



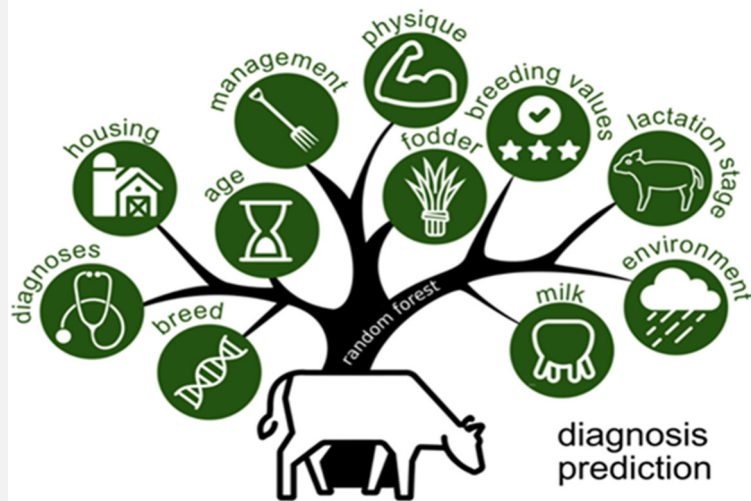
D4Dairy

**Digitalisation, Data integration,
Detection and Decision support
in Dairying**

Programme: COMET – Competence
Centers for Excellent Technologies

Programme line: COMET-Project

Type of project: D4Dairy,
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WHAT INFLUENCES THE HEALTH OF COWS? BIG DATA HELPS TO TRACK DOWN COMPLEX INTERACTIONS

A MULTITUDE OF FACTORS IMPACTS THE HEALTH AND WELLBEING OF FARM ANIMALS. BUT WHICH EFFECTS APPEAR WHERE AND HOW STRONG ARE THEY?

Health is best understood as a multidimensional, complex process. In this project, we addressed the question of how to decipher the complex interactions of different factors in order to make individual recommendations.

In a truly unique dataset, we collected data for almost 500 farms with close to 70,000 cows. Depending on the farm, this data included information from the genetic makeup and extensive health data of each single cow, to housing and husbandry conditions, the type of fodder, milking methods, or the frequency of hoof care. Sensor data for nearly 1,000 cows was also available.

To make sense of this huge amount of data, we have developed a new methodological approach that combines machine learning techniques with statistical analysis. The algorithm produced five clusters, each representing a specific type of farm, ranging from small high-altitude farms with alpine pasture to large high-performance dairy farms situated in the hotter lowlands.

In the next step, the scientists attributed a risk profile for the most frequent diseases in dairy cows to each farm type, such as mastitis, bacterial infections of the uterus after birth (metritis), metabolic disorders (ketosis) or lameness.

SUCCESS STORY

In each farm type, different clusters of factors influence the welfare of the animals. Animals are healthiest in a cluster of high-altitude farms. The majority of issues arise in clusters of high-performance farms in the much warmer lowlands, where cows are kept inside with limited possibility of movement. Consequently, in some cases, the likelihood of certain diseases is increased in these clusters. Chronic mastitis (udder infections), for example, occurs two to three times more often compared to high-altitude farms and bacterial inflammation of the uterus after calving occurs almost five times as often. The more frequent occurrence of anestrus is also favored by housing systems without outdoor access, high temperatures (heat stress), high-energy feeding (e.g. corn silage), herd size as well as a milk-intensive farm management. These results can now be confirmed and studied for their causes by further investigations. In more intensively managed farms, animals are often examined more regularly. Higher disease risks do not always imply poorer animal health, they may also indicate closer monitoring of animal health on the

farm. Future research will consider other outcome measures, such as lifespan or other health information, to assess this in greater depth.

Based on these identified risk factors, we have developed predictive models for diseases in animals. The project demonstrated that the amount of data available plays a significant role in our ability to predict diseases. Using the entire integrated data set, we are able to predict lameness with an accuracy of almost 73 percent, in contrast to just under 50 percent when only routine data are used. Further research has shown that information on housing conditions in particular improves the quality of the model.

These findings can be used to create a digital support system that offers personalized recommendations, such as a different feeding mixture, different resting areas, or new measures against the increasing heat in barns caused by global warming, which especially affects the animals.

Project coordination (Story)

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Project partners



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