REMOTE WEIGHING AND AUTODRAFTING OF PREGNANT MERINO EWES

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INTRODUCTION

Management of Merino ewes to maintain targeted ewe body weight and condition score during pregnancy improves lamb survival, ewe wool staple strength and results in finer wool from progeny (Thompson and Oldham, 2004; Behrendt et al. 2006). These benefits are of interest to sheep producers because they improve profit. Achievement of uniform live weight and condition score within a flock of pregnant ewes is difficult because of different pregnancy status and random variation among individuals. One means of overcoming this difficulty is preferential feeding of individual ewes according to requirements and live weight performance (differential management). In this paper we present results from semi-automated weighing and autodrafting to achieve ewe live weight and condition score targets. Then we examine a data screening procedure for more precise estimates of individual live weights from a fully automated weighing system on a commercial sheep rangeland enterprise.

DIFFERENTIAL MANAGEMENT

Although ewe live weight is important in reproduction and wool productivity, use in management is problematic as live weight *per se* is confounded with frame size. For that reason condition score has been advocated as a better reflection of fat and muscle tissue relating to body energy reserves (Jefferies, 1961).

At the CSIRO Chiswick Research Station in 2006 a total of 380 Merino ewes pregnant to AI were used for differential management. They were allocated by restricted randomization after pregnancy diagnosis to precision management and control groups run together as one mob according to local commercial practice on ryegrass–phalaris pasture. All ewes were fitted with radio frequency eartags and live weights were monitored twice weekly using fixed weighing. Condition scores (Jefferies, 1961) were assessed pre-mating for use in the prediction algorithm. From around days 50 to 120 of pregnancy, precision managed ewes were auto-drafted to lupin grain supplement, as determined from maternal body weight targets using a prediction algorithm (Geenty *et al.* 2007). The remainder, including controls, grazed a base pasture maintenance diet. All grazing ewes had continuous access to voluntary walk over weighing.

Ewe live weight targets

Maternal ewe body weights were estimated by the algorithm as actual live weight less the sum of the predicted weights of conceptus and greasy fleece. The decision to draft individuals in the precision managed group to lupin supplement was based on their maternal weight/condition score relative to the target condition score. Precision management aimed to maintain maternal body weight and condition score during days 40 to 120 of pregnancy. The Maternal Weight Calculator was written in Excel by NSW Department of Primary Industries Precision Management group within the Sheep CRC based on procedures in GrazFeed and GrassGro (Freer *et al.*, 1997). Details of the required data inputs are described by Geenty *et al.* (2007).

Equipment and layout

The yard layout included two holding pens for up to 400 ewes with fixed and walk over weighing platforms in parallel for entry to the second yard which also contained a watering point. A third smaller yard adjacent contained the lupin grain feeders and a water trough. Spear gates allowed animal access back to the main paddock from the second and third holding pens. This layout was a continuous loop. Ewes could voluntarily pass over the walk over weighing platform, for access to water and/or lupin grain when the autodrafting instruction allowed, then return to the paddock and base pasture ration. The fixed weighing simply used the same loop twice weekly. More detail is given by Geenty *et al.* (2007).

Ewe live weight changes, including weight of conceptus and fleece, and maternal body weights predicted by the algorithm, are shown for precision and control groups at Chiswick in Fig. 1.

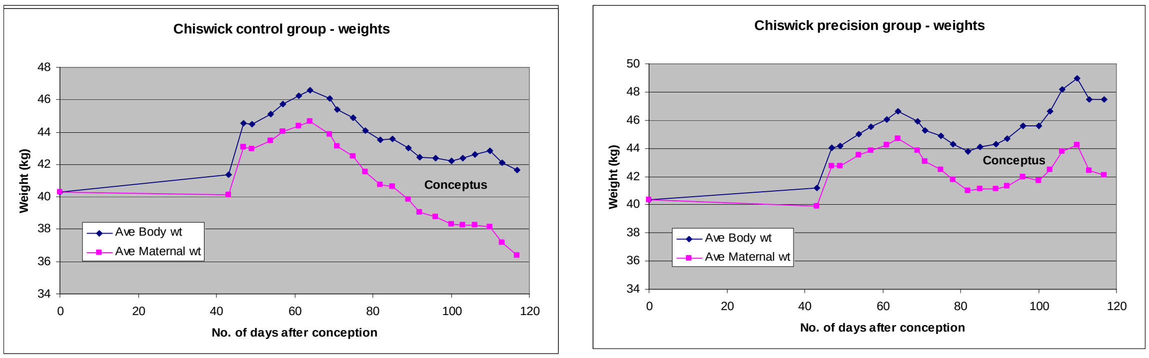

Fig 1: Ewe live weight and maternal body weight changes from conception and during the treatment period from days 40 to 120 of pregnancy.

The difference between ewe live weight and predicted maternal body weight at day 120 of pregnancy was 5.3 kg and similar in both precision and control groups. The difference in maternal body weight between precision managed and control ewes was minimal during early pregnancy but by day 120 of pregnancy precision managed ewes were 5.7 kg heavier than control ewes ($P<0.01$). Following parturition body weight differences between precision managed and control groups declined at lamb marking (4-5 weeks after lambing) to around 2.0 kg and to 0.7 kg at weaning (10-12 weeks after lambing) as the ewes gained weight.

Discussion

If a semi- or fully-automated system is to be developed for commercial producers, remote walk-over-weighing needs to be used for data capture and drafting decisions. In the current project with the Chiswick platform an average of 309 ewes (81% of the total) voluntarily walked over per day for the entire treatment period from days 40–120 of pregnancy. Those not walking over each day varied, but all ewes walked over at least once.

Accuracy of live weight collection will have consequences for ewe management through estimates of maternal condition score. In the Chiswick study, liveweights used for management were more precisely recorded with fixed weighing compared with remote fully automated walk-over-weighing. The next section looks at improved precision of weights collected with a remote, fully automated walk-over-weighing system on a commercial rangeland property.

IMPROVED PRECISION OF LIVEWEIGHTS

The automated remote collection of live weights of individual animals using walk-over-weighing is possible using radio frequency eartags (RFID) for animal identification. Live weights can be collected in extensive grazing systems as the animals move to water with minimal labour costs and stress to the animals. However, due to the uncontrolled movement of animals through the system a single walk-over-weighing live weight may be inaccurate, but use of a series of repeated live weights over a period of time can achieve more accurate estimates of individual ewe live weights.

Weigh Matrix is software developed by the NSW Department of Primary Industries Precision Management group to process live weight data collected using walk-over-weighing. It uses previous live weight information, of the flock and of individuals, in a two stage process to identify incompatible weights. This process has provided estimates of ewe live weight in late pregnancy approaching the precision with a mustered crate weight i.e. fixed weighing (Lee e*t al.* 2008) as shown in Table 1.

Table 1: Within- and between-ewe variance components of live weight (kg) of pregnant ewes collected once weekly (crate) or in weekly periods with remote walk-over-weighing and screened crudely or using Weigh Matrix

		Walk-over-weighing	
	Crate	Crude	Weigh Matrix ‡
Between-ewe variance	43.09	28.92	43.87
Within- ewe variance	0.47	52.94	4.46
Repeatability	0.989	0.353	0.908

‡Screened by Weigh Matrix using previous screened walk-over-weighing data

Reducing the within-ewe variance by 91.6% has enhanced the ability to distinguish differences between individuals, both for mean live weight and changes over time.

In 2006 the Sheep CRC's Precision Sheep Management group collected remote automated walk-over-weighing live weights over 10 months from joining in summer with maiden ewes on a commercial property near Bourke, NSW. The mean live weights, together with the variability within an individual ewe, estimated from unscreened data (other than missing data) are shown in Fig 2A. After screening these data using Weigh Matrix, the within-ewe variability was reduced by 91.9% with only a small difference in the flock mean (Fig 2B).

CONCLUSIONS

The e-sheep differential management system has allowed semi automated data capture and maintenance of maternal body weight of pregnant ewes. This precision management allowed more effective targeted feeding and is a forerunner to fully automated e-sheep systems with reduced labour input. Weigh Matrix is a useful tool to improve the quality of liveweight data collected using walk-over-weighing, in that it markedly improves measurement precision and hence the repeatability of liveweight estimates. It allows liveweight of sheep grazing rangelands to be accurately estimated with remote, fully automated walk-over-weighing systems.

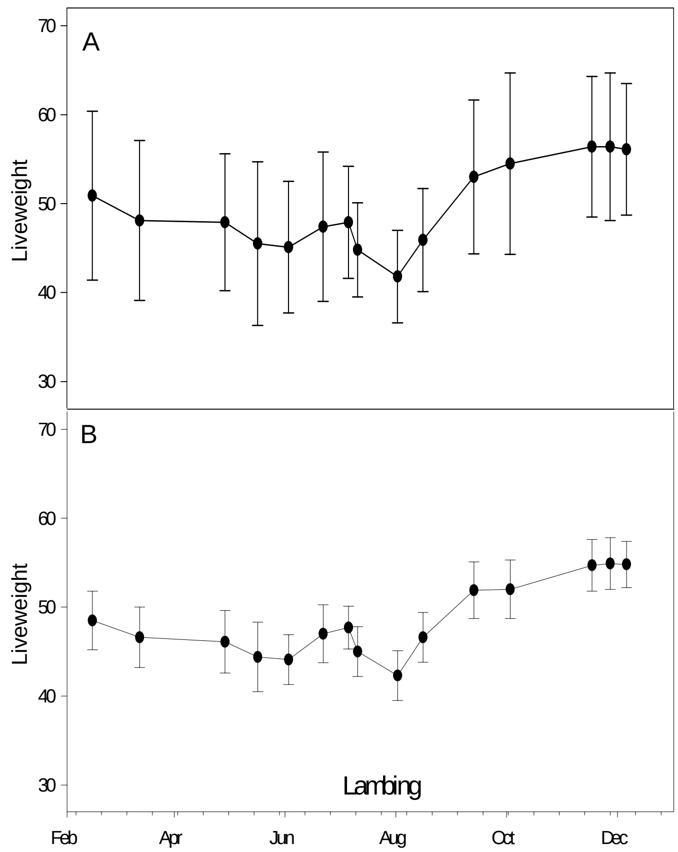

Fig 2: Mean liveweight (± mean individual se) of pregnant ewes grazing rangelands estimated from (A) raw and (B) screened data collected using a walk-over-weighing system.

References

Behrendt, R., Barber, P., Oldham, F.M., Hocking Edwards, J.D., Hatcher, S. and Thompson, A.(2006). Lifetime wool: comparisons on commercial farms show the benefit of good nutrition in pregnancy on production and lamb performance of Merino ewes. *Australian Society of Animal Production 26th Biennial Conference 2006. Short Communication.*

Freer M., Moore A.D. and Donnelly J.R. (1997) GRAZPLAN: Decision support systems for Australian grazing enterprises. II. The animal biology model for feed intake, production and reproduction and the GrazFeed DSS. *Agricultural Systems* **54**, 77-129.

Geenty K.G., Smith A.J., Dyall T.R., Lee G.J., Smith D., Brewer H. and Uphill G.C. (2007) Remote drafting technology for management of pregnant Merino ewes. In 'Recent Advances in Animal Nutrition in Australia' pp. 245-250

Jefferies B.C., (1961) Body condition scoring and its use in management, *Tasmanian Journal of Agriculture* **32**, pp. 19–21.

Lee G.J., Sladek M.A., Atkins K.D. and Semple S.J. (2008) Variance components of liveweights of pregnant ewes measured by manual or remote methods, with and without processing by data screening. *Animal Production in Australia* **27**, in press

Thompson, A.N. and Oldham, C.M. (2004). Lifetime wool. 1. Project overview. *Animal Production in Australia* 25, 326.\