Variance Components of Liveweights of Pregnant Ewes Measured By Manual or Remote Methods, With and Without Processing By Data Screening

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The remote collection of liveweights using walk-over-weighing (WOW) has been possible with the use of radio frequency identification devices (RFID) for animal identification. Liveweights can be collected in extensive grazing systems as the animals move to water with minimal labour costs and stress to the animals. However, a single WOW measurement of liveweight may be inaccurate, but using a series of repeated measurements over a period of time can achieve a more accurate estimate of an individual's liveweight (Richards and Atkins *personal communication*). This study sought to determine whether the accuracy of these estimates might be further improved by screening data using appropriate statistical techniques.

Weigh Matrix is software developed within the Australian Sheep Industry CRC to process liveweight data files collected using WOW systems. It uses previous liveweight information of individuals (base information) and group weight changes to identify weights that are incompatible with the current and earlier information.

This study compared the variances of the liveweights recorded once weekly from a conventional mustered method (crate), WOW collected over weekly periods using minimal screening and the WOW screened using the Weigh Matrix program based on either the screened weight from the WOW data or on the previous crate weight.

A flock of 71 Merino ewes (13 dry, 6 carrying twins and 52 singles) grazed a perennial pasture within which was an enclosed area with a water trough and a "Cowra lick feeder", used periodically to offer an oat grain supplement. Access to the enclosure was only possible through a short race containing a weighing platform. The ewes were mustered and weighed in a weigh crate at the start of the study and at weekly intervals, when on each occasion the flock was weighed 3 times. WOW weights were collected weekly over a 5 week period.

The WOW data was screened in 3 different ways. The first (Crude) only removed data with no animal identification and/or weight, and then discarded weights outside a range 50% either side of the weekly mean. The other 2 screening processes used the Weigh Matrix software using base information obtained from either the previous week's WOW mean (WOW-base) or first crate weight (crate-base).

The within- and between-ewe variance components of liveweight from each of the 4 datasets were estimated by fitting pregnancy status, week and their interaction as fixed effects together with ewe and the ewe x week interaction as random effects using ASReml (Gilmour *et al.* 2002).

Table 1. Within- and between-ewe variance components of liveweight (kg) of pregnant ewes collected once weekly (crate) or in weekly periods with remote walk-over-weighing and screened by 3 different processes

	Crate	Walk-over-weighing		
		Crude	Weigh Matrix crate-base†	Weigh Matrix WOW-base‡
Between-ewe	43.09	28.92	43.44	43.87
Within- ewe	0.47	52.94	5.06	4.46
Repeatability	0.989	0.353	0.896	0.908
n/week	212.2	1436.4	1615.2	1883.0

Screened by Weigh Matrix using base information from †weigh crate data or ‡earlier screened WOW data

Liveweight was most precisely measured by crate weighing, and least precisely in the Crude WOW data. Screening liveweights obtained using WOW with Weigh Matrix markedly reduced (95%) within-ewe variances regardless of the source of the base information. The between-ewe variance estimates obtained from the weigh crate and either of the Weigh Matrix screened WOW datasets were in close agreement.

The repeatability of liveweight estimates using the crudely screened WOW data was low, a consequence of a high within-ewe variance and a low between-ewe variance. Together these factors reduce the ability to distinguish differences between individuals, both in terms of mean liveweight and changes over time.

Weigh Matrix is a useful tool to improve the quality of liveweight data collected using WOW, in that it markedly improves measurement precision and hence the repeatability of liveweight estimates.

Gilmour, A.R., Gogel, B.J., Cullis, B.R., Welham, S.J. and Thompson, R. (2002). 'ASReml User Guide Release 1.0.' (VSN International: Hemel Hempstead, UK).

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