LONG TERM PRE-CONDITIONING OF EWES PRIOR TO ARTIFICIAL INSEMINATION PROGRAM – POSSIBLE EFFECT ON SUCCESS RATE

Murray Long
ClearView Consultancy
www.clearviewconsulting.com.au

Introduction

Artificial Insemination (AI) programs continue to be an integral part of many breeding programs in an attempt for breeders to increase performance or correct trait deficiencies in breeding programs. With the price of semen from some high-performance sires becoming significant and the costs of drugs associated with synchronisation rising, successful conception rates are essential to justifying the decision to undertake an AI program.

Despite many years of 'trial and error', there still seems to be no magic formula to ensure success. What tends to work in one year does not seem to provide the same success in other years, what works for one breeder can be a disaster for another so despite some general procedures to follow, the success of AI programs can be highly variable. Stress, breed type and climate are known to influence results and a previous trial conducted at the Temora Agricultural Innovation Centre (TAIC) demonstrated the influence Condition Score (CS) had on conception rates and percentage of multiples (Long, 2016). While the condition of ewes at the time of AI is important, what effect does a relatively long period of preconditioning have on success rates? There is definitely some theories that the ultimate success of any program is influenced by management strategies well before the weeks leading up to an AI program.

Method

As part of the Meat and Livestock Australia (MLA) resource flock located at the Temora Agricultural Innovation Centre (TAIC), 300 mixed aged White Suffolk ewes were joined using laparoscopic AI on the 31stJanuary/1st February 2017. 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 had had vastly different histories for the 12 months prior to commencement of AI programming with one group flushed on Lucerne before CIDR insertion.

Top mob - The ewes from the previous years AI program at TAIC which had been grazed on Lucerne all through lambing to weaning when they were shifted onto cereal stubbles through to AI

General mob – These ewes lambed down and reared lambs on natural pasture the previous year at TAIC and were moved to Lucerne after their lambs were weaned. They were blended with the other mobs AI at CIDR insertion.

Home mob – A group of ewes that were introduced to TAIC from a dryland block where they had lambed and weaned lambs on natural pasture. Upon being shifted to TAIC, were given first preference on cereal stubbles through to CIDR insertion when combined with the other mobs.

The ewes were assessed for condition score at weaning the previous year, condition scored and weighed prior to being programmed, at scanning, conditioned scored at lambing and weights and

condition scores taken at weaning. The objective was to, despite the different histories, achieve similar condition scores and weights on all ewes at AI (see Table 1)

Table 1. Average Condition score and weights at stages during trial.

	WEAN 2016	**JOINING 2017**		**SCANNING 2017**		**PRE LAMBING**	**WEANING 2017**	
	CS	**CS**	**WT**	**CS**	**WT**	**CS**	**CS**	**WT**
TOP	3.7	4.1	85.2	4	88.5	4	4	92.3
GENERAL	2.6	4.2	86.9	3.9	86	3.7	4.1	98
HOME	2.8	3.5	75	3.6	82.4	3.7	4	95.6
AVERAGE		**4.0**	**83.2**	**3.9**	**86.6**	**3.9**	**4**	**97.1**

All mobs were combined at CIDR insertion and run together to AI from which the AI sires were randomly allocated. The program was conducted over 2 days which also provided vastly different climatic scenario as seen in Table 2. The effect of the different temperatures on conception was also assessed.

Table 2. Climate data from TAIC for the days of the AI program

TEMORA	**MIN Temp. (°C)**	**MAX Temp. (°C)**	**Rainfall (mm)**	**Comment**
31st January 2017	21.0	37.1	0	Followed 43 °C day
1st February 2017	19.4	22.9	2.4	*Lowest Max in Feb*

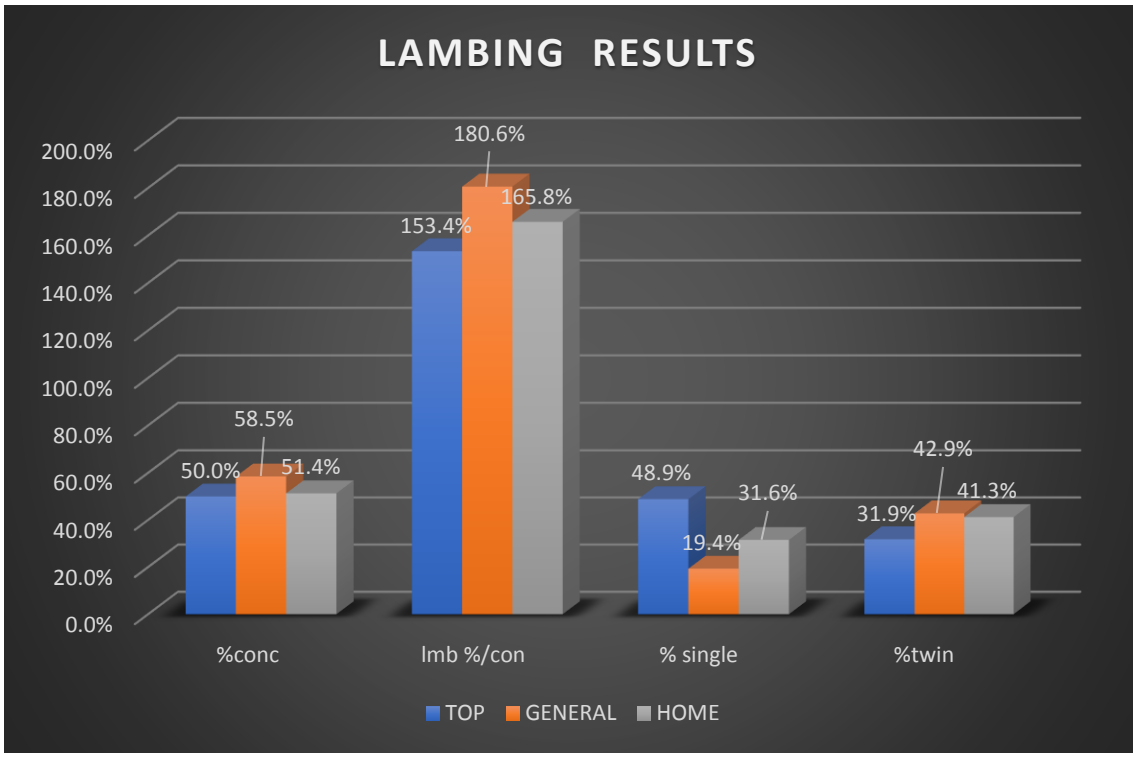
Following AI, the combined mobs were managed together on cereal stubble until lambing when they were placed on Lucerne through lambing to weaning. Backup rams were introduced at day 12 post AI and scanning conducted at 66 days post AI. At pregnancy scanning, the ewes were assessed as either in lamb to the AI program (singles and multiples), in lamb to the backup ram (backup) or dry at that time. The rams were still with the ewes at scanning raising the possibility that some of the dry ewes may have had undetectable foetuses. All but Two (2) ewes from the combined mobs eventually lambed however the early scanning did perhaps indicate the readiness of the ewes to conceive quickly to the backup ram once AI had failed.

Results

The AI program delivered an overall conception rate across the two days of 52%, just below the average figure for you would expect for terminal ewes (industry average 60-65%). However, there was a range in conception rates across the treatments with the GENERAL mob having the best success rate (59%) and the TOP and HOME mob averaging 50% and 51% respectively.

When the lambing percentage was calculated for each treatment, the difference between the treatments was even more evident. The GENERAL mob had a lambing percentage of 181% whereas the TOP mob was 153% and the HOME mob slightly better at 166%. This was as a result of the number of multiples conceived compared to singes as seen in Figure 1. with almost half the conceptions in the TOP mob being singles compared to only 19% in the GENERAL mob. With only 3 sets of triplets scanned across the treatments, these were not included in the results.

Figure 1. Comparison of lambing percentages across treatments



When the results of the scanning in relation to the conceptions from the backup ram were analysed, it was the TOP mob that had the highest percentage of ewes immediately conceiving (85%) and consequently the lowest percentage of dry ewes detected at the early scanning. The GENERAL mob was the next best at conception to the backup ram (73%) with the HOME mob not as quick to conceive to the backup (69%) and consequently the highest percentage of dry ewes. It must be remembered that all but 2 of these ewes across all treatments lambed so this comparison is only looking at the ability of the ewes to get in lamb immediately after the AI failed which may provide some indication of the difference between conception using AI compared to natural joining.

The effect of temperature on success rate was not as you might initially expect with the ewes inseminated on 31st January (hotter day) achieving a conception rate of 57.2% while those inseminated on the cooler day (1st February) had a conception rate of 48.5%. The breakup of these results is seen in Table 3.

Table 3. Effect of temperature conditions on conception rates

	DAY 1 (31st January)	**DAY2 (1st February)**
CONCEPTION %	57.2%	48.5%
SINGLES	21.4%	20.1%
TWINS/TRIPLETS	35.9%	28.6%
DRY	11.3%	8.0%
BACKUP	31.4%	43.3%

Discussion

Initial comparison of the results would seem to indicate that maintaining ewes at a high condition score and body weight through lambing to the following joining seems to hinder good conception in an AI program. This not only affected conception but also the lambing percentage with a much

higher proportion of singles to multiples. The best results were achieved by using ewes that had reared lambs and lost condition score which was subsequently increased leading up to AI by grazing on Lucerne. The ewes that were grazed on good cereal stubbles to increase body CS and weight (HOME) did not achieve the same gain in conception and lambing percentage as the GENERAL mob but still much better than the TOP mob. Was this a Lucerne effect or was there something else driving the gain in conception? It has long been considered that Lucerne associated with AI programs is not conducive to successful conception rates which tends to conflict with the flushing effect of Lucerne in natural joining programs (MLA news, 2016). The other finding from this study that seems to confirm that AI programs are inherently different to the processes of natural joining is the ease at which a majority of the TOP mob fell immediately in lamb to the backup ram but failed to achieve good conception rates to AI.

So, what could be the reason for the differences in conception and lambing percentages in this study? There has long been the belief that it is not what happens on the day or the days leading up to an AI program that determines the success of the program but it all happens well before AI date. If we isolate the condition scores of the 3 treatments and look at the increase in CS between weaning in 2016 and joining in 2017 ((4 months), there is a good relationship between the magnitude of increase in CS and the success of the program as seen in Figure 2 and 3.

Figure 2. Increase in condition score effect on AI Conception

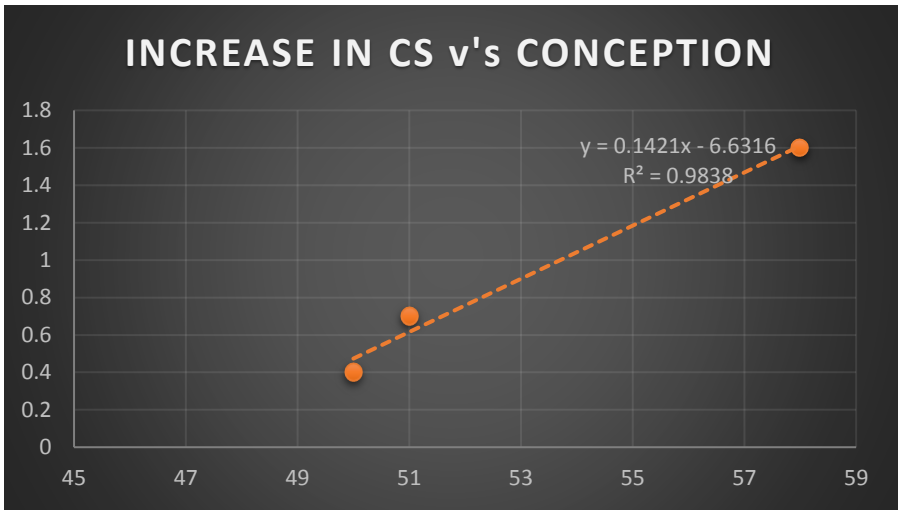
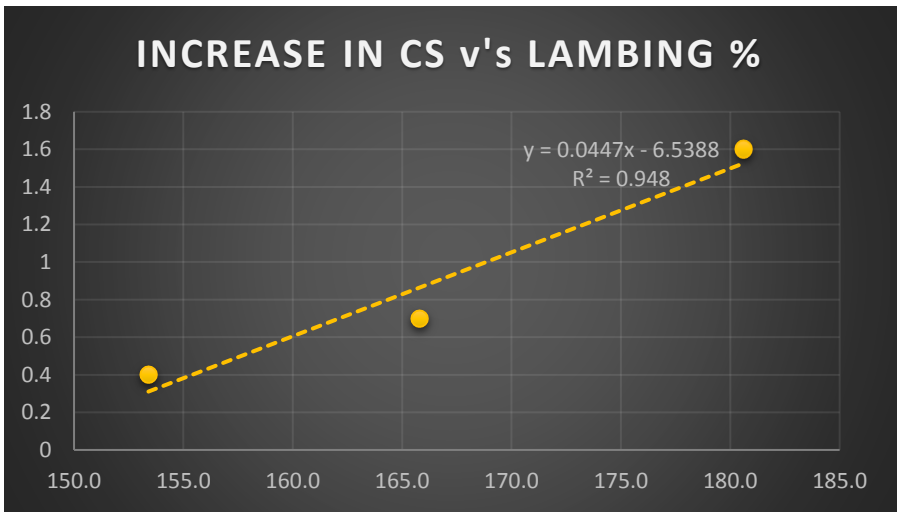


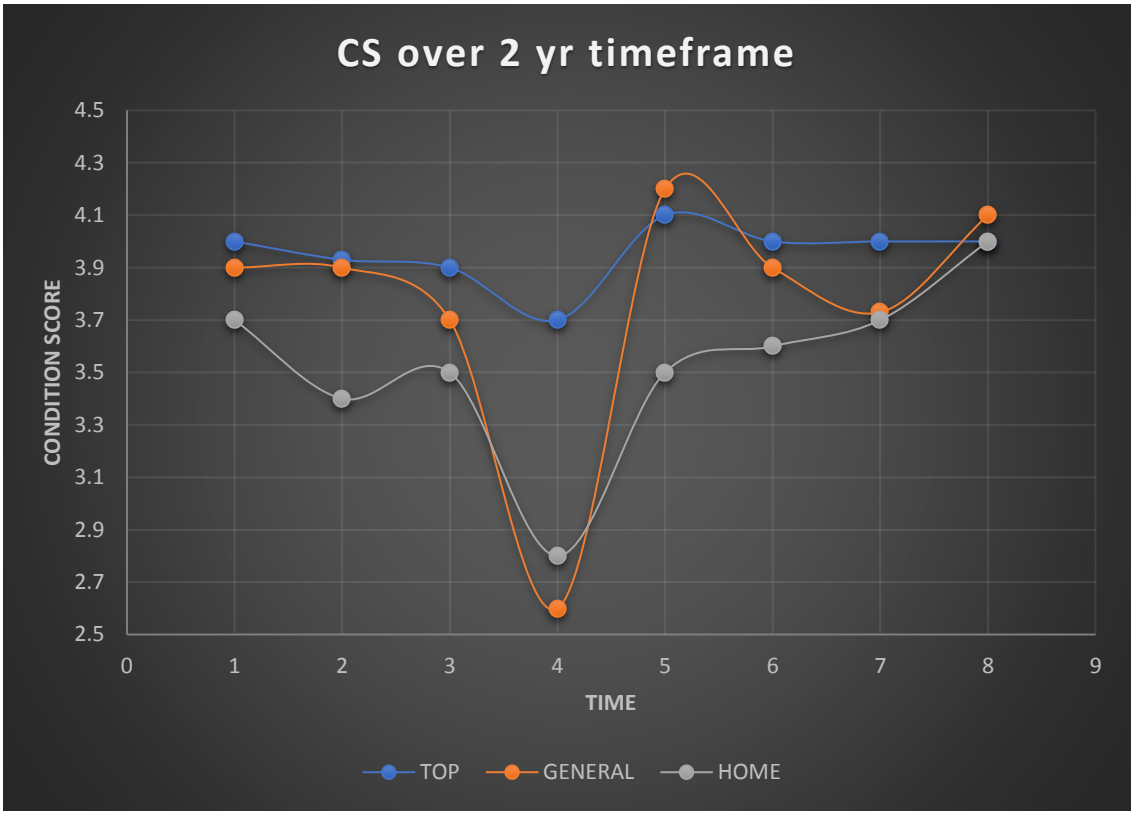
Figure 3. Increase in Condition Score and effect on lambing percentage



Although the number of data points is limited to the average of the 3 treatments, there is a general trend indicating the bigger the differential (increase) in CS between weaning and joining with AI, the better the success rate of the AI program. The effect using Lucerne had on this result cannot be determined but if there was any negative effect attributable to the Lucerne itself, it has been well and truly compensated for by the greater increase in condition score. This result of dropping CS and then "rebuilding" condition to joining has been espoused by many good sheep breeders as essential to gaining the best results from a breeding program. The general rule of thumb for an AI program is to have them on a rising plane of nutrition leading up to and continuing through the AI program. This was the case in this program as the ewes continued to gain weight and CS post AI, but it may also be the degree of the increase in CS that has an effect.

Figure 4 shows the variation in condition score from joining in 2016 (1) scanning 2016 (2), lambing 2016 (3), weaning 2016 (4), joining 2017 (5), scanning 2017 (6), lambing 2017 (7) and weaning 2017 (8) and it can be seen that theTOP mob had minimal variation in CS over almost a 2 year period whereas the other 2 mobs dropped condition score, especially during 2016 lambing (3-4).

Figure 4. Variation in condition score over 22 month period



The effect of temperature on the day of the AI program is perhaps further evidence that it is not so much the influence of a single occurrence but a combination of events that ultimately determines the success or otherwise of an AI program. The process itself assumes that, given the ewes are cycling on the day of insemination, all ewes will be potentially in lamb when they are returned to the paddock. It is the combination of events that happen around that day that ultimately determines whether the embryo 'sticks' or not. The fact that the cooler day produced a lower conception rate does not correspond with the theory that heat stress is detrimental to good AI success but there are potentially many other factors that could have affected the result? It has also been noted that electrical storms around the time of an AI program has a negative effect on conception rate (personal discussion), an occurrence which was evident on the 1st February. The week following AI

was a week of extreme temperatures peaking at 45°C around the critical days for embryo survival of 8-9 days post AI. The procedures followed were the same for both days; the result is just another anomaly of AI and why results are sometimes highly unpredictable.

Acknowledgements

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