

# Employing high-resolution big data for predictive modeling in precision dairy farming.

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## Abstract

Modern farms exercise decision making employing high level of automated computerized data acquisition by sensors installed in the dairy parlor or on the individual cows. These data are utilized in the management system to support decision making in high precision farming. Analytical reports are extracted from the raw data estimating farm and cows events (what is happening). More advanced systems can apply descriptive modeling suggesting the causes for the event (why did it happen).

New megatrends incorporated in IOT (internet of things), such as big data, cloud and mobile enables moving on to predictive modeling (what is going to happen) in high precision farming. Such predictive modeling is demonstrated in early prediction of total lactation production. Estimating total lactation yields from truncated data early in lactation allows for better selection decisions and future production planning. Selection decisions are made as early in lactation as possible, before breeding (50 DIM). Continuous production planning aimed at getting the best financial returns are essentials in quota systems and seasonal (summer/winter) differential payments. The predicted total lactation yields must also be accurate as possible to avoid selection bias. Many formulas have been adapted for truncated prediction of total production. However, these formulas were constructed retrospectively, based on huge amount of individuals, thus neglecting to attribute locality herd phenomena. Current data, employing monthly milk tests is also inefficient for making prediction at the most critical decision making time (50 days) for having only two data sets per individual at most.

The AfiFarm Herd Management system, including the AfiLab<sup>TM</sup> milk analyzer (AfiMilk, Afikim, Israel) and milk meter, which provides on-line data on gross milk composition (fat, protein, lactose and coagulation properties) is employed with additional data collected on the farm and its ecosystem for Prediction of total lactation production (305-days yield or complete lactation yield, fat protein and ECM). These predictive models calculated updated continuously to be local and herd specific.

Such an approach can also be used to predict emerging of health associated problems (post partum diseases, mastitis). The flaw of this new approach is the failure to predict black swans events.

*Keywords: on line milk analysis, descriptive analysis, predictive modelling, Big Data.*