Session 5.2: PLF Technology development and data accessibility

French experience of using ICAR approved method for predicting 24-hour fat% and fat yield from one-sampled milking in Automatic Milking Systems

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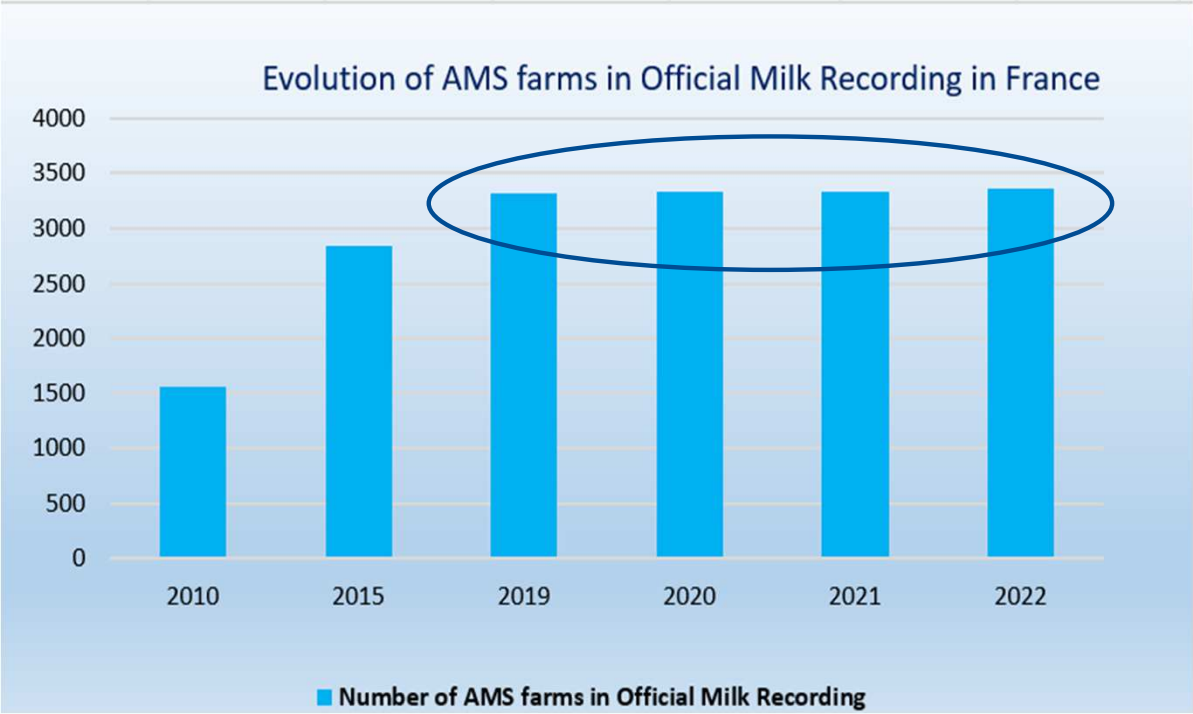
Context of this French study

- Evolution of AMS farms in Official Milk Recording

  From 1,500 farms to 3,400 farms (last 12 years)



AMS farms

Some Key Figures - 2022

12% of the farms in Official Milk Recording

14% of the cows in Official Milk Recording

85 cows/farm (+15/traditionnal)

55% of AMS farms use one box

AMS schemes used in France

- 2 types of AMS schemes approved by ICAR
- One scheme with **at least two sampled milkings** per test day (AR scheme by MRO's technicians or BR scheme by farmers)
  - Gold Standard for genetic evaluation
- Since 2017 possibility of another scheme with **one-sampled milking** per test day (with specific identification= AR* scheme or BR* scheme)
  - by using Peeters&Galesloot's method (defined in Section 2 of current ICAR Guidelines) for predicting 24-hour fat% and yield
  - by applying weighting factors for genetic evaluation
- 25 different AMS Standard Operating Procedures defined in the French Milk Recording Guidelines
- In collaboration with all AMS Manufacturers (according to model, version,…)
- For helping MRO's technicians, farmers during test day (set up Automatic Milking Samplers, parameters, data transfer,…)

Aims and method of this study carried out in 2022

- Aims:

- To **check and verify (**from a new dataset), the accuracy level of the Peeters&Galesloot's regression coefficients
- To **improve** the actual 24-hour performance predicted, by testing Peeters&Galesloot's complex models (6 different models) described in J. Dairy Sci. 85:682-688 (2002)
- To **calculate** accuracy results on test day / 24-hour Reference

- Method:

- Selection of 1,277 AMS farms with **at least two sampled milkings** for component per test day (620,792 milkings)
- Constitution of **2 independent data sets** of sampled milkings
- Estimation of regression coefficients for each models tested on a **training data set** (67%)
- Validation of the regression coefficients on a **validation data set** (33%)

Peeters&Galesloot's models tested

- One "Simple" model, currently used in France

  24-h Fat%= b_0 + b_1 Fat%(n) + b_2 Prot%(n) + b_3 Int(n) + b_4 Int(n-1) + b_5 Milk(n) + b_6 Milk(n-1) + e (residual effect)

  b_0= intercept / b_1 to b_6= regression coefficients

- 6 "Complex" models, which include different classifications (Ca to Cf) for testing the effect of class variables such as:

*Ca= **Time** (day) of sampled milking n (h), 4 classes 0-5.59, 6.00-11.59, 12.00-17.59, 18.00-23.59*

*Cb= **Interval** preceding the sampled milking n (min), 4 classes 0-360, 361-510, 511-700, 701-1440*

*Cc = **Fat/Protein Ratio** of the sampled milking n, 4 classes 0-1.10, 1.11-1.25, 1.26-1.40, >1.40*

*Cd = **Parity,** 3 classes 1, 2, ≥3*

*Ce = **Lactation stage,** 3 classes 1-99, 100-199, ≥200*

*Cf = **Combination** of Cb and Cc models : **Interval** preceding the sampled milking and **Fat/Protein Ratio** of the sampled milking n (16 classes)*

What are the accuracy results?

On 24-hour predicted for Fat% and Fat yield from:

Determination coefficient R^2

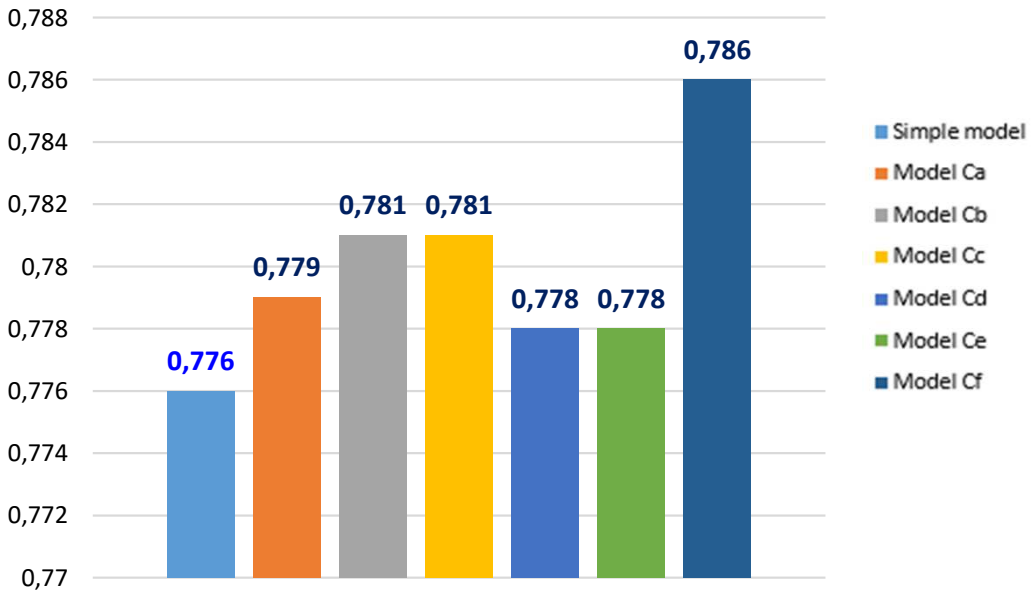
Bias

Standard Deviation of bias

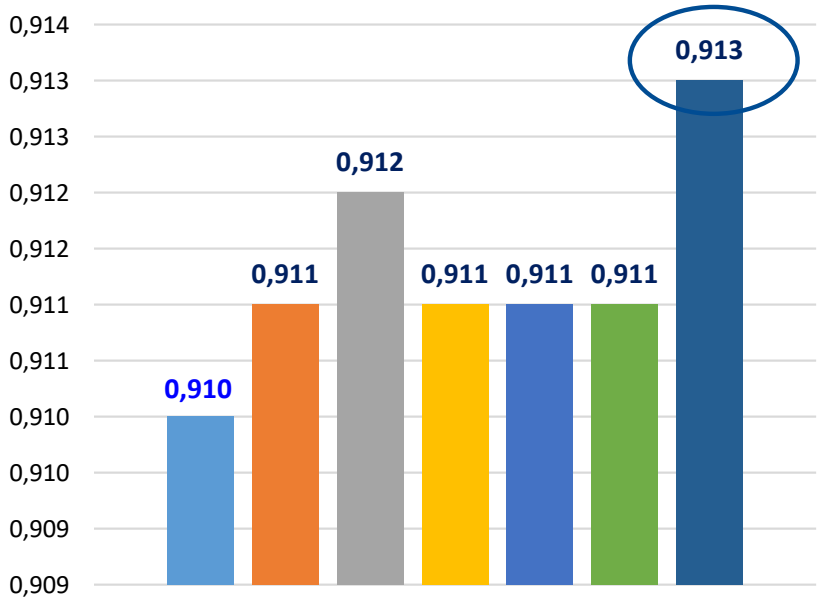
Accuracy results: R^2

R^2 of 24-hour predicted

Fat%



Fat yield

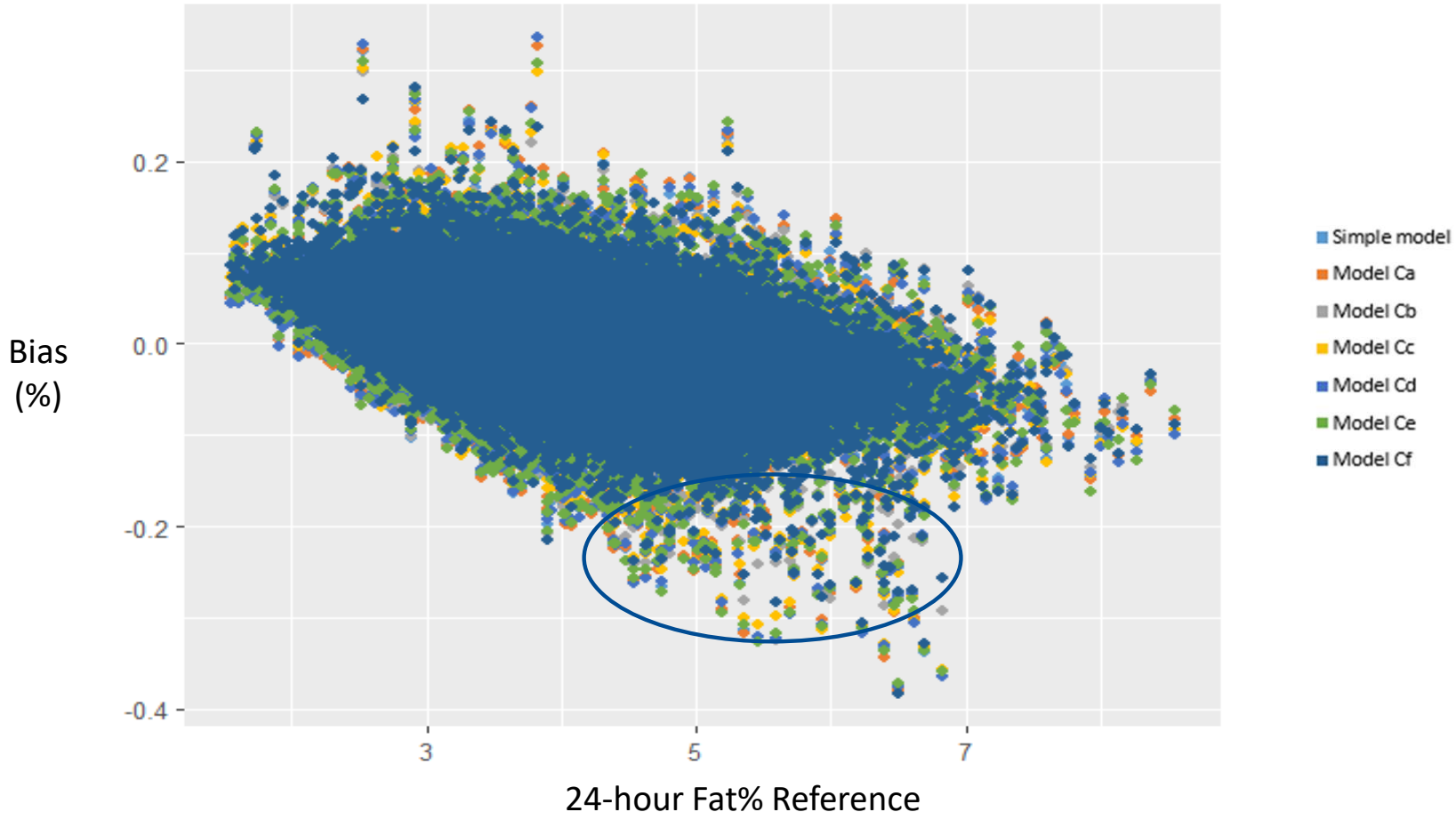


Improvement of R^2

- Fat%: from **+0.2** (Cd-Ce) to **+1.0 point** (Cf)
- Fat yield: from **+0.01** (Ca-Cc-Cd-Ce) to **+0.3 point** (Cf)

Accuracy results: Bias

Bias (dispersion) of 24-hour predicted Fat%

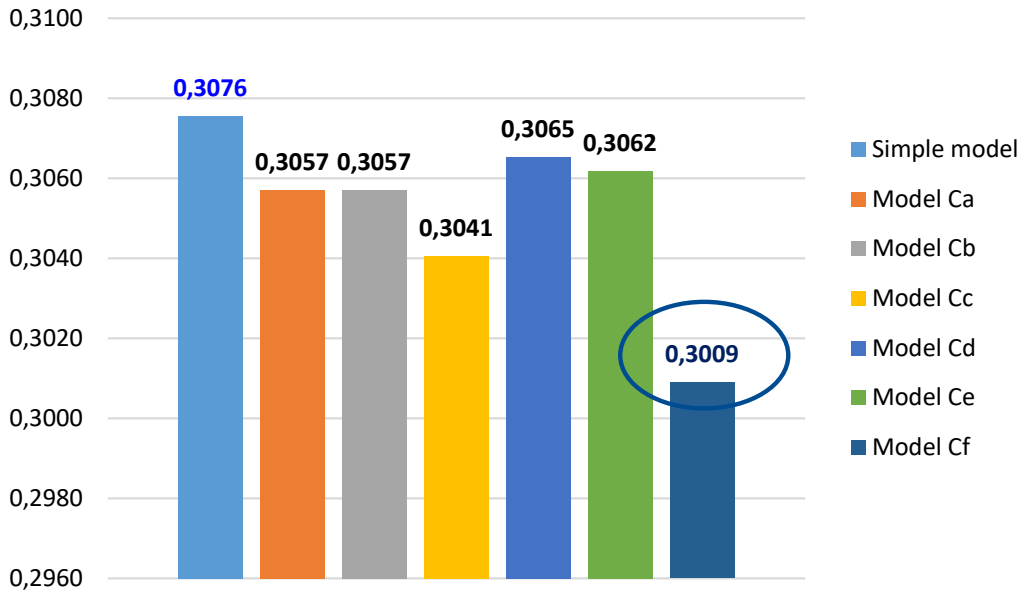


Overall the bias level is negligible especially with Cf model (less extreme value)

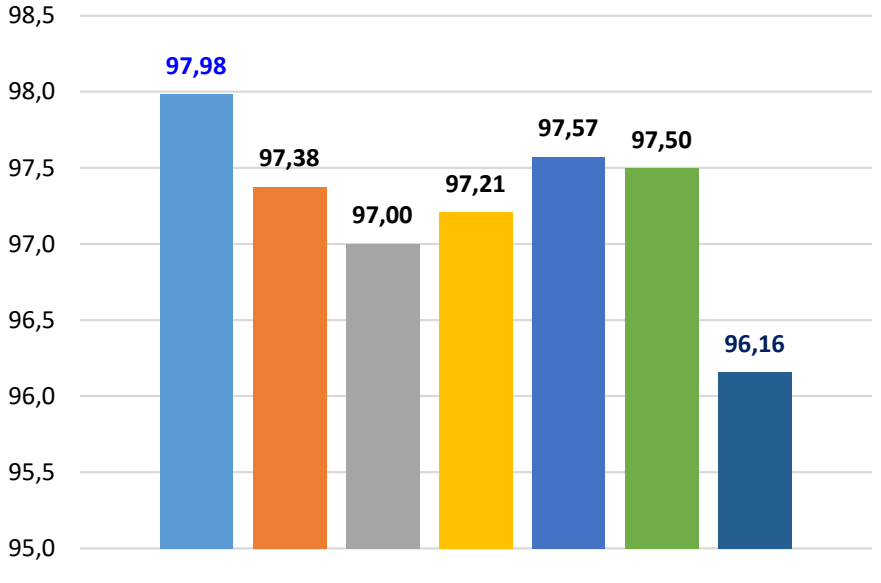
Accuracy results: Standard Deviation of bias

Standard Deviation of 24-hour predicted

Fat%



Fat yield(g)



Reduction of St. Deviation

- Fat%: from **0.0011%** (Cd) to **0.0067%** (Cf)
- Fat yield: from **0.41g** (Cd) to **1.82g** (Cf)

French accuracy results compared with J. Dairy Sci. 85:682-688 results (2002)

Comparison of R^2 between both studies (summary)

	Models tested	Accuracy R^2 French study 2022 n= 620 792	Accuracy R^2 J. Dairy Sci. 2002 n= 5 348
Fat%	*Without prediction*	*0.706*	*0.710*
	Simple model prediction	0.776	0.813
	Complex model Cf Interval - Fat/Protein Ratio	0.786	0.828
Fat yield	*Without prediction*	*0.849*	*0.855*
	Simple model prediction	0.910	0.931
	Complex model Cf Interval - Fat/Protein Ratio	0.913	0.935

Overall same accuracy gain between both studies
by using model Cf / simple model (from 1.0 to 1.5 point)

Discussion - Conclusion

About using Peeters&Galesloot method's in AMS

- This method improves the accuracy level of 24-hour fat% and fat yield in test day (French study in 2022, J. Dairy Sci. 85:682-688 in 2002)
- Regarding the accuracy level of 6 complex models tested
  - The model Cf which combines interval preceding the sampling milking (4 classes) and Fat/Protein ratio (4 classes) allows a better accuracy level of both traits analysed, especially fat% (in comparison with the current simple model)
  - This model involves to define 16 regression coefficients classes
- Checking the accuracy of regression coefficients from new datasets is necessary and relevant

Discussion - Conclusion

About using Peeters&Galesloot method's in AMS

- Finally, regarding the French experience after six years of using
  - It was an answer to expectations of MRO's, farmers to simplify, to reduce the cost of Milk Recording
  - Today all MRO's propose this scheme
  - Tools processing of AMS data in Official Milk Recording have been changed and validated
  - Decision to apply weighting factors for genetic evaluation in 2020 and concerns AR* and BR* schemes
- For information, another study about improvement research of Peeters&Galesloot method's has been carried out by Roelofs et al (2006) with other variable such as month of sampling,…

Thank you for your attention