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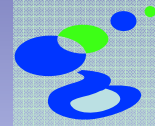
Alternative Modeling of Body Condition Score from Walloon Holstein Cows to Develop Management Tools

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FNRS

Context

A regular evaluation of Body Condition Score (**BCS**) is a valuable **management tool** for dairy farmers.



- BCS assess the **stored energy reserves** of the cow (indicator of energy balance status)
- It is linked to production, fertility and health traits

Context

- BCS has been recorded **since April 2006 in 76 dairy herds** (nearly 100 herds now) in the Walloon Region
- **Monthly** collected by the milk recording agent
- Scoring from 1 (emaciated cow) to 9 (obese cow)

Context

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“Herd BCS Balance Sheet”

- sent to farmers after each milk recording
- allows to point across time cows which are not in the range of desirable scores

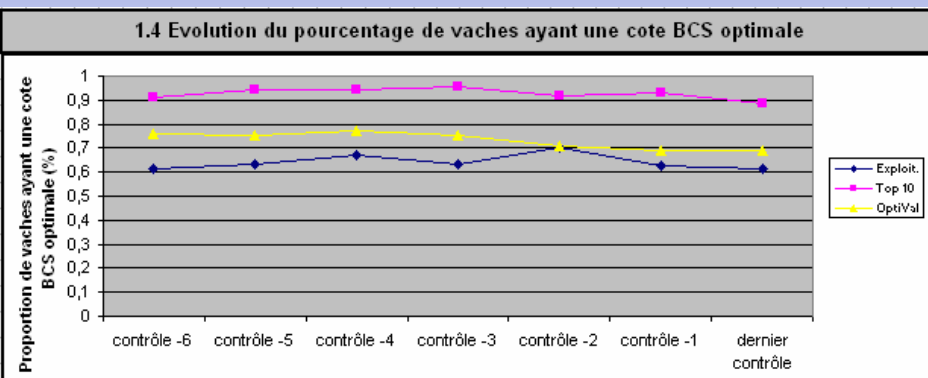
Context: "Herd BCS Balance Sheet"

Number of primiparous in each class of days in milk according to their BCS

| 1.1 Répartition des PRIMIPARES en fonction de leur BCS | | | | | | | | | | |
|--|-------|-----|---|---|---|---|---|---|---|---|
| Classe | Total | BCS | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tarissement | 1 | | | | | 0 | 1 | | | |
| de 0 à 45 jours | 0 | | | | 0 | 0 | 0 | | | |
| de 45 à 100 jours | 6 | | | 0 | 3 | 1 | 2 | | | |
| de 100 à 200 jours | 11 | | | | 2 | 4 | 5 | | | |
| de 200 à 270 jours | 13 | | | | 4 | 2 | 5 | 2 | | |
| de 270 jours au tarissement | 13 | | | | 1 | 1 | 8 | 3 | | |

Context: "Herd BCS Balance Sheet"

Evolution of percentage of cows presenting optimal BCS



Objective

Model BCS to **predict a BCS value for each day of the lactation** in order to develop decision-making indicators for dairy farmers

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1. Define the model
2. Assess its usefulness
 - overall fit
 - ability to predict missing and future records
3. Develop potential decision-making indicators

Data & Model

Data

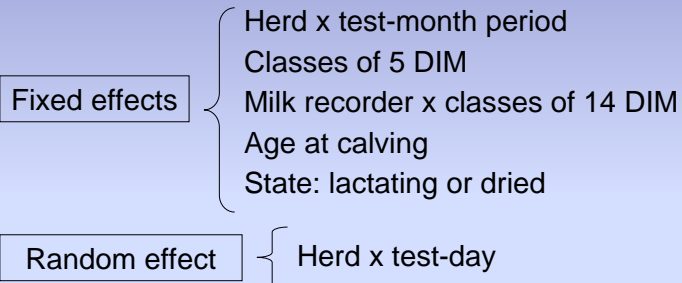
54,955 BCS records from 5,123 cows collected between the 1st April 2006 and the 31st March 2008

Data & Model

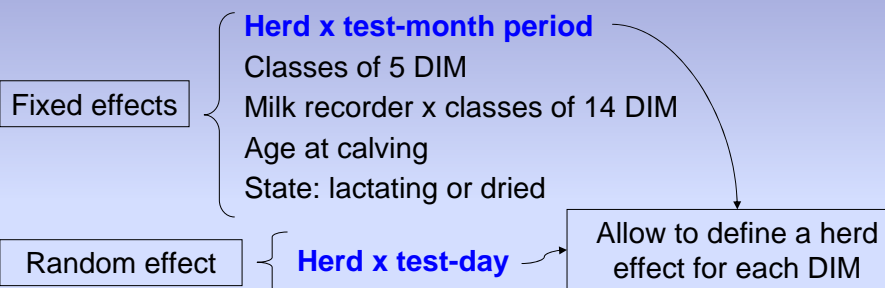
Fixed effects

Herd x test-month period
Classes of 5 DIM
Milk recorder x classes of 14 DIM
Age at calving
State: lactating or dried

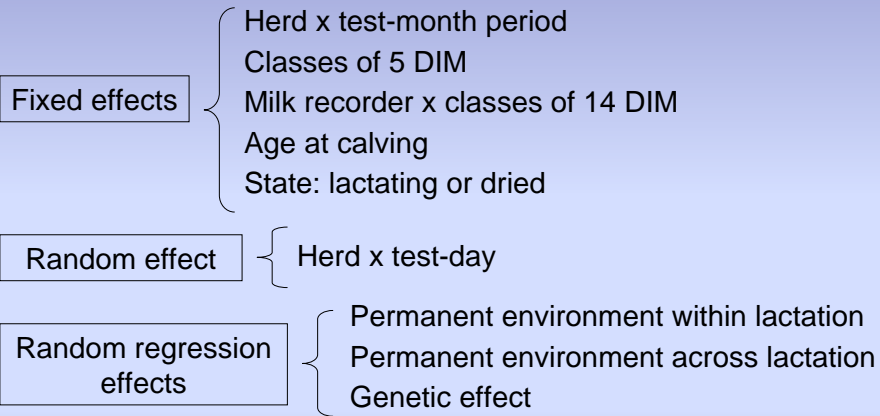
Data & Model



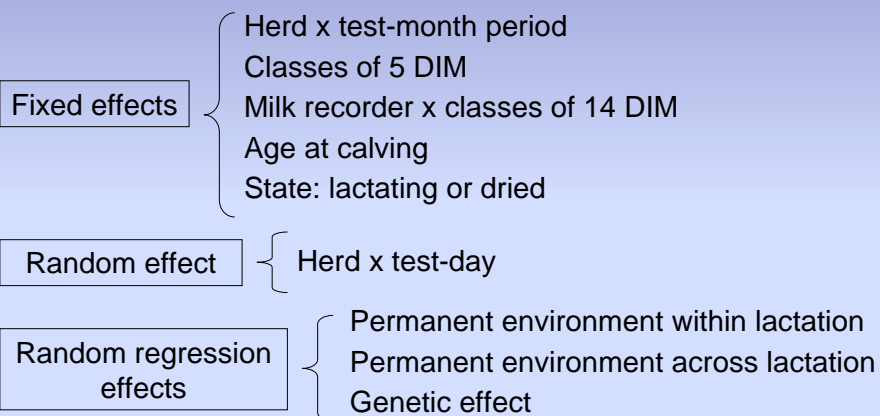
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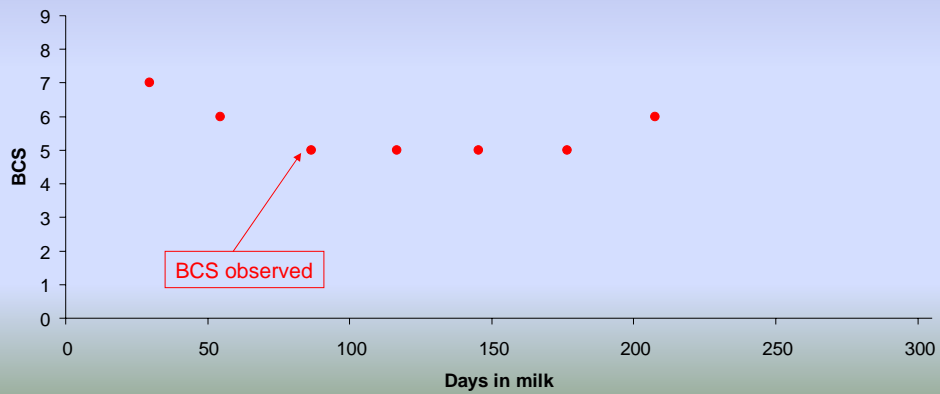
Data & Model



Regression curves modelled with 2nd order Legendre polynomials

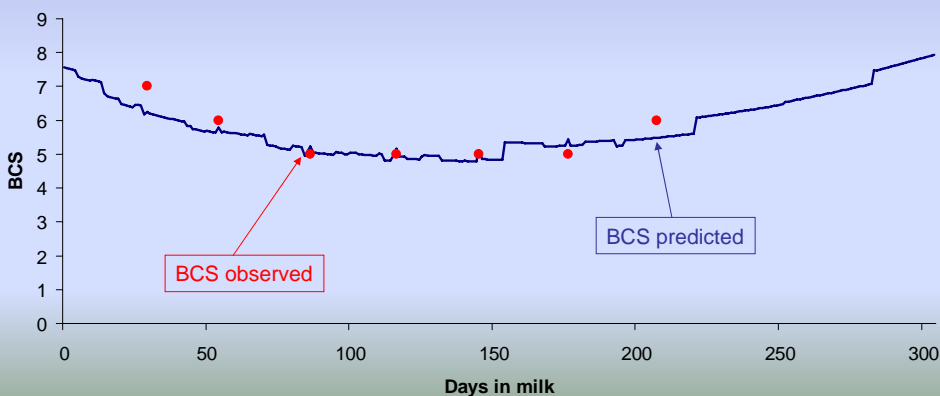
Results

Based on known information, it is possible to predict a BCS value for each day in milk of a given cow



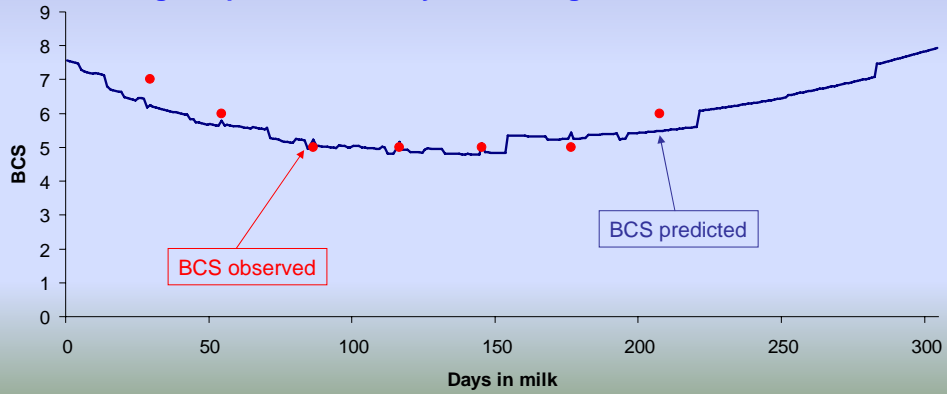
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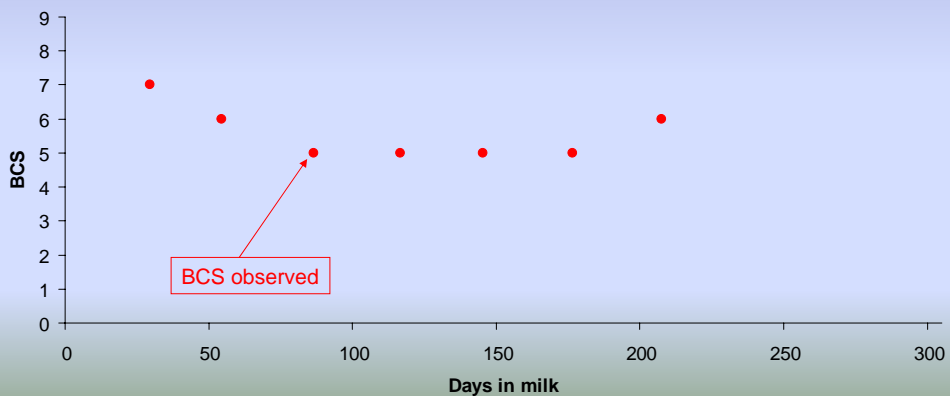
Results

- ➔ Use this modeling for management purposes requires :
- **good adjustment** on data used for the solution estimation
 - **good predictive ability** for **missing** and **future** records



Results

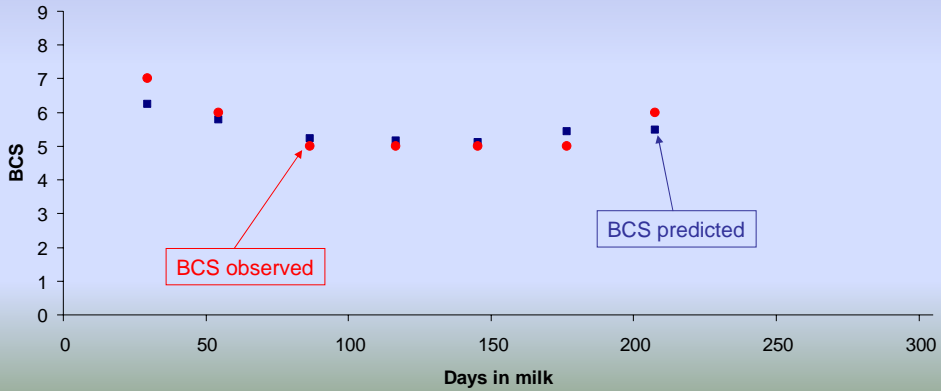
- ➔ **Adjustment**
- On data used for the solution estimation



Results

Adjustment

On data used for the solution estimation

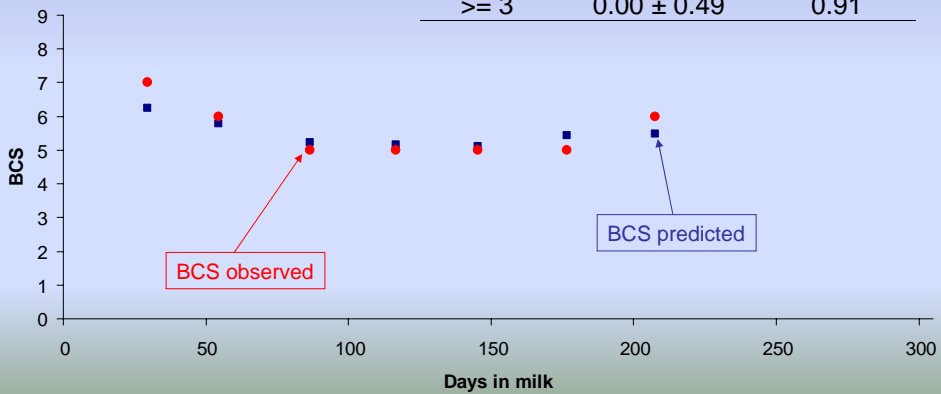


Results

Adjustment

On data used for the solution estimation

| Lactation | Prediction error mean \pm STD | Correlation |
|-----------|---------------------------------|-------------|
| 1 | 0.00 \pm 0.47 | 0.88 |
| 2 | 0.00 \pm 0.46 | 0.91 |
| ≥ 3 | 0.00 \pm 0.49 | 0.91 |

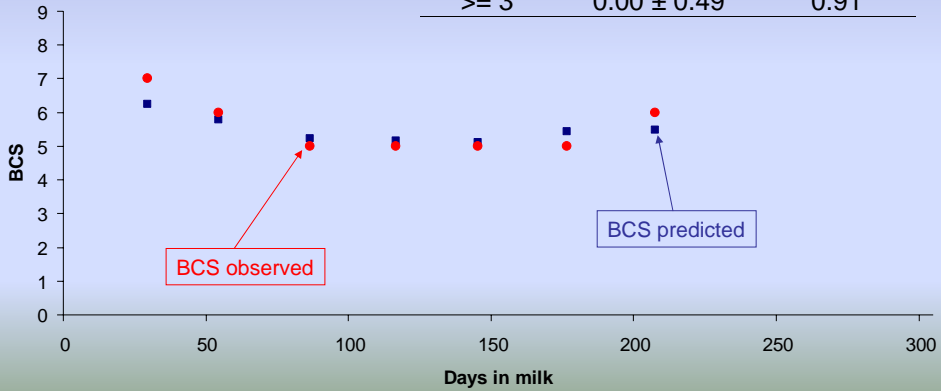


Results

The overall fit of the model is good



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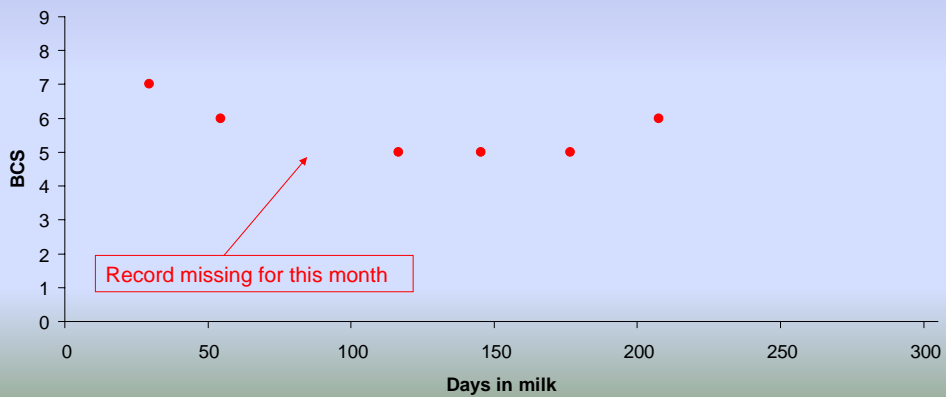
Results



Predictive ability for **missing** records



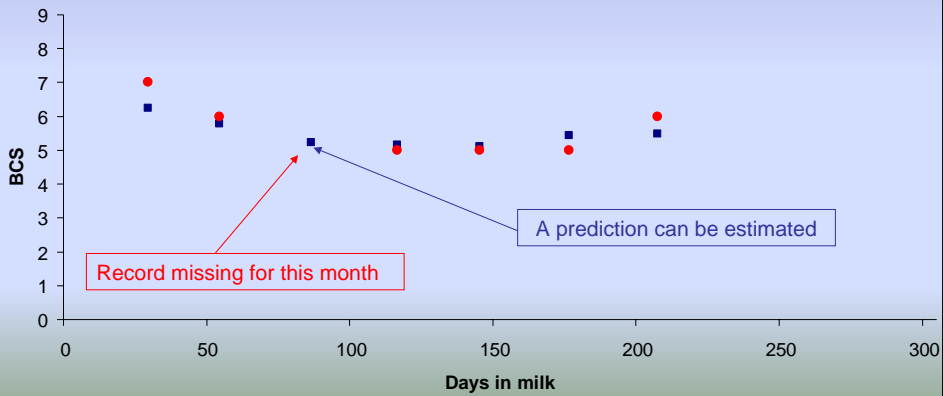
On data of March 2007



Results

Predictive ability for **missing** records

On data of March 2007

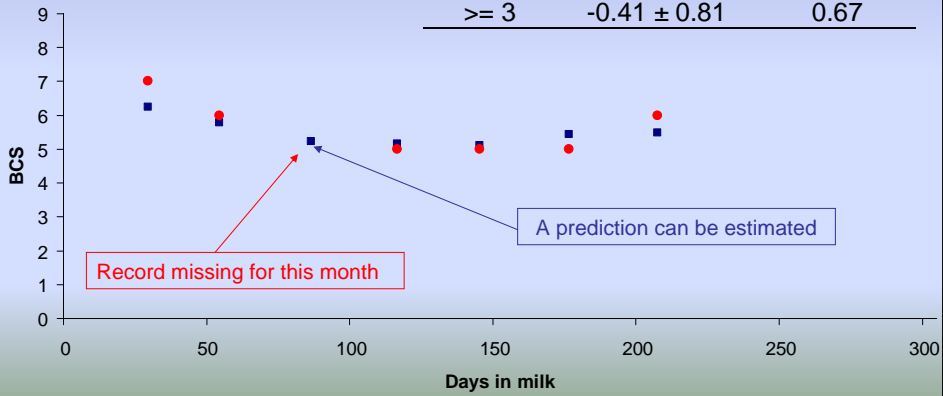


Results

Predictive ability for **missing** records

On data of March 2007

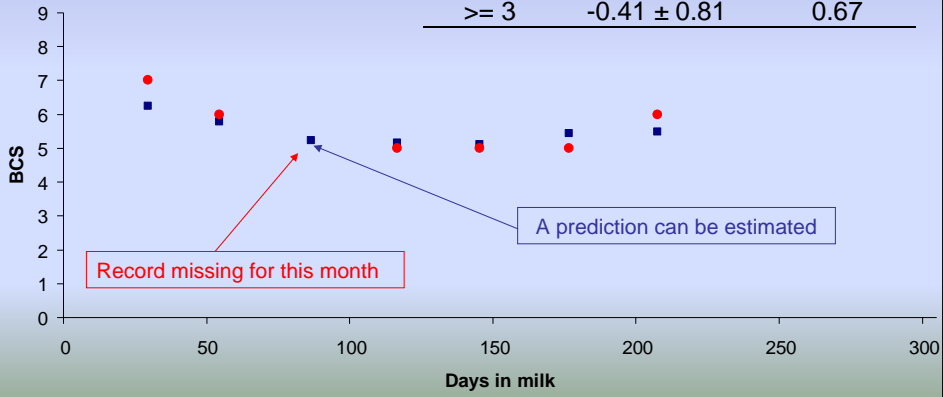
| Lactation | Prediction error mean \pm STD | Correlation |
|-----------|---------------------------------|-------------|
| 1 | -0.34 \pm 0.78 | 0.64 |
| 2 | -0.42 \pm 0.84 | 0.58 |
| ≥ 3 | -0.41 \pm 0.81 | 0.67 |



Results

BCS systematically underestimated and correlations lower

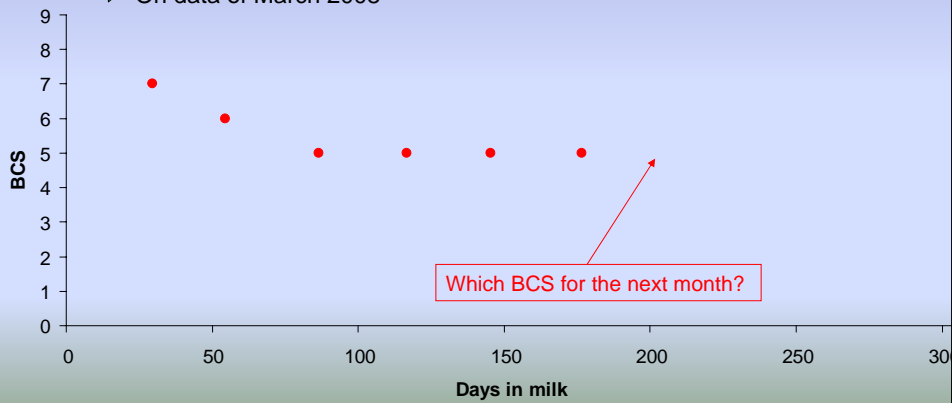
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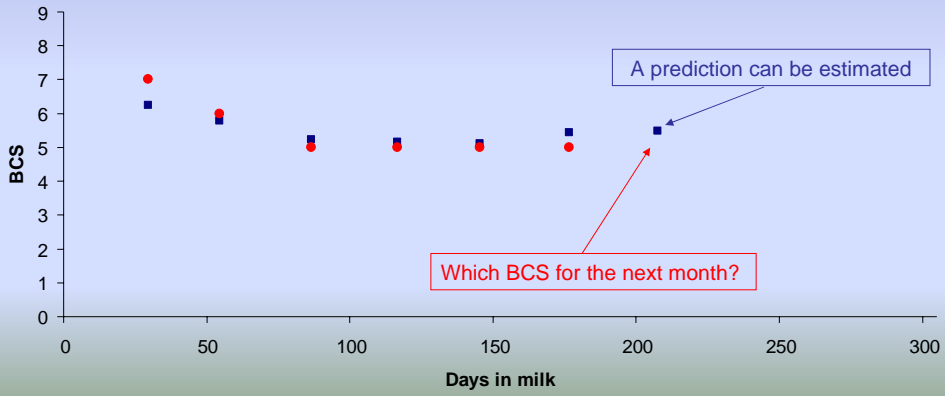
Predictive ability for future records

On data of March 2008





Results

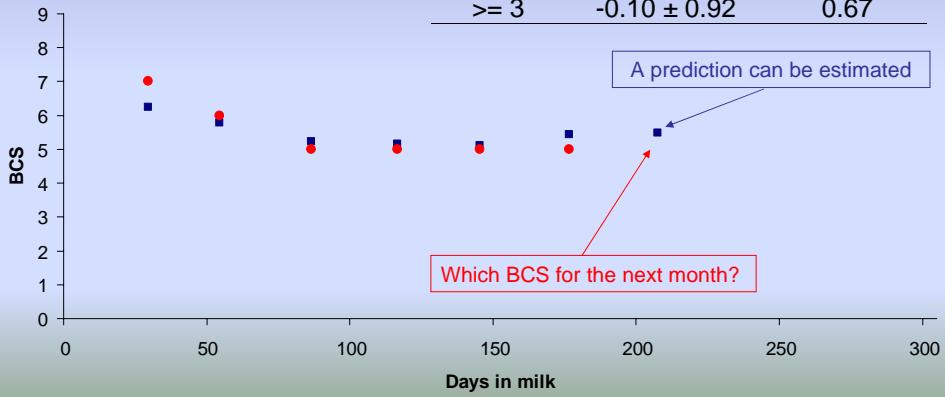
 Predictive ability for **future** records
 On data of March 2008



Results

 Predictive ability for **future** records
 On data of March 2008

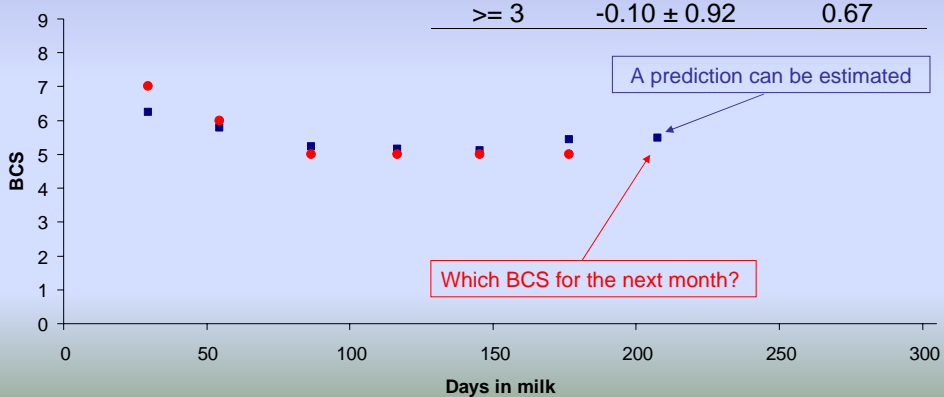
| Lactation | Prediction error mean \pm STD | Correlation |
|-----------|---------------------------------|-------------|
| 1 | -0.13 \pm 0.92 | 0.57 |
| 2 | -0.06 \pm 0.98 | 0.54 |
| ≥ 3 | -0.10 \pm 0.92 | 0.67 |



Results

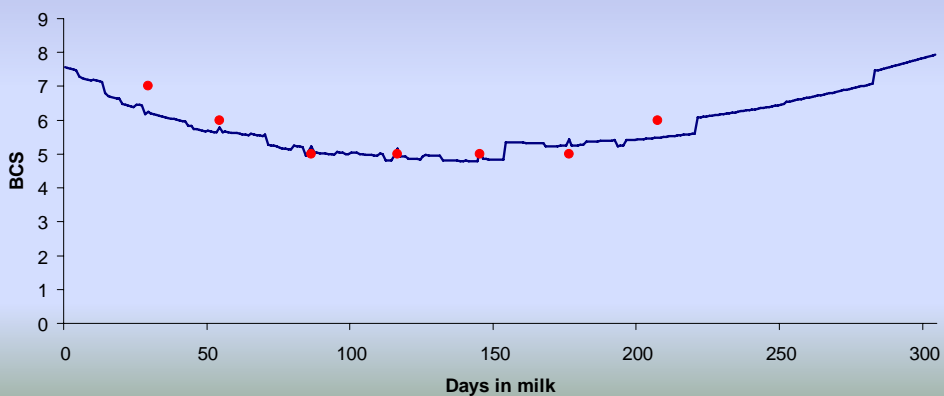
Results for prediction satisfying considering the structure of data

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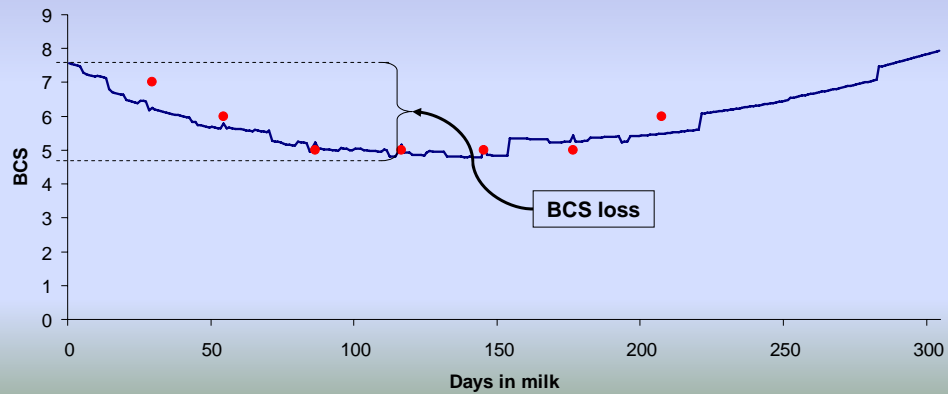
Potential decision-making indicator

Based on this alternative modeling, indicators could be defined:



Potential decision-making indicator

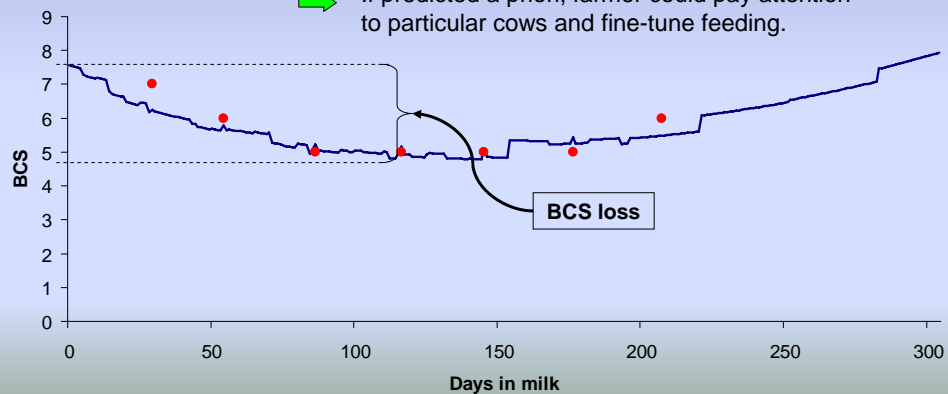
- ➔ Based on this alternative modeling, indicators could be defined:
- **BCS loss** at early stage of lactation



Potential decision-making indicator

- ➔ Based on this alternative modeling, indicators could be defined:
- **BCS loss** at early stage of lactation

➔ If predicted a priori, farmer could pay attention to particular cows and fine-tune feeding.



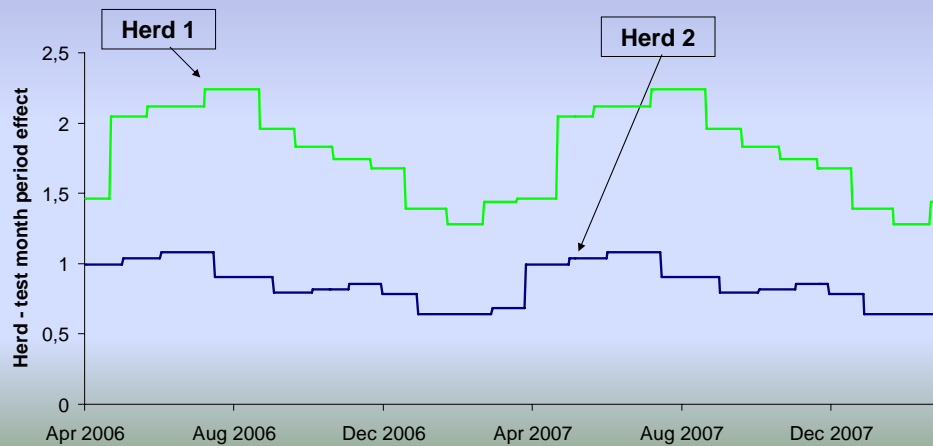
Potential decision-making indicator

Besides individual prediction, **herd indicators** could be defined:

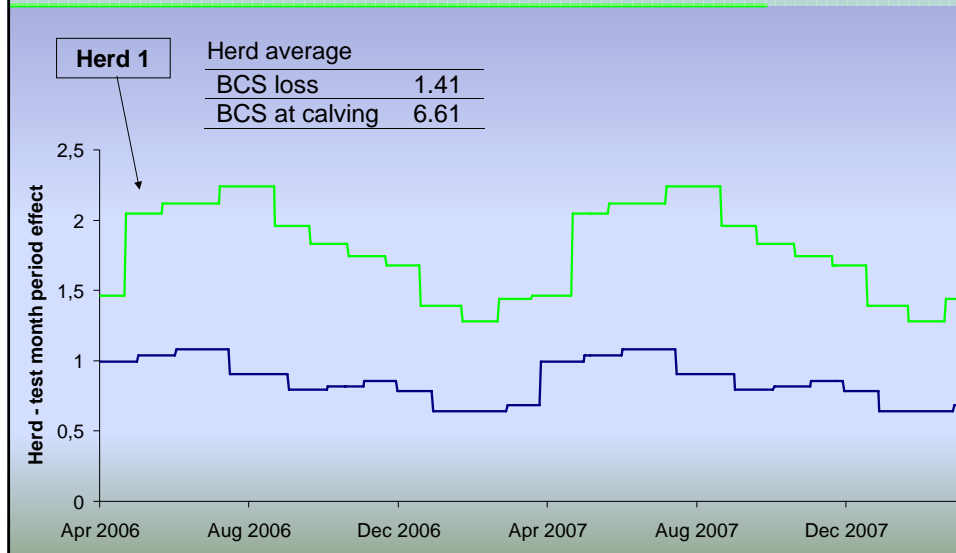
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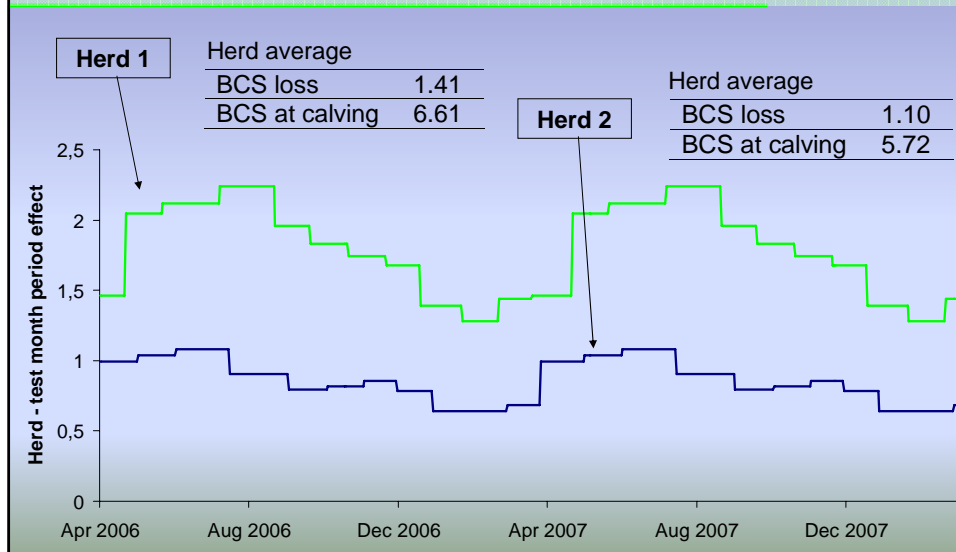
➤ **herd effect** across time



Potential decision-making indicator



Potential decision-making indicator



Conclusions & Prospects

- **Adjustment** of the model was **good**
- **Predictive ability** of the model for missing and future records was **satisfying**

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 - According to the structure of data (less than 2 years of recording)
 - Model improvement could be done

Conclusions & Prospects

- **Adjustment** of the model was **good**
- **Predictive ability** of the model for missing and future records was **satisfying**
 - According to the structure of data (less than 2 years of recording)
 - Model improvement could be done
- **Indicators** based on **this alternative modeling** could be developed and included in the current “**Herd BCS Balance Sheet**”

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Thank you for your attention

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With the support of :

