Development of a stochastic simulation model for estimating economic losses at farm level – scientific report

Ayal Kimhi
Michael van Straten

Abstract

The main aim of this project was to develop a dynamic-stochastic economic model of the Israeli dairy farm, encompassing elements from the aspects of animal health, farm management, feeding, economics and veterinary. The secondary aim was to use the model to compare the economic implications of various managerial decisions in different types of farms, and to estimate the economic losses resulting from various animal diseases.

The model uses numerous parameters to simulate the life cycle of the cow, and contains many different possible life cycles. In the second stage, the model makes an economic assessment of a given scenario, including estimated income and expenses, profit per cow and profit per quota. In the final stage the model computes the optimal policy, in terms of the various farm-management decisions, that will lead to the best outcome over time.

The model was written using the Python software, and the parameters of the distributions of the relevant variables were estimated using data from the herd book.

Given budget and time constraints, we could not complete the construction of the model. We were able to reach a basic version in which each cow has a maximum of 4 milking cycles. At the end of each milking cycle, the cow can be replaced by a cow with an unknown genetic quality (out of three types). The economic value of the cow is computed at the end of each milking cycle, and a decision is made whether to replace her or not, according to each of the two criteria: profit per milking cycle, and profit per liter of quota.