7. Data Analytics: What Can New Analyses Techniques Bring for Better Farm Results 1

Title presentation

How can cow-individual sensor data, national data and drone images improve our understanding of resilience

Author(s)

C. Kamphuis*, W. Ouweltjes, M. Poppe, C.A. Mücher & Y. de Haas

Institution for which the first author of this abstract is working

Abstract

Resilient dairy cows can be characterized by completing multiple lactations, with good (re)productive performances, facing no or few health problems that they overcome easily, and that are efficient and consistent in milk production. Improving resilience has clear advantages, but phenotypic information on this trait is lacking. We explored whether we can fill this gap with information from sensor technologies as these offer high-frequency, continuous, and longitudinal data of individual cows. We did this in three studies: the first study developed cow-specific resilience proxies using milk yield sensors, and correlating these proxies to national data to study herd factors impacting resilience. The natural logarithm transformed variance (LnVAR) in daily milk yield appeared an interesting cow-individual resilience proxy: a low LnVAR was genetically correlated to better udder and hoof health, better longevity and fertility, a higher body condition score, and lower ketosis and milk yield. A low LnVar, thus, represents a cow with a good resilience. Subsequently, herd-year effects for LnVar were estimated and correlated with herd performance parameters derived from the national milk recording system. This revealed large differences in resilience between herd-years: the LnVar in the herd-year with the largest effect was >6 times larger than the LnVar in the herd-year with the smallest effect. The positive correlation with the proportion of cows with a rumen acidosis indication (r = 0.31) suggested that feed management may have an important effect on resilience. The second study used sensor data collected during the first lactation to predict a lifetime resilience score using logistic regression or random forest. Both methods had a similar classification performance (accuracy 45-50%). However, random forest required much less data pre-processing to get to this performance. This makes random forest an attractive method to derive information from sensor data, particularly when input becomes even more complex with new sensor technologies entering the market. One of these new technologies could be camera-mounted drones, which were explored in the third study. These drones were used during several field trials, and artificial intelligence was used to detect, locate and identify cows, and obtain specific cow characteristics (height, volume, weight) from the images. Accuracies of >95% for detecting cows, ~91% for identifying cows, and ~88% for obtaining cow characteristics (lying, standing or grazing) were achieved. This makes camera-mounted drones a promising new technology in monitoring traits that can be used for resilience assessment.