

The economics of managing breeding ewes

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The Lifetime Wool project has quantified the relationships between ewe fat score during pregnancy and production of both the ewe (wool production and quality, reproduction and mortality) and her progeny (wool production and quality and survival). (See Primefact 807 *Why fat score breeding ewes?*) A key component of Lifetime Wool was economic modelling of breeding ewe management to quantify the impact of managing ewes to fat score targets during pregnancy on whole farm profitability.

Altering the fat score of breeding ewes impacts on whole farm profitability through a combination of four mechanisms:

- impacts on the future production of the surviving progeny,
- variation in the survival rate of the lambs born,
- varying production achieved from the ewes including CFW, FD and number of lambs conceived, and
- varying energy demands of ewes which results in changes in stocking rate and supplementary (grain) feeding.

Critical stages in the breeding cycle

The critical stages of the Merino reproductive cycle are:

- Weaning – between weaning and joining is the key period for ewes to recover any lost condition in preparation for their next joining.
- Joining – fat score at joining sets the lambing potential of the flock for both adult and maiden ewes.

- Mid-pregnancy (approximately day 90 from the start of joining) – at this time the nutritional requirements of single and twin bearing ewes begin to differ. Fat scoring at this time will allow you to determine the condition of your ewes going into the last third of pregnancy. You can then plan ahead in terms of the required herbage mass and paddock selection for the next period.

In addition, fat scoring at lambing can help you to decide which lambing paddocks to allocate to which ewes.

MIDAS and the 'model' farm

MIDAS is an optimising model that describes the biological relationships occurring on a farm and uses this information to estimate the profitability of a particular enterprise or management strategy. The MIDAS model represents the whole flock and includes feed budgeting to optimise animal and pasture management across the whole farm. It calculates the optimum stocking rate and the optimum rate of grain feeding to maximise profitability while achieving the targets specified for the ewes. The model accounts for changes in flock structure and ewe energy requirements from increased lambing percentage and varying numbers of singles and twins.

For the southern NSW sheep and cereal production zone, the modelling was based on a 'typical' farm in the Wagga Wagga region. The growing season is from May to October utilising phalaris, lucerne and annual based pastures and about 30% of the property used for cropping. A self-replacing Merino enterprise based on about 3,600 ewes weighing 50 kg in fat score 3, cutting 3.4 kg clean fleece weight at 20 micron, lambing in July/August with an 88% weaning rate (Table 1) grazed the pastures.

Impacts of ewe nutrition are additive

One of the key findings of Lifetime Wool that impacts on the economic modelling is the fact that the effects of ewe fat score in early and late



Table 1: Production characteristics of the model farm for the standard fat score 3 profile

Profit (\$/ha)	135
Number of ewes	3,650
Stocking rate (DSE/WG ha) ^A	12.6
Supplementary feeding (kg/DSE) ^B	35
Total supplement (t)	273
Flock structure	
% ewes	66
Sale age of CFA ewes	5.5
Sale age of surplus young ewes	hoggets
Sale age of wethers (yrs)	hoggets
Lambing (%)	87
Crop area (%)	30
Pasture growth (t/ha)	6.1
Pasture utilisation (%)	63
Wool income (\$/ha)	336
Sale sheep income (\$/ha)	140

^A Stocking rate calculated using 1.5 DSE/ewe and 1 DSE/hd for hoggets. WG = winter grazed.

^B The standard grain prices were \$200/t for oats and \$250/t lupins fed out.

pregnancy are additive. This means that the impacts of ewe nutrition in early to mid pregnancy can be added to the impacts of nutrition in late pregnancy.

Losing fat score during early to mid pregnancy and then regaining that lost condition by lambing gives the same net result as maintaining the ewes' fat score over the whole of pregnancy.

Comparing fat score profiles – balancing energy and production

A standard profile of joining in fat score 3 and maintaining this condition through to lambing was used as the basis for comparison with other fat score profiles.

The economic analysis was based on 15 different fat score profiles (Figure 1) which varied in:

- fat score at joining
 - 3 alternatives (2.6, 3.0 and 3.4),
- amount of condition lost to the minimum
 - 3 alternatives (no loss, lose 0.3 FS and lose 0.6 FS),
- amount of condition regained to lambing
 - 2 alternatives (no gain and gain 0.3 FS).

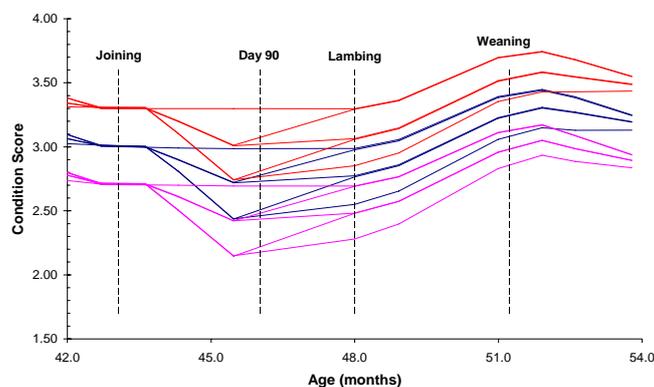


Figure 1: The 15 fat score profiles

Each of the profiles has differing energy demands and different production outcomes of the ewes and their progeny. Starting and finishing at a lower fat score requires less energy for the entire year while losing condition after joining reduces energy requirements during that period but increases it later depending on when it is regained. It is important to remember that losing and then regaining fat score requires more energy than maintaining condition as gaining condition requires more energy than losing condition generates.

Defining the economic optimum fat score profile is all about trade-offs, balancing the energy required to maintain or gain fat score versus the energy required to drive the various aspects of production, be it reproduction, ewe wool production, progeny wool production or progeny survival.

Before and after Lifetime Wool

Before Lifetime Wool defined the effects of ewe fat score on progeny wool production and survival, it was generally believed that running ewes thinner and losing more weight over autumn and during pregnancy meant more money through savings in feed. The typical fat score profile for this scenario would be to join in about FS 2.6, lose 0.6 FS and regain 0.3 prior to lambing and the remainder after lambing

The farm profit relationship for this fat score profile is shown by the dashed line in Figure 2, which shows that profit is maximised at a stocking rate of about 12.6 DSE/ha. This relationship ignores what we now know about the impact of ewe nutrition on progeny fleece value and survival.

However we now know that the production penalties for not having ewes in good condition, particularly at lambing, can be substantial. If these impacts are taken into account farm profitability at the same stocking rate will be greater, about \$1,515 additional profit per farm (2% of total profit or \$0.40 per ewe) shown by the solid line in Figure 2.

Comparison of the two lines in Figure 2 puts the magnitude of the benefits from Lifetime Wool into

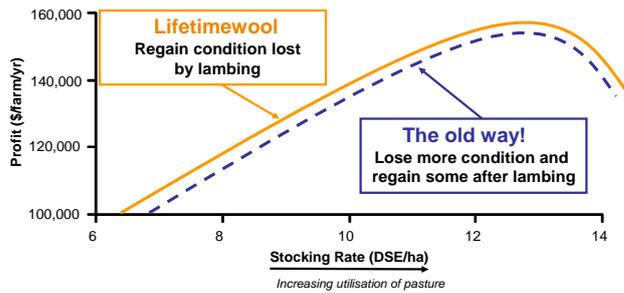


Figure 2: Farm profit – before and after Lifetime Wool.

context. If a farm has productive pastures with high utilisation rates there is little scope to increase profit by further increasing stocking rate but concentrating on ewe condition targets is an avenue for them to increase profit.

However, for the farm with less productive pastures and lower utilisation rates the benefits from monitoring ewes to achieve the condition targets is less than the benefit achieved from running an extra 1 DSE/ha. In this situation there is more to be gained by changing stocking rate than implementing Lifetime wool guidelines.

The most profitable fat score profile for Merino ewes

The economic optimum fat score profile is to aim for a fat score of about 2.6 at joining, followed by a managed moderate loss of condition (0.3 FS) to reach a minimum of 2.3 at about day 90 from the start of joining and then using green pasture to regain the lost condition prior to lambing. This is the solid line in Figure 3, with a likely profit of \$163/ha and a value of production of \$77.70/ewe.

This is where the trade-offs between biology and economics comes into play. The 'biological' optimum profile is to join in fat score 3, allow a slow loss of about 0.3 FS to day 90 and regain all of that lost condition before lambing (the dashed line in Figure 3), but this profile is \$9/ha less profitable than the economic optimum despite a higher value of production (\$84.50/ewe) due to an increased amount of supplement (+3.4 kg/DSE) to meet the target.

When ewe nutrition targets change, the optimum stocking rate and the optimum level of grain feeding both change **but** the change in grain feeding is five times as important as the change in stocking rate.

Costs of missing targets

If fat score targets are not met and too much or too little condition is gained or lost at different times then profit will be reduced. The following three scenarios provide some insight into the importance

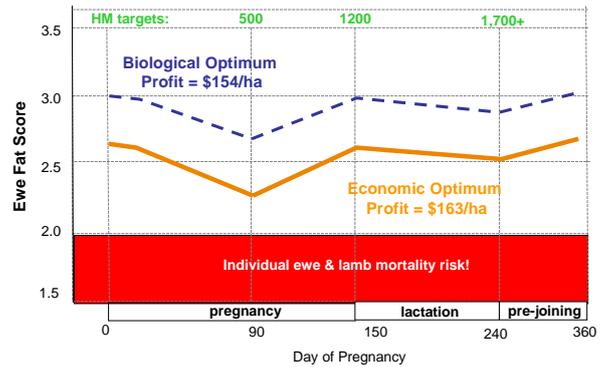


Figure 3: The biological and economic optimum profiles

of achieving the fat score targets – remembering that regaining lost condition leading up to lambing is of equal importance to losing condition between joining and day 90.

If it will be difficult to gain condition in late pregnancy because of a shortage of feed, the most profitable solution is to transfer more feed from early to late pregnancy. Losing extra condition in early pregnancy and regaining some in late pregnancy is better than losing less and gaining less.

For each of the scenarios, the value of production is the amount that could be spent to increase ewe fat score (or reduce loss of condition) at the different times. The profit includes the cost of providing the feed to meet the fat score targets in an average year. If season is not average the change in the value of production and an estimate of the cost of feeding could be used to decide if it will be profitable to alter the feeding of the ewes.

Ewes are in fat score 3

Effectively this is biological optimum profile, where the ewes are in a higher fat score for the whole reproductive cycle (the dashed line in Figure 3). Their value of production is \$6.80 higher than the economic optimum profile but this requires \$10.10/head in extra feed and results in a reduction in profit of -\$2.30/ewe or -\$9.00/ha.

If this higher fat score is able to be achieved on pasture alone, a profit is likely due to the higher level of production.

Maintain ewes at fat score 2.6 during pregnancy

Maintaining the ewes in the same fat score (i.e. 2.6) from joining to lambing (Figure 4) has a value of production of \$75.80/ewe which is \$1.90 *less* than the economic optimum. As an additional \$1.80/head feed is required to maintain fat score during pregnancy, profit is reduced by -\$3.70/head or -\$16.00/ha.

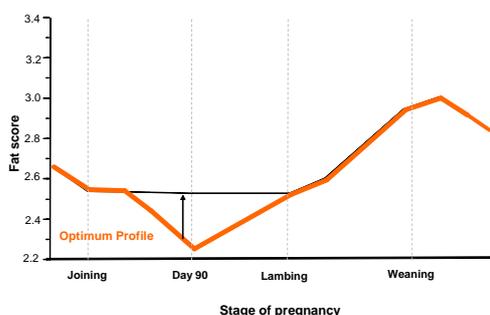


Figure 4: Maintaining the same condition from joining to lambing.

Ewes are too thin

Failing to regain the condition lost prior to lambing (Figure 5) has the lowest value of production of the three scenarios, \$72.70/ewe (i.e. \$5.00/ewe less than the economic optimum). Despite a saving of \$1.80/ewe in feed costs, the lower production of these ewes lowers profit per ewe by -\$3.20/head or -\$15.00/ha.

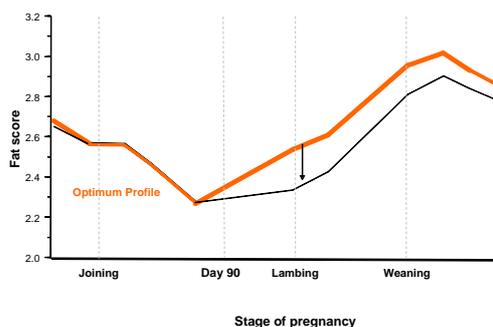


Figure 5: Ewes are too lean at lambing.

Across all fat score profiles, gaining condition using grain will not be profitable. However it is profitable to use grain to reduce or stop loss of condition.

Key drivers – ewe and lamb survival

Differences in ewe and lamb survival between the various fat score profiles are driving the differences in profitability. Relative to the standard profile of maintaining fat score 3 during pregnancy, the economic optimal profile results in slightly lower ewe deaths (-0.5%) and single born progeny (-1.9%) and nearly 5% lower twin survival (Table 2). Importantly, failing to regain condition at lambing (Figure 5) has a significant detrimental impact on ewe and progeny survival, particularly that of twins.

Table 2: Ewe and lamb survival differences between fat score profiles.

Fat score profile			Lamb survival % difference	Ewe survival % difference
Joining FS	Day 90 FS	Lambing FS	Singles	Twins
3.0	3.0	3.0	0.0	0.0
2.7	2.7	2.7	-1.9	-4.8
3.0	2.8	2.6	-4.5	-10.1
2.7	2.3	2.3	-6.4	-14.1

Can Lifetime Wool add value to ewe management?

You can use this information to see if Lifetime Wool will add value to your ewe management. Fat score a random sample of ewes at day 90 and again at marking to determine which fat score profile you are following:

1. Maintaining ewes at FS 3 = \$135/ha profit
2. Join in FS 3, lose 0.3 FS to day 90 and regain by lambing = \$154/ha profit
3. As above, but fail to regain FS to lambing = \$138/ha profit
4. Join in FS 2.6, lose 0.3 FS to day 90 and regain by lambing = \$161/ha profit
5. As above but fail to regain FS by lambing = \$145/ha.

These figures are based on the Wagga 'model' farm, and will differ from property to property.

Managing breeding ewes to fat score targets during pregnancy can have a large impact on farm profitability. But more importantly this information can assist you to determine where your breeding ewe management sits at present, identify possible options for change and establish how much that change will cost you in terms of the value of production and expenses required to achieve the change.

Key points

- Achieve as much fat score as possible from pasture between weaning and joining.
- Determine the responsiveness of your flock's reproduction rate to a change in fat score (see Primefact 309 *How responsive is the conception rate of your Merino ewes?*). This will determine the profit response you will achieve from any supplementary feeding.

The major factors driving the economic response are ewe and lamb survival, not increased wool value. So the critical question you have to answer is 'How does your flock respond?'

In a low responding flock (i.e. less than 8 additional foetuses per fat score per 100 ewes) ewe management should be focused on the latter part of pregnancy to maximise survival.

For a highly responsive flock, ewe management should focus on both the period between weaning and joining (i.e. to achieve the higher lambing potential) as well as leading up to lambing to ensure high survival rates of the additional lambs conceived, which will most likely be twins.

The key to optimising breeding ewe management is to achieve the higher production from pasture whenever possible.

Acknowledgment

This text is based on Young, J *Implications of Lifetime Wool for On-farm Management in Southern NSW Wheatbelt*, Farming Systems Analysis Service January 2008. The full report can be downloaded from www.lifetimewool.com.au

Lifetime Wool

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