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# Optimal Cow Replacement On New Zealand Seasonal Supply Dairy Farms.

A thesis presented in partial  
fulfilment of the requirements  
for a **Mastrate degree**  
**of Agricultural Science** in  
Animal Science at  
Massey University.

Bevin Lyal Harris

1986

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An intraherd best linear unbiased prediction (BLUP) model for predicting the future milkfat production of individual cows was developed. A major advantage of the BLUP technique was to enable prediction of the future milkfat production of freshening heifers, since relationships between animals were included in the model. These predictions of future performance were incorporated, along with various costs and revenues of production in New Zealand and calving date, into a model to arrive at an expected net revenue for each individual cow.

Three models to rank cows on future profitability were developed and evaluated. Two models utilised dynamic programming procedures. One model estimated the annualised present value of the net returns of each cow and her replacement up to a predetermined planning horizon. The second model used the same criterion, but also allowed optimal replacement to occur in future seasons. The third model utilised replacement model evaluation techniques and estimated the annualised present value of the net returns based on the remaining economic lifespan of individual cows.

The models were tested over a large number of different situations. The effects of changes in the different economic parameters are discussed and the behaviour of each model is documented. The parameters directly associated with the cost of replacement had the greatest effect on the annual present value's (APV) of individual cows. The optimal rankings were affected by the price of the heifer replacement and the price of manufacturing beef, whereas milkfat price played an insignificant role. Varying the price of manufacturing beef and the price of the heifer replacement simultaneously had only a small effect on the ranking of the cows. The parameters such as interest rate and planning horizon also affected the APVs produced by the dynamic models. Increasing the planning horizon past 10 years caused a reduction in the variation between the

APVs.

It was concluded that the dynamic programming model which allowed optimal replacement in future seasons provided the best system for ranking cows on expected future income.

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