NEW SOUTH WALES
LIFETIME WOOL
MAXIMISING THE GENETIC POTENTIAL OF YOUR FLOCK

VOLUME 4, ISSUE 2 • JUNE 2008 • ISSN 1832–3790

INSIDE

HIGHLIGHTS

The economics of managing breeding ewes

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The economic modelling described in this article was based on a 'model' farm based in the Wagga region of NSW. The findings are generally applicable to both the tablelands and slopes of southern and central NSW. The NSW Lifetime Wool project team is currently working on an analysis that will be applicable for the summer rainfall region of the Northern Tablelands.

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.

What are the 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 (approx 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.

Economic implications of lifetime wool on managing breeding 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.

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

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

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 µm, 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 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 the:

- 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).

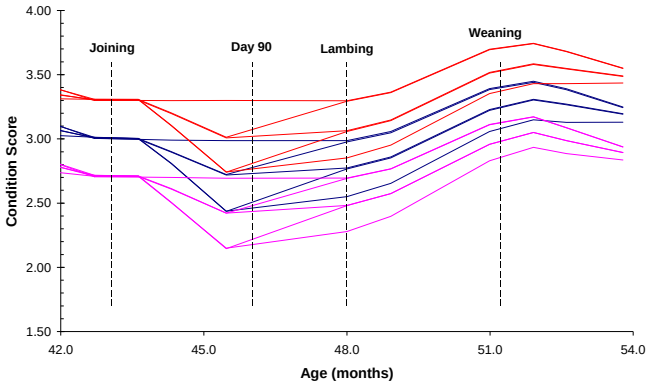

Figure 1: The 15 fat score profiles.

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 there 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.

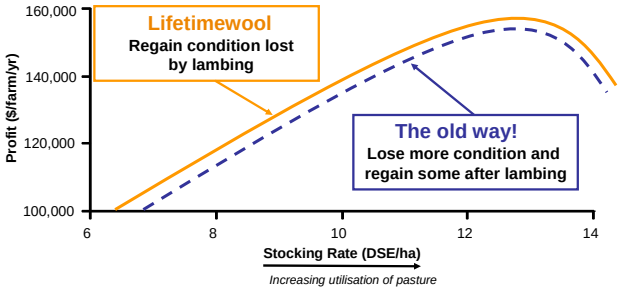

Figure 2: Farm profit - before and after Lifetime Wool.

Comparison of the two lines in Figure 2 puts the magnitude of the benefits from Lifetime Wool into context. If a farm has productive pastures with high utilization 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 utilization rates the benefits from monitoring ewes to achieve the condition targets is less than the benefit achieved from running an extra 1DSE/ha. In this situation there is more to be gained by changing stocking rate than implementing Lifetime wool guidelines ***but*** producers in this situation can use the Lifetime Wool measure to manage philosophy to increase confidence to increase stocking rate.

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 (ie 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.

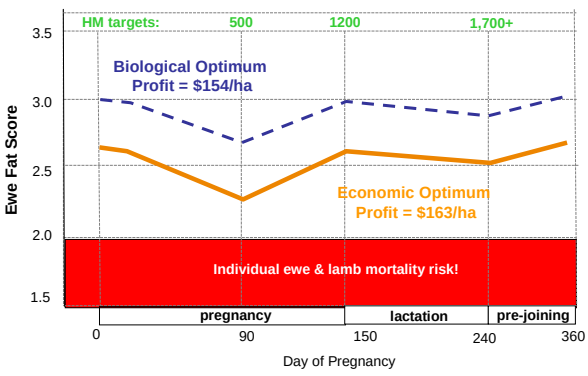

Figure 3: The biological and economic optimum profiles

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 (ie the dashed line in Figure 3), but this profile is $9/ha less profitable than the economic optimum despite an 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 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.

<u>Ewes are in fat score 3</u>

Effectively this is biological optimum profile, where the ewes are in a higher fat score for the whole reproductive cycle (ie 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.

<u>Maintain ewes at fat score 2.6 during pregnancy</u>

Maintaining the ewes in the same fat score (ie 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.

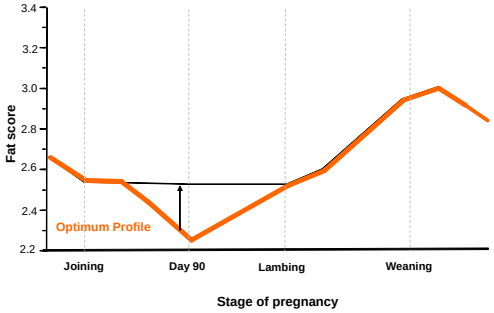

Figure 4: Maintaining the same condition from joining to lambing.

<u>Ewes are too thin</u>

Failing to regain the lost condition prior to lambing (Figure 5) has the lowest value of production of the three scenarios, $72.70/ewe (ie $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.

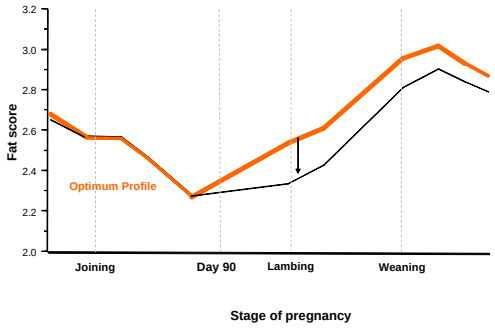

Figure 5: Ewes are too lean at lambing.

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 (-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	0.0
2.7	**2.7**	**2.7**	**-1.9**	**-4.8**	**-0.5**
3.0	2.8	2.6	-4.5	-10.1	-0.9
2.7	2.3	2.3	-6.4	-14.1	-2.2

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 FS3, lose 0.3FS 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 FS2.6, lose 0.3FS 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 NSW DPI Primefact 309). 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 (ie less than 8 additional foetuses per fat score per 100 ewes) ewe management should be focussed 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 (ie 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 off pasture whenever possible.

Modified from Young, J Implications of Lifetime Wool for On-farm Management in Southern NSW Wheatbelt. Farming Systems Analysis Service Jan 08. The full report can be downloaded from www.lifetimewool.com.au

The key effects of ewe fat score during pregnancy

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Joining

- Ewes in better fat score at joining have more lambs.
- For each extra fat score at joining, between 0 and 40 extra lambs are conceived per 100 ewes joined.
- A change in fat score from FS 2.0 to FS 3.0 is equivalent to an increase of about 5-7 kg in liveweight of the ewe, depending on the frame size.

Early to mid pregnancy

- Lamb birth weights can increase or decrease by 0.5 kg in response to ewe nutrition.
- Low lamb birth weight results in reduced lamb survival, particularly in twins.
- Fibre diameter and clean fleece weight of progeny is affected by poor nutrition during both mid and late pregnancy and these effects add up.

Late pregnancy

- Ewes should reach FS 3.0 by lambing to avoid reducing lamb birth weights.
- Fibre diameter and clean fleece weight of progeny is affected by poor nutrition during both mid and late pregnancy and these effects add up.
- Effects on progeny birth weight, fibre diameter and fleece weight due to poor nutrition prior to day 90 can be overcome by improving nutrition in late pregnancy.

Lambing

- Lamb survival is heavily influenced by birth weight and ewe fat score, especially when poor weather conditions are likely.
- Ewe mortality at FS 1.5 is double that at FS 3.0 and above - twinning ewes must be above FS 2.0 by lambing, what ever the season.
- Optimum birth weight is 4.5 - 6.0 kg. Survival decreases rapidly if lambs are below 4.0 kg.

Lactation

- Better lactation through increased ewe nutrition improves lamb growth rates and weaner survival.

Weaning

- Liveweight explains most of weaner mortality - lambs should be greater than 23 kg liveweight going into summer.
- Weaners need to achieve positive growth rates through summer and autumn.

Post-weaning/pre-joining

- The more liveweight that ewes gain on green feed in the post-weaning phase, the less it will cost to achieve target fat scores by the next joining.

Modified from "Ewe Management Handbook" Optimising Merino ewe nutrition to increase farm profit. high rainfall zone edition 2007 www.lifetimewool.com.au

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The Lifetime Wool Project is a national project supported by Australian Wool innovation Ltd, Dept of Primary industries Vic, Dept of Agriculture and Food WA, NSW Dept Primary Industries, SA Research and Development Institute, Tas Dept of Primary industries and Water, Austral Park: Coleraine, Billandri Poll Merino Stud; Kendenup and over 120 wool producers across southern Australia.

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