Merino ewe nutrition drives wool profitability

Lifetime Wool, an eight-year, $6.4 million Australian Wool Innovation project, is investigating the impact of breeding ewe nutrition on ewe performance and lifetime progeny productivity and their effects on wool production profitability. This article is the first in a 12-part series outlining the project's findings and how producers put them into practice.

Wool producers adopting guidelines developed by the Lifetime Wool Project can boost ewe reproductive rates.

When coupled with careful management of nutrition during pregnancy, wool producers who adopt the project guidelines can increase their weaning percentage and produce lambs that are more profitable during their life.

The profitable production of wool and sheepmeat from pasture-based systems depends on high levels of pasture production being used efficiently by grazing sheep of high genetic merit.

Increasing stocking rates and lambing during late winter to spring are the most powerful management tools to increase pasture use and profitability.

There is a trade-off between stocking rate increases and ewe nutrition.

Achieving a balance between the two is critical to maximising profit.

Each wool producing business and each production year will have a different set of circumstances and subsequently different optimum stocking rates and nutrition levels.

Findings from the Lifetime Wool Project have shown that wool producers need to ensure minimum ewe nutrition targets are met to avoid compromising individual ewe performance or the lifetime performance of progeny.

The Lifetime Wool Project started during 2001 and the research team is continuing to carry out detailed research, economic modelling and on-farm validation studies to increase knowledge of the relationship between ewe nutrition and ewe and progeny performance.

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Lifetime Wool Project research shows ewes need to be in condition score 3, like these pictured in south-western Western Australia, in order to achieve high reproductive rates.

Project collaborators are working closely with more than 150 wool producers in Australia's major wool growing areas to develop practical guidelines to make more informed and timely decisions about daily ewe nutrition.

Nutrition and reproduction

A ewe's nutrition is critical to her reproductive performance. Having ewes in better condition at joining will boost their reproductive rates (see Figure 1).

Commonly, 90–95 per cent of Merino ewes in a flock become pregnant with 20–50% of ewes conceiving twins.

On average, across about 70 ewe flocks in the Lifetime Wool Project, an increase of one condition score (or fat score) at joining improved the reproductive rate by 22 lambs per 100 ewes joined.

But there are significant differences between individual flocks in how they respond to improved nutrition and condition score at joining.

An extra condition score at joining improved reproductive rate by less than 10 lambs per 100 ewes joined in some flocks to more than 40 lambs per 100 ewes joined in other flocks.

The cost-effectiveness of management options leading up to joining depends on the responsiveness of the bloodline to improved nutrition; the ability to capitalise on extra lambs by providing adequate ewe nutrition to maximise lamb survival; the type of production system; market value of surplus stock and the cost of supplementary feed.

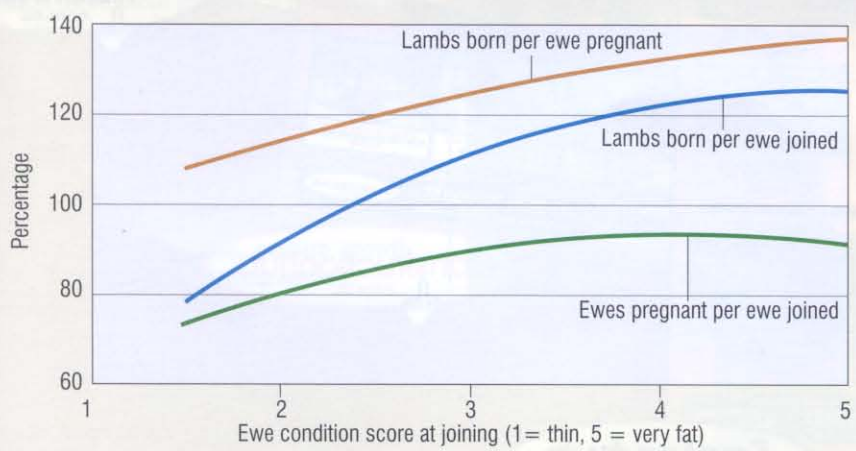
In addition, there are hidden benefits to having ewes in a better condition at joining that are often ignored.

These ewes will have better immunity to worms and require less feed to maintain

At a glance

- Profitable wool production depends on high levels of pasture production being used efficiently by sheep of high genetic merit.
- The key is to know how nutrition affects the performance of ewes and their progeny.
- The effects of ewe nutrition on weaning percentages are well known but poor nutrition during pregnancy also permanently reduces progeny's wool production potential.
- The effects on lifetime progeny fleece value are large and need to be considered in formulating cost-effective ewe management systems.

FIGURE 1 Relationship between ewe condition score at joining and reproductive traits



Source: Lifetime Wool Project.

them than it would to fatten them during pregnancy so they are in adequate condition for lambing and lactating.

Wool producers need to carry out calculations for their circumstances and set liveweight or condition targets for joining to optimise the number of lambs conceived versus the costs.

Lifetime Wool Project research suggests producers need to aim to have ewes in condition score (fat score) 3 at joining to avoid low reproductive rates.

To achieve target condition scores at joining, planning and monitoring are necessary so a maintenance ration can be fed when the ewes have started to lose weight and are approaching the target.

If the ewes slip below the target condition score, it never will be cost-effective to feed supplements to regain condition before joining. It is inefficient to allow ewes to lose weight and then try to increase their condition just before joining.

One kilogram of liveweight loss provides the ewes with about 20 megajoules of energy (about the same as two kilograms of barley provides) but to put back on that kilogram the ewe requires about 70MJ of energy (about 7kg of barley) above maintenance.

Ewe nutrition affects lamb survival

Achieving adequate conception rates is only part of the story.

Nutrition between conception and lambing (and shelter from weather at lambing) will determine how many of the lambs conceived will survive to weaning and beyond.

Lamb birthweight and ewe nutrition at lambing are key determinants of mortality within the first 48 hours.

Of the lambs that die between lambing and weaning, 70% of losses occur in the first 48 hours.

Producers tend to focus on the last 4–6 weeks before lambing as being critical for maximising lamb birthweights and lamb survival.

But research from he Lifetime Wool Project supports previous results that show ewe nutrition throughout pregnancy is crucial for lamb development and lamb survival.

The better the condition ewes lamb in and the better the pasture they are on at lambing, the lower the rate of lamb mortality.

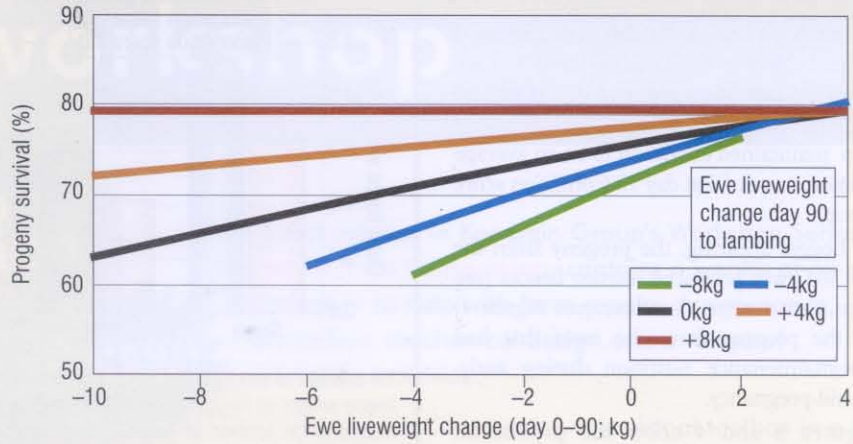
It is typical for ewes to lose weight at some point during pregnancy.

The timing of this loss and its severity depends on lambing time, pasture growth and the supplementary feeding regime.

In a spring lambing situation, as winter approaches and pasture growth rates slow, the level of nutrition supplied by pasture tends to fall below that required by pregnant ewes.

These ewes lose weight until pasture growth and available pasture increases or supplementary feed is provided.

FIGURE 2 Effect of ewe liveweight change on progeny survival



Source: Lifetime Wool Project.

Ewes that have lost a significant amount of weight in early- to mid-pregnancy and have not regained weight before lambing will have compromised lamb survival rates and will produce lower weaning percentages.

Figure 2 shows a range of scenarios of liveweight gain or loss in early pregnancy and then in late pregnancy and presents the range of expected survival rates of progeny.

For example, looking at the far left-hand side of the figure, for a mob of ewes that has on average lost 8kg (about one condition score) in the first 90 days of pregnancy and then maintained weight (0kg line) during late pregnancy, lamb survival will be about 65%.

If those ewes had gained that weight back in late pregnancy (+8kg line), lamb survival is expected to be close to 80%.

Producers who fail to monitor ewe condition will be unaware of these options.

Wool production

The nutrition of pregnant Merino ewes has permanent effects on developing lambs.

Until now, ewe management advice has not considered the effects of ewe nutrition on lifetime fleece value of their progeny. Follicles in the skin produce the wool fibres that make up the fleece of Merino sheep.

In the developing lamb, primary follicles develop between day 60 and day 90 of pregnancy and secondary follicle initiation starts from about day 90 of pregnancy and continues until the lamb is born.

All follicles that develop will have been initiated by the time the lamb is born but some follicles will complete their development in the first month of the lamb's life.

As follicle density increases, fleece weight increases and fibre diameter decreases.

Previous research has shown the potential density of follicles is genetically determined but the actual number of follicles that are initiated and mature is determined by the nutrition of the pregnant ewe and its effects on nutrient supply to the developing lamb.

During pregnancy, if there are less nutrients available to the developing lamb at the time of secondary follicle development, secondary follicle development will be impaired, decreasing overall follicle density. This, in turn, will reduce progeny fleece weight and increase wool fibre diameter.

Follicle density is permanent, so the effects on potential wool production remain throughout the life of the progeny.

In addition, a decrease in nutrients available to the lamb will cause a permanent reduction in mature size.

Early to mid-pregnancy effects

Lifetime Wool Project research separated the effects of ewe nutrition on progeny wool production into two phases: joining to day 90 of pregnancy (early- to mid-pregnancy); and day 90 of pregnancy to lambing late-pregnancy). Both these parts of pregnancy have an effect on the lifetime performance of the progeny.

The project has shown differences in progeny wool production can be related

Monitor ewes to manage them better

Source: Victorian Department of Primary Industries.

directly to early- to mid-pregnancy ewe nutrition effects.

Ewes were joined in an average condition score of 3 and then divided and managed differently: one group lost condition to have an average condition score of 2.3 at day 90 (condition score 2.3 group) and the other group maintained condition to be an average condition score of 3 at day 90 (condition score 3 group).

At hogget shearing, the progeny from the better fed ewes produced heavier fleeces (see Figure 3) that were also finer (see Figure 4) than the progeny from the ewes that had below-maintenance nutrition during early- and mid-pregnancy.

Figures 3 and 4 show the production differences between single- and twin-born progeny.

The differences between twins and singles, which have been known for some time, are an example of how follicle development is impacted by the level of maternal nutrients being received by the developing lamb.

In a twin lamb situation, the nutrients available for the development of each lamb are reduced, resulting in lower birth weights, which is observed regularly.

The nutrient reduction also results in reduced follicle development, leading to decreased follicle density.

Twin lambs cut less but broader wool than their single counterparts.

Late pregnancy effects on progeny

Ewe nutrition during late pregnancy also has an effect on follicle development in the developing lamb and therefore dean fleece weight and fibre diameter of the progeny.

The amount of green pasture provided to pregnant ewes was used to control ewe nutrition in Lifetime Wool experiments.

FIGURE 3 Nutrition and fleece weight*

*The effect of pregnant ewe nutrition on clean fleece weight at hogget shearing of either sub maintenance (condition score 2.3) or above maintenance (condition score 3) during the first 90 days of pregnancy in single- and twin-born progeny.

Source: Lifetime Wool Project.

FIGURE 4 Nutrition and fibre diameter*

*The effect of pregnant ewe nutrition on progeny mean fibre diameter at hogget shearing of either sub-maintenance (condition score 2.3) or above maintenance (condition score 3) during the first 90 days of pregnancy in single- and twin-born progeny.

Source: Lifetime Wool Project.

As the amount of green pasture available to the ewe in late pregnancy is increased (increasing ewe nutrition), so too does the density of secondary follicles in the developing lamb up to a point above which there is no further benefit.

Improved ewe nutrition of ewes in late pregnancy increases clean fleece weight (see Figure 5) and reduces mean fibre diameter (see Figure 6) at the hogget shearing of the progeny.

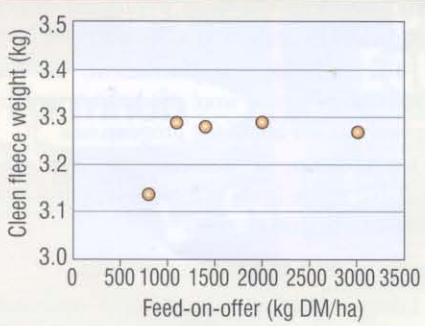
Although these production differences seem small, when they are added over several shearings, the effects of ewe nutrition on the lifetime fleece value of progeny become more apparent.

In addition, the differences in progeny performance shown at the hogget shearing are evident at the first adult shearing.

More information on ewe management options and decision support tools developed by the Lifetime Wool Project will be outlined in future *Farming Ahead* articles.

For more information on Lifetime Wool, contact Andrew Thompson, Department of Primary Industries, Victoria, on email andrew.thompson@dpi.vie.gov.au or phone (03) 5573 0900. FA

FIGURE 5 Clean fleece weight*



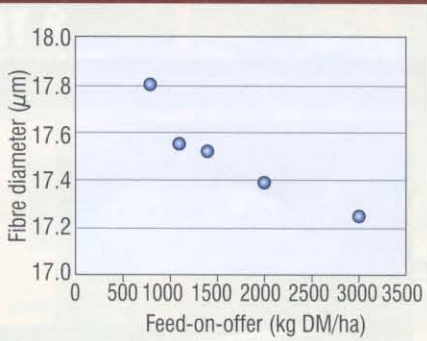
* Of progeny hoggets in response to increasing pasture available to pregnant ewes in late pregnancy and lactation.

Note: Food-on-offer (FOO) is all above-ground biomass.

Herbage matter= FOO – 300kg DM/ha.

Source: Lifetime Wool Project.

FIGURE 6 Mean fibre diameter*



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Note: Food-on-offer (FOO) is all above-ground biomass.

Herbage matter = FOO – 300kg/DM/ha.

Source: Lifetime Wool Project.

Maximising profitability

Lifetime Wool Project research and on-farm evaluations have shown:

- Wool producers can wean 10–40 extra lambs per 100 ewes joined by achieving the correct ewe condition at lambing.
- Significant variations exist in the responsiveness of different Merino ewe flocks.
- Monitoring breeding ewes allows better-informed management decisions.
- Setting and meeting condition or liveweight targets at joining requires early planning. Lifetime Wool suggests a joining target of condition score 3.
- Ewe nutrition throughout pregnancy will affect lamb birthweight and survival. Aim for condition score 3 at lambing.
- Reduced nutrition of pregnant ewes below a threshold results in a permanent decrease in fleece weight (up to 0.2kg) and an increase in fibre diameter (up to 0.5 micron) of the progeny.
- Both early- and late-pregnancy nutrition affect lifetime performance of progeny.