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Managing Scanned Ewes – Sheep CRC Workshop Series

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Summary

Estimates suggest about 30% of the national ewe flock is scanned to determine pregnancy status. Most of the scanning is said to identify wet and dry ewes; scanning ewes for twins is increasing and, more recently, so too is foetal ageing. Evidence is building that supports the value of pregnancy scanning using ultrasound, with benefits for the ewe, the lamb and their production. The Co-operative Research Centre for Sheep Industry Innovation (Sheep CRC) supported the 'Managing Scanned Ewes' (MSE) workshop series, which was delivered between 2009 and 2012. The workshops were attended by 1571 producers, who were responsible for over 3.14 million sheep. These workshops aimed to: extend the practice of pregnancy scanning and ewe management to producers across the nation; increase adoption of scanning; and increase the productivity of the national ewe flock. This paper reviews available literature on the benefits of pregnancy scanning and presents a summary of the workshop presentations and the outcomes of the MSE workshops.

Introduction

There are currently 110 pregnancy scanners operating in Australia. These operators are estimated to be scanning approximately 30% of the national ewe flock. Thus, the number of scanned ewes is around 12 million, of which about 60% (7.2 million) are scanned for wet and dry (pregnant or not pregnant), while the remainder are scanned to identify twin lambs (4.8 million). It is expected that the number of ewes scanned will continue to increase with concomitant increases in the number of ewes scanned for twins.

At the November 2012 national conference for pregnancy scanners, the 40 operators in attendance indicated that the number of producers requesting scanning for twin lambs was increasing, was higher among crossbreed producers and was higher in high rainfall environments. Among Merino producers and in lower rainfall environments, scanning requests were more commonly for wet and dry status. Requests to estimate foetal age are also increasing, again with more crossbred producers in particular asking for the late mated ewes to be additionally drafted or identified.

Review of literature

Real-time ultrasound scanning of ewes at gestational ages between D50 and D100, is a safe and practicable means of diagnosing pregnancy status (White *et al.* 1984), with accuracies of 97% for the number of lambs born compared to the number of foeti identified (Fowler and Wilkins 1984). Real-time ultrasound can be used to identify pregnancy status from as early as D25 to the point of lambing and can also be used to identify reproductive tract disease in the male and female (Buckrell 1988). Current recommendations are to diagnose pregnancy at 45 days post-breeding, at which stage accuracy is sufficiently high (Goel and Agrawal 1992).

Identifying pregnancy status provides the opportunity to reduce nutritional supply to dry ewes and enhance nutrition for twin bearing ewes. The first implication of pregnancy status diagnosis is that flock segmentation is required to realise the potential benefits. For the benefits of scanning to be maximised, the opportunities it provides to increase selection pressure for improved fecundity, reduced reproductive wastage and increased wool production must be utilized (Bowman *et al.* 1989).

The first Australian publication examining the potential of real time ultrasound in pregnancy diagnosis was that of Fowler and Wilkins (1984). That study was undertaken with a slow operator scanning speed of one minute per sheep. The study was able to demonstrate accuracy of pregnancy diagnosis to be 99.4%, with an accuracy for the number of foeti present being 97%. Factors affecting accuracy included litter size and foetal age. Diagnosing pregnancy in ewes at 40-47 days post-mating was 93% accurate, which returning to 98% for ewes at 56 to 96 days. Scanning for wet and dry was 100% accurate, identification of single lambs was 98% accurate and for twins was 68-80%. Improving techniques and increasing the time taken to examine ewes increased twin accuracy to 93.8%. Differences between operators were small, but training was recommended to lift accuracy. The most common error was twins being present in ewes scanned as singles. Triplets and quadruplets were generally inaccurately identified, but were at least always identified as twins.

Curnow *et al.* (2011) discusses the complexity of on-farm adoption, highlighting variation between farmers in their attitude to risk, their knowledge and skill levels and their confidence under peer review by neighbours as common barriers. Vanclay (2004) discussed up to 27 principles affecting adoption of technology and practices by farmers, 16 of which relate to sheep-focussed farm systems, the most important being that technology is not automatically legitimised because it is scientific and the perception of low profitability in particular farmers' environments associated with various technologies. What is clearly needed is an examination of the motivations for scanning practice across regions, supported by economic analysis to highlight the conditions when pregnancy scanning is profitable, and under what circumstances it is not.

The value of pregnancy scanning

There continues to be disagreement about the value pregnancy scanning offers producers. Studies of producer focus groups in Western Australia found a dichotomous view towards pregnancy scanning. Some producers felt it was an essential tool to manage scarce nutrition; others felt it was not worth the cost. Those producers who did not favour pregnancy scanning tended to be happier with their flock fertility and lamb survival rates (Elliot 2011). The strong view was that in flocks with very high fertility rates (the number of ewes pregnant per ewe mated), there was no value in scanning, no saving of feed costs in removing "half a dozen dry ewes in a hundred". This demonstrates an economic approach is taken by producers to the importance of pregnancy scanning, but which does not consider the biological (genetic) ramifications. The genetic value is long term improvement of flock reproduction. What the sheep industry requires is a set of conditions that need to be met before a positive return on investment can be achieved, for a wide range of environments and business structures (i.e. location, dam breed, proportion of wethers and proportion of crossbreeding).

Economic modelling of the value of pregnancy scanning in South West Victoria suggested benefits of pregnancy scanning of about $1.55 per ewe (Young 2008). Identification of dry ewes and their sale after shearing was the most significant contributor to the return on investment (60% of profit), while management of twins as a separate mob accounted for 40%. If dry ewes are 5% or less there was no value in scanning and only when twin rates were 15% or more, did it become profitable to scan for litter size. The cost of scanning itself, per ewe, had a relatively minor influence on the return on investment in scanning and, hence, should have an equally minor influence on the decision to scan for pregnancy status (Young 2008). This economic study revealed the circumstantial conditions that need to be considered by the producer to capture the full value of scanning.

Holmes and Sackett (2006) examined scanning ewes for twins and identifying foetal age. Recommendations were made to maintain the condition of single bearing ewes that will lamb in the first cycle and to supplement twin bearing Merino ewes to avoid dramatic loss of condition (i.e. so the ewe does not lamb in less than condition score two). At feed costs of $170 per tonne, the breakeven price was $25 per Merino lamb. It was important that improvements in twin lamb survival occur. The advice for the management of crossbred ewes, when lambs were valued at a $60, was not as clear.

In a later edition, Holmes and Sackett (2008) stated that for crossbred producers to justify the cost of scanning and feeding twin bearing ewes, there needs to be at least 10% dry ewes in the flock. That modelling assumed improvements in lamb survival were uneconomic for crossbred ewes and deliberately aimed to offer ewes 75% of their maintenance requirement. For Merino producers, modelling showed similar returns to crossbred ewes, when the proportion of dry ewes was around 10%. The return on investment in scanning increases when the proportion of twin ewes increases. The take-home message from Holmes and Sackett (2008) was that it was more profitable no to scan but ensure adequate nutrition for ewes in late pregnancy, managing them as if the whole flock were bearing a single lamb and were to lamb in the first cycle of lambing, rather than scanning and managing according to pregnancy status.

It is not clear if any of the economic studies accounted for genetic gain, achieved via the additional selection pressure attained from the increased surplus of young sheep. Furthermore, the assumptions made in the models were based on reductions in lamb survival of average birthweight lambs and did not consider the much larger reduction in survival for already light weight lambs. As is discussed later in this paper, there are also benefits for the dam's fleece weight and ewe survival, as well as for the fleece and liveweight of the offspring. Improving aspects of reproduction is not simply about the economics, however, implications for animal welfare (ewes and lambs) must be considered. For example, some authors have posited that lamb mortality rates of greater than 5% are unacceptable (Fragkou *et al.* 2010). Lamb mortality rates in Australian are commonly between 15 and 20% (Hinch 2008).

Scanning for litter size

There is some debate about the benefits of scanning for litter size (twinning). The study undertaken by Hocking Edwards *et al.* (2011) is one of the best demonstrations of what pregnancy scanning can contribute to long and short term profitability. Some ewes were managed to lamb in body condition score 3 (Jefferies 1961; Russel *et al.* 1969), having been scanned for litter size. The study compared the performance of ewes managed for body condition score three (CS3) to ewes managed according to local practice. It was revealed that the normal practice resulted in ewes being fed 70-90% of their average requirements during early to late pregnancy, only meeting 100% of the requirement of single bearing ewes during lactation; 15% of the flock were bearing twins. Compared to the ewes managed according to local practice, those managed for CS3 had heavier fleeces and improved ewe survival. Of the progeny born to CS3 ewes, newborn lamb survival was significantly higher in single (+11%) and twin (+29%) lambs. Liveweight was higher at weaning and to 6 months of age, by which time the single lambs of ewes managed according to local practice caught up to the twin lambs of ewes managed to achieve CS3. Compared to the fibre production of all single-born lambs, the fleece weight over three shearings was no different for CS3 twins, with little or no difference for aspects such as fibre diameter or staple strength.

No formal examination of scanning practice across regions appears to have been undertaken. Anecdotally, adoption of twinning appears to have some regional distribution. Pregnancy scanners whose clients operate in rangelands and semi-arid environments are most commonly directed to wet and dry. Towards the Slopes and Tablelands, in the higher rainfall environments of NSW, pregnancy scanners are more commonly directed to 'twin' the ewes and "spray-mark the lates".

Scanning for foetal age

Adoption of scanning for foetal age appears to attract a growing interest, but there has been no formal study of the value of ageing to producers.

Early Australian work was able to develop models for age prediction based on the length of the metacarpal (cannon) bone and the biparietal (skull) diameter (Greenwood *et al.* 2002). In that study, estimates of foetal age were made to 5 days of age. In examining a single operator, Robertson *et al.* (2012) found that estimating age to 5 days was too imprecise. Ageing to 5 days was satisfactory for lambs 10.5 and 12 weeks of age, but was not satisfactory for lambs 10 weeks and younger. Those authors, however, continued to support grouping scanned ewes into early and late mobs. It is

recommended that producers wanting to separate groups of ewes into foetal age mobs need to make some assessment of the accuracy of their operator before establishing the practice as a routine activity. It could be reasonably assumed that operators improve their accuracy with experience and sufficient feedback. In which case, continued advanced training for operators is likely to yield improvements on the return on investment for foetal aging and twinning.

Future uses for pregnancy scanning might also include scanning pelvic dimensions to identify ewes with elevated probabilities of dystocia, and to do so early in life, before mating maiden ewes (Warren *et al.* 2012). It might be possible to select rams on this basis also, to mate to large or smaller pelvis ewes.

Managing scanned ewes - workshop program

Since 2009, 78 managing scanned ewes (MSE) workshops have been undertaken. These workshops have been attended by more than 1500 producers (Table 1), under whose management were more than 3.14 million sheep. The MSE workshops were held in each sheep producing state, with NSW, Victoria and South Australian producers hosting the most (Table 2).

Table 1. Total number of workshops, their participants and the number of sheep managed by participants for each year of the program

Year of workshop	No. of workshops	No. of participants	No. of sheep
2009	28	501	901,360
2010	16	363	777,610
2011	14	317	695,490
2012	16	321	595,180
2013	4	89	175,100
Total	**78**	**1519**	**3,144,740**

Table 2. Total number of workshops, their participants and the number of sheep managed by participants by state

State	No. of Workshops	No. of Participants	No. of Sheep
NSW	27	678	1,099,040
Vic	22	436	709,260
SA	15	251	538,660
Qld	8	142	385,770
Tas	2	44	215,230
WA	2	25	na[#]
Total	**76**	**1571**	**3,145,370**

[#]na, no data was available

Surveys in 2011 of MSE workshop participants attending during 2010 and up to June 2011 revealed that 51% of participants felt the workshop had a major or moderate impact on their flock reproduction, with 75% reporting increases of 10 to 15% in lambing percentage. This improvement was attributed to higher conception rates, better lamb survival or both. The majority of producers (75%) aimed to get their flock in condition score 3 for lambing.

Since attending the workshop, 79% of producers scan for twins, compared to 49% prior to attending. After scanning, 63% tried to manage their mobs according to nutritional and management needs, yet only 55% examined udders for wet and dry ewes after lambing (Hatcher *et al.*, 2013). Other practice changes included 74% of respondents selecting better lambing paddocks, providing more

shelter, creating smaller lambing-mob sizes and providing some supplementation for twin bearing ewes.

National scanners training workshops

Training workshops have been provided to improve the consistency and quality of sheep scanning. At these workshops pregnancy scanners are provided with updates on technology and are retrained in the methods of identifying litter size and estimating foetal age. Table 3 lists the number and location of workshops which have been undertaken since 2011. The process of gathering the scanners has helped to identify reproduction issues and make observations of adoption within the industry. In the absence of the Sheep CRC providing support for training workshops, there remains a strong enthusiasm among existing operators to continue group training events, which may be self-funded events.

Table 3. Location, date and number of scanners attending scanner-training workshops

Location	Date	Number scanners
Burra SA	February 2011	10
Uralla NSW	March 2011	5
Canowindra NSW	November 2012	25
Bendigo Vic	July 2010	50*
Canowindra NSW	November 2012	40*

*Workshop held as part of the National Scanners Conference

Managing scanned ewes - workshop content

By 2007 the national flock had fallen in size to around 71 million sheep (ABARE 2007). Adding to the pressure on the flock size was a record high lamb slaughtering. These facts motivated the Sheep CRC commitment to the MSE program.

The MSE workshops centred on re-educating producers on topics of reproduction management and discussed how to include pregnancy scanning into existing management programs. The discussions focussed on management interventions relevant to issues such as: matching feed supply to feed demand; identifying critical times of the reproduction cycle; managing sheep health; ewe condition; causes of lamb mortality; how to plan a successful scanning; how to manage dry, single and twin bearing ewes; how to undertake selection for reproduction and what level of gross margin was associated with different levels of reproduction for a range of enterprises.

Key messages of the MSE workshops included selection of ewes for fertility, where identifying twice dry ewes and culling them achieved the greatest rate of gain in flock fertility while removing the smallest fraction of ewes. Pasture quantity targets were identified for single- and twin-bearing ewes and producers were shown how to assess ewe fatness. Benchmark fatness values were identified for the stages of reproduction. Producers were also shown how to assess reproduction levels in their flock and were encouraged to develop annual management programs to achieve improved reproduction and to consistently refer back to them.

Conclusions

The number of ewes being pregnancy scanned across Australia is increasing. This suggests that producers view pregnancy scanning as a means to cost-effectively increase weaning rates. The science examining the value of pregnancy scanning demonstrates that it is accurate and offers improvement to ewe and lamb survival and subsequent productivity, but that the degree of complexity pregnancy scanning offers in terms of flock segmentation and supplementation needs to be considered against both economic and genetic circumstances. The MSE workshops have delivered high quality ewe management information to a large group of producers, to support the growth of the practice. Decisions on how to incorporate pregnancy scanning into their flock need to consider a range of important factors including economic, genetic and welfare outcomes. The MSE workshops have been

able to do this for the participants, whose changes in sheep management have resulted in increases in weaning rates.

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