A MONTE-CARLO SIMULATION MODEL TO DETERMINE THE OPTIMAL VOLUNTARY WAITING PERIOD FOR DAIRY COWS

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The voluntary waiting period (VWP) is defined as the minimum time in weeks post-partum after which farmers decide to inseminate their cows. Determination of the optimal VWP with field data is very difficult because of different attitudes and management skills of farmers with respect to e.g. insemination strategies. Therefore, to support the decision for farmers at an individual cow level, a Monte-Carlo dynamic-stochastic simulation model was created to calculate the economic effects of different VWP's. The dynamic model used time steps of one week to simulate the reproductive cycle (ovulation, estrous detection and conception) and included the occurrence of postpartum (pp) disorders and a lactation curve for individual cows, using data that reflect Dutch dairy farming. During the simulation process, cows with a given breed, parity, month of calving and 305-d milk yield were created. Several variables, such as milk production level and pregnancy rate, were varied randomly given relevant distributions and were adjusted for cow statuses. The lactation curve was modeled using Wood's function. Peak milk yield, time of peak yield and milk persistency were determined based on this function. For economic input, we included costs of milk production due to raising an additional cow to fulfill milk quota (between €0.07-0.20 per kg), a calf price (between €50-200), insemination costs (between €7-24 per insemination), calving management costs (between €137-167 per calving), and culling costs expressed as the retention pay-off (between €1,616-318), respectively. A partial budget approach was used to calculate the economic effect of VWP's varying from 7 to 15 wks pp, using a VWP of 6 wks pp as reference. Per iteration, the VWP with the minimum economic loss or the maximum profit was determined as the optimal VWP.

On average, a VWP larger than 6 weeks resulted economic losses. The optimal VWP of most cows (93 %) was shorter than 10 wks. For only 7 % of the iterations, a VWP of 10 wks pp was optimal. In general, these iterations were from cows with a high milk persistency. A stochastic dominance analysis was done to evaluate two different types of farmers. For farmers who prefer a higher economic value, it appeared that the optimal VWP was differently from cow to cow. For farmers who prefer to reduce the risk of economic losses and want to implement a fixed VWP for all cows irrespective their production level and persistency, a VWP of 6 wks was shown to be optimal.