

Estimating Young Stock Rearing Total Costs using Stochastic Simulation

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Introduction

- Young stock rearing is often being overlooked due to unawareness of Dutch farmers to the total costs.
- Previous studies on the total costs estimation did not consider continuous and variation in growth and uncertainty in disease incidence.
- Several costs component (feed, healthcare, breeding) are interrelated with variation in growth and uncertainty in disease incidence.

Objective

- Estimating the distribution of total costs of young stock rearing in The Netherlands using stochastic simulation.
 - A bio-economic model is developed.
 - Variation in growth and uncertainty in occurrence of diseases is included.

The Bio-economic model

- Add-in @Risk in Microsoft Excel.
- Stochastic simulation with 20,000 replications.
- No disease transmission or herd dynamics.
- 56 stages to reflect age.
 - Simulating at calf level from 2 weeks until first calving.
- States to reflect biological changes in young stock life.
 - Bodyweight.
 - Health status: Healthy, diseased, death.
 - Two diseases included: Calf Scours (CS) and Bovine respiratory diseases (BRD).
 - Breeding status: Pre-pubertal, cyclic, pregnant.
- Transition between states within stages.
 - Growth curve unique for every simulated calf using two phase growth function (Koenen and Groen, 1996).
 - Health status is determined by using transition matrices (Table 1) built at every stage (56 transition matrices).
 - Disease effect (growth rate reduction) is based on age and has only short term effect.
- Economic components.
 - Based on literature and expert knowledge.

Table 1: Example of a transition matrix to simulate health status at 2 weeks of age (stage 2).

		Week 2 (Stage 2)			
Week 1 (Stage 1)		Healthy	CS	BRD	Mortality
Healthy		0.9536	0.044	0.0024	0
CS		0.70	0	0	0.38
BRD		0.88	0	0	0.12
Mortality		0	0	0	1

Results

- The total costs of rearing a young stock is € 1540.
- The total costs of young stock rearing is approximately 13% of the cost price of milk.
- Average first calving age is 25 months with average weight of 542kg.
- The total costs of rearing is €78 higher when a heifer was diseased once compared to a non-infected heifer.
- Diseases do not affect first calving age and weight.
- Growth rate affect first calving age, weight and total costs of rearing.

Table 2 : The costs of rearing a young stock that successfully reached first calving age (5% and 95% percentiles given in brackets).

Costs component	Average costs (€)
Calf price	55
Prevention	26
Farmer's treatment	2 (0; 36)
Veterinary treatment	5 (0; 0) ¹
Feed	697 (657; 778)
Labor	499 (475; 536)
Breeding	40 (27; 81)
Barn	180 (176; 198)
Mortality and culling	34
Total	1540 (1423; 1689)

¹ The 1% to 99% percentiles is €0 to €186

Average total rearing costs change

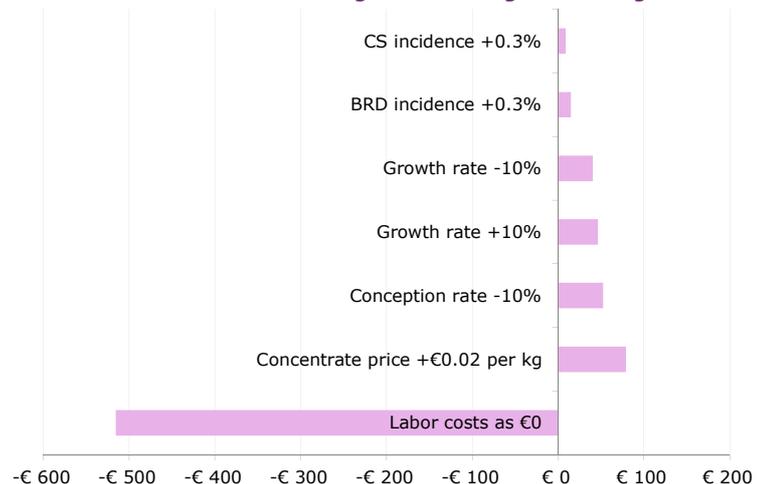


Figure 1: Sensitivity of average total costs of young stock rearing for disease incidence, growth rate, conception rate, feed costs and labor costs.

Conclusions

- The total costs of rearing a young stock is € 1540.
- The total costs of young stock rearing is approximately 13% of the cost price of milk.
- Healthcare and mortality costs are minimal costs in average total rearing costs.
- Optimal growth is important to reduce total rearing costs.
- The model is able to calculate total costs and give insights in young stock rearing total costs distribution.
- Farmers should be aware of the total costs and should make management changes based on important findings of this study.

Reference

Koenen, E.P.C. and A. F. Groen. 1996. Genetic analysis of growth patterns of black and white dairy heifers. J. Dairy Sci. 79:495-501.

