THE GLOBAL STANDARD FOR LIVESTOCK DATA

ZUCHT DATA

Network. Guidelines. Certification.

Sensor data for animal health and welfare

Present perspectives and future applications

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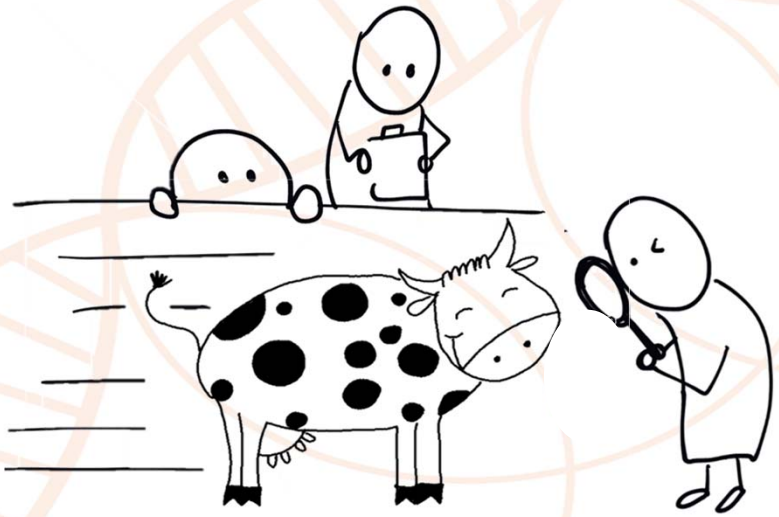
BRAND-NEW – Sensor data from dairy cows!

- **Wearable sensor devices** measuring **cow behaviour** are increasingly used on dairy farms
- Activity, standing and lying times, rumination and feeding, rumen temperature,…
- Used for **herd management**:
  - Oestrus and calving detection
  - Health alarms, …
- **Large amount of high resolution data for individual cows!!!**
  - Research, breeding, DHI,…



BRAND-NEW – Sensor data from dairy cows!

- Currently potential of these data is under investigation
  - **ICAR Functional Trait Working Group:** guidelines on the **use of sensor data**
  - **ICAR Measuring, Recording and Sampling Devices Sub-Committee:** guidelines on the **validation of sensor systems**

- **Potential applications for ICAR member organisations?**
- **Use for animal health and welfare improvement?**
  - **Guided interviews** with five persons related to ICAR and member organisations
  - **Qualitative content analysis**

Potential applications of sensor data

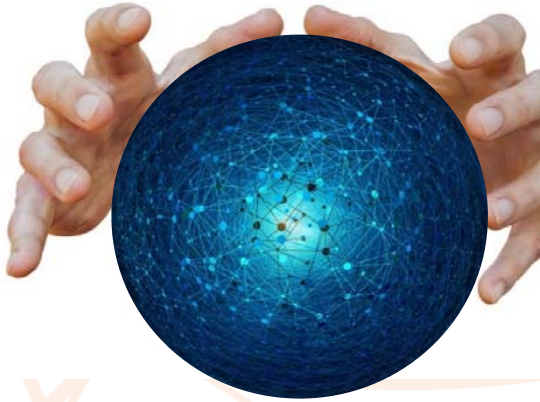
- Benefit emerges when **integrating** it with other farm data and historical information for e.g. disease predictions
- Smart applications including **benchmarking across farms**
- **Beyond farm level:**
  DHI and milk recording organisations can **add value to existing services** or broaden their **service portfolio**
- **Genetic evaluation**
  - Large scale **phenotyping**
  - **New traits or proxies** for complex traits (e.g. resilience)
  - **Improve** existing traits – closer to animal‘s physiology

Status quo and…

- **ICAR** initiative on **validation** of sensor systems
  - Understand what systems are able to do
  - Accordingly define purpose of the data use
- **Research** focus on **data exploration**
  - **Variation** of the behaviour across animals, farms,…
  - Differentiate physiological variation and deviations
- Exploring potential for **disease predictions**
- **New traits** for genetic evaluation related to fertility
- Development of new technologies

  → **Computer vision** to mimic observations

…and future plans



- Approaches to **standardise data** across farms and manufacturers
- Coordinate collaborative efforts to getting **access to sensor data**
- Definition of new **traits** and possibility for introducing new **evaluations** (e.g. heat stress or fertility related)
  - Superior to current evaluations
  - Lower costs for phenotyping
- New **modelling approaches** for on-farm modelling applications

Challenges

- **Data accessibility and availability and data ownership**
  - Farmers‘ consent and data confidentiality
  - Data provision by manufacturer
    → economic interests and company policies
  - Do organisations have to pay for data in future?
- **Lack of detailed information on sensor parameters**
  - Change of sensor measurement into output value
  - Validity of parameters
  - Accuracy of alerts
  - Calibration of sensors

Challenges

- **Reference values for sensor measurements**
  - Physiological spectrum
  - Desirable behaviour
- **Gold standard** for predictions or development of proxies
- Differentiation of **measurement errors**, **outliers, disturbances** and **meaningful deviations**
- **Optimisation for herd management**
  - Measurement or alarm must serve management purpose and may not be suitable for other purposes
- **Lack of standardisation** between devices

Strategies to overcome the challenges

- **Much experience and data within research organisations**
  - Ruminate the data
  - Lack of resources and potential for grant application
- **Integration of data science and domain knowledge**
  - Data editing, modelling and interpretation of results
  - Develop ontologies based on domain knowledge
- **Collaborative efforts**
  - Strengthen research (infrastructure, results)
  - Open data approach
  - ICAR as advocate towards manufacturers

Animal health and welfare

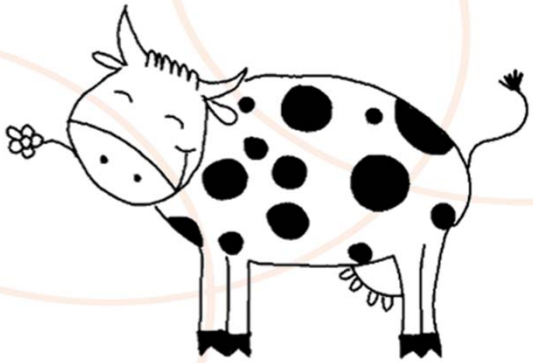
- **Farm level**
  - **Easier identification of** cows with potential health issues in large herds
  - **Early detection** and intervention

- **Research**
  - Improved understanding of **normal behaviour** of cows
  - Explore relation with parity, age, breed and diurnal patterns

Animal health and welfare

- **Downstream production and service providers**
  - **Data-driven assessment** and reporting of cow health and welfare status across animals, farms, regions,…
  - **Benchmarking tools** for improving animal health and welfare on farms

- **Breeding for improved animal health and welfare**
  - More resilient animals
  - Animals less likely to have health issues
  - Traits closer to animal physiology



Importance for the future of dairy sector?

- Overall impression was **high importance**
  - Rating 1 (not important) to 10 (important): **8** or **9**
- Improvement of **farm management**
- **Objective monitoring** of animal welfare
- Usefulness for **farmer has to be first priority**
  - Otherwise sensors will not be used
  - Mutual client as link to sensor manufacturers
- **Not ready yet!**
  - Careful with promising solutions and applications
  - ‚You can only ring the bell once‘

ICAR would like to acknowledge the 11 Members who help fund the inaugural Brian Wickham Young Persons Exchange Program

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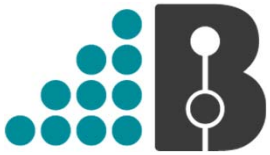

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