

Agreement of dairy cattle replacement policies by two models: Optimization and simulation.

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The objective of this study was to compare proposed replacement decisions of a dynamic programming as an optimization model and a Markov chain as a simulation model. Lactation, month in milk, and pregnancy status were used to describe cow states in a herd in both models. The same economic and management parameters were used in both models. To compare models results the cow value calculated by the Markov chain model and the retention pay-off calculated by the dynamic programming model were used to rank all the animals in a sample herd. Then, the rank correlation (Spearman's correlation) was calculated between results of both models. The overall correlation was 89% (df = 998, P -value <0.0001), which evidenced a strong linear relationship between value ranking of animals from the 2 models. By considering only 10% of lowest ranking cows from both models the correlation increased to 98%. Cows with lower values are the main interest for replacement decisions. Therefore, based on this higher correlation for cows with lower values, we concluded that the final replacement decisions with both models were similar. A post optimality analysis was used to explore the effect of the optimal replacement decisions on the herd dynamics and herd net return. A net return was improved \$6/cow per year by using replacement decisions of both the dynamic programming model and the Markov chain cow value model.

Key Words: optimum replacement policy, optimization, simulation