

Stochastic economic evaluation of dairy farms' reproductive performance.

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The objective of this study was to evaluate reproductive performance in dairy cattle under farms uncertain and variable conditions. Consequently this study introduced stochasticity into a Markov chain model. A Markov chain model with 21 d stage length and 3 state variables—parity, days in milk, and days in pregnancy—was developed. Uncertainty was added to all main transition probabilities - involuntary culling, pregnancy rate, abortion risk, and milk production level- step by step to explore the effect of adding a single random variable at a time. Randomness was introduced in 1 of 2 ways: (1) using a polynomial regression model to build a white noise around the observed historical data for involuntary culling and abortion; and (2) using distributions -such as normal distribution for milk production levels and triangular distribution for pregnancy rates. The model was run for 10,000 replications after introducing each random variable. After verifying model's behavior, the model was run for 2,000 replications to study the effect of incrementing the 21-d pregnancy rates from 10 to 25% with one-unit-percentage intervals. An overall increase in the net return (\$/cow per yr) from 10% 21-d pregnancy rate to 25% was observed. This marginal increment was greater at the lower pregnancy rates ($\$9 \pm 6.8/\text{cow per yr}$) and decreased to $\$5 \pm 5.1/\text{cow per yr}$ in higher pregnancy rates. The reason for this difference among net returns of different reproductive performances was mainly due to the increment in the calf revenue and decrement in the culling and reproductive costs. There was a slight reduction in the overall milk revenue after increasing 21-d pregnancy rate, which was mainly due to the defined shapes of the milk lactation curves used in this study.

Key Words: Markov chain, stochastic, reproductive performance