



Advanced analytics create insight and supports the Danish dairy farmers

J. Frandsen, T. Hejgaard Sørensen and L.A. Nielsen

SEGES Innovation, Denmark

Danish dairy farmers have access to one of the most comprehensive management systems in the world. Data is the key to most management decisions on the farm and with advances analytics, data is transformed into valuable insights. Below are four examples of advanced analytic solutions available to the Danish dairy farmers.

- Predictive forecasting models is used to predict the cell count for the coming 4 months. The prediction is based on more than 7 years of data, taking detected seasonality into account.
- Advanced statistical models are implemented several places for example to predict lactation curves for individual and groups of cows. Advanced statistical models are also used to create a graphical analysis tool showing a longevity profile and a claw trimming profile for individual herds.
- Key influencers are derived from regression analysis in a reproduction management tool available to dairy farmers. The identified key influencers are the individual factors with the most impact on reproduction results.
- AI solutions such as Optical Character Recognition (OCR) and speech recognition is implemented in mobile apps to simplify data entries for the Danish farmers.

Abstract

The Danish Cattle Database system is unique in the sense that data from sources within the whole dairy industry is registered in one place and therefore provides a huge amount of information available for both farmers, advisors, and researchers, see the overview in figure 1. Examples of some of the more important data contributors to the Danish Cattle Database are:

- The farmers.
- Dairies – daily amount of delivered milk and analysis.
- Slaughterhouses – weight and quality data on culled animals.
- Breeding companies.
- Veterinarian management system.
- Milking equipment management systems.
- Feeding equipment management systems.
- Sensor equipment management systems.

Introduction

The data registered on animal level are movement data, milk recording data including milk quality analysis, reproduction events from heat to pregnancy, registration of disease, treatment and medicine consumption, slaughter data like quality and weight, sensor data like activity and health alerts and in some cases also daily milk weight from milking equipment. On group and herd level the database receives delivered milk incl. quality analysis and feed consumption each day.

The big amount of data at the representation across all areas in the dairy production gives a good foundation for solid data analysis to guide the farmer and the service sector around the farmer.

Examples for data analysis in the Danish Management system, DMS

In the following there is a short description of how data are uses in analyses of the production to guide the farmer towards optimizing the production. The main engine in the data analysis is the Data WareHouse, DWH, where the raw data are crouched and processed to enriched key figures and used in different reports and systems. Most of the reports are build in Microsoft Power BI, which offers motivation dynamic presentation of the data, and a continuedly development in functionality

Forecast of the milk production

With certified data on milk production from the milk recording on more that 90% of the dairy cattle and validated movement data and solid reproduction data SEGES has analysed data and developed a system to forecast the production. By using data on the individual cow, it is possible to make the forecast on the individual cow. These forecasts are used in different analyses from lactation analyses to forecast of the production for budget purposes

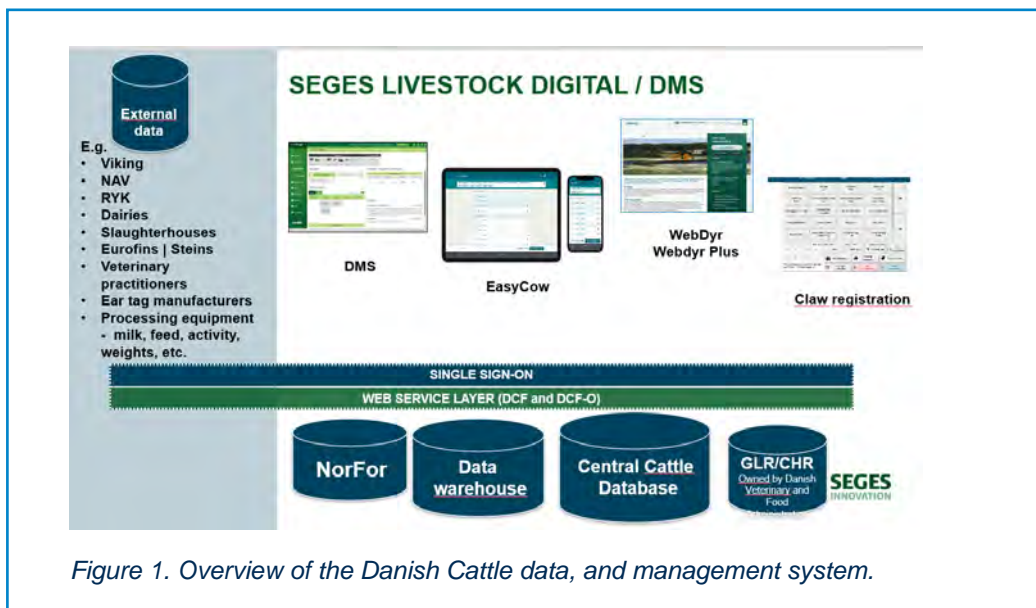


Figure 1. Overview of the Danish Cattle data, and management system.

The dairies in Denmark use SSC as a parameter in their payment to the farmer, which leads for a decrease in payment for e number of farmers. Bu using the forecast possibilities in Power BI on the data series in the database the farmer in DMS can see the consequences in payment id nothing is done. As a supplement to the data DMS present some advises about how to avoid the problem

Prescriptive data

By using data from the different sources DMS presents a daily Dashboard for the dairy farmer to guide in where to focus. It gives a daily KPI overview of the herd performance on milk production, reproduction, heath and feeding including a reference to goals for the performance.

Daily dashboard

Topic	Status	Key figure (unit)	Achieved	Alarm limit	Reporting period
Milk	✓	ECM delivered (kg/day)	11,713	Min 10,942	Latest measurement
	✓	Milk yield per lactating cows (kg ECM/day)	37.1	Min 35.1	Latest measurement
	●	Milk quality (numbers of deductions)	1		Last 7 days
Reproduction	✓	Inseminations of cows (numbers)	14	Min 4	Last 7 days
	●	Inseminations of heifers (numbers)	1	Min 2	Last 7 days
	✓	Not pregnancy examined cows (numbers)	0	Max 0	Last day
Health	✓	Disease treatment, cows (numbers)	5	Max 5	Last 7 days
	✓	Dead animals (numbers)	0	Max 0	Last 7 days
Feeding	✓	Energy efficiency (%)	103	Min 93	Last feed control

A lot of farmers find a big motivation in benchmark against other similar herds performance. By using data and the daily data processing in the Data WareHouse DMS provides a Benchmarking system with more than 140 key figures with possibilities to benchmark against other comparable herds and own goals as seem in this example

Benchmarking

All in all, the data in the Danish Cattle Database are used to analysis for the benefit of the farmer, it

Conclusion

- Gives the farmers a very qualified basis for making decisions on an operational and strategic level regarding their production.
- Gives the service entities around the famer the best possible basis for servicing and advising the farmers.
- Makes it attractive for the on farm equipment suppliers to join the data exchange for the benefit of the farmers.