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Animal Production

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Improved method for calculating daily yields from alternating testing schemes

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Introduction

- A joint project to improve the estimation of daily fat and protein yield from alternating testing schemes
- Project partners: **VIT**, Germany, **Institut de l'Elevage and Milk Recording Organisations,** France

- Alternating testing schemes increase to reduce costs on farm level
- But problems with estimation of daily Fat and Protein Yields.

Methods of recording performance : T methods

Tmethod (eg AT4)

- *Nb of milkings / day* :	2 milkings/day
- *Recording performance :* **T**	- Milk yield recorded on 1 alternate milking - Contents recorded on 1 alternate milking

Methods of Milk Recording : Z method (EMM) (ICAR, 2004, Sousse)

Z method (eg CZ)

- *Recording operator :* **C** Recording by Technician and Farmer
- *Nb of milkings / day* : 2 milkings/day
- *Recording performance :* **Z**
  - Milk yield recorded on 2 milkings
  - Contents recorded on 1 alternate milking

Test n

Evening milking : **Farmer**
milk yield

Morning milking : **Technician**
milk yield + contents

Test n+ 1

Evening milking : **Technician**
milk yield + contents

Morning milking : **Farmer**
milk yield

Aim of the project:

- **Increase accuracy of estimates for daily fat and protein yields from "Z" testing schemes:**
- Idea:
  - Extension of the German model for estimating daily fat and protein yields (Liu et al., 2000) developed for T schemes
  - Using Milk Yield obtained on the 2nd milking as an additional information

Current Model

- Current German model considers separate regressions for combinations of
  - parity classes (i)
  - milking interval classes (j)
  - lactation stage classes (k)

$$y_{A4}^{[ijk]} = b_0^{[ijk]} + b_1^{[ijk]} \, y_{AT\text{-}am}^{[ijk]}$$

Current Model

- Definition of effect classes considered in the model

Trait	No. classes	Class definition
Parity	2	1st lactation, 2nd and later lactations
Milking interval	4	AM: < 13h; 13h-13.5h; 13.5 h-14h; ≥14h PM : ≥ 11h; 10.5h-11h; 10 h-10.5h; < 10h
Stage of lactation	12	30 days per class

Extended Model for Z testing schemes (Lactocorders)

- Milk yield of the other milking is used as an additional covariate

  - **PM-milk yield** when AM-contents are available
  - $y_{A4}^{[ijk]} = b_0^{[ijk]} + b_1^{[ijk]} y_{AT\text{-}am}^{[ijk]} + b_2^{[ijk]} \mathbf{Milk}_{\text{-pm}}^{[ik]}$

  - **AM-milk yield** when PM-contents are available
  - $y_{A4}^{[ijk]} = b_0^{[ijk]} + b_1^{[ijk]} y_{AT\text{-}pm}^{[ijk]} + b_2^{[ijk]} \mathbf{Milk}_{\text{-am}}^{[ik]}$

Data

- 2 data sets were provided by 3 French milk recording organisations

Milk and Contents obtained on both milkings separately ("True" and estimated Fat and Prot daily Yields)

- Data set (I) for deriving new regression coefficients / formulas:
  - 24,491 milkings
  - 8,655 cows
  - 169 herds
  - 2.8 milkings per cow
  - Milkings from January 2008 - November 2009

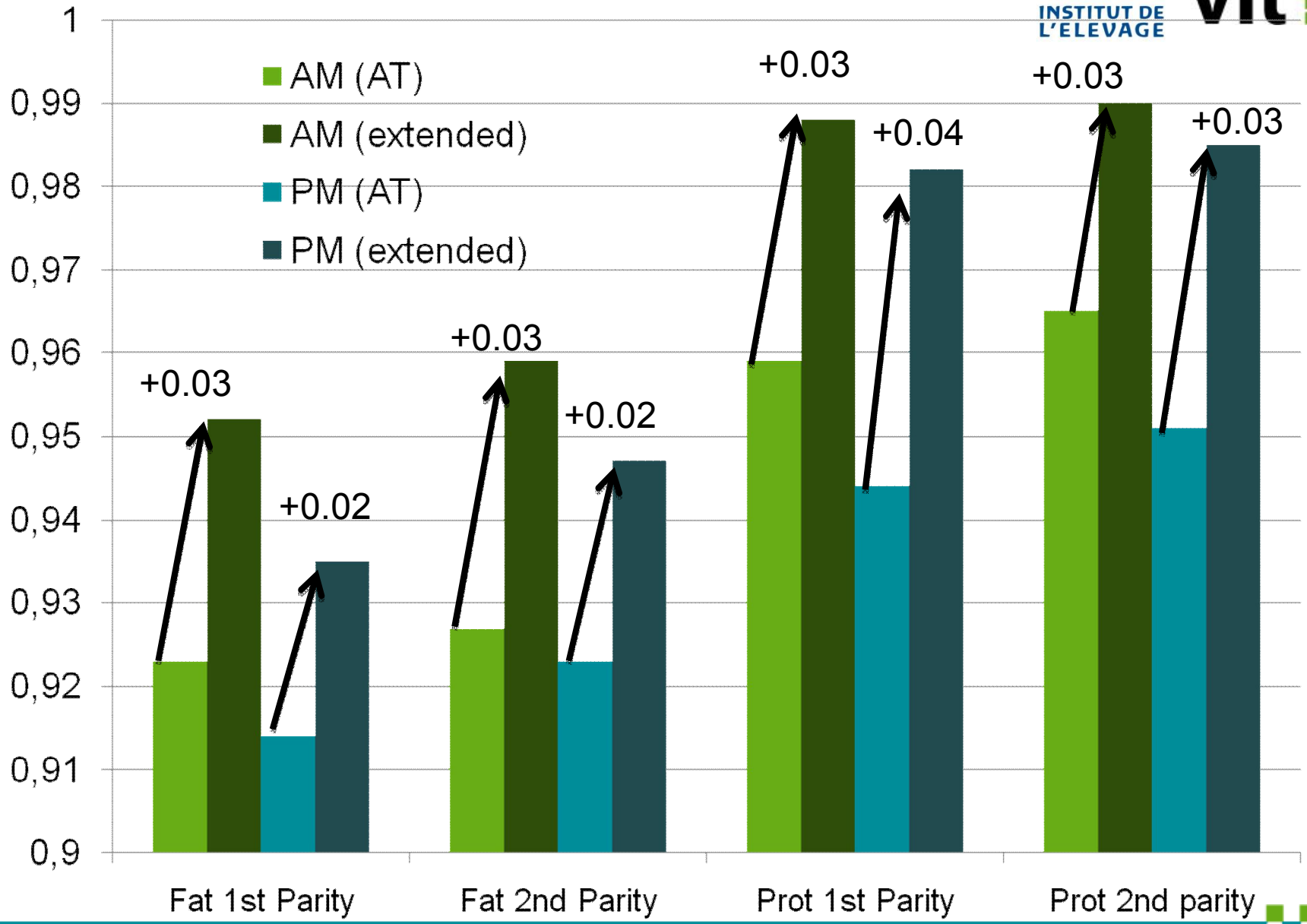
- Data set (II) for validation
  - 22,407 milkings
  - 8,190 cows
  - 156 herds
  - 2.7 milkings per cow
  - Milkings from November 2008 - March 2010

Data

Both data sets, n = 46,898 milkings

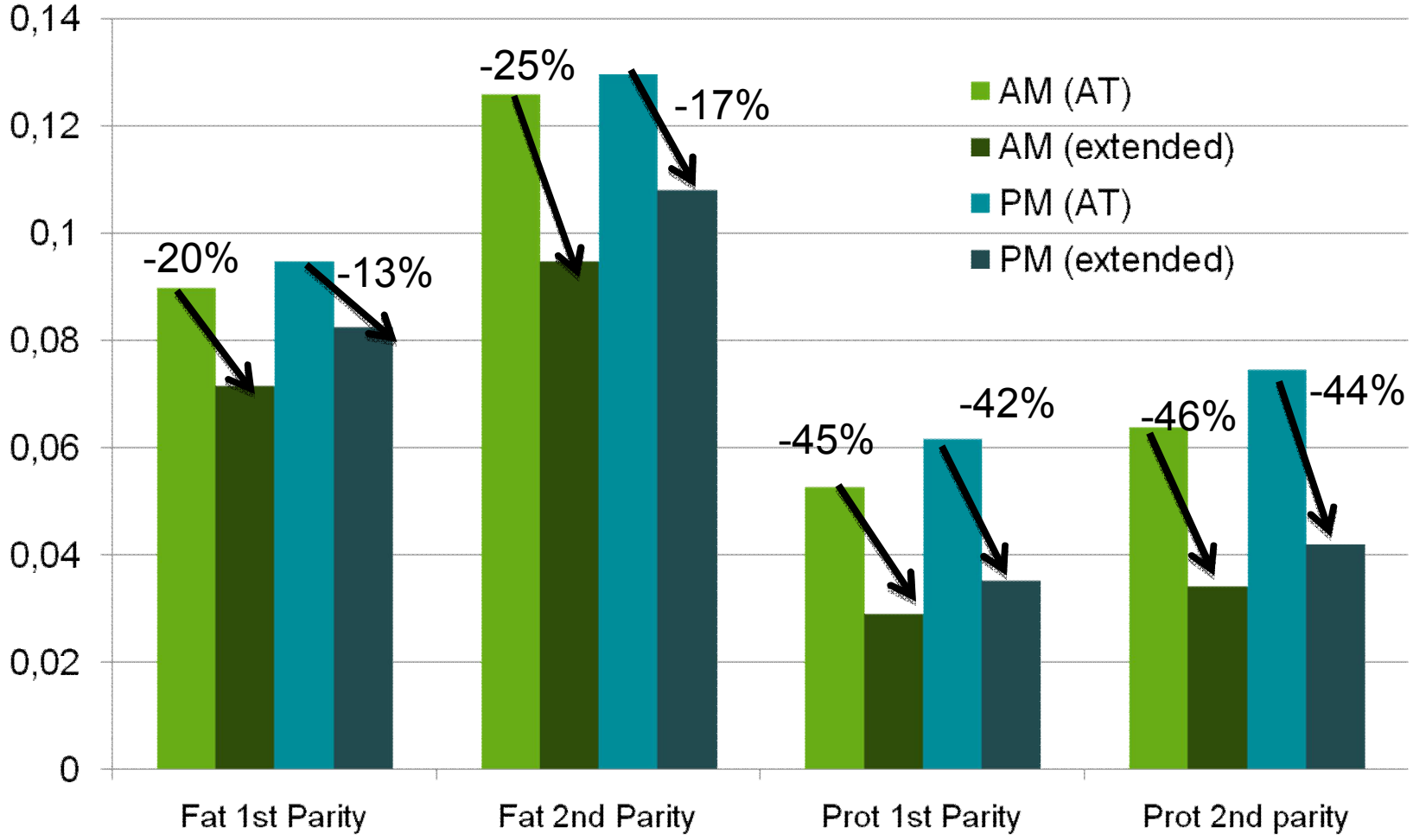
Trait	Mean	Std.-Dev.	Minimum	Maximum
Daily milk-kg	28.3	8.15	2.3	67.0
AM milk-kg	15.7	4.62	1.1	48.6
PM milk-kg	12.6	3.89	1.2	45.8
Daily fat-kg	1.11	0.31	0.07	2.97
AM fat-kg	0.58	0.17	0.03	1.89
PM fat-kg	0.53	0.17	0.03	2.04
Daily protein-kg	0.90	0.23	0.11	1.99
AM protein-kg	0.49	0.13	0.04	1.54
PM protein-kg	0.40	0.11	0.03	1.42
Milk. Interval AM (h)	**13.3**	**0.71**	**9.7**	**17.1**
Milk. Interval PM (h)	**10.7**	**0.71**	**6.9**	**14.4**

Results: Correlations between true and estimated daily yields (1st or 2nd parity)



Results

- Standard deviations of residuals (in kg)



Results

- Fat yield: Percentage of milkings with absolute differences expressed in percentage of true daily yield

		AM-milking		PM-milking	
	Difference	Current	New	Current	New
F-kg	< 1%	10.1	12.9	10.1	10.5
	1-5%	37.1	44.8	36.1	38.9
	5-10%	28.5	28.2	28.6	30.6
	10-20%	**18.1**	**12.0**	**18.1**	**16.4**
	> 20%	**6.2**	**2.2**	**7.1**	**3.6**

Results

- Protein yield: Percentage of milkings with absolute differences expressed in percentage of true daily yield

		AM-milking		PM-milking	
Trait	Difference	Current	New	Current	New
	< 1%	14.8	22.8	11.7	19.2
	1-5%	48.0	61.7	41.0	57.5
P-kg	5-10%	26.6	14.3	29.2	20.5
	10-20%	**9.2**	**1.1**	**14.9**	**2.7**
	> 20%	**1.5**	**0.1**	**3.2**	**0.1**

Results

- Mean differences btw. true and estimated daily fat yield depending on proportion of AM milk yield to PM milk yield

		AM		PM	
		F-kg		F-kg	
Model	No.	Current	New	Current	New
0-	3	-0.77	-0.35	0.73	0.29
0.25-	29	-0.27	-0.09	0.36	0.12
0.50-	132	-0.19	-0.10	0.23	0.07
0.75-	1,830	-0.09	-0.05	0.08	0.02
1.00-	**9,371**	**-0.02**	**-0.03**	**0.01**	**-0.01**
1.25-	8,048	0.02	-0.01	-0.03	-0.03
1.50-	2,256	0.07	0.01	-0.08	-0.05
1.75-	536	0.14	0.03	-0.12	-0.08
2.00-	202	0.25	0.08	-0.22	-0.12

Results

- In general
  - For all traits higher accuracy is achieved with morning milkings
  - Lowest accuracy is found for fat yield

- With the new extended model
  - Accuracy increases for estimated daily fat and protein yield
  - Estimation errors are reduced, especially for very unbalanced milkings with large differences between morning and evening milk yields
    - Very often unbalanced milkings lead to unreliable estimates
      ➔ this source of errors can be reduced with the new model

Conclusion

- With the new model disadvantages of alternating testing schemes can be reduced

- For practical use the regression coefficients should be derived from a data set that includes milkings of at least a whole year to
  - reduce seasonal effects
  - reduce effects caused by short lactations

- **The new extended model for estimating daily yields from alternating testing schemes could be a further step to increase the accuracy and therefore the acceptance of alternating testing schemes**

Aknowledgement

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