Rethinking flock age structures whilst accounting for within flock selection

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Flock age structure influences productivity and profitability within commercial sheep flocks. Meat income is determined by the number of animals available for sale and the distribution in age of those sale animals. Wool income is controlled by wool production and quality, both of which are affected by the age of animals within the flock. A comprehensive study on flock age structure and the components that influence this was conducted by Turner *et al.* (1968) and is still widely referenced today when determining age structure within flocks. However, that study provided general guidelines and did not examine the impact of different selection strategies in determining the optimal age structure. Currently, there are more measurements of wool and meat traits in Merino ewes, and within flock ewe selection is becoming more widespread. Therefore, a rethink on how flock age structures are determined is required. Our study used an excel-based flock prediction tool to show the importance of individual flock productivity and the nominated within-flock selection strategy on the resulting production under different flock age structures within a Merino ewe flock.

The flock structure calculator (Richards and Atkins 2006) was used to examine the best flock structure for a self-replacing base flock of 19µm fibre diameter, 5kg greasy fleece weight and a reproductive rate of 80% lambs weaned per ewes joined. Under this scenario, results showed that at least 3 age classes were required to remain sustainable without needing to buy in replacement ewes (self-replacing). Without any impact from selection, Table 1 shows three age classes of ewes would produce the highest mean fleece value by keeping more younger animals and cast for age at a younger age (due to age effects on these traits). This is shown by both lower micron and higher fleece weights under this age structure compared to keeping more age classes.

		Ewe age classes with 80% reproduction					Ewe age classes with 100% reproduction				
trait	Selection*	3	4	5	6	7	3	4	5	6	7
Fibre Diameter (µm)	None	18.80**	18.89	18.98	19.04	19.03	18.80	18.89	18.98	19.04	19.03
	FD	18.60	18.36	18.25	18.29	18.30	18.28	18.11	18.03	18.14	18.18
	FD&FW	18.71	18.67	18.67	18.72	18.72	18.58	18.56	18.58	18.66	18.67
Greasy fleece weight (kg)	None	5.09	5.07	5.03	4.99	4.93	5.09	5.07	5.03	4.99	4.93
	FD	5.07	5.01	4.96	4.91	4.86	5.04	5.00	4.94	4.90	4.84
	FD&FW	5.16	5.24	5.26	5.21	5.16	5.26	5.31	5.33	5.27	5.20

*where None = no ewe selection; FD = selection for finer diameter ewes, FD&FW = selection for both finer diameter and heavier fleece weight ewes

**Highlighted cells show the optimal result across age classes for each particular scenario

Table 1. Impact of number of ewe age classes on fibre diameter (FD) and fleece weight (FW) under different selection strategies and reproduction rates for a self-replacing flock (19µm FD and 5kg greasy FW)

There was benefit from increasing the number of age classes when selection was applied at hogget age for either lower micron ewes or combined selection for lower micron and heavier fleeced ewes attributable to the increased selection intensity. The same age classes were still the optimum in each corresponding scenario if reproduction rate was 20% higher. When applying selection with a higher reproduction rate the flock responses increased in the corresponding selected traits due to a greater selection intensity. It is worth noting that in none of these scenarios was the 7th age class advantageous for reducing mean flock fibre diameter or increasing mean flock fleece weight.

This example was only based on selection of two fleece traits. Including additional traits, such as body weight and reproduction would provide a more complete comparison. The balance between younger sale animals and older cast for age animals was influenced by the chosen age structure and will impact sale meat value. These factors show the impact of the selection strategy imposed and the complexity that can result when determining the best age structure.

References

Richards JS, Atkins KD (2006) *Proceedings of the Trangie Qplu$ Merinos Open day 2006* 60-67.
Turner HN, Brown GH, Ford GH (1968) *Australian Journal of Agricultural Research* **19**, 443-475.