IMPACT OF CONDITION SCORE ON ARTIFICIAL INSEMINATION SUCCESS IN WHITE SUFFOLK EWES

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Introduction

The advantages of using artificial insemination (AI) to increase the genetic merit of sheep flocks is now well entrenched as the standard for many sheep producers and not restricted to just seedstock producers. The use of laparoscopic techniques has greatly increased the success of AI and therefore the economic benefits through the use of this technology. Despite many years of understanding the processes involved, there still remains the unpredictability of the final result; that being good conception rates. A forum conducted at the 2009 White Suffolk Annual Conference in Albury, NSW, (AWSA, 2009) determined that the results gained from an AI program were as varied as the procedures that may producers employed, and what works for one program or producer, doesn't necessarily work for another. The general recommendation given is to maintain ewes in moderate condition scores (CS) and on a rising plane of nutrition both through the AI program and post AI making sure to avoid any stress on the inseminated ewes. However, there are plenty of reports where conception rates well below 50% (AWSA pers. communication) are achieved following these recommendations making the cost per lamb a significant consideration and questioning the benefits of using AI for some producers.

Method

As part of the Meat and Livestock Australia (MLA) resource flock running at the Temora Agricultural Innovation Centre (TAIC), 200 mixed age White Suffolk ewes were programmed and inseminated using laparoscopic AI on the 4th February 2016. These ewes were programmed using CIDR's and given 2ml PMSG (Serum Gonadotrophin) after CIDR removal which was staggered to eliminate any timing effects. The ewes were assessed for condition score and weighed prior to being programmed, flushed on Lucerne for the 12 days after CIDR insertion and once inseminated, returned to a fresh stubble paddock containing self-sown, actively growing barley. Backup rams were introduced 13 days after AI.

The ewes were again assessed for condition score and body weight at pregnancy scanning (day 69 post AI). Pregnancy scanning identified foetus number (single, twin, triplet) and differentiated between those ewes pregnant to the AI program and those that failed to conceive to AI.

Results

This AI program resulted in conception rates of 60% (industry average 60-65%) and of those that conceived, 167% lambs in utero. The effect that condition score had across the whole range of criteria in determining what would be considered a successful program was substantial and surprisingly consistent across the range of condition scores measured. Given the recommendations to limit condition score to average levels leading up to AI, the results shown in Figure 1 seem to challenge the theory that high condition score ewes are counterproductive to good conception rates. There was a gradual increase in conception rates as CS values increased from CS 2-3 (57.1%) up to CS 4-5 (62.7%).

Figure 1. Influence of Condition Score on AI Conception rate.
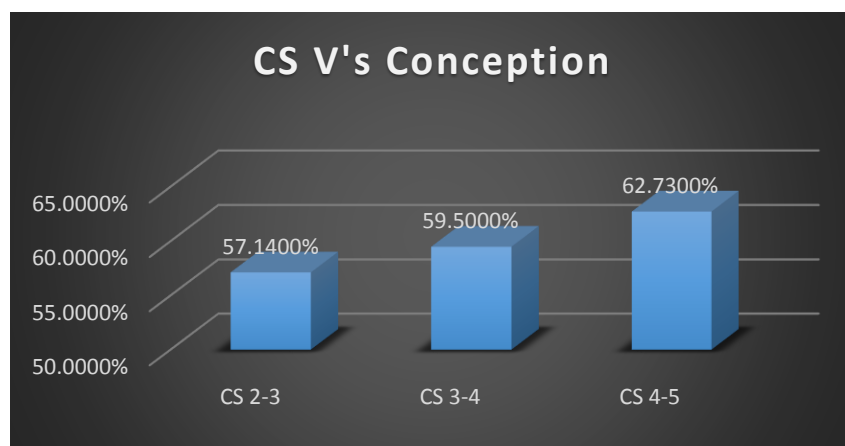
Given that the differences in conception rates between CS 2-3 and CS 4-5 is around 5.6%, this would not be enough to recommend a shift to higher condition scores pre-AI, however it is the effect of condition score on foetal number on consequently lambs in utero that is noteworthy as seen in Figure 2 and Figure 3.

Figure 2. Influence of Condition Score on Foetal number in utero
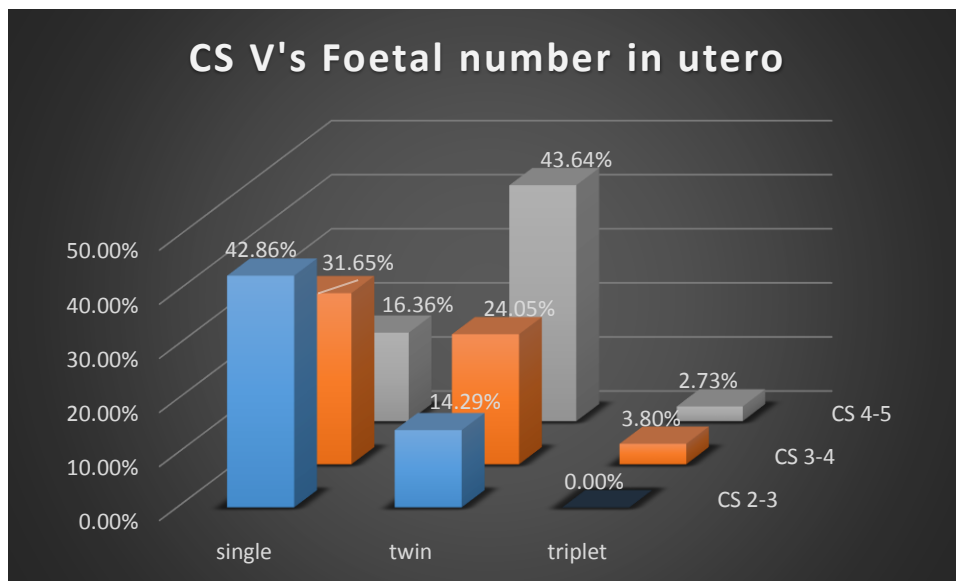

Figure 2 indicates that as condition scores increase from CS 2-3 through to CS 4-5, the percentage of singles decreases at similar rates to the increase in percentage of twin lambs in utero. No triplets were recorded at CS 2-3. This translates to an increase in lambs in utero from 125 % (CS 2-3) to 178% (CS4-5), an additional 53% more lambs at the higher condition scores as seen in Figure 3.

Figure 3. Influence of condition score on percentage lambs in utero
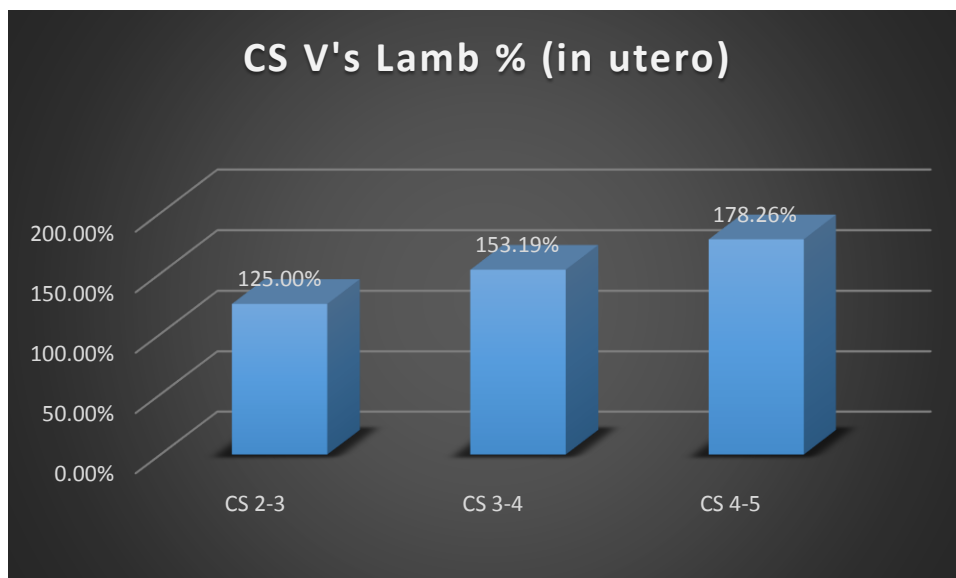
Discussion

The outcomes of this analysis only serve to add to the ambiguities surrounding the results obtained from many laparoscopic AI programs. Suggestions from the findings of the survey conducted by the South Australian Stud Merino Breeders Association (2013) indicated that CS 3-3.5 was ideal to achieving best results indicating overfat ewes ran the risk of poorer conception as a result of poor synchronisation through absorption of progesterone from the pessary by body fat. This is the same recommendation from most AI technicians and veterinarians regarding preparation of ewes for AI. The discussion around ideal condition score for AI programs is also confounded by the recommendation for natural joining to have ewes in as good a condition score as possible to achieve best results. Results from a previous trial conducted by Long (2015) found that the best results for foetal number in the same White Suffolk ewes was at CS 3-3.5 indicating a disparity between recommendations and subsequent results for the totally different conception methods. The programming of

ewes for AI is markedly different to the natural mating process and therefore not surprising that there is a difference in responses to condition score.

The range of factors that can affect AI conception include maintaining body CS and weight immediately following insemination. In this trial, average CS and body weight were relatively unchanged from insemination to pregnancy scanning, CS 4.0 / 84Kg and CS 3.9 / 80Kg respectively. While there was a general correlation between CS and body weight as seen in Figure 4, there was insufficient indication that heavier ewes achieved better conception rates or more foetuses than lighter ewes. Figure 4 indicates that, for a majority of body weights, the full range of condition scores assessments are covered. Condition score, not body weight is the ideal assessment to monitor ewe condition prior to and during any AI program.

Figure 4. Relationship between condition score and body weight

CS V's BODYWEIGHT
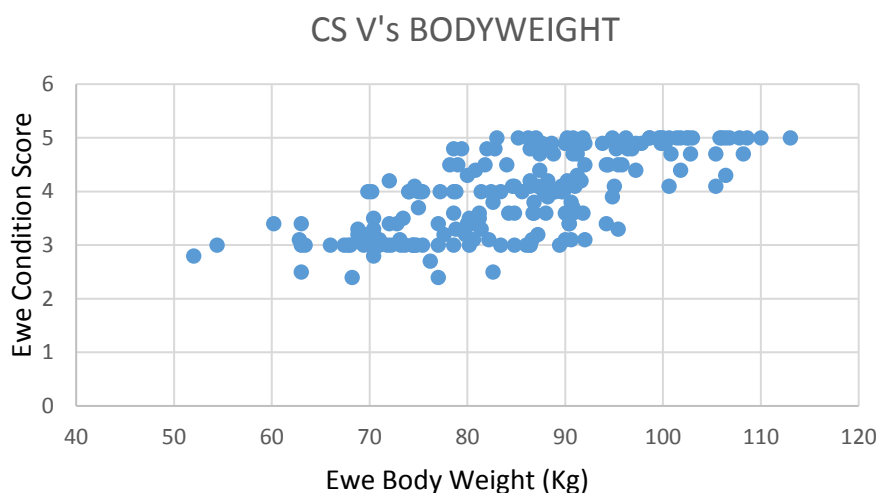
The results of this trial indicate that higher condition scores resulted in better conception rates, higher percentages of multiple foetuses and consequently higher percentages of lambs in utero. However, having ewes at high condition scores can lead to difficulties for some producers in maintaining critical recommendations such as low stress levels and maintaining body weight and condition score post AI. Fatter ewes are more difficult to manage to maintain weight and condition score and if the weather turns hot, they are more likely to suffer higher levels of stress. In this trial, maximum temperatures following AI were not at extreme levels usually associated with February and all conditions regarding feed availability, shade and weather were favourable for good results. It could be argued that the safest level to have ewes would be in the CS 3-4 range and aim to maintain or increase condition score after insemination, however the results from this analysis indicate that gains in fecundity can potentially be achieved by aiming for higher condition scores leading into an AI program.

It is widely accepted that higher body condition score leads to potentially more lambs (Lifetime Wool) and the response achieved in this program fits well into their predictions. The 'trick' with AI programs is to retain the foetuses post AI, not getting the eggs fertilised. Technically all ewes are in lamb post AI given correct programming and good semen quality, it is those embryos that actually 'stick' that determines the success of the program. Potentially, ewes that are fatter create a greater risk of embryo loss and are harder to manage, especially given that most AI programs are carried out in the summer months when heat and feed shortages are more likely. Any loss of body condition produces breakdown of fat which releases ketones into the system which are detrimental to embryo survival. Reports of ketone damage has been observed in over fat ewes just through the overnight yarding of ewes prior to an AI program (pers. comm. with AI Vet.). The use of pastures such as Lucerne or high protein feeds to maintain weight causes problems with embryo retention due to ammonia in the circulatory system. The consumption of high energy feed in early pregnancy is also detrimental to embryo survival resulting in a 20% drop in pregnancy conception when compared to a maintenance ration (Parr et al, 1987). Given these scenarios, it is more likely to be management post-AI that determines the ultimate success of the program and management to achieve maximum embryo retention becomes more achievable for many producers with more moderately conditioned ewes. However, there are plenty of seedstock producers who have consistently inseminated high condition score ewes for many years with outstanding conception results.

The flushing of the ewes for a short time prior to AI has the impact of increasing potential number of multiple foetuses and is common practice in many AI programs. The report from the AWSA (2009) stated that this

effect works better on ewes with lower condition score and not as effective on better conditioned ewes therefore adding some significance to the results observed in this analysis.

The variability of results across many artificial insemination programs both within and across various breeding operations however should provide a warning that a different season or different flocks provide a totally different result. The same practice across different seasons can produce totally different results for no explicable reason. In this assessment, higher condition scores delivered higher numbers of lambs and better conception rates. Experience indicates that a totally different result is possible given another set of circumstances and the best advice for any producer would be to follow the directions provided by the AI veterinarian and work within the constraints of the prospective management and climatic circumstances that are likely to occur. Don't change what is already working!

Additional Information - Analysis at Lambing

The actual number of lambs born compared to the number of foetuses scanned indicated slightly above average embryo losses between scanning and birth. Average embryo losses of around 15% between scanning and birth can be experienced in commercial flocks (pers. comm. LTEM) whereas in this program, 18.7% (203 scanned, 165 born) of foetuses were lost post scanning. Analysis of embryo loss against ewe condition score showed a marginally higher risk of loss with higher condition score but this was more than likely due to the higher incidence of multiples with higher condition scores. Of the ewes that lost embryos, there was a high proportion of total embryo loss with 50% of the ewes losing all scanned embryos. Once again there was no relationship between total embryo loss and ewe condition score.
It would therefore seem that given good post AI nutrition and management, high ewe condition score does not adversely affect embryo survival.

Acknowledgements

References

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