birth weight, growth rate and survival of lambs.
  - Maintaining ewes at CS 3 rather than CS 2, from joining to lambing, will require higher rates of feeding and for feeding to start earlier. Ewes maintained at CS 2 will have lower lambing rates, lower wool production and higher mortality rates and production and survival of both single and twin lambs will be lower.
- Rams – CS 2 after joining but need to be above CS 3 for three months before and at joining.
- Young sheep/weaners:
  - Growth rate of 0.5–2 kg/month after weaning. Early weaned and light weaners (less than 20 kg at weaning) need to grow at the higher growth rates.
  - 45 per cent of their mature weight when feed dries off.

Setting targets for sheep production

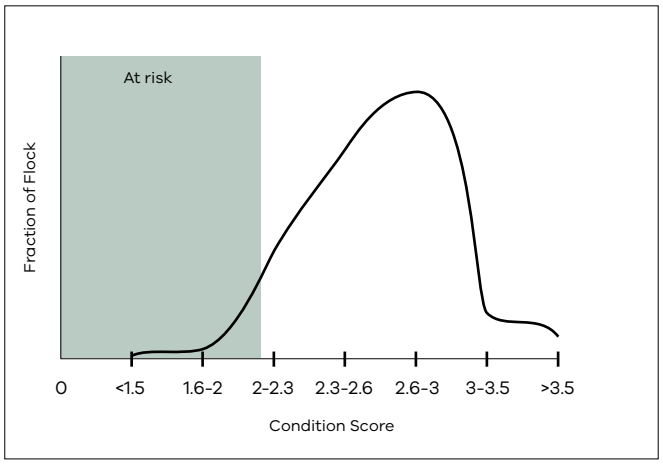
Setting production targets for maintaining sheep through drought will define how they perform during and after drought, as well as how much and what quality feed will be required, and when you will need to start supplementing.

Depending on the class of sheep and your enterprise objectives, these targets may be growth rate, live weight and/or body condition score. The targets for the feeding program may be, for example, to maintain ewes in a suitable condition for joining or to hold replacement weaners at their present weight and body condition for the next three months. These will have significant impact on the costs of feeding, cash flow and income from animal production and therefore need to be considered when formulating and budgeting in a Drought Action Plan (Chapter 1 – Preparing for drought).

The level of production that sheep are managed to through a drought will affect their performance the following season. For example, the condition that ewes are maintained at will affect their lambing results and the performance of their lambs. Different targets will impose a different feeding regime and cost. In addition, the targets set may affect the most economical choice of feed.

When setting production targets for a class of sheep, consider both the mob average and the minimum acceptable target for individual sheep in that mob. Maintaining sheep at minimum weight or condition targets and not accounting for the tail of the mob will increase the risk of disease and mortality. Typically, about 95 per cent

of sheep in a mob will be within 0.5 condition score (CS) of the average. For a mob with an average CS of 2.5 this means some sheep will be lower than CS 2 and some will be higher than CS 3. Adult sheep below CS 2 will be at a much higher risk of disease and reduced reproduction rate. Similarly, merino weaners that are fed as a mob to maintain at an average of 22 kg live weight will have a significant proportion of the mob well below 22 kg. Lighter weaners have a higher risk of mortality unless they are drafted off and fed separately to grow at reasonable rates. Similarly, drafting and splitting large mobs of ewes into similar groups (e.g. fat, average, thin) based on CS will enable better targeting of feed to meet requirements to individual mobs. Figures 2.1 and 2.2 illustrate a typical range and spread of condition or live weight in a mob of ewes and weaners at average CS 2.5 and 22 kg live weight, respectively.



Figures 2.1: Spread and range of condition scores in a mob of ewes with an average condition of 2.5.

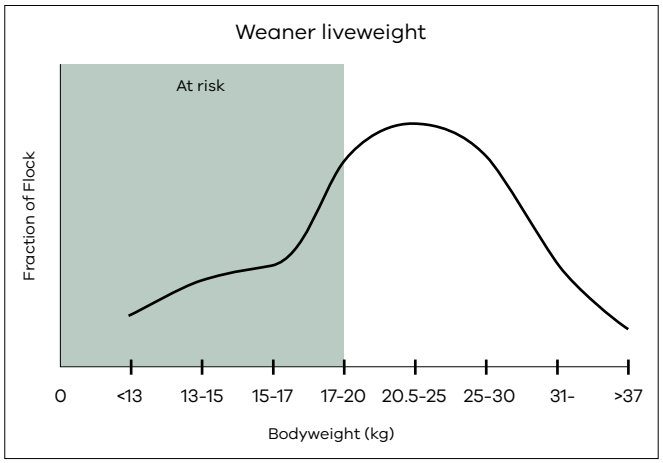


Figure 2.2: Spread and range of body weights in a mob of Merino weaners with an average weight of 22 kg.

The production targets you set will also determine when to start supplementary feeding. It is far more efficient to maintain stock at a weight or condition score than to feed the high-quality diets needed to put weight back on if stock have dropped below target weight.

Condition, fat or weight

Assessing the amount of fat and muscle that an animal has in reserve is useful for monitoring stock and assessing their need to gain or even lose weight. Body condition is most important for assessing reproductive targets for pregnant sheep, as ewe live weight will be affected by the developing lamb/s and reproductive targets for mature ewes are well correlated to body condition.

Given the wide range of sheep breeds and mature sizes, assessing body condition may be a more accurate indication of production if the mature live weight is unknown.

Fat and muscle cover in sheep is measured either at the short ribs (condition score) or the long ribs (fat score).

Fat scoring assesses the soft tissue (fat and muscle) cover over the GR site which is 110 mm down from the backbone on the second last long rib (Site A on Figure 2.3). This is the site used for measuring fat depth of the carcase as an indicator of total fat so is more useful for ensuring that stock meet fat specifications at sale. It can also be a useful measure for monitoring the status of the animal but is less sensitive than condition scoring at the lower range.

Condition scoring assesses the soft tissue over the short ribs and backbone (Site B on Figure 2.3). What to feel and where for each condition score is outlined in Table 2.2. Condition scoring is more sensitive for monitoring condition of sheep for management such as for reproduction targets.

Both systems have a scoring system ranging from 1 to 5 and these are outlined in the following section.

There is a strong correlation between condition score and fat score but the relationship is not linear. Fat score 2 covers a wide range in condition score from 2 to 3.5 (store to greater than forward store). When managing ewe flocks there is greater precision in using condition scores than fat scores.

Weighing is the most accurate way to measure even quite small changes or monitor changes in animals that are not pregnant. Live weight can be misleading for assessing ewes in late pregnancy as they will be putting on considerable weight associated with the developing lamb/s and may be losing some of their own fat and muscle reserves while doing this.

The standard reference weight (SRW) is the expected weight of a mature animal with a condition score in the middle of the range (CS3).

For example, an adult medium-frame Merino ewe may have a SRW of 50 kg at CS3 but a large framed ewe may be 60 kg at CS3. If a medium-frame ewe loses condition to CS2 she may weigh about 40 kg; if she gains condition to CS4 she may weigh about 60 kg, but her SRW is still 50 kg.

Young animals such as weaners can lose weight quickly, resulting in health and welfare risks. They have little fat reserves and generally need to gain some weight.

Assessing condition and fat reserves of sheep

Fat and condition scoring require some training and practice to be confident and consistent in making the assessment. With practice, it is possible to pick quite small differences in tissue cover and to do this quite quickly for a sample in a mob, which will provide a guide to the average condition and the range within the mob. If you don't have the confidence to pick differences of at least half a score, consider monitoring a sample of live weights as well. For example, if a condition score is equivalent to 9 kg live weight, a loss of half a condition score (4.5 kg), is a significant amount of weight to lose. Assessing condition by eye is not recommended and can be misleading as both wool length and pregnancy status can cause sheep to look in better condition than they are.

Fat score

Fat scores are an assessment of tissue depth (muscle and fat, but predominately fat) over the GR site which is 110 mm from the centre of the backbone on the second last long rib (Site A on Figure 2.3). Fat scores range from 1 to 5 and each score is equivalent to 5 mm of tissue. A sheep with a Fat Score 5 will have more than 21 mm of tissue at this site compared to an animal of Fat Score 1, which will have 0–5 mm tissue. Table 2.1 outlines the tissue depth and what it feels like for each fat score.

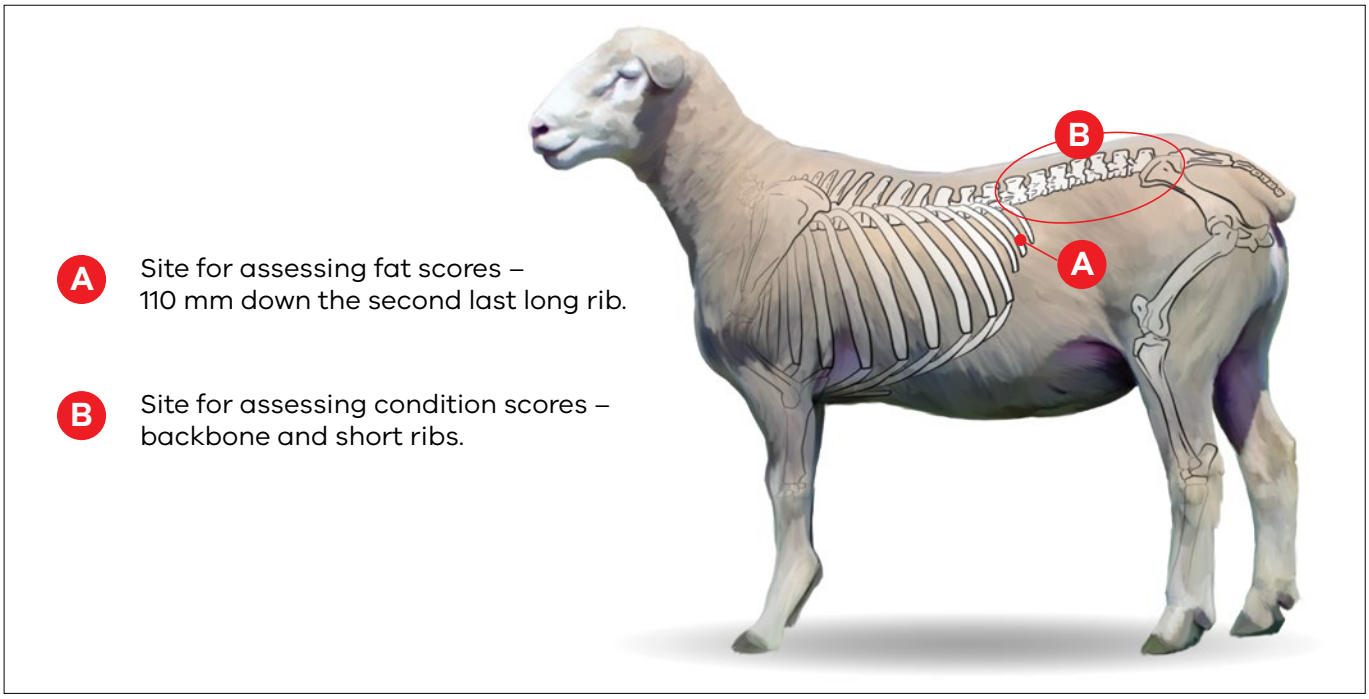


Figure 2.3: Picture of the sites on the sheep for assessing fat reserves.

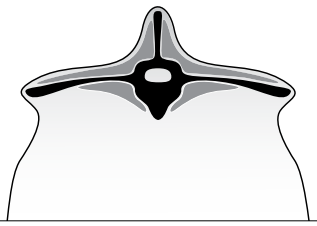
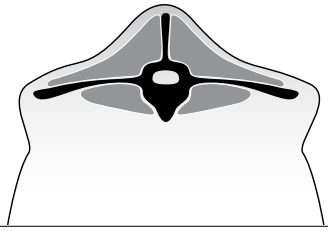
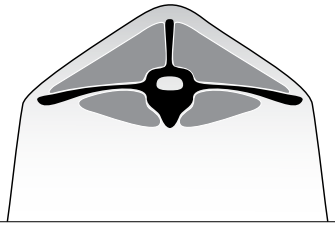
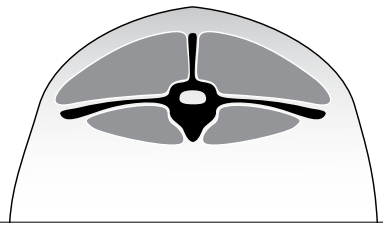
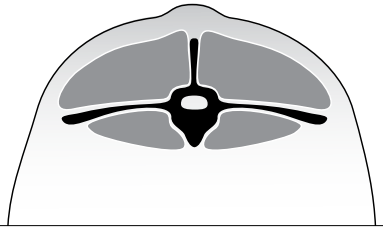
Table 2.1: Fat scores and what to feel.

Fat Score	1	2	3	4	5
GR tissue depth (mm)	0–5	6–10	11–15	16–20	20 and above
Feels like	Individual ribs felt easily and cannot feel any tissue over the ribs.	Individual ribs easily felt but can feel some tissue cover.	Individual ribs can be felt with more pressure as more tissue cover (i.e. >10 mm).	Can only feel ribs with pressure. There is fluid movement of tissue.	No ribs can be felt.

Condition score

Condition scores, ranging from 1 to 5, assess the soft tissue over the short ribs and backbone (Site B on Figure 2.3). What to feel and where for each condition score is outlined in Table 2.2.

Table 2.2: Condition scores and what to feel. Source – lifetimewool

1		**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 1 cm apart, it feels like the fingernail under the skin with practically no covering.
2		**Backbone** The bones form a narrow ridge but the points are rounded with muscle. It is easy to press between each bone. There is a reasonable eye muscle. Store condition – ideal for wethers and lean meat.	**Short Ribs** The ends of the short ribs are rounded. Using fingers spread 0.5 cm apart, the ends feel rounded like finger-ends. They are covered with flesh but it is easy to press under and between them.
3		**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 ideal for most lamb markets now. No excess fat).	**Short Ribs** The ends of the short ribs are rounded and filled in with muscle. Using 4 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.
4		**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.
5		**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.

Other useful tools and resources for condition scoring are available from lifetimewool.com.au/conditionscore.html

This site includes templates and a video for condition scoring. There is also the free lifetime ewe management app that is available for download (LTEM).

Targets for sheep

Dry adult sheep (>2 years old)

Dry/unjoined ewes, rams (post-joining) and wethers can be maintained at CS 2 during drought feeding situations. If the average condition of a mob is CS 2, it is likely that 50 per cent of the mob are less than score 2 and the lightest animals will be less than CS 1.5. These animals will have a higher risk of health and welfare issues. Mobs maintained at CS 2.0 will also be at higher risk when nutritional demands increase or when circumstances put more stress on the animal, such as high worm burdens or extreme weather events (e.g. after animals are shorn or the autumn break results in cold, wet and windy conditions). To maintain the entire mob at CS 2 and not below will require drifting or drafting off tail end sheep to feed separately.

Reproducing ewes

Feeding levels and targets for pregnant ewes during drought need to be considered carefully as both ewe and lamb production are affected by ewe nutrition during pregnancy.

Conception rates are very responsive to ewe condition at joining. Both time of lambing, breed and genotype will affect the responses to both nutrition and absolute condition score at joining. Responses are typically an increase in the number of lambs conceived of 1.5–2.5 per cent for every extra kilogram of weight that ewes were joined at. Where response rates were assessed across a number of farms in the lifetimewool project, Merino ewes joined at one condition score heavier, scanned on average 20 extra lambs per 100 ewes joined, but there was wide variation across the farms involved (0 to 40 extra lambs per 100 ewes joined). The response varies with breed and within breeds (autumn lambing crossbred ewes and small Merinos are likely to have a lower conception rate than spring lambing crossbred ewes).

Figure 2.4 illustrates the impact of condition score on the pregnancy status of ewes at scanning. As ewes increase in condition above CS 2, the number of dry ewes reduces and the number of ewes with twins increases. There is little change in the number of ewes with singles, until condition score increases above CS 3 when the number of ewes with singles reduces in favour of twins.

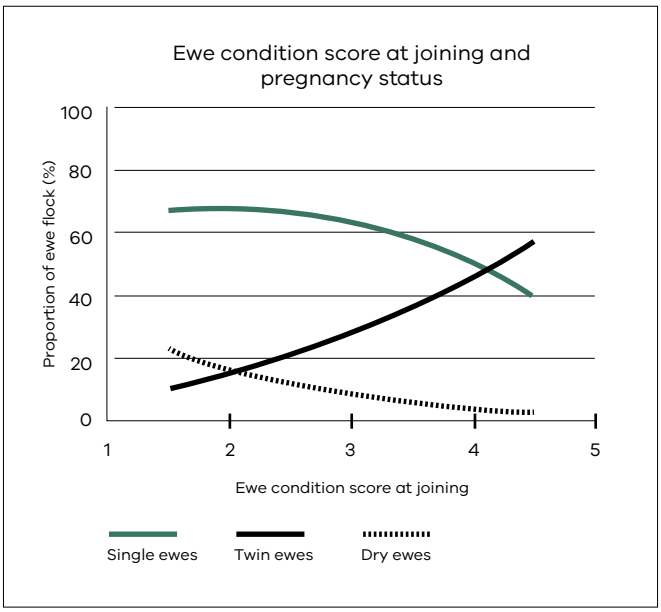


Figure 2.4: The influence of condition score at joining on the pregnancy status of ewes. Source – lifetimewool

Setting a target for joining will set the scene for the number of lambs conceived, but also for their future lambing success. In drought, there will be limited options for increasing condition to improve lambing success through higher birth weights, survival rates and lamb growth rates. For wool-focused enterprises, cost savings may be made by not joining or by delaying joining, but this needs to be considered against the longer-term effect on income and the proportion of income dependent on surplus livestock sales. If you decide not to join ewes in spring or summer because of drought, joining may still be possible in early autumn if there is an early break.

While nutrition and condition of ewes have the most impact on conception and lambing percentages, there may be other contributing factors, such as ram condition and health, genetics and disease.

For pregnant and lactating ewes, the mob's average condition score needs to be at least 2.5 to reduce the number of ewes at or below CS 2.0, which have higher risk of mortality. Optimal condition targets for pregnant ewes range from CS 2.7 (ewes with singles) to 3.3 (ewes with twins) to achieve best results for lambing and subsequent lamb performance. Scanning ewes to identify dry, single and multiple lambs is an extremely valuable tool to identify and manage ewes to their nutritional needs and production targets.

Figures 2.5 and 2.6 have been adapted from the lifetimewool program to illustrate the optimal condition scores for spring lambing Merino ewes in a high rainfall zone (Figure 2.5) and May lambing in the low rainfall zone (Figure 2.6). These condition scores are for a flock that includes both singles

and twins. Where scanning has been undertaken and twins are separately managed from singles a higher target at lambing (+0.3 CS) should be reached for twins. Singles should lamb at their joining condition score.

At the autumn break, when spring lambing ewes are in early to mid-pregnancy, the ideal average CS is 2.7. This means they can lose 0.3 CS during early pregnancy provided this condition/liveweight is regained by lambing. Individual ewes below CS 2 are at a higher risk of death particularly in late pregnancy.

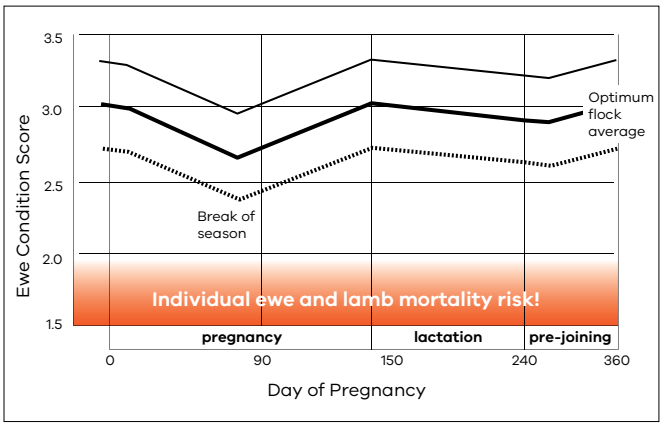


Figure 2.5: The optimum condition score target over a year for Merino ewes lambing in spring in the high rainfall zone. The middle line represents the ideal average. The top and bottom dotted lines represent higher or lower targets that can be followed but the higher target costs more to feed and the lower target has increased risk of higher mortalities in both ewes and lambs. Source – lifetimewool.com.au/pdf/EwemanagementHRZeditionweb.pdf

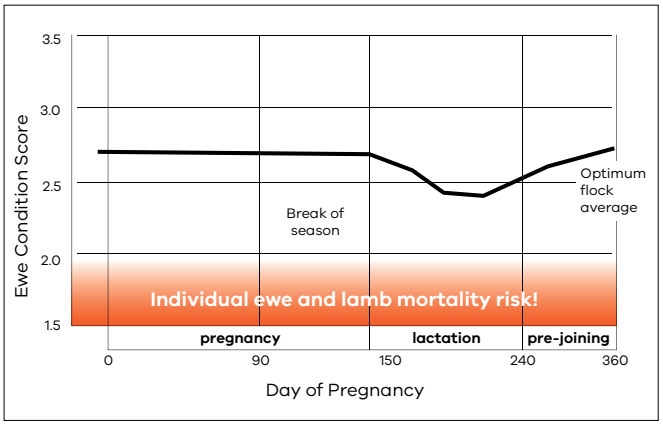


Figure 2.6: Ideal condition scores over a year for Merino ewes lambing in May in the low rainfall (cereal sheep) zone. Adapted from: www.lifetimewool.com.au/pdf/EwemanagementHRZeditionweb.pdf

Setting an appropriate and cost-effective condition score to maintain ewes when dry or in early pregnancy must take into account the consequences for later in pregnancy and at lambing. Under-nutrition before joining reduces the number of lambs conceived. Under-nutrition during pregnancy reduces birth weight and lamb survival. Severe under-nutrition of a pregnant or lactating ewe, can permanently decrease the lifetime wool production of her lamb (see Implications of different targets in this chapter). Maintaining ewes below the ideal condition score of 2.7 will affect subsequent lambing performance. This needs to be balanced against the extra cost and cash flow requirements to maintain sheep at heavier weights. For example, for every extra kilogram that a ewe is maintained at, about 70 grams extra of barley or wheat is needed per week to maintain that weight and feeding will need to start earlier, before they drop below the target weight.

Maiden ewes and joining ewe lambs

Two-year-old maiden ewes need to be about 75 per cent of their mature weight at joining (Table 2.3). If maiden ewes are well below this target, consider not joining.

The reproductive performance of ewe lambs (joined at 7–9 months of age) is generally poor if they are mated at less than 35 kg live weight. Their reproductive rate improves as live weight increases above 40 kg. A ewe lamb that is heavier at breeding is more likely to wean a heavier lamb herself and she will be heavier at weaning and so in a good position for the next joining. In poor seasons, joining ewe lambs is unlikely to be a cost-effective option. However, if a drought year is followed by a good season, joining ewe lambs that are up to target weights and condition may provide opportunities for rebuilding stock numbers.

If the risk is high that drought conditions will extend well into pregnancy, consider not joining maiden ewe hoggets and ewe lambs. The cost of feeding can be high and the consequences for under-nutrition are greater for these two groups and their lambs.

Lambs (<3 months)

Early weaning can reduce feed costs and simplify management of both ewes and lambs. One of the main advantages is to wean lambs before ewes lose too much condition, enabling ewes to be maintained at a weight and condition that meets the target for getting back in lamb at joining.

For breeders who traditionally wean lambs at 12–14 weeks, there may not be any advantage in weaning earlier. However, when feed for ewes and lambs is scarce, lambs can be weaned at an absolute minimum age of 6 weeks and a minimum live weight of 9 kg (small Merinos). Crossbred lambs have been successfully weaned at 5 weeks

onto high-quality diets, but generally weaning at 8-9 weeks can lead to good growth rate, final weight, carcase weight and fat composition, if good nutrition is provided. Early-weaned lambs require high-quality rations, particularly meeting their higher protein requirements and good overall management, including internal parasites.

Weaners (3–12 months)

Weaning weight and consequent growth rate are the most critical targets that can reduce the risk of mortality in weaners. Weaners under 20 kg at weaning and those that lose weight post-weaning are at high risk of mortality during dry seasonal conditions. In a drought, weaners will be one of the first classes of animals to be affected, primarily because of the reduced availability of pasture of sufficient nutritive value to maintain growth.

For Merino weaners, there are two key management targets to ensure good weaner survival:

- weaning weight of at least 20 kg and 45 per cent of adult weight by pasture senescence (haying off)
- growth rate of 0.5–2 kg/month after weaning.

Research has shown that even if weaners achieve a good weaning weight, low growth rate after weaning significantly increases the risk of mortality. A growth rate of at least 0.5 kg per month is critical but a higher rate will bring added benefits. The recommended minimum targets for weaners are:

- 2 kg/month for weaners weighing <20 kg
- 1 kg/month for weaners weighing 20–30 kg.

The lightweight tail of the weaner flock (20 per cent) should be drafted off at weaning for preferential feeding and management.

Consider the mature live weight of your sheep when setting targets for larger Merinos, crossbred or maternal sheep breeds.

Table 2.3 shows target weights for young sheep from birth to first joining. In a 'normal' season, the growth target for weaners would be to exceed 50 per cent of their mature (4-year-old) weight by the autumn break. Lower growth rate targets during drought months could be considered as part of the target drought-feeding strategy, but losses in live weight of weaners should be avoided. Severe under-nutrition of ewe weaners in their first year can reduce lifetime reproduction by up to 20 per cent. Severe nutritional restrictions in the 6 months after weaning can lead to 25 per cent lower mature body weight. Weaners on a poor level of nutrition will also be more prone to parasites, diseases and other health and welfare risks.

Finishing lambs

If the season is such that lambs do not meet market specifications before feed limits production, finishing lambs with grain must be costed carefully. Consider selling all or poor-performing lambs as store lambs, as the cost to finish these lambs may outweigh any extra returns. For example, on average you might budget on 7 kg of grain to produce 1 kg of live weight (or half a kg of carcase weight) but there will be lambs that require much more than this and/or just do not grow well. Research into lamb feed efficiency by Agriculture Victoria consistently finds high-efficiency animals with feed conversion ratios (kg of feed consumed per kg of live weight gain) as good as 3:1, but there are lambs as poor as 20:1. Using an average feed conversion ratio of 7:1 for budgets and planning is a realistic average.

Table 2.3: Target weights for weaners. Source – Sheep nutrition in the Victorian environment

Mature weights	**Target weights (kg)**				
	Birth	Pasture drying off	Autumn break	Late winter	Joining
45 kg	4	20	22.5	27	34–36
50 kg	4.5	22.5	25	30	37–40
55 kg	5	25	27.5	33	41–44
60 kg	5	27	30	36	45–48
70 kg	5.5	31.5	35.5	42	52 –56
% Mature weight	8–9%	45%	50%	60%	75–80%

As part of the preparation in developing a budget and business case, clear targets need to be established for the finishing operation, such as what carcase weight will need to be achieved to deliver the proposed return. Combined with a knowledge of starting live weights, having a clear picture of a target slaughter weight, such as light domestic (18–20 kg HSCW), domestic trade (20–22 kg HSCW) or heavy export (>24 kg HSCW) will help determine if required growth rates are feasible, as well as how long lambs will need to be fed to reach the target weights.

For finishing lambs to make a reasonable margin, you need lambs with the frame, body size and genetics to capitalise on good nutrition. Lambs that have suffered a significant check or nutritional restriction due to drought are likely to always be lighter and may be best targeted towards a traditional domestic market specification (20 kg HSCW) rather than taking them through to higher export carcase weights (>24 kg HSCW). Beware of taking light weight older lambs through to a heavier carcase weight, as longer periods on feed is less likely to be profitable. There are a number of good sources of information and feed budgets available to work through options to finish or sell store lambs.

You can do your own calculations and test feedlot rations, costs and market specifications using a feedlot calculator that can be downloaded from the web: dpi.nsw.gov.au/animals-and-livestock/nutrition/feeding-practices/feedlot-calculator

Rams (>1 year old)

Rams should not be ignored; they need to be on the same level and type of rations as the ewes at least 3 months before joining. Sperm production takes about 8 weeks, so ram health and nutrition cannot be left to the last few weeks before joining. It may be feasible to maintain rams at CS 2 after joining but they will need to be at or above CS 3.5 for joining. If rams are not in ideal condition at joining, consider increasing the percentage of rams per ewe.

Implications of different targets

Calculating the cost and financial returns of managing sheep at different production targets is complex and will differ for every enterprise and farm. The most critical is the production target for ewes over the reproduction cycle.

When the sheep industry in Victoria was dominated by Merinos with a wool focus, targets in droughts were often set at the lower end of the range (CS 2–2.5) to reflect the lesser influence of livestock sale on returns and lower response of wool to nutrition. The consequences of ewes in lower condition tended to be greater after droughts broke with low lambing percentages, wool of lower staple strength and stock at higher risk of mortality and disease when conditions were cold and wet. If the focus of the sheep enterprise is dual purpose (meat and wool) or meat production, the implications on reproduction and lamb performance cannot be ignored. Research, such as the lifetimewool (LTEM) project referred to frequently in this book, highlights critical condition targets for optimal ewe and lamb performance and the consequences of not achieving these targets. The research was predominantly conducted on Merino ewes but there is supporting evidence that optimal condition score targets will be similar for crossbred or meat breeds.

The following calculations provide a guide on how to estimate the value of maintaining ewes at a higher or optimal (e.g. CS 3) condition compared to a lower or minimum condition (e.g. CS 2).

Costs

The main cost of maintaining ewes in higher condition score will be feeding higher rates of supplements, both in the daily amount and starting feeding earlier. As a guide, for every extra kilogram that a ewe is maintained, about 70 grams extra of barley or wheat is needed per week.

Example:

One condition score is equivalent to about 6–9 kg live weight. For this example, we will use 8 kg as the live weight difference between a ewe in CS 2 and a ewe in CS 3.

Ewes in CS 3 will require about 0.6 kg more barley per week than ewes maintained at CS 2.

Assuming that ewes are fully fed for 6 months, the extra maintenance requirement would be 14.4 kg grain/ewe (0.6 x 4 weeks x 6 months).

Feeding will need to start up to a month earlier to maintain them at the higher condition. The extra feed at the start will vary due to pasture availability, sheep type, etc, but a reasonable estimate would be 9 kg grain/ewe extra.

Therefore, the total additional amount of grain would be 23.4 kg/ewe (14.4 kg + 9 kg).

If grain is $300/tonne, the extra cost would be $7.00 a head or $700 per 100 ewes.

If the reproduction response is 20 per cent more lambs scanned per 100 ewes and assuming 80 per cent survival rate of scanned lambs (16 lambs per 100 ewes) then the cost per lamb could be $44 ($700 for 100 ewes/16 extra lambs)

If only 10 per cent more lambs were scanned for the extra condition score, at 80 per cent survival, this would indicate a cost of $88. Alternatively, a highly responsive flock of 50 per cent (40 extra lambs born) would reduce the cost per lamb to $17, assuming the same survival rate and other variables. This is an example only; you need to use your own estimates based on likely flock responses, feed costs, etc. You need to consider cash flow required and the extra costs if money is borrowed.

Table 2.4 provides an indication of the response in survival rates of singles and twins (for Merinos) when target condition score differs from CS 3 at some or all stages of the reproduction cycle. The first row of figures shows ewe production and progeny production when the ewe is maintained at condition score 3.0 throughout pregnancy. All other figures show the difference in production when condition score throughout pregnancy differs from 3.0. These figures relate to the genotype of a medium Merino (50 kg) ewe with 4 kg clean fleece weight and 20.5 micron wool.

As indicated in this table, survival rates of singles and twins are reduced quite severely if ewes are mated at CS 3 and then drop to CS 2 between joining and lambing compared to ewes maintained in CS 3 (19 per cent lower survival for singles and 39 per cent lower for twin born lambs). If ewes were maintained at CS 2.5 from day 90, instead of dropping to CS 2, the table indicates that survival is only reduced by 6 per cent for singles and 15 per cent for twin lambs, further illustrating the impacts on reproduction of having ewes at CS 2.

There will also be extra feeding and variable costs associated with more animals carried through as a result of the higher survival rates of ewes and lambs.

Returns

The extra returns from maintaining ewes in better condition are the extra lambs that are available for sale or as replacements beyond weaning, but also higher survival rates of the ewes. The simple calculation is the cost per lamb and the likely return for the lambs at sale. If the cost to get the extra lamb on the ground is $42, the returns from the lamb need to be more than that to recoup the feed costs plus other associated production and sale costs.

Table 2.4 also indicates that with Merinos there will be some additional benefits with wool production from the ewes and the lambs. The value of this will also be influenced by the micron premiums at the time (given that the ewes' wool will be broader and the progeny's wool finer for the ewes held at CS 3) and staple strength, which is often lower following the season break. The other impact not reflected here is the ongoing performance of progeny that are kept as replacement ewes. As illustrated in Figure 2.4, ewes joined at CS 3 will have more twins scanned and fewer dry ewes than ewes joined at CS 2 (so there will be more ewes lambing and more ewes with multiples). This will be balanced by ewes being in better condition at lambing to support higher birth weights, growth rates and weaning weights. Lambs that do not meet production targets pre- and post-weaning may struggle to reach joining weights at the usual time and may have lower longer-term reproduction rates.

Table 2.4: Production consequences (wool traits, reproduction and mortality) for Merino ewes and their lambs of maintaining ewes below CS 3 from joining to lambing. Source – lifetimewool

Condition score profile			**Ewe production**				**Progeny production**					
Joining	Day 90	Lambing	CFW (kg)	FD (µm)	Mortality	Reprod. rate (%)	CFW singles (kg)	CFW twins (kg)	FD singles (µm)	FD twins (µm)	Survival singles (%)	Survival twins (%)
3.0	**3.0**	**3.0**	**4.1**	**20.5**	**3.2**	**120**	**3.4**	**3.1**	**17.6**	**18.1**	**91**	**71**
Condition score profile			**Difference in ewe production compared to ewes maintained at CS 3.0**				**Difference in progeny production compared to ewes maintained at CS 3.0**					
Joining	Day 90	Lambing	CFW (kg)	FD (µm)	Mortality	Reprod. rate (%)	CFW singles (kg)	CFW twins (kg)	FD singles (µm)	FD twins (µm)	Survival singles (%)	Survival twins (%)
2.5	2.0	2.0	-0.6	-0.6	3.2	-11	-0.1	-0.1	0.2	0.2	-13	-28
		2.5	-0.3	-0.2	0.8	-11	-0.1	-0.1	0.0	0.0	-3	-6
	2.5	2.0	-0.6	-0.6	3.2	-11	-0.1	-0.1	0.2	0.2	-17	-35
		2.5	-0.3	-0.2	0.8	-11	-0.1	-0.1	0.0	0.0	-5	-12
		3.0	0.1	0.3	0.0	-11	0.0	0.0	-0.2	-0.2	3	7
3.0	2.5	2.0	-0.7	-0.6	3.2	0	-0.2	-0.2	0.3	0.3	-19	-39
		2.5	-0.4	-0.2	0.8	0	-0.1	-0.1	0.2	0.2	-6	-15
		3.0	-0.0	0.2	0.0	0	0.0	0.0	0.0	0.0	2	5
	3.0	2.5	-0.3	-0.2	0.8	0	-0.1	-0.1	0.2	0.2	-9	-21
		3.0	0	0	0	0	0	0	0	0	0	0
		3.5	0.3	0.7	-0.1	0	0.1	0.1	0.0	0.0	5	16
3.5	3.0	2.5	-0.4	-0.2	0.8	11	-0.1	-0.1	0.3	0.3	-11	-24
		3.0	-0.1	0.2	0.0	11	0.0	0.0	0.2	0.2	-1	-2
		3.5	0.2	0.6	-0.1	11	0.0	0.0	0.0	0.0	5	14
	3.5	3.0	-0.1	0.3	0.0	11	0.1	0.1	0.2	0.2	-3	-8
		3.5	0.3	0.7	-0.1	11	0.0	0.0	0.0	0.0	4	10
		4.0	0.6	0.8	0.1	11	0.1	0.1	-0.2	-0.2	7	23

Source: Values based on lifetimewool experimental data. CFW = clean fleece weight, FD = fibre diameter.

Using this table, if a ewe is joined at CS 2.5 and drops to CS 2 in late pregnancy and lambing, then compared to a ewe that is maintained at CS 3, clean fleece weight is reduced by 0.6 kg; fibre diameter by 0.6 micron; ewe mortality increases to 3.2 per cent; and reproduction rate will be 11 per cent lower. Fleece weight of the lambs (progeny) will also be slightly lower, fibre diameter will be higher, and survival rate of single lambs will be 13 per cent lower and 28 per cent lower for twin-born lambs.

The information in the table can be used as a guide to estimate the possible impacts of different feeding targets have on reproducing Merino ewes.

Table 2.5 provides an example of developing your own partial budget for estimating the potential benefits to your enterprise of feeding stock to higher production targets.

Table 2.5: Example of a partial budget for estimating the cost benefits of feeding to meet different targets.

Extra benefits for better fed ewes		**Extra costs of feeding sheep and/or benefits foregone by feeding sheep for higher targets (i.e. an extra cost as a result of better feeding)**	
Extra lambs sold	$	Extra feed	$
Extra wool sold (including from those saved from dying)	$	Feed and variable costs of ewes that would have been saved if ewes/ stock had died	$
Deaths prevented	$	Feed and variable costs of lambs that would have been saved if not born/survived	$
Total extra benefits	A (sum above)	Total extra costs	B (sum above)
Net benefit	A-B = C		
Percentage Return on Extra Capital	(C/B) x 100		

Weaner targets

Target weights for weaner sheep are outlined in Table 2.3. Not achieving these targets will reduce their chances of survival and their ability and readiness to reproduce at their first joining. In farm trials, it was found that for Merino weaners the target of 45 per cent of mature weight at pasture senescence (feed drying off) was a more reliable target than a set weight of 23 kg and achieved weaner survival rates of 95 per cent. Weaners fed to reach 40 kg by the time green feed was available had greater survival to hogget shearing and the mortality rate for not achieving this was much higher for ewe weaners compared to wethers.

Research in lambs has indicated that early restriction in nutrition (at and/or before weaning) will lead to fatter carcases than animals that have been well fed, at the same carcase weight. This also occurred in crossbred weaners that had restricted feed at and/or before weaning and were later well fed to catch up and assessed at the same carcase weight as lambs fed well all through (Hopkins et al, 2007; Butler-Hogg and Johnsson, 1986).

Research with cattle has shown in addition to potential impacts on weight gain, the impact of an animal's growth path prior to entry to a finishing system will affect carcase composition and retail yield at slaughter. When compared at the same age, pre-natal and pre-weaning growth and nutrition have been shown to have a significant impact on carcase composition at slaughter. Calves that were subjected to a nutritional restriction have a reduced carcase yield (compared to calves that have been well grown early in life) driven by a reduction in weight of retail beef (from lighter carcase weight) and an increase in fat trim (Greenwood and Café 2007).

As a general rule, the earlier a restriction to animal growth occurs, the less likely it is to be fully recovered. The impacts of an *in utero* restriction that results in lighter birth weights may be evident all the way through to slaughter weights, while a restriction to post-weaning growth may be recovered (depending on severity and duration of restriction) once animals are returned to suitable nutrition. This highlights the need to ensure weaners achieve the best possible weight gains prior to weaning as a way of setting them up for future finishing or production.

Cash flow

While simple sums can give an indication of the likely value of the production targets you might aim for, a more robust cash flow and budget will be required to ensure you have both the funds and cash flow to meet potential financial requirements in the longer term. Some of these decisions will have impacts on the cash flow and recovery of the farm finances beyond the year of the drought. For example, if replacement ewe numbers are severely reduced, then sales from surplus stock will be reduced until ewe numbers and weaning rates are back to normal.

Monitoring

Whatever targets you set, monitoring a sample of each mob is critical for assessing whether the supplement is enough or too much, and to check that weight and/or CS targets are being met. If stock are fed on pasture and not in containment, it is difficult to estimate what proportion of a ration they are getting from the pasture. Pasture will change over time depending on the season and regular assessments are required. Also, nutritional requirements can vary slightly between breeds and flocks so estimating a ration should always be viewed as a guide that needs to be checked. If stock drop below your target, it can be difficult and expensive to put weight back on as weight gain requires not only more energy but also a higher proportion of protein in the diet than maintenance feeding. Alternatively, if stock are doing better than required, it may be possible to decrease the ration and save some money.

To monitor a mob for weight or condition change, tag or identify 50 sheep and monitor them regularly. This will give a good indication of whether the mob as a whole is putting on or losing weight. If it is easier to randomly draft some sheep to monitor, 10 per cent of the mob or a maximum of 80 sheep/mob should give confidence of identifying weight changes of 2 kg or more. If using CS to manage weaners, it is important to measure a minimum of 100 randomly selected animals or 50 tagged weaners to assess the change in CS. Monitoring a proportion of the mob will provide guidance on the ration required but will not identify the sheep in the mob that are below minimum targets and need feeding separately. Drafting off animals below your targets and managing them separately to meet their needs will improve production results and make setting targets for individual mobs easier.

Further information

Further reading and resources

- Sheep Nutrition in the Victorian Environment (1987). Technical Report series No. 136. Edited by Foot, J.Z., Egan, J.K. and Love, K.J. ISBN 0 7306 0308 3
- Lifetime wool – condition scoring: lifetimewool.com.au/conditionscore.html
- Condition Scoring of sheep: agric.wa.gov.au/management-reproduction/condition-scoring-sheep
- Making More From Sheep Module 3 Market Focused Lamb and Sheepmeat Production: makingmorefromsheep.com.au/manual/module-3-market-focused-lamb-and-sheepmeat-production/
- Lot feeding lamb calculator: dpi.nsw.gov.au/animals-and-livestock/nutrition/feeding-practices/feedlot-calculator
- Managing Merino weaners: Sheep CRC Practical Wisdom: webarchive.nla.gov.au/awa/20190913044845/http://pandora.nla.gov.au/pan/59698/20191030-0039/www.sheepcrc.org.au/files/pages/fact-sheets/pw13-reproduction-series/Managing_Merino_Weaners_for_web.pdf

Scientific references

Behrendt, R, van Burgel, AJ, Bailey, A, Barber, P, Curnow, M, Gordon, DJ, Edwards, JEH, Oldham, CM, Thompson, AN (2011) On-farm paddock-scale comparisons across southern Australia confirm that increasing the nutrition of Merino ewes improves their production and the lifetime performance of their progeny. *Animal Production Science* **51**, 805–812.

Butler-Hogg, BW, Johnsson, ID (1986) Fat partitioning and tissue distribution in crossbred ewes following different growth paths. *Animal Science* **42**, 65–72.

Campbell, AJD, Vizard, AL, Larsen, JWA (2009) Risk factors for post-weaning mortality of Merino sheep in south-eastern Australia. *Australian Veterinary Journal* **87**, 305–312.

Edwards, JEH, Gould, RM, Copping, KJ (2008) Putting Merino weaner management recommendations to the test. *Australian Journal of Experimental Agriculture* **48**, 974–978.

Greenwood PL, Hunt AS, Hermanson JW and Bell AW (1998) Effects of birth weight and postnatal nutrition on neonatal sheep: 1. Body growth and composition, and some aspects of energetic efficiency. *Journal of Animal Science* **76**, 2354–2367.

Greenwood, P, Bell, A (2003) Prenatal nutritional influences on growth and development of ruminants. *Recent Advances in Animal Nutrition in Australia* **14**. pp.57–73.

Hegarty RS, Shands C, Marchant R, Hopkins DL, Ball AJ and Harden S (2006) Effects of available nutrition and sire breeding values for growth and muscling on the development of crossbred lambs. 1: Growth and carcase characteristics. *Australian Journal of Agricultural Research* **57**, 593–603.

Hopkins, DL, Stanley, DF, Martin, LC, Ponnampalam, EN, van de Ven, R (2007) Sire and growth path effects on sheep meat production 1. Growth and carcase characteristics. *Australian Journal of Experimental Agriculture* **47**, 1208–1218.

King, J, Fisher, J, Murphy, P (1990) Threshold condition scores of Merino ewes for improved autumn lambing performance in Western Australia. *Proceedings of the Australian Society of Animal Production* **18**, 272–275.

Morgan-Davies, C, Waterhouse, A, Pollock, M, Milner, J (2008) Body condition score as an indicator of ewe survival under extensive conditions. *Animal Welfare* **17**, 71–77.

Paganoni, B.L, Ferguson, M.B, Kearney, G.A, Thompson, A.N (2014) Increasing weight gain during pregnancy results in similar increases in lamb birthweights and weaning weights in Merino and non-Merino ewes regardless of sire type. *Animal Production Science* **54**, 727–735.

Thompson, A.N, Ferguson, M.B, Gordon, D.J, Kearney, G.A, Oldham, C.M, Paganoni, B.L. (2011) Improving the nutrition of Merino ewes during pregnancy increases the fleece weight and reduces the fibre diameter of their progeny's wool during their lifetime and these effects can be predicted from the ewe's live weight profile. *Animal Production Science* **51**, 794–804.

Thompson, A.N, Young, J.M (2002) Potential economic benefits from improving ewe nutrition to optimise lifetime wool production and quality in south-west Victoria. *Wool Technology and Sheep Breeding* **50**, 503–509.

Young, JM, Thompson, A.N, Curnow, M, Oldham, C.M (2011) Whole-farm profit and the optimum maternal live weight profile of Merino ewe flocks lambing in winter and spring are influenced by the effects of ewe nutrition on the progeny's survival and lifetime wool production. *Animal Production Science* **51**, 821–833.