



Sheep breeding: Maternal handicaps

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The environment provided by the ewes imposes a number of penalties on their progeny. These are called maternal handicaps. The age of the dam and the lamb's birth and rearing status are maternal handicaps.

That is, the progeny of young dams are often disadvantaged when compared to those of older dams, as are lambs born as twins or triplets compared to single-born lambs.

Maternal effects on wool traits

Birth rearing effects are the main maternal influence on hogget wool traits in the Great Southern environment, according to an analysis of data on the Katanning Base Flock.

Dam age was not identified as a significant source of variation in this case.

Single-reared hoggets were significantly heavier than twin-reared hoggets. In addition, the single-born hoggets clipped more wool that was lower in fibre diameter than wool from the twin-born hoggets. The data suggested that most of a hogget's wool growing potential is established before birth.

Primary fibre-producing follicles are laid down early in gestation, with secondary follicles being initiated later. As the foetus grows, competition for available nutrients increases, and secondary follicle initiation may be slow. This effect is exaggerated with multiple births. Since secondary follicles usually produce finer fibres, twin-born hoggets often have coarser wool. Single-born hoggets tend to produce more wool.

To accurately estimate breeding values, correct the data so that it does not discriminate against environmentally handicapped hoggets. Then, all sheep will appear to have the same birth and rearing rank.

The effect of the environment on selection

Environmental penalties, which include maternal penalties, cause unequal selection among single-born and multiple-born sheep. Figure 1 shows distributions for a trait in which twins suffer a maternal penalty (dark bars). If everything above zero standard deviations were selected, then singles would be much better represented than twins. This might be the case in ewe selection.

For example, if sheep with measurements more than 2.33 standard deviations from the mean, in the given trait, were selected, then few twins would be retained. Therefore, the true selection differential would be lower than the predicted value, and genetic gains would be less than estimated.

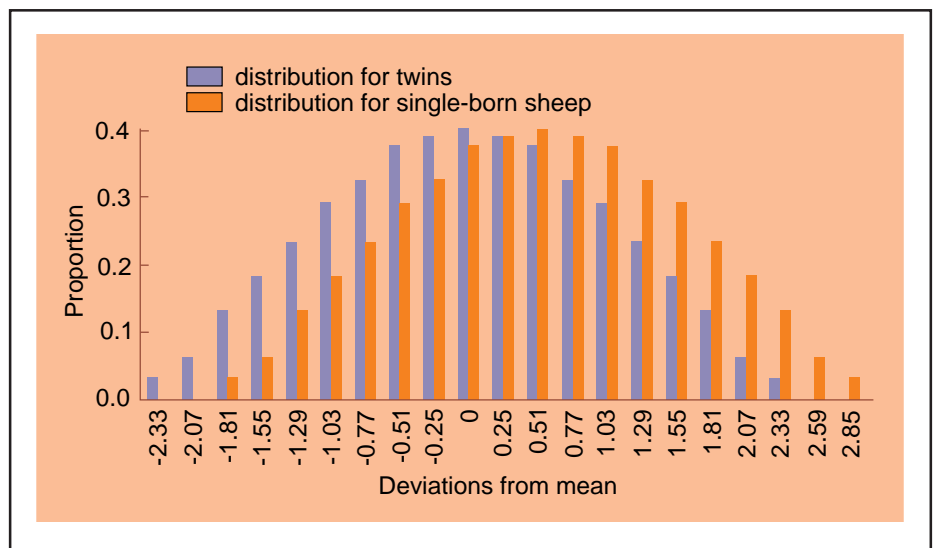


Figure 1. Distributions for a trait measured on two sets of sheep with different environmental effects but genetically similar. Deviations from the mean are expressed in standard deviations.

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Correction of data for maternal effects

Correcting data to equalise the mean, using information such as that in Table 1, is fairly simple. For the traits listed, use the figures given in the table as adjustments.

Deduct these amounts from the performance figures for all of the single/singles and twin/singles. The twin/twins are left unadjusted. Then all the hoggets will appear to have been born and reared as twins.

Instead of adjusting all hoggets to a twin/twin basis, correcting the data to a single/single equivalent is also an option.

Table 1. Birth/rearing effects on objectively measured wool traits: Single born superiority over twin-born offspring

Birth/rearing rank	Greasy fleece weight	Clean fleece weight	Fibre diameter	Hogget liveweight
Single born/single reared	0.21	0.15	-0.37	1.94
Twin born/single reared	0.15 ns	0.10 ns	0.04 ns	1.51 ns

ns = Not significantly different to twin/twin.

Table 2. Maternal effect adjustment factors used in WOOLPLAN

Trait	Twins	Two-year-old dams
Clean fleece weight	+0.25 kg	+0.20 kg
Hogget live weight	+2.5 kg	+2.0 kg

How WOOLPLAN copes

WOOLPLAN computer programs adjust clean fleece weight and hogget liveweight for both birth/rearing rank and dam age. The adjustment factors are shown in Table 2.

The two effects are additive. A twin-born/reared offspring of a two-year-old dam would have its clean fleece weight adjusted upwards by 0.45 kg or its hogget liveweight upwards by 4.5 kg.

WOOLPLAN also adjusts for birth date, although this is not strictly a maternal effect.

Further reading

- Farmnote No. 53/93 'Sheep breeding: Estimated breeding values' (Agdex 430/30).
- Farmnote No. 73/2003 'Genetic nomenclature and animal breeding terms' (Agdex 400/30).

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