PRACTICE ABSTRACT

An 'On-Farm' approach to using Precision Livestock Farming Tools to Optimize Herd Level Resilience & Efficiency

Problem

Whilst many farms now invest in on-farm sensor technologies to support their management, their application is often still limited to the detection of individual alerts that the farm can react to with management adaptation at the individual cow level.

However, by utilizing Precision Livestock Farming (PLF) approaches, big data outputs from commercially available biosensors have the potential to signal physiological, immunological, behavioural, and other variables in livestock, and assist decision-making for overall farm management, improving sustainable herd performance, resource efficiency and reducing labour requirements.

Currently there are few farms that actively consider herd level resilience & efficiency (R&E) when making management decisions and commercially available software packages tend not to calculate or display resilience and efficiency values effectively on farm.

Solution

Using published algorithms and a small sample set of data, GenTORE has developed a demonstration dashboard that can visualize herd Resilience & Efficiency ranking at a herd level with a simple and practical view for both farmers and vets. A second level of function highlights which of four performance areas is most likely responsible for R or E ranking changes: Production, Fertility, Health or Herd Inventory.

Keeping the following key ideals in mind: Simple. Useful, Practical and Sensor Based, a demonstration dashboard has been designed to take data input, calculate an overall resilience & efficiency score, identify key problem areas using individual component scores which will then support herd management action.

As demonstrated, using commercially available technology, perturbations in daily milk yield, activity and rumination data can identify individual cows that are sick or have underlying health conditions including early mastitis detection, left displaced abomasum (LDA's), and digestive disorders.

However, when combined with key herd parameters such as 'Age at first calving', signaling Herd Inventory changes, it becomes possible to identify whether a change in overall herd resilience rank is due to changes in Production, Fertility, Health events or youngstock management. This allows early targeting of scarce resource for subsequent herd level investigation and intervention in order to achieve more sustainable production.

Outcome

Ranking cows on Resilience & Efficiency using commercially available PLF sensor data can offer new and effective insights to inform herd level as well as individual animal management changes.

Summary

Herd level Resilience & Efficiency can be predicted using Precision Livestock Farming tools ie: data from commercially available sensors.

The quality and availability of data is of high importance when ranking cows in a herd to utilise PLF opportunities for sustainable production.

Author(s)

Angela Lockwood, Jonathan Statham (RAFT)

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Adriaens, I.,Friggens N.C., Ouweltjes W., Scott. H., Aernouts B., Statham, J. (2020) Productive lifespan and resilience rank can be predicted from on-farm first parity sensor time series but not using a common equation across farms. *J. Dairy Sci.* 103 https://doi.org/10.3168/jds.2019-17826

Keywords

Resilience, Efficiency, Sensor Technologies, Precision Livestock Farming (PLF).

Illustrations

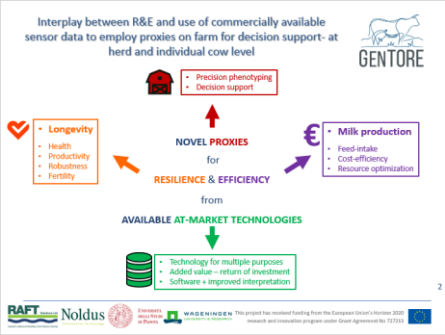

Figure 1: The Interplay between R&E and use of commercially available sensor data to employ proxies on farm for decision support- at herd and individual cow level.

Figure 2: Demonstration version of the software dashboard to display herd Resilience & Efficiency

*"**GEN**omic management **T**ools to **O**ptimize **R**esilience and **E**fficiency - GenTORE"* is an H2020 project which aims to develop innovative genome-enabled selecton and management tools to empower farmers to optimize cattle resilience and efficiency in different and changing environments.

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