Analysis of the accuracy of a method for estimating 24-hour fat (percentage and yields) with robots protocols and one single sample

INTRODUCTION

The objective of this study is to propose an evolution of the robots protocols to meet the expectations of the Milk Recording Organizations, the breeders, the required quality for cow management and genetic evaluation.
The current study was conducted in 2016-2017 and consisted to:
- test an ICAR method for estimating 24-hour for fat percentage and yields from a single sample on robots protocols (ICAR Guidelines, 2017),
- evaluate the accuracy of the method on test day record and on lactation.

MATERIAL AND METHODS

The method is based **on a multiple regression** model that includes fat percentage, protein percentage, milking interval and milk weight of the sampled milking, milking interval and milk weight of the previous milking (Table 1).

Table 1: Presentation of the simple model Peeters and Galesloot

Fat% 24-hour estimated = b0 + b1Fat%(n) + b2Protein%(n) + b3MI(n) + b4 MI(n-1) + b5Milk(n) + b6Milk(n-1)
b0 = intercept ; b1 to b6 = regression coefficients ; MI = Milking interval ; Milk = Milk weight ; (n) = milking sampled (n-1) = previous milking

Data collected by Milk Recording Organizations were selected in order to constitue relevant datasets for the different steps of the study (Table 2).

Table 2: Description of the dataset for analysis on test day record

	Dataset
# Milkings robots (individuals)	820 875
# Cows	77 095
# Herds	884
# Sample per cow	2.1
Average milk weight - kg	11.3
Average fat - %	3.97
Average protein - %	3.28
Average length between milking - hour:minute	9:34

Table 3: Description of the dataset for analysis on lactation

	Dataset
# Lactations	10 981
# Herds	399
Average milk yields - kg	9 943
Average fat - %	3.79
Average fat yields - kg	377
Average duration of lactation - days	402

The statistical analysis was carried out by comparing the reference 24-hour fat percentage with fat percentage (from the first milking sampled) unadjusted and adjusted.

RESULTS

On test day record

Table 4: Bias and correlations between reference 24-hour fat (% and yields) and unadjusted / adjusted single sample (N= 332 698 first milking sampled)

	Mean bias		Std bias		Correlations (R^2)	
Traits	*Unadjusted*	**Adjusted**	*Unadjusted*	**Adjusted**	*Unadjusted*	**Adjusted**
Fat %	*0.0315*	**-0.0350**	*0.4150*	**0.0300**	*0.714*	**0.786**
Fat yields - kg	*0.0100*	**0**	*0.1350*	**0.0960**	*0.852*	**0.912**

On lactation records

Table 5: Bias and correlations on lactation (N= 10 981 lactations)

	Mean bias		Std bias		Correlations (R^2)	
Traits	*Unadjusted*	**Adjusted**	*Unadjusted*	**Adjusted**	*Unadjusted*	**Adjusted**
Fat - %	*0.0382*	**-0.0290**	*0.2045*	**0.1639**	*0.828*	**0.876**
Fat yields - kg	*3.8380*	**-0.3770**	*20.81*	**16.62**	*0.922*	**0.948**

CONCLUSION

This study shows that the Peeters and Galesloot method's of estimating 24-hour for fat (percentage and yields) with robots based on a single sample **improves the accuracy of the data compared with one single sample unadjusted.**
The regression formula defined from a first relevant dataset has been validated from a second independent dataset and confirms the reliability of the model.
On test day record, the gain of accuracy is **8%** for fat percentage and **6%** for fat yields. On lactation data, the gain of correlations is **5%** for fat percentage and **3%** for fat yields.
The use of this method by the Milk Recording Organizations is an answer to the expecttions of the breeders to simplify the protocol and to reduce the cost of milk recording with robots while maintaining a sufficient accuracy for cow management and genetic evaluation purpose.

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Authors:
S. Minéry[1], X. Bourrigan[1], D.Saunier[2], G.Augier[2]
[1] Institut de l'Elevage, 149, rue de Bercy, 75595 Paris, France
[2] France Conseil Elevage, 42, rue de Châteaudun, 75009 Paris,
Contact: xavier.bourrigan@idele.fr