NEW SOUTH WALES
LIFETIMEWOOL
MAXIMISING THE GENETIC POTENTIAL OF YOUR FLOCK
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Cicerone Project confirms Lifetime Wool project outcomes

Michael Lollback, NSW DPI Livestock Officer (Sheep & Wool), Tamworth

The Cicerone project located at CSIRO's Chiswick Research Centre between Uralla and Armidale on the Northern Tablelands was a research and extension activity initiated by local wool producers which ran from 1998 to 2006. The major focus of the project was a trial to compare the profitability and sustainability of three different production systems which were representative of the systems used by local producers.

Briefly the systems involved different levels of fertilizer, pasture improvement and grazing management and included a high input system (Farm A), a medium input system which mimicked the most common system used on the Northern Tablelands (Farm B) and a third system with the same inputs as Farm B but where the grazing management system was based on intensive rotational grazing or cell grazing principles (Farm C). Land was leased from CSIRO at Chiswick and subdivided into three 50 ha farmlets with identical features. Fine wool Merino breeding enterprises based on the same genotype were run on each farm.

Fat scoring was used to monitor the level of nutrition of ewes on each of the farms and scores were recorded on a regular basis enabling annual fat score profiles of each flock to be graphed. An economic analysis of the three farms provided the opportunity to examine the relationship between enterprise performance (gross margin /dse) and the annual fat score profiles of the breeding flocks.

The Lifetime Wool project site in the Armidale area also generated fat score data which was then related to production data from the high and low nutrition treatment groups being monitored at the site. The results of the Lifetime Wool project have been used to develop recommended fat score profiles for breeding ewes for the various sheep production regions in all states. These profiles vary depending on geographical location, pasture growth curves and the timing of major events such as joining, lambing and shearing in the annual management program.

The recommended fat score profile for Merino breeding flocks on the Northern Tablelands and the fat score profiles of the high and low nutrition groups from the Armidale site of the Lifetime Wool project are presented in Figure 1. The basic features of the recommended profile are that the target fat score at joining should be 3.5 and that during the critical last 50 days of pregnancy ewes should be maintained in fat score 3. During early and mid pregnancy the goal should be to maintain ewes in 3.0 to 3.5 fat score.

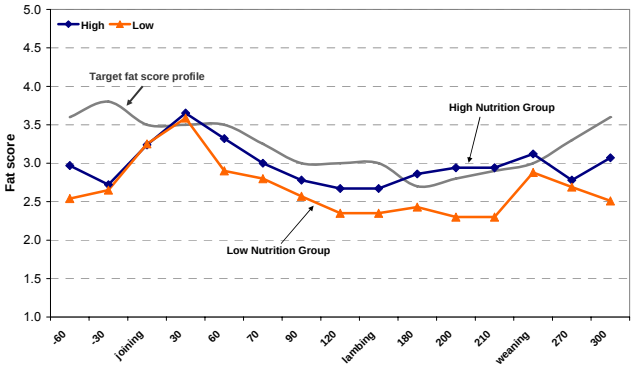


Figure 1: Lifetime Wool project – fat score profiles of high and low nutrition ewe treatment groups.

In the Cicerone project economic analysis of the Merino breeding enterprises (2000 to 2006) indicated that farm A achieved the highest average annual gross margin followed by farm B and farm C. If the fat score profiles of each of the Cicerone farms are mapped against the recommended New England fat score profile it is the farm A profile that comes closest to matching the recommended profile; the farm B and farm C profiles result in a less closer match which is in line with their gross margin performance.

Similarly at the local site of the Lifetime Wool project the fat score profile of the high nutrition treatment group more

closely matched the recommended fat score profile than the low nutrition treatment group. Again, the production level of the high nutrition group was significantly better than the low nutrition treatment group. The high nutrition ewes weaned 6.7% more lambs and grew more wool that was longer, stronger and only about 0.9µm broader than low nutrition ewes. Interestingly there was a trend for the high nutrition ewes to have lower FEC than low nutrition ewes from weaning onwards.

More importantly the progeny of the high nutrition treatment group achieved significantly higher production levels at twelve months of age than the progeny of the low nutrition treatment group. The high nutrition progeny cut heavier fleeces which were broader and higher yielding with lower curvature and longer staple length than low nutrition progeny. At their first joining, the high maternal nutrition maidens had a 14 % higher lambing potential (foetuses scanned *in utero* per 100 ewes) than the low maidens largely due to a lower percentage of dry ewes (i.e. 6 versus 17 %).

The Northern Tablelands Merino production system is based on joining in autumn and lambing in spring. The summer dominant rainfall pattern and consequent pasture growth rates generally ensure that ewes are in adequate condition for joining. However the drier cold winters and depressed pasture growth rates make it particularly challenging to meet the nutritional requirements of ewes from pasture during the last 50 days of pregnancy. Supplementary feeding is regularly required during late pregnancy to overcome the nutritional limitations of available pasture and offset the additional energy requirement imposed on the breeding ewe by mid-winter shearing; common in upwards of 80% of Northern Tablelands sheep enterprises.

Active management of Merino breeding ewes to achieve the target fat score profile developed for the Northern Tablelands will ensure optimal wool and reproduction outcomes. Results from the Cicerone Project have reinforced the findings of the Lifetime Wool project and will enable a clearer understanding of the production losses and costs associated with inadequate nutrition especially during the critical last 50 days of pregnancy and the development of strategies to overcome this problem.

Ewe nutrition during late pregnancy - vital for ewe & lamb survival

Dr Sue Hatcher, NSW DPI Senior Research Scientist

Lamb marking percent has an important influence on the profitability of a breeding ewe enterprise. High percentages can result from good management that promotes high lamb survival through adequate nutrition of the ewe in late pregnancy. Monitoring the fat score of ewes during pregnancy and implementation of appropriate management interventions can lead to higher lambing percentages.

Most of the growth of the developing foetus occurs in the last 50 days before birth. To provide increased nutrition to the foetus for this active growth phase the ewe's energy requirement increases by 50% for single bearers and 80% for twin bearers by lambing. The ewe's protein requirements follow a similar trend (see Volume 2 Issue 2 April 2006 of this newsletter).

The ewe must increase her feed intake to deliver the additional energy and protein to her foetus/s. It is thus imperative that ewes in late pregnancy have access to highly digestible and abundant pasture - 700 kg DM/ha of 75% digestibility or 1,200 kg DM/ha of 68% digestibility. If pasture of this quantity and quality is not available, supplementation is a must. It is important to note that the placenta and foetus together represent a considerable mass that can physically reduce a ewe's intake of feed through pressure on the rumen. Therefore any forage or ration offered to breeding ewes should be sufficiently energy dense so as to enable sufficient intake. This is particularly true for ewes bearing twins.

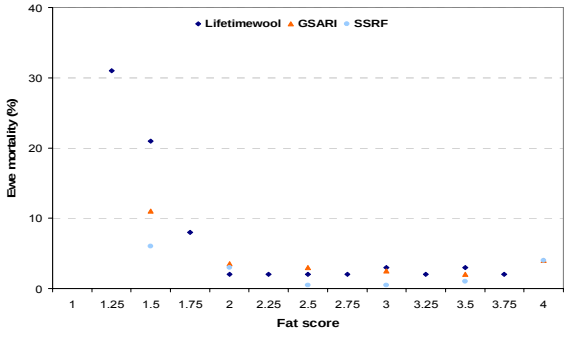
Diseases of late pregnancy such as pregnancy toxaemia and chronic hypoglycaemia can be guarded against by ensuring breeding ewes have adequate energy and protein intakes. Following birth, the ewe experiences a very high demand for energy with the onset of lactation. This energy requirement is seldom met by grazing and is supplemented by the ewe drawing on her own body reserves - in fact the ewe's body reserves can provide up to a third of the energy requirements for lactation. Good nutrition in late pregnancy will allow ewes to maintain these essential body reserves for a successful lactation.

Single and twin bearing ewes should both be in fat score 3 at lambing. Ensuring your ewes reach this fat score target at lambing will have positive benefits on both ewe and lamb survival. Where ewes can gain fat score in late pregnancy on green feed, they can be allowed to lose fat score to day 90 of pregnancy. Where pasture and feed availability results in ewe fat score either only maintaining or decreasing in the last third of pregnancy, ewe fat score at day 90 becomes more important and they should be at or above their target fat score for lambing at this time.

Ewe fat score in late pregnancy/early lactation and ewe mortality

Ewe mortality can be an important issue when fat score falls below 2 during late pregnancy or at lambing (Fig 2). Maintaining ewes in adequate fat score to avoid mortality is especially important when there is likely to be poor weather conditions and/or low pasture feed availability.

Figure 2: Ewe mortality in late pregnancy increases sharply below fat score



2.

Individual ewes whose fat score is less than 2 prior to lambing should be managed separately and have increased access to good feed. Ewes bearing twins are more likely to be in danger than single bearing ewes, with at least 2-3% higher mortalities for the same fat score.

Remember that over fat ewes at lambing will also cause problems for lambing management. Ewes that are fat score 4 or above may be at increased risk of having lambing difficulties due to dystocia caused by high lamb birth weights (i.e. 6 kg and higher).

Good management of the ewe during pregnancy (particularly the last 50 days) is essential to present a fit ewe at lambing - dead ewes don't have lambs!

Ewe fat score at lambing and lamb survival

The fat score of the ewe at lambing has a strong influence on the survival of her lamb (Fig 3). Poor ewe nutrition and hence low fat score at lambing has a detrimental effect on the physiology of lactation as well as the expression of both maternal and lamb behaviour - each of which have the potential to contribute to increased lamb mortality.

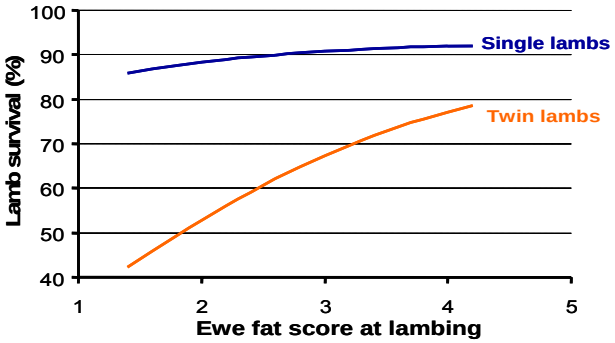


Figure 3: The relationship between ewe fat score at lambing and lamb survival.

Under nutrition at lambing has been associated with a belated onset of lactation due to a delay in the post-partum decline of the pregnancy hormone progesterone that circulates in the ewe's blood. The delayed clearance of progesterone results in a prolonged labour, lower milk secretion rate and a reduction in maternal grooming behaviour. Delayed onset of lactation is most common in twin bearing ewes and can persist for up to 4 hours post birth - therefore no milk is available for up to 4 hours after the first lamb is born. This often results in one lamb from the pair of twins being orphaned.

Note that delay in the decline of progesterone can also occur in fat ewes as these ewes (ie score 4 or above) have a lower food intake which also reduces the metabolic clearance rate of progesterone. So overfat ewes tend to have larger lambs but also a longer drawn out labour which will significantly increase the chance of trauma and asphyxiation of the lamb during birth.

Additional to delayed lactation, low nutrition leading up to lambing has been associated with reduced udder weight and mammary gland development which leads to reduced colostrum production as well as reduced total milk yield.

In terms of ewe behaviour, lightweight ewes are more motivated to eat after the birth of their lamb/s. This is associated with the increased likelihood of undernourished ewes moving away from the birth site - ideally the ewe and lamb should remain at the birth site for at least 6 hours to facilitate a strong ewe lamb bond.

Survival rates of 90% for singles and upwards of 70% for twins are achievable for Merino's if your ewes are in good condition at lambing.

Lamb birthweight and survival

There are a number of possible factors that contribute to lamb death - these were summarised in an earlier edition of this newsletter (see Volume 2 Issue 3 October 2006). The importance of any one particular factor will vary between years with variation in the fat score of ewes at lambing and the pasture quality (Table 1). However, there is a strong quadratic relationship between lamb birth weight and subsequent survival - that is both light and heavy lambs are more likely to die (Fig 4). Lamb birth weight is strongly related to ewe fat score at lambing - fatter ewes have heavier lambs.

The average birth weight of single lambs from well-fed Merino ewes (50 kg mature weight) is about 5.0 kg (Fig 4). The average birth weight of twin lambs is often less than 4.0 kg and mortality rates can exceed 40 - 50 % for twin-born Merino lambs.

Table 1. Ewe condition, forage at lambing and possible sources of lamb death.

Ewe fat score at lambing	Pasture quality	Causes of lamb death		
		Neural damage	Starvation	Other
> 4	good	↑	↓	↑ stillborn
> 4	poor	↑	↑	↑ preg tox
3	good	↓	↓	
3	poor	some	↑	
< 2	good	↓	↓	↓ birth wt
< 2	poor	↑	↑	↓ birth wt, higher losses

(Source: Holst 2002)

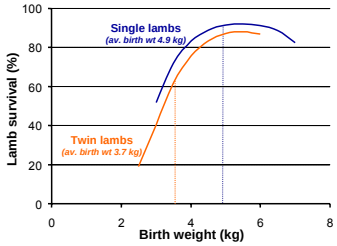


Figure 4: The impact of lamb birth weight on survival.

Lightweight lambs, particularly those from multiple litters, have a higher incidence of death from exposure and starvation than heavy lambs. Exposure to the elements during birth and soon after increases the risk of light lambs succumbing to hypothermia. Compared with heavy lambs, light weight lambs have a relatively larger surface area to volume ratio, reduced total body fat reserves and brown adipose fat (a critical first energy source for newborn lambs to metabolise and derive energy to stand and suckle). Due to their lower energy reserves, light weight lambs are slower to stand, seek the udder and to suck compared to heavy lambs.

While identification of lambing paddocks with specific physical characteristics to promote lamb survival (see Volume 2 Issue 3 October 2006 of this newsletter) will lessen the environmental impact on these light weight lambs, active management of ewe fat score in late pregnancy to hit the target of fat score 3 at lambing will ensure that the number of light weight lambs born into a flock is reduced.

Twin born lambs are much more susceptible to changes in ewe fat score at lambing as they are effectively competing *in utero* for available nutrients and will generally always be lighter than single born lambs. Twin bearing ewes should therefore be given higher priority in terms of feed availability and quality than single bearing ewes.

Creep feeding lambs

Doug Alcock, NSW DPI Livestock Officer, Cooma

It is common to wean winter and spring born lambs in the southern states of Australia at the end of the growing season just as pasture quality and quantity are declining. In this scenario it is important to ensure that lambs reach a target weaning weight to ensure their survival. Losses exceeding 50% have been reported in Merino weaners below 20 kg.

Ideally lambs should weigh 25 kg at weaning to ensure high survival rates as survival of medium-wool Merinos grazing dry summer pastures can decline from 97 % at 25 kg to 78 % at 15 kg.

Creep feeding is a simple way to allow lambs access to extra feed supplements or a different supplement while excluding ewes. This means that the lambs will still be suckling milk and grazing but will also have extra supplements to make up any shortfall in their intake. The lambs will gain access to the feed through a 'creep' which is simply an opening in a fence or gate that is large enough to allow the lambs access but too small for the ewes to enter.

Creep feeding is appropriate when:

- pasture quality and quantity are limiting milk production and hence lamb performance;
- ewes have lambed in low fat score and their milking potential has been reduced;
- the ewes are already receiving supplements but lamb performance is still inadequate ;
- the mob consists of scanned twin-bearing ewes and most of the lambs are being reared as twins.

Creep feeding will not be cost-effective when animals are grazing adequate quantities of high quality green pasture (i.e. 1,000 kg DM/ha and 1,500 kg DM/ha at 75% digestibility for single and twin bearing ewes respectively).

A major advantage of creep feeding is in training lambs to hand feeding. Rations for early-weaned lambs are identical to creep rations and lambs already trained to creep feeds are much easier to wean at early ages without the usual setbacks. Ceasing to feed ewes in the week before weaning will encourage them to 'dry off' and increase the lambs dependence on the creep. Early weaning will provide a great boost to the ewes to recover their body condition lost during lactation in preparation for their next joining. Lambs do not generally consume significant quantities of solid food until about 4 weeks of age. If their ewes are hand-fed during lambing, the lambs will be familiar with the supplements and will readily adapt to creep feeding from about 4 weeks into lambing. If the lambs do not readily adapt, you may need to open the creep pen to the ewes for a few days so that they can train their lambs to enter the creep area.

This article was summarised from a NSW DPI Primefact 224 Creep feeding lambs which contains further practical details about creep feeding including the required hardware, location of the creep pen, feed ration sand feeding rates and economics. Primefact 224 can be downloaded from http://www.dpi.nsw.gov.au/aboutus/resources/factsheets/primefacts/creep-feeding-lambs or ask you local NDWDPI Livestock Officer (Sheep & Wool) for a copy.

http://www.lifetimewool.com.au

The Lifetime Wool project now has its own website which provides breeding ewe management guidelines, tools and tips and background research results with economic analysis for Merino producers across southern Australia. NSW Merino producers will notice that the Lifetime Wool website uses condition scoring instead of fat scoring and FOO (feed on offer) rather than HM (herbage mass).

Fat scores versus condition scores

Both techniques score using a 1 to 5 system, where 1 is the leanest and 5 the fattest. The two techniques differ in the site at which the assessment of body condition is made:

- fat score - palpation at the 'GR' site approximately 11 cm down the 12th rib
- condition score - palpation at both the backbone and the 'C' site over the loin (short ribs)

Recent experiments have shown both techniques equally assess fatness and the two techniques are interchangeable when used to assess the fatness of ewes for reproduction outcomes. So simply substitute FS for CS on the website.

HM versus FOO

The difference is in the harvesting method used to cut the pasture. HM uses a shearing handpiece and typically leaves about 4 mm of herbage at ground level while FOO uses a scalpel. CSIRO research has identified that 300 kg DM/ha is an average difference between FOO and HM over a range of plant densities, so simply subtract 300 from FOO to get HM (ie HM = FOO - 300).

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