



THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

ICAR Guidelines and Testing of Automatic Milking Systems and Samplers

Steven Sievert, Chair, ICAR MRSD-SC

21 September 2023

Coming Together –

Meeting Challenges Using Data from AMS Systems





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Restructure of Section 11
completed March 2023 &
adopted July 2023

14 procedures in 5 sections

- Overview & General Processes
- Device Testing & Certification
- System Testing & Validation
- Best Practices
- Annual Reporting

Each procedure stands alone

Integration of numerous
appendices into each procedure

Section 11 – Guidelines for Testing, Approval and Checking of Measuring, Recording and Sampling Devices

Part 11A – General Guidelines for Device Certification and System Validation by ICAR

- 📄 Overview: Guidelines for Testing, Certification and Checking of Measuring, Recording and Sampling Devices
- 📄 Procedure 1: Procedure for Application for Testing of Measuring, Recording and Sampling Devices or Sensor
- 📄 Procedure 2: Procedure for ICAR Certification of Devices and ICAR Validation of Systems [View PDF](#) | [Download PDF](#)
- 📄 Procedure 3: Procedure for Labeling of ICAR-Certified Devices and ICAR-Validated Systems [View PDF](#) | [Download PDF](#)

Part 11B – Testing of Measuring, Recording and Sampling Devices for ICAR Certification

- 📄 Procedure 4: Procedure for Testing of Traditional Recording and Sampling Devices [View PDF](#) | [Download PDF](#)
- 📄 Procedure 5: Procedure for Testing of Automatic Milk Recording and Sampling Systems [View PDF](#) | [Download PDF](#)
- 📄 Procedure 6: Procedure for Evaluation of Installation and Routine Calibration Procedures for Recording and Sampling Devices
- 📄 Procedure 7: Procedure for Computerized Solutions for Periodic Checking of Recording and Sampling Devices

Part 11C – Testing of Sensor Systems for ICAR Validation

- 📄 Procedure 8: Procedure for Validation of Sensor Systems [View PDF](#) | [Download PDF](#)
- 📄 Procedure 9: Procedure for Evaluation of Installation and Routine Calibration Procedures for Sensor Systems
- 📄 Procedure 10: Procedure for Computerized Solutions for Periodic Checking of Sensor Systems [View PDF](#) | [Download PDF](#)

Part 11D – Guidelines and Best Practices for Animal/Sample Identification and Data Handling

- 📄 Procedure 11: Guidelines for Data Capture, Connectivity and Credibility when using Automatic Identification and Data Collection
- 📄 Procedure 12: Procedure for Test-Day Practices for Obtaining Milk Samples on Individual Animals from Sampling

Part 11E – Procedures for ICAR Member and Manufacturer Reporting


- 📄 Procedure 13: Procedure for Annual Reporting of ICAR-Certified Devices and ICAR-Validated Systems in the Market
- 📄 Procedure 14: Procedure for Annual Reporting of ICAR-Certified Device and ICAR-Validated System Usage and Performance
- 📄 Appendix 1: Template for Annual Reporting of ICAR-Certified Devices and ICAR-Validated Systems in the Market
- 📄 Appendix 2: Template for Annual Reporting of ICAR-Certified Device and ICAR-Validated System Usage by Member



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← → ↻ icar.org/index.php/icar-recording-guidelines/ 🔍 🏠 ☆ 2 ⚙️ ⬇️ 🗄️

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ICAR Guidelines

ICAR has updated how we structure and present our Guidelines. The new format makes them easier to browse and to access your specific interests.

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- Section 0 – Preamble
- Section 01 – General Rules
- Section 02 – Cattle Milk Recording
- Section 03 – Beef Cattle Recording
- Section 04 – DNA Technology
- Section 05 – Conformation Recording
- Section 06 – AI and ET Data and Fertility Analysis
- Section 07 – Bovine Functional Traits
- Section 08 – Certificate of Quality
- Section 09 – Dairy Cattle Genetic Evaluation
- Section 10 – Identification Device Certification
- Section 11 – Guidelines for Testing, Approval and Checking of Measuring, Recording and Sampling Devices
- Section 12 – Milk Analysis
- Section 13 – On-farm Milk Analysis
- Section 14 – Alpaca and Goat Identification and Fibre
- Section 15 – Data Exchange
- Section 16 – Dairy Sheep and Goats
- Section 17 – Buffalo Milk Recording
- Section 18 – Breed Associations
- Section 19 – Recording Feed Intake for Genetic Evaluation
- Section 20 – Methane Emission for Genetic Evaluation
- Section 21 – Meat, reproduction and maternal trait in sheep and goats







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^ Section 11 – Guidelines for Testing, Approval and Checking of Measuring, Recording and Sampling Devices

Part 11A – General Guidelines for Device Certification and System Validation by ICAR

-  Overview: Guidelines for Testing, Certification and Checking of Measuring, Recording and Sampling Devices or Systems [View PDF](#) | [Download PDF](#)
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Part 11C – Testing of Sensor Systems for ICAR Validation

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Part 11D – Guidelines and Best Practices for Animal/Sample Identification and Data Handling

-  Procedure 11: Guidelines for Data Capture, Connectivity and Credibility when using Automatic Identification and Data Recording Simultaneously [IN REVIEW] [View PDF](#) | [Download PDF](#)
-  Procedure 12: Procedure for Test-Day Practices for Obtaining Milk Samples on Individual Animals from Sampling Devices [View PDF](#) | [Download PDF](#)

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Online Application Processes

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You are here: [ICAR](#) > Application form for ICAR validation of sensor systems

Application form for ICAR validation of sensor systems

A - GENERAL INFORMATION

Manufacturer

Address

Country

VAT number

Product manager

Email

Signing authority

Device name

Please provide the name of the device including additional 'brand' names under which the device is are marketed or sold in various countries.

Online Applications for Device and Sensor System Testing

ICAR Staff Manages Submission & Test Contracts

Direct & Secure Upload of Documentation of the System to ICAR Server

Protect IP, Avoid Email & File Transfer/Sharing Services



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Documentation Required with Application

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- Technical characteristics, drawings, and photograph(s) of device.
 - For those devices that are a modification of a device with existing ICAR-certification, a technical summary of the changes should be included.
- Technical manual outlining functional metering and sampling processes and principles as well as software/firmware documentation
- Installation procedure
- Routine test or periodic check procedures for service technicians
- Operational manual for the farmer – both AMS and sampler
- AMS herd management software manual (where applicable)



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Testing & Certification Procedure

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Requirements for automatic milking systems & sampling systems

- Automatic milk recording systems record milk yield and
 - a) take samples of milk, or
 - b) perform milk analysis without human supervision or interference.
- Automatic sampling systems are well-known in automatic milking systems, but could also be used in milking parlours and eligible for testing by ICAR



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Requirements for automatic milking systems & sampling systems

- a) Deliver electronic data. The file must include cow ID, amount of milk, time of milking and the position where the cow was milked. The file must contain every milking during the recording period
- b) Have no mismatches of animal identification with milking time, milk production and sample identification/results of the milk analyser
- c) Have a success rate in reading animal identification of at least 98 % (and must have the technical capability of 100% correct identification at recording)
- d) Indicate if a milking is a complete milking (at least 80 % of the expected milk yield is collected)



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Requirements for automatic milking systems & sampling systems

- e) Take samples each time an animal is milked and take care that samples are properly treated and/or stored to ensure the quality of the sample for analyses or perform milk analysis each time an animal is milked.
- f) Have a capacity to record and sample all the animal milkings within the intended sampling period
- g) Have a rate of sampling / milk analysing to ensure no or minimal delay of the milking of the next animal
- h) In case of sampling - the sampling unit shall meet with ergonomic demands (weight, construction, connectivity, accessibility of critical places, portability)



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Sampling

- a. Representative for all the milk collected during that milking.
- b. Sufficient amount for analysing the milk composition.
- c. A minimum volume of 25 ml shall be taken at the minimum recordable milk yield of 5 kg for cattle.

This guideline on sampling is related to single day (one milking of the test day or all milkings during the test day) of component measurements for the system. The MRO then applies traditional models for prediction of periodic component yields.



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ICAR certification for automatic milk recording and sampling systems are based on the combination of the robot and the sampler.

The automatic milk recording system must be tested with automatic sampling device(s) to achieve an ICAR certification.

The automatic milk recording system cannot be tested by itself for milk yield nor may an automatic sampling device be tested by itself for milk sampling.



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Multiple automatic milk samplers may be tested with a single automatic milk recording system,

and/or

Multiple versions of the automatic milk recording system may be tested with one or more automatic milk samplers as part of the same test when requested as part of the application process.



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AMS & Samplers Required

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Table 4. Number of automatic milk recording systems with either automatic milk samplers or milk analysers needed for a certification test.

	Robot
Number of AMS for field test	2
Number of farms for the field test	2
Number of reserve devices	NA

Note: The manufacturer/test applicant is responsible for the correct installation and calibration of the automatic milk recording system(s) on the farms. After installation, the test centre will conduct the tests without representatives of the manufacturer/test applicant present.

Multiple automatic milk samplers may be tested with a single automatic milk recording system but does not change the number of AMS or number of farms

Manufacturers' test farms are not eligible to be part of the ICAR test



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AMS with In-Line Analysers

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1.3 In-line milk analyser in automatic milk recording systems

In the case that the automatic milk recording systems is equipped with an in-line milk analyser, the milk analyser shall:

- a. Give a value for fat and protein at a minimum, representative for all the milk collected during that milking session.
- b. Have no observed or measured effect on the milk flow or quality in any way.

A milk analyser shall be resistant to all conditions encountered in its normal working environment (i.e. during milking, washing, disinfecting and, when applicable, transport). All parts subject to wear and tear shall be easily replaceable.

The key condition is the 'representative' nature of the milk analysed.

In-line analysers that meet this guideline may be part of the traditional ICAR test for device/sampler certification



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ICAR List of Certified Combinations

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- Animal identification ▸
- Milk meters ▸
 - Certified milk meters for cows
 - Certified milk meters for sheep and goats
- Certificate of Quality ▸
- DNA technology certifications ▸
- Milk Analysis ▸
 - AMS and Automatic Sampling Trays
 - Certified jars
 - Software for milk meters testing
 - Steps to submit a device to ICAR testing
 - Application form for testing
 - Test centres

For more information on the ICAR testing process or required modifications, please contact Steven Sievert, the Sampling Devices Sub-Committee.

ICAR-certified AMS and automatic milk sampler/tray combinations

As a courtesy, those combinations under ICAR test at the present time are represented in the following table; not granted nor implied on those combinations under test at any time. Users of this table are encouraged to check the most current ICAR certifications.

This table contains additional resources in addition to the list of ICAR-certified combinations. To see a more detailed list of automatic milk sampler/tray, please click on the thumbnail in the table. The manufacturer's manual (where available) for a specific automatic milk sampler/tray may be viewed by clicking on the name of that automatic milk sampler/tray. Further, if there are required modifications for a specific combination, that information may be found by clicking on the status in the table for that specific combination.

ICAR certified	Under ICAR test	Not ICAR tested	Not ICAR tested	Not ICAR tested	Not ICAR tested	Not ICAR tested	Not ICAR tested	
ICAR certified		Not ICAR tested	Not ICAR tested	Not ICAR tested	Not ICAR tested	Not ICAR tested	Not ICAR tested	
Not ICAR tested		ICAR certified	Under ICAR test	ICAR certified	ICAR certified	ICAR certified	ICAR certified	
Not ICAR tested		ICAR certified	Under ICAR test	ICAR certified	ICAR certified	ICAR certified	ICAR certified	
Not ICAR tested		ICAR certified	Under ICAR test	ICAR certified	ICAR certified	ICAR certified	ICAR certified	

A new platform for collecting data on "Cow, sheep and goats milk recording systems"



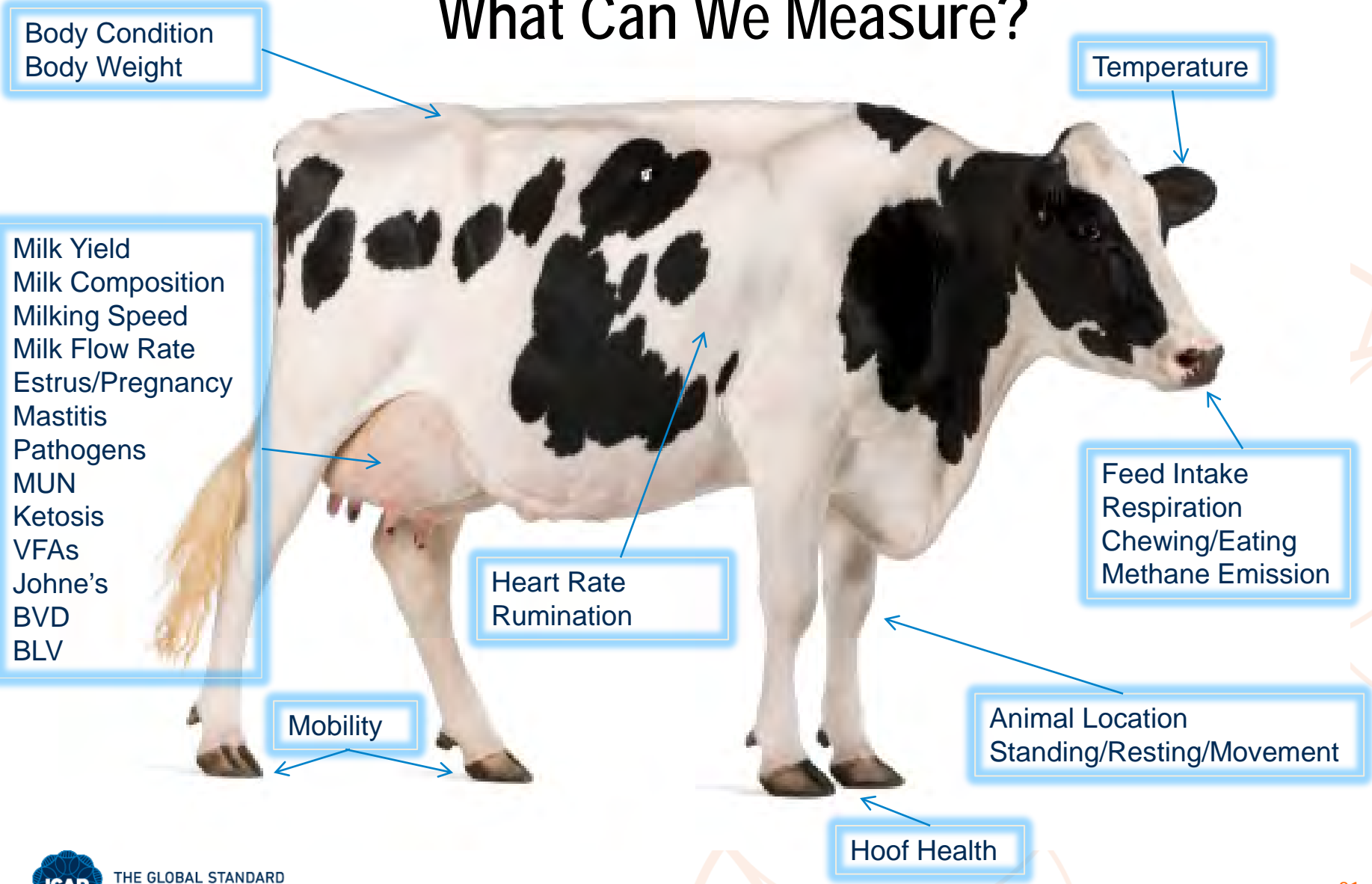
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ICAR Guidelines for Validation of AMS with Sensor Systems

AMS Sensors for Components and Other Measured Parameters

What Can We Measure?





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Certification vs. Validation

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Sensor Systems

- The system is more than a sensor recording observations
- Simultaneous & automatic ID and measurement recording
- Linkage to sensor ID to official ID
- Data transformation, handling, editing – what is measured is rarely what is reported or creation of multi-day means based on multiple observations

Used as Part of a Recording System or Scheme

- The traditional practices to reduce errors are removed

Sensor System Challenges



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The System Approach

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Data Quality – The System Approach

data that has all five elements of quality at once:

Data
Quality

VS.

Data
Accuracy

- accuracy
- completeness
- consistency
- credibility
- custody

Data Accuracy – an element of quality that deals with the data meeting bias & precision standards when using a single or series of certified device measurements



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Simultaneous Animal ID & Sensor Measures

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Errors Associated with ID

ID Association

- Wrong live animal with ID in data file
- Override of ID corrections by other farm management systems

ID Linkage or Cross-Reference

- Wrong sensor ID with official ID
- Animal ID to Sample ID

ID Positional Errors

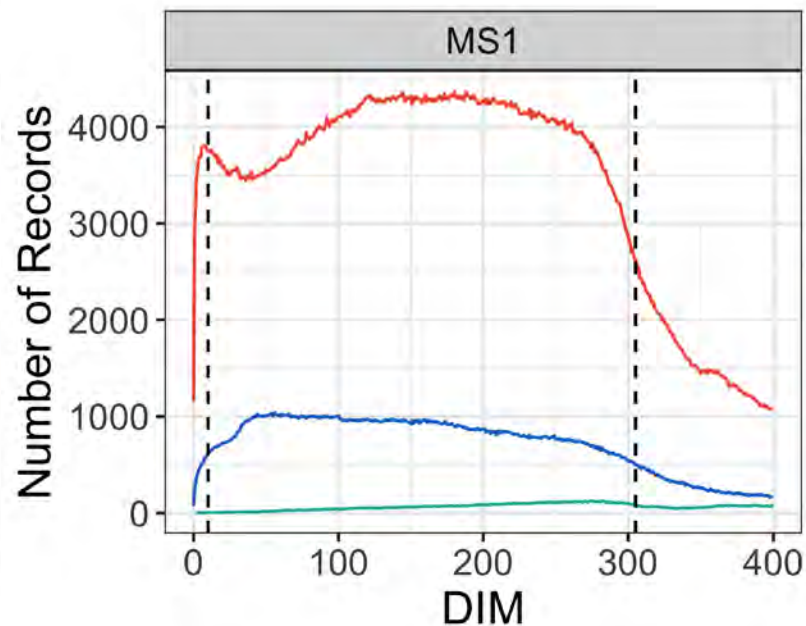
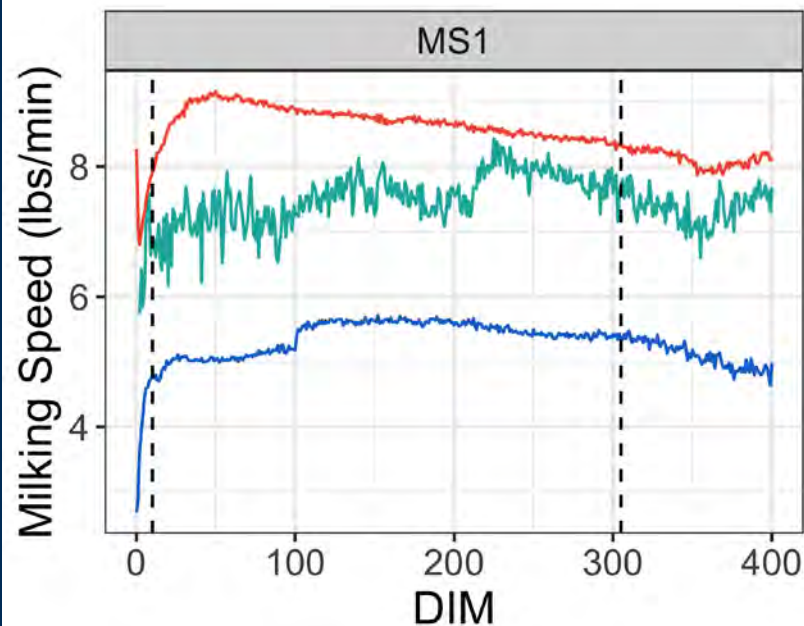
- Missing data points (unreadable ID)
- Cows out of order (reading errors)
- Samples or observations out of order



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Milking Speed by AMS Manufacturer (Holstein)



OEM

- DeLaval
- GEA
- Lely

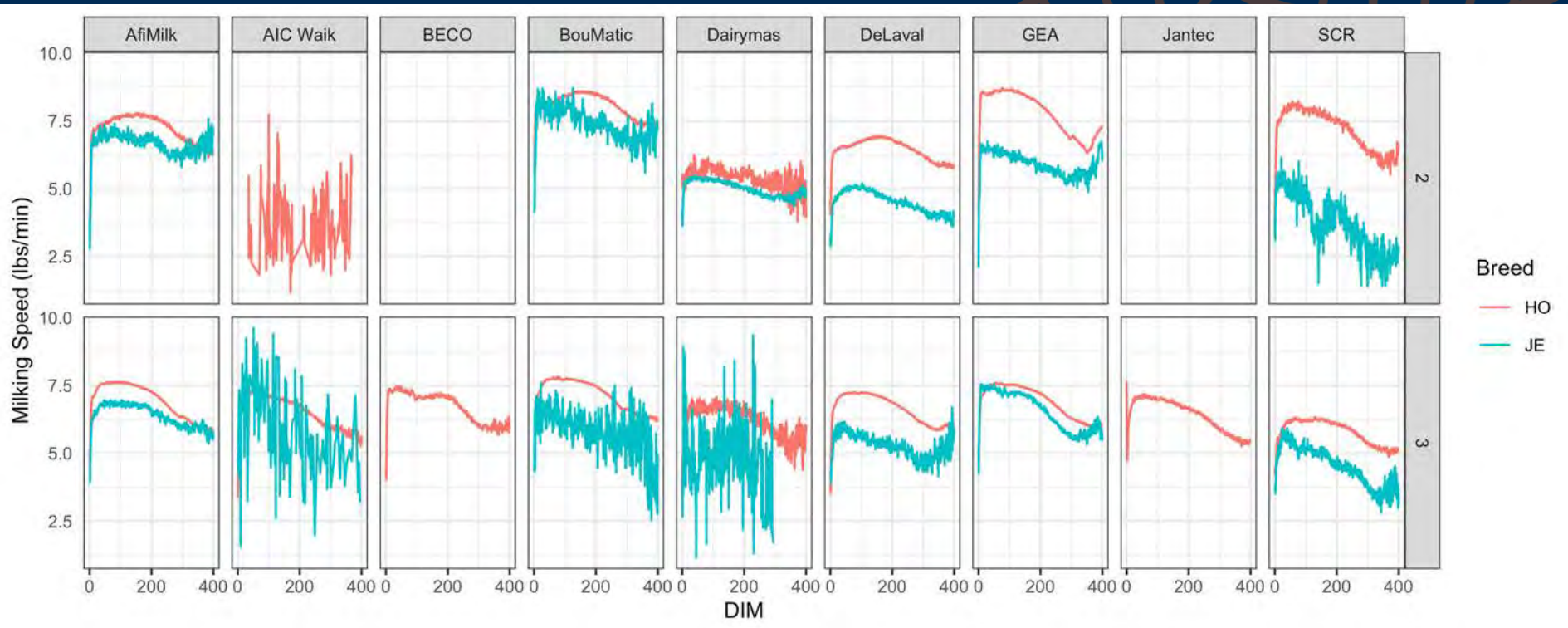


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OEM, BREED, FREQUENCY, & DIM

OEM, BREED, FREQUENCY, & DIM – Traditional Parlours





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Testing & Validation Procedure

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Components of ICAR Sensor System Test

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**MRSD-SC
Test Centre
Develops a
Test Plan for
the System**

Definition of the Measurement & Principle (Direct/Indirect/Proxies)

Evaluation of the Accuracy, Repeatability, & Reproducibility of the System Data

Evaluation of the Animal ID System(s) & Linkage to Sensor System Measurements

Evaluation of the Data Handling for Estimates, Rounding, Missing Data, & Reporting

Evaluation of the Data Interface & Transfer Procedures to External Databases

Evaluation of the Sensor System Installation or Commissioning Procedures

Evaluation of the Routine Check or Monitoring Procedures of the Sensor System

Evaluation of the Effect of the Sensor System on Animal Well-Being



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Conducting the Sensor System Test

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MRSD-SC Test Centre Conducts the Test Plan for the System

The Test Centre Coordinates the System Test – One Contact, One Contract, One Report for the System Manufacturer

The Test Plan May Reference Other Sections of ICAR Guidelines (ADE, Milk Analysis, Feed Efficiency, Conformation, Etc.)

The Test Plan May Reference other Standards when no ICAR Guideline Exists or when no "Golden Standard" is Available (IDF, ISO, AOAC, Etc.)

External Parties or Resources Involved as Needed – Data Modeling, Expertise (Consultation, Review, Labour)

Review of Internal Manufacturer Data, Peer-Reviewed Publications, Field Testing, and/or Data Modeling

Confidential Test Report to MRSD-SC for Review and Recommendation

Test Report Provides Public Comments to MRO/HRO on Quality Assurance – Installation, Routine Checking, Use Considerations, and Limitations of System

Coming Together –

Meeting Challenges Using Data from AMS Systems



Manufacturers lead in innovation but also need to protect interests –
What data is available?

Producers are saying I made the investment –
Will you use my farm/herd data?

Recording organizations are looking for guidance –
Can we use the data?