EMBRACING NEW STREAMS OF DAIRY DATA – HOW GOOD IS GOOD ENOUGH?

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Changing Dynamics of Herd Recording

Traditional herd recording programs rely on a mix of:

- Portable meters owned by herd recording organization or fixed in-place meters owned by the herd
- meter maintenance, calibration and operation
- Investment in equipment carried by recording organization or herd

The new construct of data flow from farms:

- Fewer herds coupled with increased herd size
- Real time access to data and results
- Investment in integrated milking systems/software by dairy
- Desire for increased data handling efficiency with less labour

Challenges in Modern Herd Recording

The V's of Data

Volume
Velocity
Variation
Validity

How Good is Good Enough?

Dairy cows are generating more data than ever–
What can we tell you?

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

HROs are looking for guidance –
What do we do with this data?

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Uses of Data

Management Data
- Yield
- Milking Speed
- Feed Efficiency
- SCC

Animal Health Data
- Locomotion
- Reproduction
- Disease
- BCS/Weight

Animal Welfare Data
- Activity
- Mobility
- Eating, Resting
- Heat Stress

Data for Genetic Evaluations

With Different Needs for Accuracy & Precision

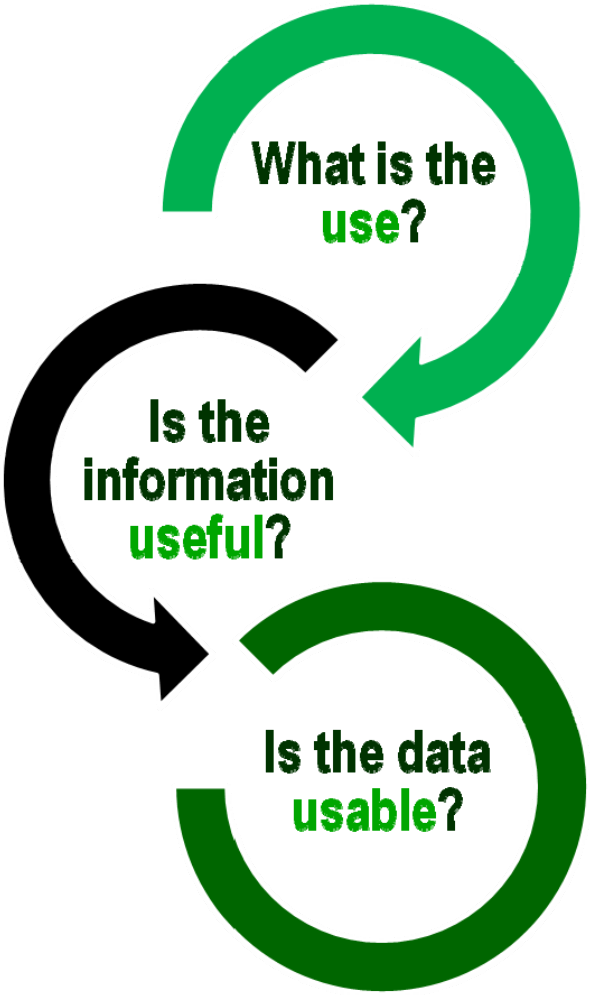
Data Linked to Direct Farm Payments
- Yield
- Fat, Protein
- SCC

Alarm Data
- Heat Detection
- SCC
- Locomotion
- Location

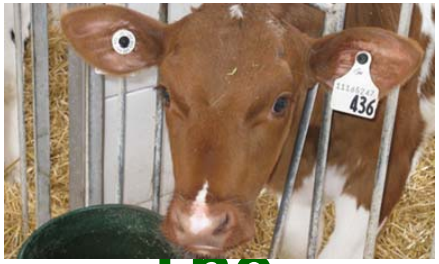
Yes/No Data
- Pregnancy
- Disease

Trend Data
- BCS/Weight
- Milk Flow/Speed
- Feed Efficiency
- Activity

Decision Tree for Data Usability



Usability may change based on intended use and quality of the data



The Importance of Animal ID

Simultaneous recording of animal ID and data measurement is key principle that is often overlooked in assessing data quality

- The 'official ID' of an animal most likely will not be the same as ID associated with device measurements
- Animals may have multiple IDs for data flow over their lifetime
- Animals may have multiple IDs on their body or in the data flow/computer system(s) at once
- Individual ID may not be enough – pen/string/location ID may/will be needed

<u>The key questions related to ID on data usability</u>

- Do we have protocols for ID cross-referencing and validation?
- Do we have protocols for on-farm validation of the ID system & for data transfer/custody from farm management software to external users?

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Data Quality

vs.

Data Accuracy

Data Quality – The System Approach

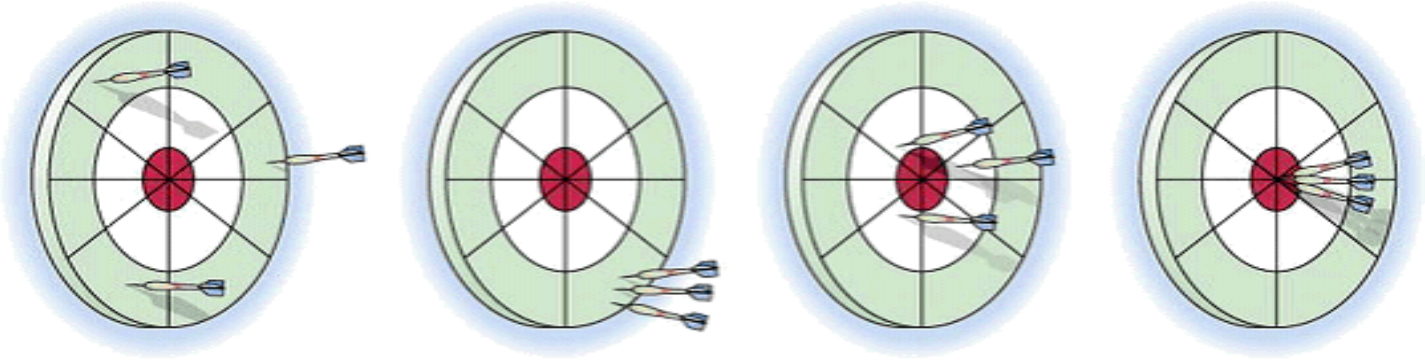
data that has all five elements of quality at once:

- accuracy
- completeness
- consistency
- credibility
- custody

Data Accuracy – The Device/Sensor Measurement

an element of data quality that deals with the information being exact (bias & precision) when describing the physical characteristics or measurements

Accuracy & Precision



(a) Low accuracy Low precision (b) Low accuracy High precision (c) High accuracy Low precision (d) High accuracy High precision

Some traits need high accuracy & high precision

- Milking speed, body weight

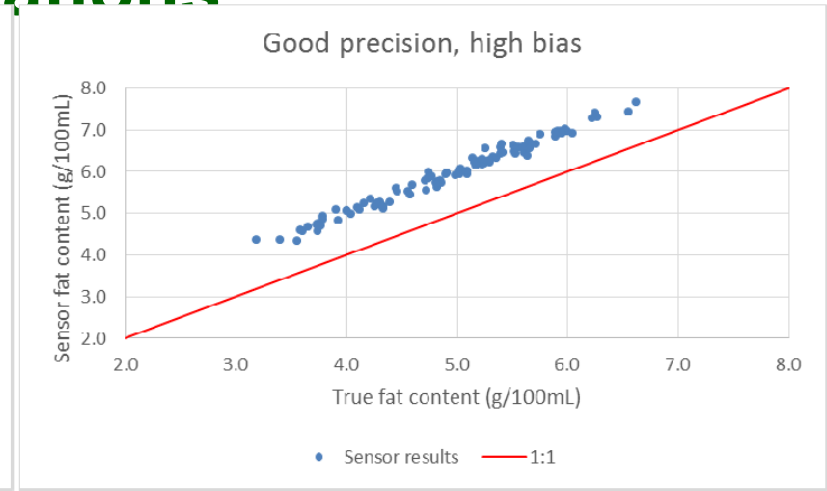
Some traits high accuracy & lower precision may be okay

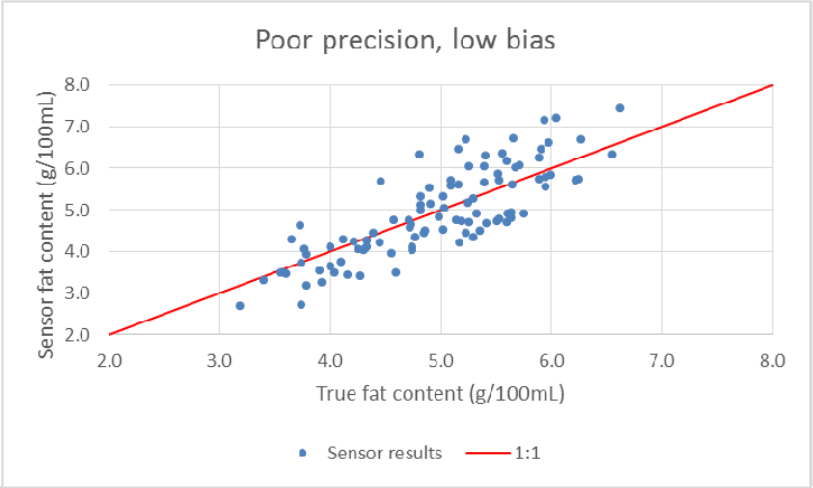
- SCC, fat, protein

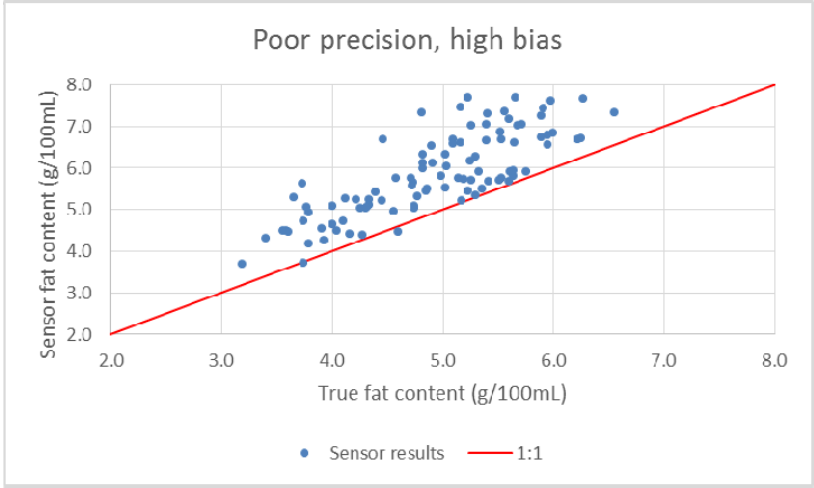
Some traits high precision is ideal and low accuracy is acceptable

- Body condition scores, activity measurements

Accuracy & Precision of Four Milk Fat Estimations







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Potential Sources of Error in Data Recording

Accuracy	Excellent	Good	Fair
Milk Meter	98%	98%	98%
Controller	99%	99%	99%
Animal ID	100%	97%	95%
Milker (Human)	99%	99%	99%
Data Transfer	100%	100%	100%
Maximum Data Accuracy from On-Farm System	96%	93%	90%

- An accurate meter or sensor alone is not sufficient
- Errors also exist in traditional herd recording using portable and fixed meters
- Need to review entire system and minimize errors

Data Validation Questions

Data Handling

- Handling of missing data points
  - Estimated data included?
  - Mean of actual data only?
- Decision rules for handling and/or exclusion of outliers
- Data smoothing

Data Validation

- Range of accurate measurement for sensor
- Distribution of errors
- Evaluation of algorithm
  - May need test data set to send through system algorithm to validate output.

More than One Measurement May be Needed

The Activity Example

- Measurements/Observations on one parameter without the other parameters provides incomplete picture
- Develop a baseline for herd or pens/strings within a herd to determine pen/string effect
- Multiple Uses of Data – Pen/String Changes and Individual Cow Changes

Cumulative Effect of Errors in Milking Parlours

AMS/Robotic Systems

- Limited or no choice of milking stall
- Error effect may be high or consistent

Parallel or Herringbone Parlours

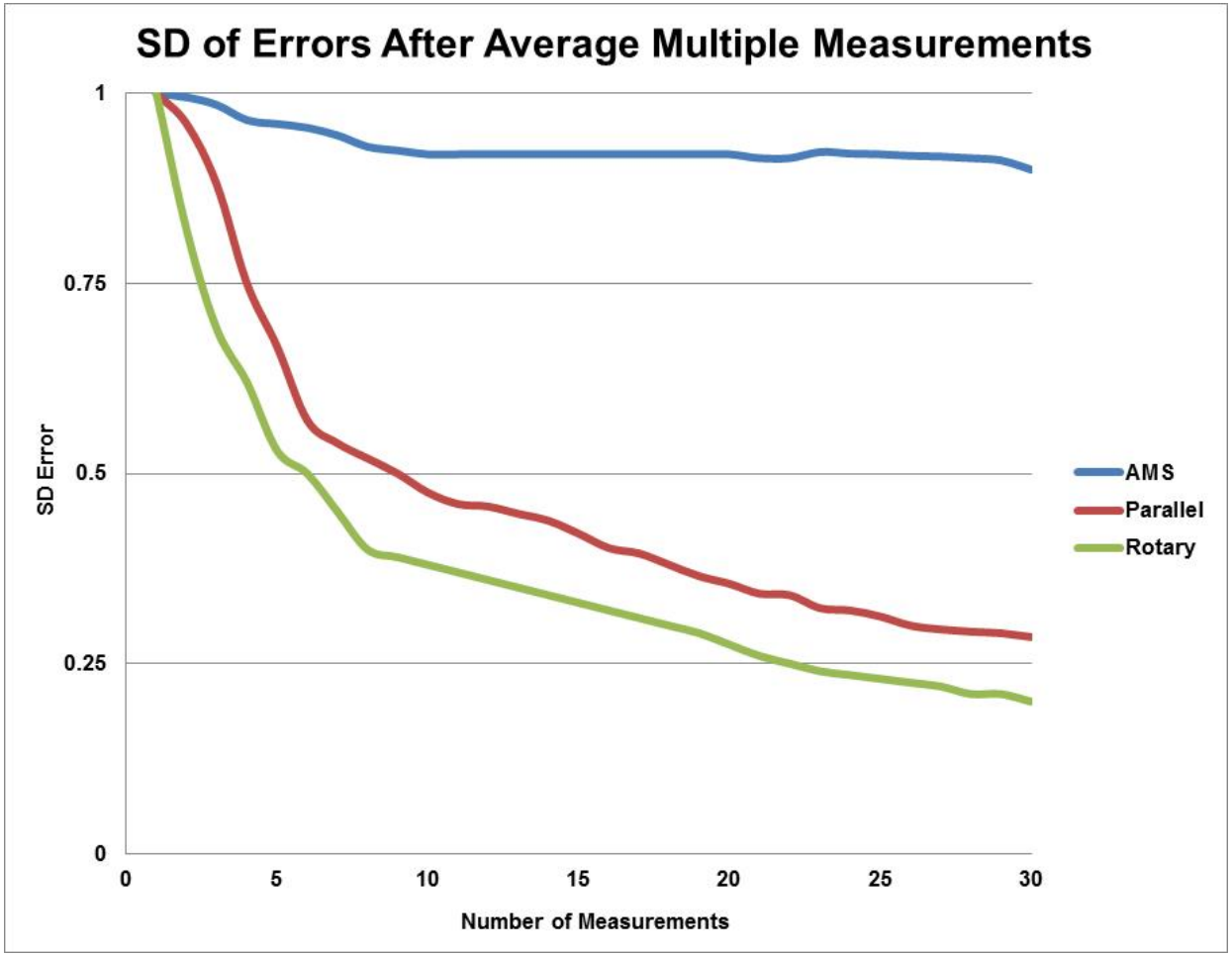
- Cow behaviours lead to trends
- Error effect exists but is moderately low

Rotary Parlours

- Random stalls at each milking
- Error effect is low

More Measurements Does Not Mean Higher Quality Data

There may be a point of diminishing returns with measurement of some traits



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How Good is Good Enough?

An Approach to Consider

- System Quality Validation and Recording the Source of Data Measurements
- Focus on Ingestion of Data from Farm Management Software instead of Exclusion
- Develop Routine Quality Monitoring Tools to Assure Consistent and Credible Data
- Focus on Data Use and Usability for Specific Needs Instead of All or Nothing Approach
- Removal of Incomplete Data Instead of Editing the Data to Meet Standards or Improve Quality

Points to Ponder

- Focusing on quality of the data system includes completeness - animal ID, trait measurement, missing data handling, calculations, transfer
- HRO and dairy data programs should look at quality of various data sources as a whole rather than focus on accuracy of individual measurements
- Opportunity to merge like data from various sources or system together and deliver quality information to herd managers and the HRO system
- How we address these questions will be key to the **effectiveness of dairy data and management systems**