

BRIEF COMMUNICATION: Ewe ultra-sound pregnancy diagnosis and its use by New Zealand farmers

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Introduction

Ultra-sound pregnancy diagnosis can be a valuable management tool for sheep farmers. The benefits include early identification of non-pregnant (dry) ewes which can be culled, freeing up valuable feed for pregnant ewes (Blair 1986) and the identification of single, twin and triplet fetuses, allowing ewes to be fed based on their specific nutritional requirements during pregnancy (Garrick 1998). In addition, selection of lambing paddocks can be made based on the number of fetuses identified (Garrick 1998).

Currently, in New Zealand, farmers can choose between several pregnancy diagnosis options: identification of pregnant ewes (wet/dry), identification of dry ewes or single or multiple fetuses (dry/single/multiple) or identification of the number of fetuses (dry/single/twin/triplet). However, there is currently little information on the uptake of the use of ultra-sound pregnancy diagnosis as a management tool and the factors that influence its utilization, in particular farmer age.

Materials and methods

A printed survey was distributed to ~12,000 sheep farmers within the 'Heartland Sheep magazine' (NZX Agri, Feilding New Zealand) in October 2012. A total of 1007 surveys were returned. The survey contained the question "Which of the following best describes your use of ultrasound pregnancy scanning?". The options provided were "Not used", "Only sample % of ewes scanned", "Wet/Dry", "Dry/Single/Multiple", or "Dry/Single/Twin/Triplet". In addition, farmers were asked to provide their age (based on age categories) and their scanning (number of fetuses per 100 ewes presented for breeding) and lambing percentages (lambs tailed per 100 ewes presented for breeding) for ewe lambs (5 to 7 months of age) and mixed age (MA) ewes in 2011. It should be noted that it is normal practice for farmers undertaking Dry/Single/Multiple option to be given a scanning percentage calculated based on dry, single and twin ewes and no allowance is made for triplet fetuses.

Of the 1007 respondents, 971 provided useable data. Of those 971 respondents, 936 provided age information, therefore, the analyses were conducted using data from 936 respondents. All statistical analyses were conducted using SAS (SAS Institute, Cary, NC, USA). The percentage of respondents that used each type of diagnosis option and the percentage within each age category (<40 years (n=144), 40 to 49 (n=194), 50 to 59 (n=326) and >60 years of age (n=302)), was determined using a generalized model using a logit transformation. The model contained diagnosis option and age as fixed effects. The scanning percentages reported by respondents that used each type of diagnosis option was analysed using a general linear model which included the fixed effect of diagnosis type. The relationship between scanning and lambing percentages was determined for those respondents that utilised the Dry/Single/Twin/Triplet option only, using a linear regression model. Other scanning classes were not considered because they could not provide total fetal numbers.

Results and discussion

Pregnancy scanning type

Approximately one quarter of all respondents did not use pregnancy diagnosis as a management tool (Table 1). When examined by age it was apparent that older respondents were less likely to use this tool. Across all age categories, the most commonly used ultra-sound pregnancy diagnosis option was Dry/Single/Multiple followed by Dry/Single/Twin/Triplet (Table 1). The Dry/Single/Multiple option provides the farmer with information that allows for removal of non-pregnant (dry) ewes, preferential feeding and selection of lambing paddocks for multiple-bearing ewes but at a slightly lower cost than Dry/Single/Twin/Triplet (\$0.55 vs \$0.75 / ewe; Pangborn 2010). There are additional potential benefits of utilising the Dry/Single/Twin/Triplet diagnosis option. Triplet-bearing ewes have greater nutritional requirements in late-pregnancy and lactation than twin-bearing ewes (Morris & Kenyon 2004; Nicol & Brookes 2007). In addition, they give birth to lighter lambs which are more susceptible to death by starvation and exposure

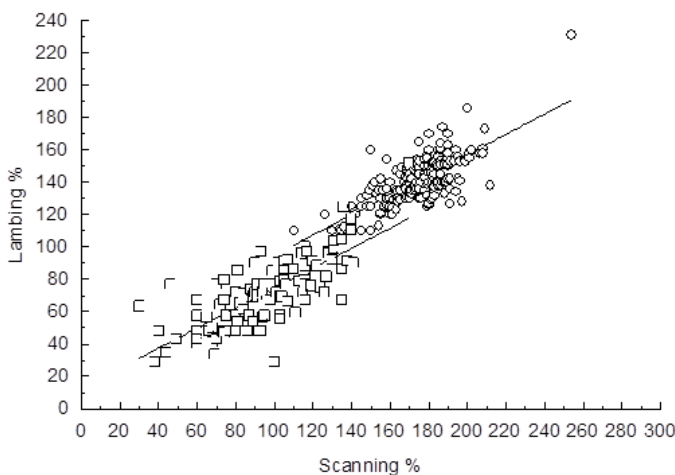
Table 1 The percentage (back-transformed mean with 95% confidence interval in parentheses) of all survey respondents, or respondents according to their age category (<40, 40-49, 50-59 and > 60 years of age), that used each pregnancy diagnosis option (not used, only sample %, Wet/dry, Dry/single/multiple or Dry/single/twin/triplet).

Pregnancy scanning option	Age of respondent				
	All respondents ‡	<40 years	40 - 49 years	50 - 59 years	≥60 years
n	971	114	194	326	302
Not used †	27.9 ^v (25.2 - 30.8)	11.8 ^a (7.5 - 18.2)	16.5 ^a (11.9 - 22.4)	26.7 ^b (22.2 - 31.8)	47.7 ^c (42.1 - 53.3)
Only sample % †	1.9 ^v (1.2 - 2.9)	2.8 (1.0 - 7.2)	1.0 (0.3 - 4.0)	2.5 (1.2 - 4.8)	1.7 (0.7 - 3.9)
Wet/dry †	4.1 ^w (3.0 - 5.5)	3.5 (1.5 - 8.1)	4.6 (2.4 - 8.7)	5.5 (3.5 - 8.6)	3.0 (1.6 - 5.6)
Dry/single/multiple †	40.4 ^z (37.4 - 43.5)	54.9 ^c (46.7 - 62.8)	50.5 ^c (43.5 - 57.5)	41.1 ^b (35.9 - 46.5)	31.8 ^a (26.8 - 37.3)
Dry/single/twin/triplet †	21.9 ^x (19.4 - 24.5)	27.1 ^b (20.5 - 34.9)	27.3 ^b (21.5 - 34.0)	24.2 ^b (19.9 - 29.2)	15.9 ^a (12.2 - 20.5)

† ^{abc} within rows superscripts that differ indicate that means are significantly different amongst age categories (P<0.05)

‡ ^{vwxyz} within columns superscripts that differ indicate that means are significantly different (P<0.05)

Figure 1 Scatterplot of scanning percentage (number of fetuses per 100 ewe presented for breeding) and lambing percentage (lambs tailed per 100 ewes presented for breeding) of ewes (circles) and ewe lambs (squares). The linear regression equations were: ewe lamb lambing percentage = 13.4 + 0.64 x scanning percentage ($r^2=0.59$, P<0.05) and MA ewes lambing percentage = 32.8 + 0.62 x scanning percentage ($r^2 = 0.54$, P<0.05).



(Scales et al. 1986; Kenyon et al. 2002). Therefore, if feeding levels do not allow for all ewes to be fed to their requirements, or if there is a shortage of lambing paddocks with adequate shelter, benefits from knowing which ewes were bearing triplets may be expected. However, when there is adequate feed available, there are fewer benefits to be gained by identifying ewes with triplets. Further analyses are needed to determine the potential cost/benefit of identifying multiples as opposed to twin and triplets as it is likely to vary across scanning percentages.

Scanning percentages

For MA ewes, the reported scanning percentage was $165.0 \pm 0.7\%$ (back-transformed logit mean \pm S.E.M.). The scanning percentage reported by respondents that utilised the Dry/Single/Multiple diagnosis option was $161.2 \pm 0.9\%$ which was less (P<0.05) than reported by Dry/Single/Twin/Triplet respondents ($173.8 \pm 1.2\%$). This equates to a difference of 12.6%. Based on the predictions of Amer et al. (1999) for a flock scanning percentage of 175%, the percentage of triplet-bearing ewes is 5%, indicating that the difference in the scanning percentage was not due solely to the identification of triplets, suggesting that farmers using Dry/Single/Multiple may be underestimating by up to 12 fetuses for every 100 ewes. However, this does assume that the distribution of single, twin and triplet fetuses in the national population is similar to that modelled by Amer et al. (1999). Alternatively, differences in scanning percentages may indicate that the

Dry/Single/Twin/Triplet option was used on farms with higher scanning percentages where the perceived benefits are greater due to the greater number of ewes bearing triplets.

Lambing percentage

Lambing percentages reported by respondents that utilised the Dry/Single/Twin/Triplet option was 74.3 ± 2 and $140.9 \pm 1.3\%$ for ewe lambs and MA ewes, respectively. In 2011, the national lambing percentage for ewe lambs was 43% and for MA ewes was 118% (Statistics New Zealand 2012). The magnitude of the differences in lambing percentages reported in the current study compared with the

national statistics suggests that farmers that provided data on MA ewes were more representative of the industry (survey respondents had scanning %'s 1.19 times greater than national average) than those who provided ewe-lamb data (1.73 times greater). The ewe lamb lambing percentages in the current study were greater than those reported from survey data collected in 2002 of approximately 60% (Kenyon et al. 2004).

Relationship between scanning and lambing percentages (Dry/Single/Twin/Triplet respondents only)

Figure 1 illustrates the relationship between scanning and lambing percentages of both ewe lambs and MA ewes. The regression equation indicates that the difference in percentage between scanning and lambing for ewe lambs and MA ewes was 26 and 23 fetuses per 100 ewes presented for breeding, respectively. In a similar analysis of survey data from farms in the Marlborough region, Anderson and Sewell (2000) reported a scanning percentage of 150% that resulted in a lambing percentage of 123%, which is comparable with 125% in the current study for MA ewes. These figures can be a ready-reckoner for farmers to determine if their losses are above or below the industry average.

Implications

The results of this study showed that although the use of ultra-sound pregnancy scanning was relatively common there remain a significant percentage of farmers (33.9%) that do not know the pregnancy status of their ewes. Therefore, feeding guidelines that are based on the differential feeding of ewes bearing singleton, twin and/or triplet fetuses are of limited use to these farmers. To encourage more farmers to utilise pregnancy scanning the benefits of differential management and nutrition of ewes of various pregnancy statuses needs to be highlighted.

Conclusion

This is the first study that has examined the use of pregnancy diagnosis at a national level in New Zealand. The use of pregnancy diagnosis by New Zealand sheep farmers appears greater within younger than older farmers. The identification of triplet pregnancies is less common than identification of multiple pregnancies, which may be due to either cost or a lack of perceived benefit from the additional information. The apparent lamb loss between

pregnancy diagnosis and weaning is similar to that reported more than a decade ago.

References

- Amer PR, McEwan JC, Dodds KG, Davis GH 1999. Economic values for ewe prolificacy and lamb survival in New Zealand sheep. *Livestock Production Science* 58: 75-90.
- Anderson PVA, Sewell J 2000. The significance and use of sheep scanning data. *The Society of Sheep and Beef Cattle Veterinarians of the New Zealand Veterinary Association*. Pg. 31-36.
- Blair HT 1986. The economics and benefits of pregnancy testing ewes. *Proceedings of the 16th Annual Seminar Society of Sheep and Beef Cattle Veterinarians of the New Zealand Veterinary Association* 90-99.
- Garrick DJ 1998. The potential benefits of knowing the pregnancy status of ewes. *The Society of Sheep and Beef Cattle Veterinarians of the New Zealand Veterinary Association*. Pg. 203-218.
- Kenyon PR, Morris ST, McCutcheon SN 2002. Does an increase in lamb birth weight through mid-pregnancy shearing necessarily mean an increase in lamb survival to weaning? *Proceedings of the New Zealand Society of Animal Production* 62: 53-56.
- Morris ST, Kenyon PR 2004. The effect of litter size and sward height on ewe and lamb performance. *New Zealand Journal of Agricultural Research* 47: 275-286.
- Nicol AM, Brookes IM 2007. The metabolisable energy requirements of grazing livestock. In: Rattray PV, Brookes IM, Nicol AM. eds. *Pasture and supplements for grazing animals*. Occasional Publication No. 14. The New Zealand Society of Animal Production. Hamilton, New Zealand.
- Pangborn J ed. 2010. *Financial budget manual*. Christchurch, New Zealand. Lincoln University. 661 p.
- Scales GH, Burton RN, Moss RA 1986. Lamb mortality, birth-weight, and nutrition in late pregnancy. *New Zealand Journal of Agricultural Research* 29: 75-82.
- Statistics New Zealand. 2012. *Sheep breeding statistics 1992 to 2012* [Online]. StatisticsNZ. Available: www.stats.govt.nz/infoshare [Accessed 18/07/12 2012].