# STATIC AND DYNAMIC EFFECTS OF BODY CONDITION SCORE ON CONCEPTION AND FECUNDITY WITHIN NON-MERINO PRIME LAMB DAMS

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*Findings from an on farm demonstration conducted in association with Farmlink Research Ltd.*

**Introduction**

It has long been accepted that the higher the body condition scores of ewes at joining, the greater the flock and individual ewes reproductive potential through a reduction in dry ewes and improvements in twin bearing ewe numbers (Sheep CRC, Lifetime Wool). Producers have however asked if it is possible to "get ewes too fat to join". Recent findings of Corner-Thomas et al (2015), Aliyari et al (2012) and Jalalin & Moeini (2013) propose that a condition score of 3 – 3.5 was optimum for fertility and number of lambs born among breeds (genotypes) studied. While it is recognised that genotype has a significant influence on the ability of ewes to recover body condition from one pregnancy to the next, are there any significant and/or financial benefit(s) to be gained from increasing ewe body score condition to levels higher than 3 in non-Merino prime lamb dam genotypes and could this practice indeed be counterproductive in terms of conception and fecundity outcomes?

**Methods**

One hundred and seventy four (174) mixed age (3-6yr old) White Suffolk ewes were assessed for body condition score (BCS) at weaning in September 2014 and run under differing grazing and feed conditions to deliver two live weight and BCS recovery 'paths' prior to joining in January 2015. Group 1 (BCS+ , n=73) were managed to allow ewes to gain weight and BCS between weaning and joining. Group 2 (BCS=, n=101) were managed to maintain or marginally improve live weight and BCS. Ewes had all lambed the previous season and a majority had full performance data (Australian Sheep Breeding Values (ASBV's)) to help identify any likely interactions of effects between carcase traits and possible influence of CS on conception rates and fecundity. Body condition scores were taken at commencement of joining (Day 1), mid-joining (Day 21) and again at the end of joining (Day 42). Individual ewe live weights were collected on Day 21.

During joining (42 days) the BCS= treatment were given access to better quality cereal stubble pastures. The BCS+ ewes were grazed on cereal stubbles with less food on offer, frequently those paddocks grazed initially by the BCS= ewes with the aim to maintain weight and BCS. All ewes were provided with abundant volumes of cereal stubbles during joining and no higher quality pasture or grain supplement was provided. Ram percentages used were 2.0% and 2.6% in the BCS= and BCS+ groups respectively, both in excess of industry recommendations of '1% +1' rams for mature ewe mating.

Ewes were pregnancy tested using ultrasound technology at day 50 post joining (92 days after ram introduction) to determine pregnancy status and litter size(dry/singles/multiple foetuses). All ewes were run as one mob post joining and allowed to graze higher quality feed (including dryland Lucerne) to increase BCS throughout the 2$^{nd}$ and final trimester of pregnancy.

**Results**

At weaning, both ewe groups averaged between 3.2 and 3.6 BCS (Table 1). By Day 1 of joining the BCS+ ewes achieved a steady increase in BCS (group average ~4.5) while the BCS= ewes maintained BCS, averaging ~3.3 by joining. Both groups achieved demonstration target BCS 'recovery' paths.

The BCS= ewes increased condition score slightly to mid joining (Day 21). Both ewe groups lost condition score during the latter stages of joining due to a drop in relative feed quality during this period. At mid joining there was approximately an 8Kg difference in average weights between the 2 groups.

Table 1. Change in condition scores between weaning and the end of joining

| TREATMENT | WEANING | START OF JOINING | MID JOINING | WEIGHT MID JOINING | END OF JOINING |
|---|---|---|---|---|---|
| **BCS+** | Range 3.3-3.6 | Av CS 4.5 | Av CS 4.4 | 85.7 Kg | Av CS 4 |
| **BCS=** | Range 3.2-3.4 | Av CS 3.3 | Av CS 3.5 | 77.5 Kg | Av CS 3.3 |

As shown in Table 2 (below) the percentage of ewes scanned 'dry' was lower in the BCS+ group compared to the BCS= group (6.8% v's 9.9%). A majority of the ewes that scanned dry in the BCS= treatment were at the lower end of the condition score evaluation (BCS 2) at scanning, several having weaned twins the previous year. It is assumed that recovery was not sufficient to enable these ewes to conceive which may have accounted for the higher than expected number of dry ewes in this group. None of the ewes in the BCS+ group had condition scores lower than 3 at either joining or scanning.

Number of lambs in-utero however was not appreciably different (148% v's 151% respectively for BCS+ and BCS= ewes joined) due to a higher twin diagnosis within the BCS= ewes. (68% v's 59% for ewes scanned in lamb (SIL)). These findings suggest a higher potential lambing percentage was achieved in ewes managed to maintain weight and BCS targets >3.0 to 3.5 between weaning and joining.

Table 2. Effect of treatment on conception and number of lambs in utero

| TREATMENT | Dry ewes (%) | Singles (% SIL) | Twins (% SIL) | Total (%SIL) | Total (Joined) |
|---|---|---|---|---|---|
| **BCS+** | 6.8% | 41% | 59% | 159% | 148% |
| **BCS=** | 9.9% | 32% | 68% | 168% | 151% |

The positive influence of PWwt, Pfat and Pemd on conception within Merino ewes has been promoted through Bred Well Fed Well and other producer education programs. Less is known how these traits impact on high performance, composite or non-Merino breeds or genotypes. Carcase ASBV averages for the 2 groups are shown in Table 3. and do indicate a difference in the 2 treatment groups for growth, fat and muscle. The ewes have common sire linkages across pedigrees and are from the same breeding program. Differences between group averages for each trait shown is unlikely to have major impacts on conception and/or fecundity.

Table 3. ASBV Averages for the two treatments

| TREATMENT | Pwwt (Growth) | Pfat (Fat) | Pemd (Muscle) |
|---|---|---|---|
| **BCS+** | 10.50 | -0.54 | 0.73 |
| **BCS=** | 11.30 | -0.43 | 0.87 |

An analysis of individual ewe's Pfat and Pemd ASBV's however suggest that there may be responses in terms of their effect on twin foetus conception rates as illustrated in Figures 1 and 2 below.

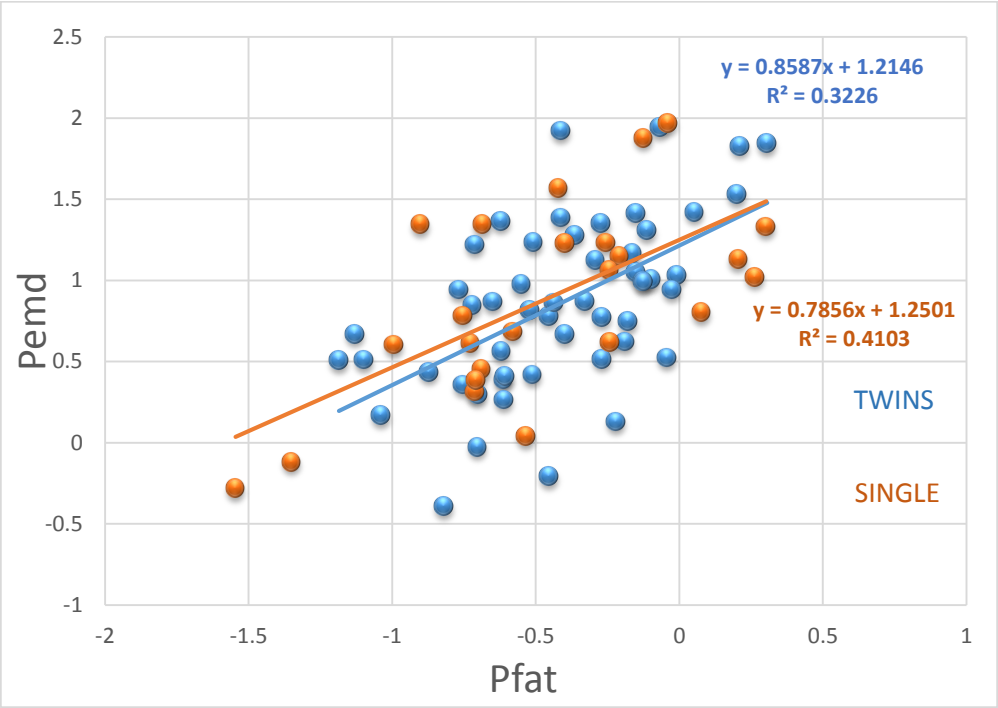


Figure 1. Incidence of foetal number relative to Pfat/Pemd ASBV's for BCS= ewes

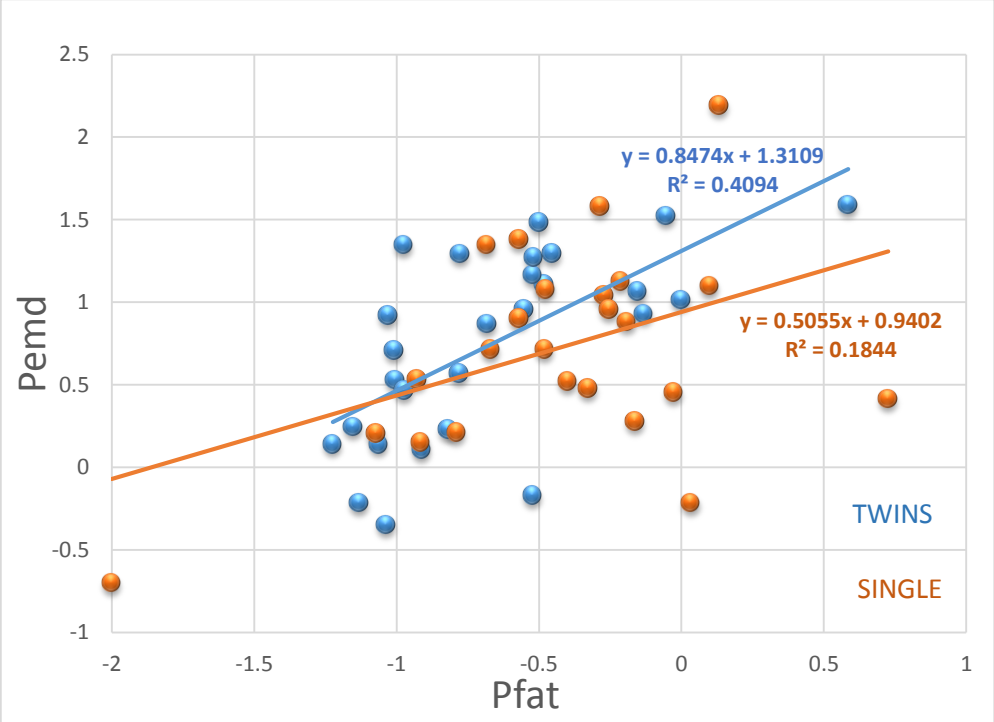


Figure 2. Incidence of foetal number relative to Pfat/Pemd ASBV's for BCS+ ewes

Within the BCS= ewes, twin foetus' appeared to be evenly distributed across all combinations of Pfat and Pemd (Figure1.). The BCS+ ewe's (Figure2.) had a higher incidence of twins (77% v's 23%) when the Pfat ASBV become leaner than -0.5. The PWwt ASBV did not affect twin foetal number distribution within either ewe group.

**Discussion**

It is generally considered that higher levels of genetic fat within Merino ewes plays an important role under feed limiting conditions in terms of conception rates (Bred Well Fed Well, Ferguson (2012)). Performance among non-Merino ewes nationally has, to date however, not been quantified. The findings of this study (a higher incidence of multiple foetuses in the BCS= group) seems to confirm the findings of Corner-Thomas et al (2015), Aliyari et al (2012) and Jalalin & Moeini (2013) that condition scores higher than 3 are counterproductive to fertility in non-merino ewes. Aliyari et al found a difference of 35% in lambs born per 100 ewes at CS 3 and above CS 3.5. Rhind et al. (1984) found similar BCS effects with a 37% decrease in number of lambs born per unit increase in CS above 3 at joining. Sezenler (2011) found a positive relationship between condition score and fertility but not number of lambs born indicating an adverse effect on litter size with increasing condition score.

While decreases in lamb numbers of this magnitude were not found in this study, and the key difference was the number of multiple foetuses, it does raise the question as to whether non-Merino ewes can be too fat at joining. The higher incidence of twin foetuses in the BCS+ group at Pfat ASBV's of -0.5 or leaner would tend to indicate that lower levels of genetic fat may offset the effect of higher condition score. With higher levels of genetic fat playing an important role on conception in feed limiting conditions and as the ewes in the BCS= treatment were consistently around condition sore 3 – 3.5 and not above this level, significantly higher levels of twin foetuses were achieved at Pfat levels in the range of -0.5 to 0.5 which supports this message.

Figure 3 illustrates that for an average increase of 1 unit in genetic fat for the BCS= group, an extra 22% of twins were achieved whereas in the BCS+ treatment the same 1 unit increase appeared to impact negatively on twin conception rates. High genetic fat levels in high performance ewes appears to 'work against' multiple conceptions when ewes are joined in very good body condition but may enhance twin conception rates among ewes in lower BCS and/or on restricted feed.

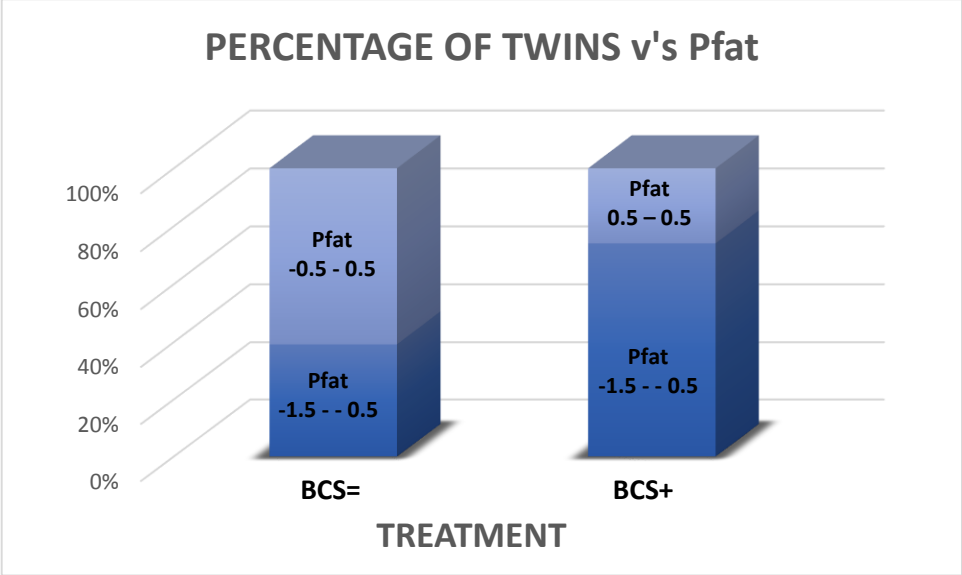


Figure 3. Percentage of twins as affected by Pfat across treatments

The increase in dry ewe numbers was possibly due to some ewes not recovering adequate body condition post weaning. While the treatment to hold ewes at their weaning condition score would not be considered good management practice and never recommended, there may be an acceptable range in ewe BCS's within which potential lambing percentages are not adversely affected due to higher twin conception rates.

Obviously with condition scores lower than 3, fertility is going to be adversely affected as found in the studies by Jalalin & Moeini (2013) and Abdel- Mageed (2012) where condition scores lower than 3 at joining resulted in reduced number of lambs so the benchmark may well be BCS ≥ 3. Interestingly Abdel-Mageed also found an increase in foetus abortion at the extremes of condition score in the range of 10-17% whereas at moderate condition scores (CS 2.5 – 3.5), abortion levels averaged 0 - 2%.

The use of White Suffolk ewes is clearly pushing the boundaries in relation to the potential for reduced lamb numbers at high condition scores. Many of the studies referenced were conducted on non-Merino genotypes, typically composite or fat tail/hair breeds. Nationally the Merino remains the dominant 'breeding ewe' genotype with genetics geared primarily for wool production. The major limitation in many Merino operations is actually getting them to condition score 3 to 3.5, not ensuring they don't exceed this level. It is generally accepted that Merino genetics are relatively leaner than composite or 1st cross breeds – the importance of increasing ewe BCS pre-joining to achieve higher conception rates remains a critical industry target within Merino strains.

The impact of targeted selection for increased fleece weights (YCFW) on reproduction in the Merino is well documented by Adams et al (2006) who suggest that strategic management of nutrition during the breeding cycle is critical to achieving high lambing percentages. This agrees with Koycu et al (2008) who found a consistent increase in fertility up to CS 5 in Merino genotypes, quite different to what others (Sezenler et al (2011), Kenyon et al (2004)) have found regarding the optimum condition score for maximum reproductive performance which varied between non merino breeds (genotypes) at levels considerably lower than condition score 5.

While the results of this trial don't actually show a penalty in lamb numbers from ewes at or above condition score 3, there is evidence that the incidence of twins in non-Merino ewes may increase within ewes having leaner (ie more negative Pfat) levels of genetic fat and there is potentially a twin conception rate 'penalty' for over fat ewes with higher Pfat ASBV's.

Given that many first cross or composite ewes do not have the potential for high levels of genetic leanness, relatively higher levels of genetic fat, combined with excessively high condition scores at joining, may negatively impact on ewe fertility and, indeed, answer the question "can ewes be too fat to join". Such ewes may, in fact, perform better if maintained at an average condition score of 3 to 3.5 pre joining. Management may be better targeted to ensure non-Merino ewes reach minimum BCS's rather than pushing them to higher levels. Doing so may also lead to a saving on pasture/feed/supplement costs.

**Acknowledgements**

Thank you to Geoff Duddy and Brad Long for assistance in reviewing this publication.

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