Cost-benefit analysis of artificial insemination for genetic gain in Australian fine wool Merinos

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Abstract. Context: Though artificial insemination (AI) is widely used in the dairy industry for genetic improvement, in the Australian Merino industry uptake has been minimal in commercial flocks. A cost-benefit analysis using a gene flow model was performed to quantify the impact of AI on a commercial self-replacing flock of fine wool Merinos.

Aims: The current study aimed to estimate the net discounted benefits (NDBs) per lamb weaned of a one-off laparoscopic AI program on a selected number of ewes to breed rams for use in a self-replacing commercial fine wool Merino operation.

Methods: A deterministic gene flow model predicting the genetic merit and cumulative discounted expression of 83 generations was developed. The model was parameterised with industry data, flock parameters, and genetic parameters to produce realistic estimates of NDBs. The profitability of two current AI sires (sire A and sire B) selected for emphasis on either clean fleece weight (CFW) or mean fibre diameter respectively, when used across average flock ewes (random AI; RAI) or genetically superior flock ewes (targeted AI; TAI) was compared.

Key results: Use of AI led to positive NDBs by offsetting high replacement ram costs and increased wool revenue through increased wool production. NDBs of TAI for sire A and sire B were $644.31 per lamb weaned and $439.59 per lamb weaned respectively. These NDBs reduced to $489.47 per lamb weaned and $284.74 per lamb weaned for sire A and sire B when average flock ewes were used for AI (RAI scenario). These results were robust with positive NDBs for TAI with sire A even when the wool price, AI conception rate, and ram costs were simultaneously reduced to $6.25/kg clean, 52.66%, and $500/ram respectively.

Conclusions and implications: Sparing use of AI is profitable for commercial producers of fine Merino wool in a wide range of wool prices, ram prices, and AI conception rates given that a suitable AI sire is chosen which is sufficiently genetically superior to available rams in CFW. Future research should focus on adapting and running the model for; Sheep Genetics indices instead of singular traits, and dual-purpose Merino production systems.