Use of dairy Herd Test-day effects stemming from genetic evaluations for herd management purposes

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INSTITUT DE L'ÉLEVAGE

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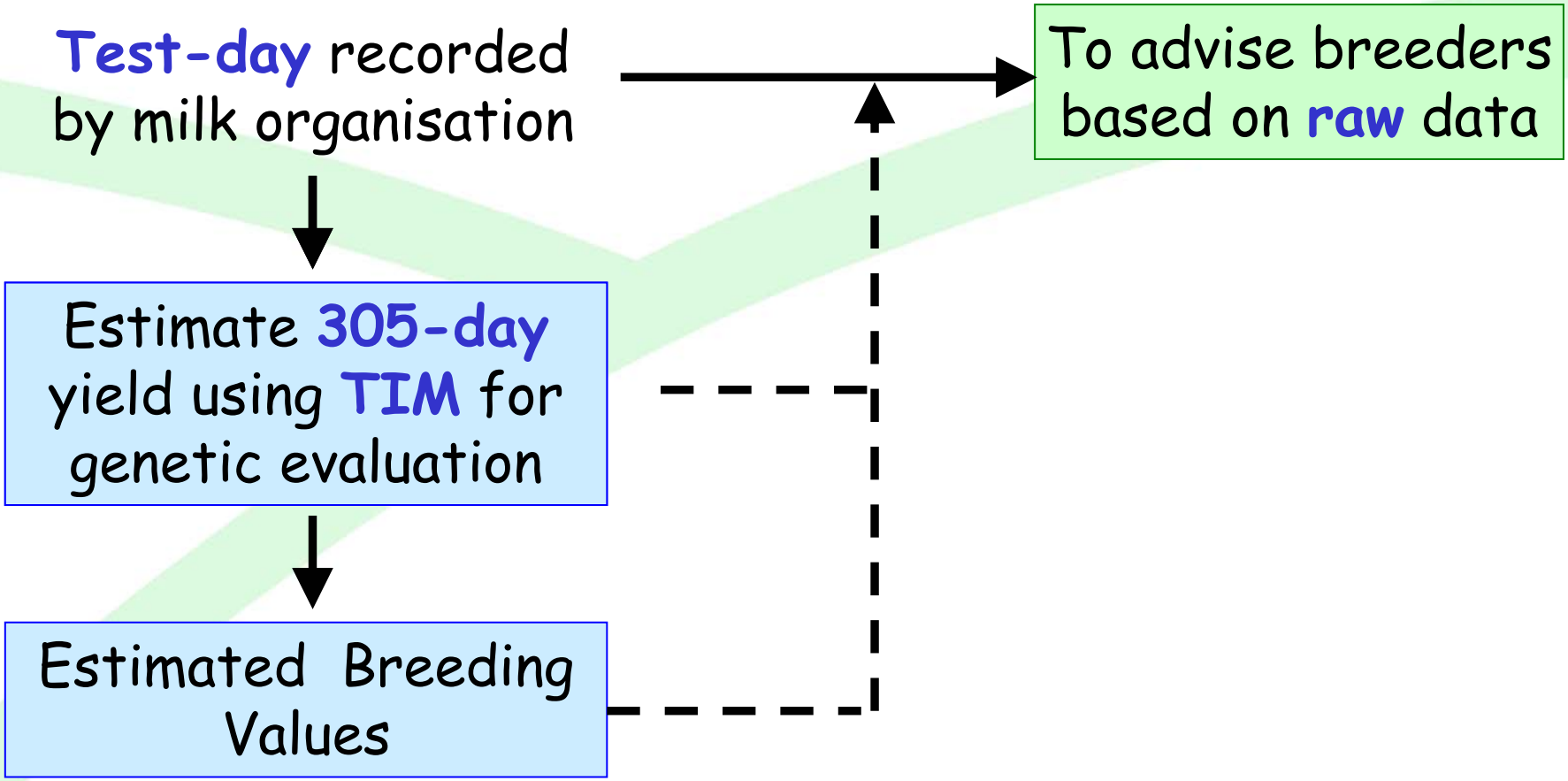
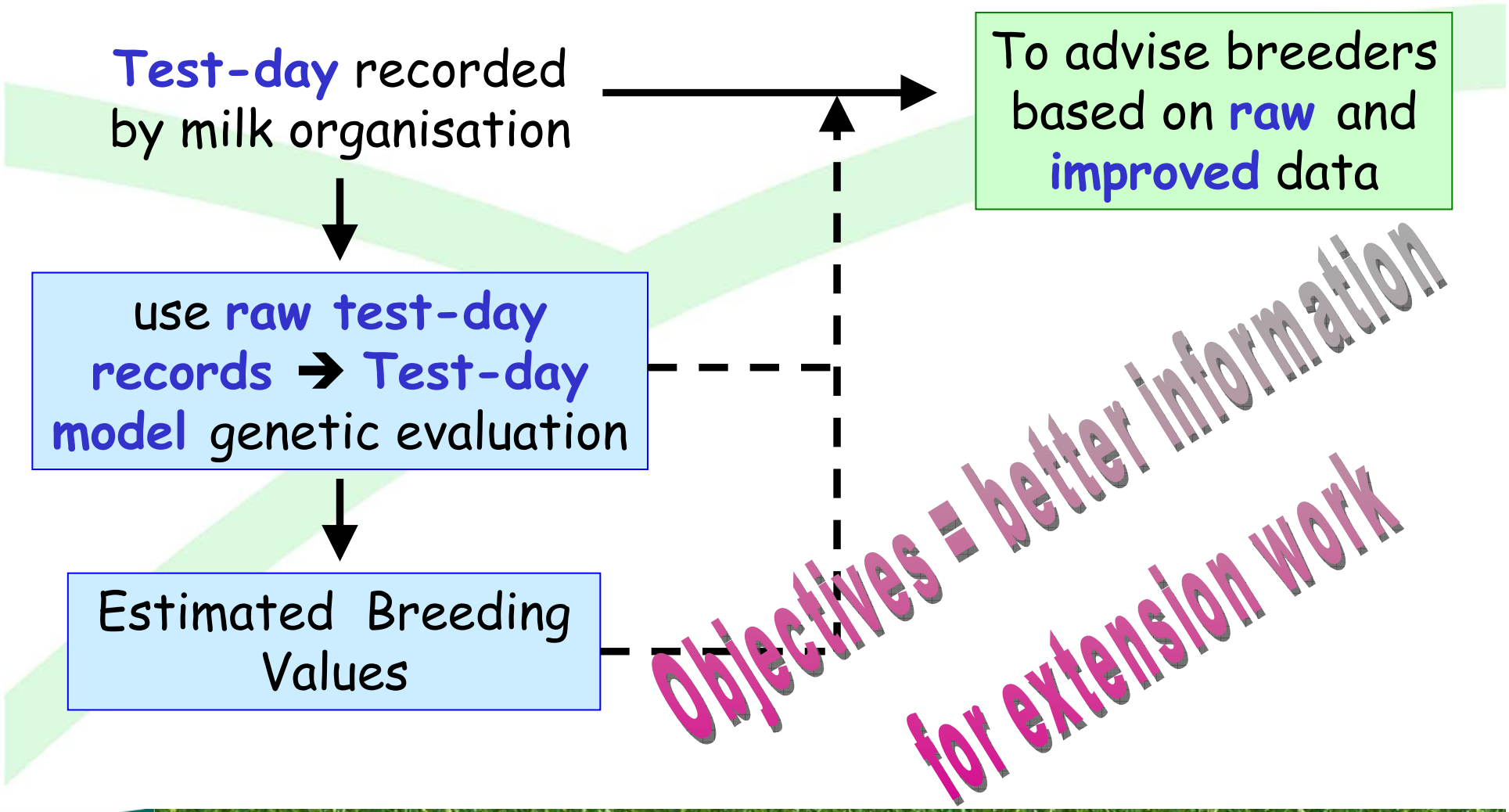
From lactation to test-day records



From lactation to test-day records



The genetic evaluation model

Test-day record (Milk, Fat and protein yield, Fat and protein content) =

Fixed effects =

- Herd-Test Day effect **(HTD)**
- Lactation curves : year x region x parity x effects (calving age, calving month, length dry period, gestation)

+ Random effects (random regression) =

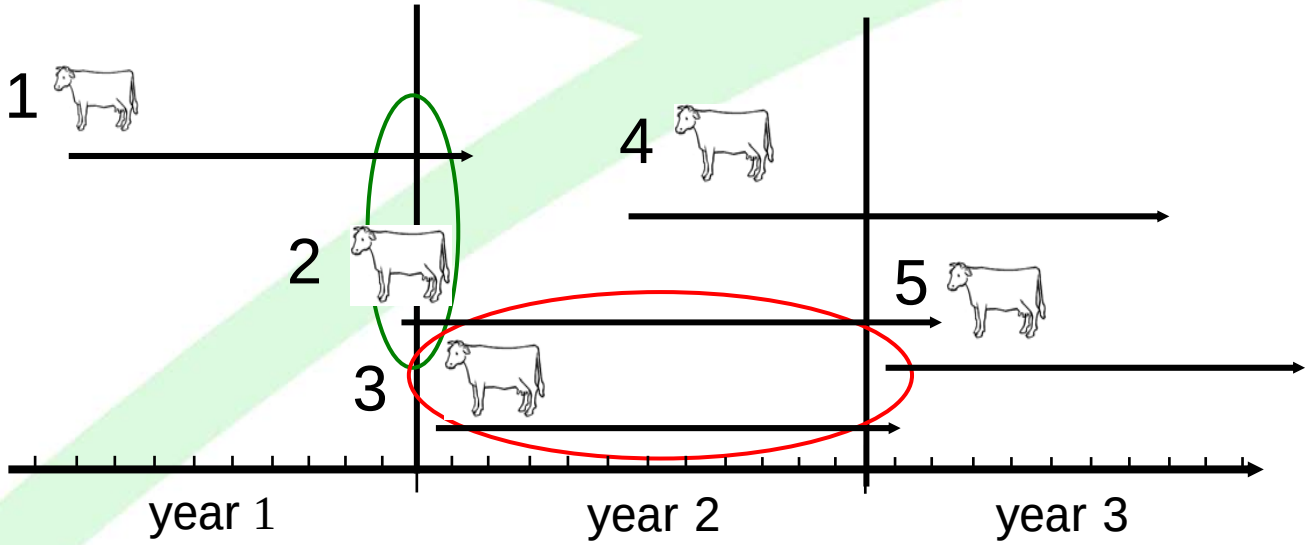
- Genetic effects (production level + persistency by lact.)
- Permanent environment effects

+ Residual

Test-day model (TDM) = better account for effects

Principle : each effect influences individually each test-day instead of the complete lactation, for instance :

The **herd x year effect**

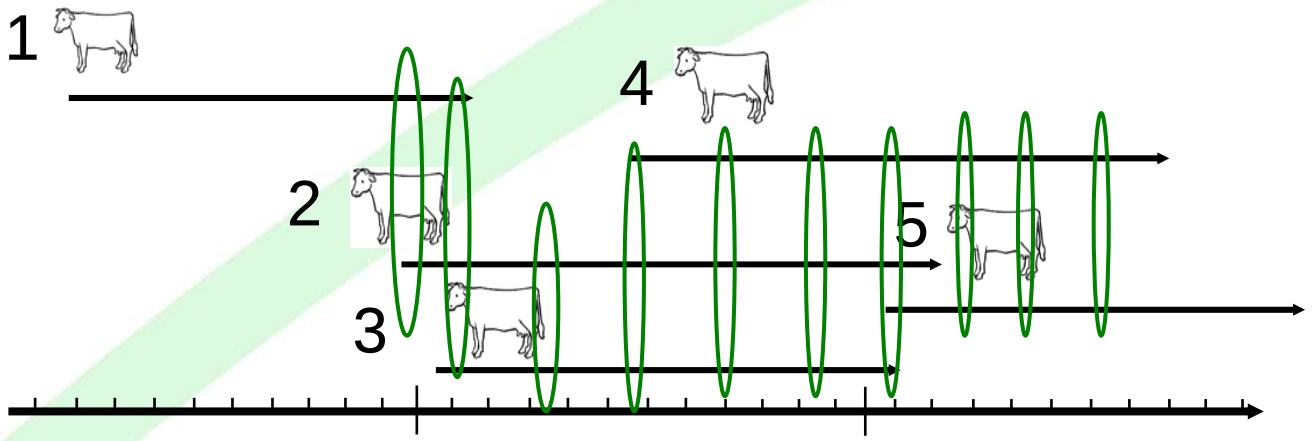


Lactation

Test-day model (TDM) = better account for effects

Principle : each effect influences individually each test-day instead of the complete lactation, for instance :

The **herd x year effect** ➔ **herd x test-day (HTD)**



Lactation

TDM

Herd-Test day effect = HTD

Herd x Test-day (HTD) is related to short term environmental effects such as feeding, weather condition, herd health, the "know how" of the breeder…

⇨ Good **indicator of the herd management efficiency**

APPLICATIONS

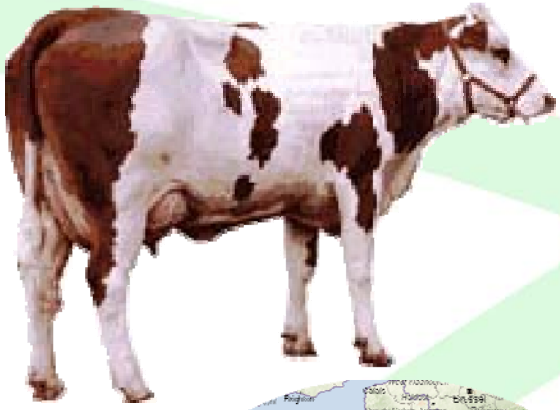
- ✓ A **prospective tool** to **forecast herd production** level for the next months and to adjust the management to the needs
- ✓ A **monitoring tool** to assist technicians and famers in **detection and identification** of herd management problems through **comparison** of **predicted HTD** with the **real one**

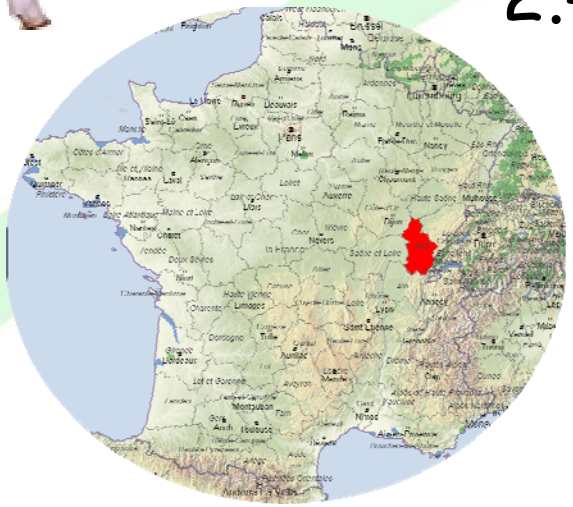
Aims of the study

- **Compare the abilities** of 3 approaches to predict HTD

- **Put forward** the interest of developing management tools for dairy breeders from estimates obtained with TDM genetic evaluation.

Data used





Montbéliarde Test-day (TD) yields from Jura

Lactation 1-3

Sept 1988 – August 2004

Days in Milk (DIM) = 7–335 days

2.4 million TD from 1170 herds

More than 137 000 HTD

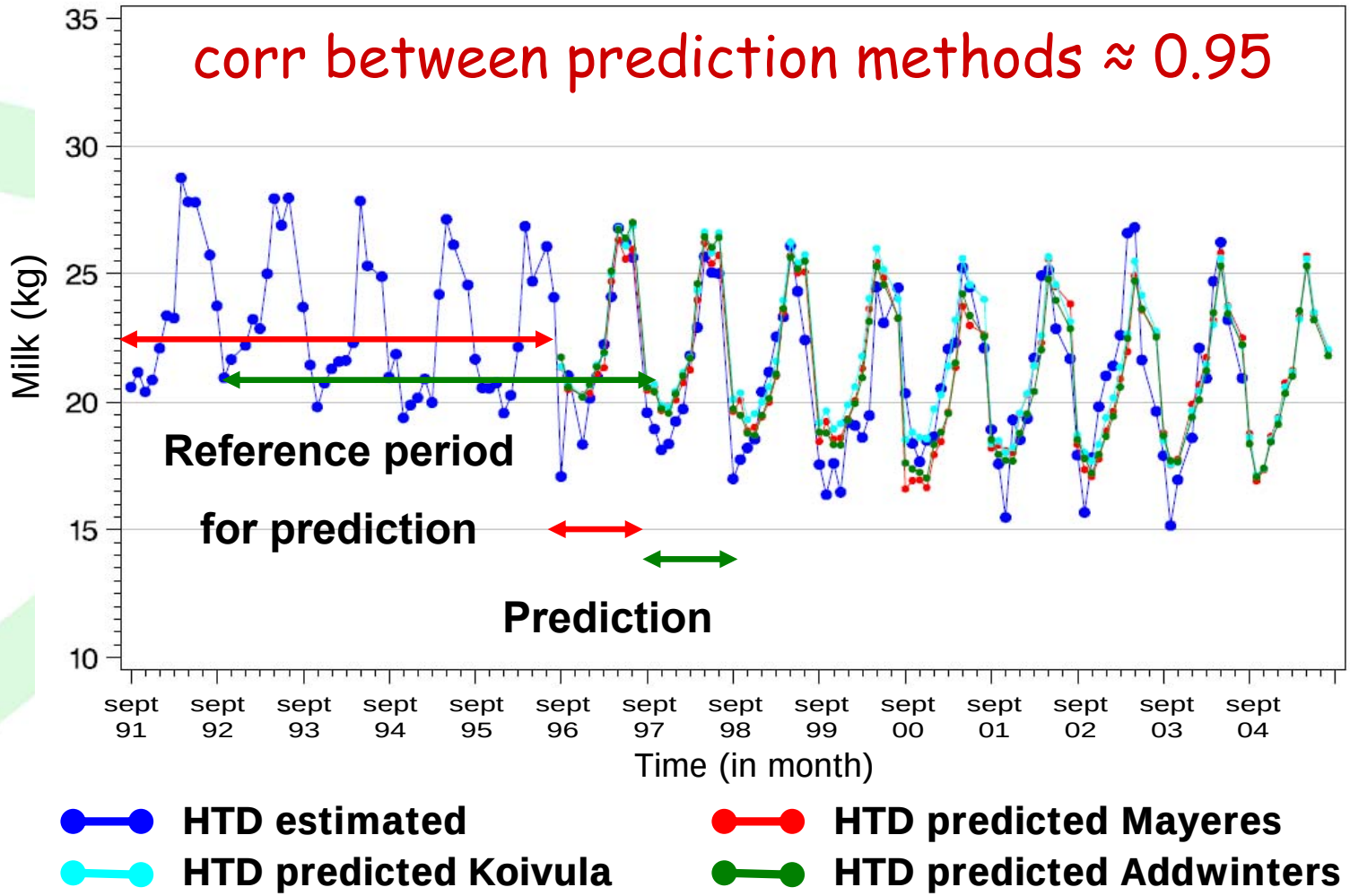
Traits = Milk, Fat yield and %, Protein yield and %

Analysis of HTD effect for prediction and extension purposes

3 methods proposed to predict **HTD** effects

- ✓ **Mayeres** *et al.* (2004) : consists in decomposing the HTD into a **sum of predictable effects**
  (HTD = herd x year + herd x month (over 5 years) + error)
- ✓ **Exponential smoothing** (SAS Addwinters) based on the observation of **time series**. (HTD = within herd {const. + linear trend + seasonal effect})
- ✓ **Koivula** *et al.* (2007) based on **mixed model** methodology. (HTD = within herd fixed effects + within herd x year random effects)

HTD Modelling for milk and prediction of future effect



Correlation between HTD predicted with the 3 methods and the HTD estimated

	Mayeres	Addwinters	Koivula
Milk	0.840	0.841	0.844
Fat	0.811	0.808	0.839
Protein	0.805	0.805	0.838
Fat%	0.706	0.713	0.723
Protein%	0.758	0.763	0.771

- **Prediction ability** of HTD is **satisfactory** (0.71 - 0.84)

Contents are more **difficult** to predict

- **Similar** range of **correlations** with the 3 methods but slighly better with **Koivula** approach

A dynamic follow-up

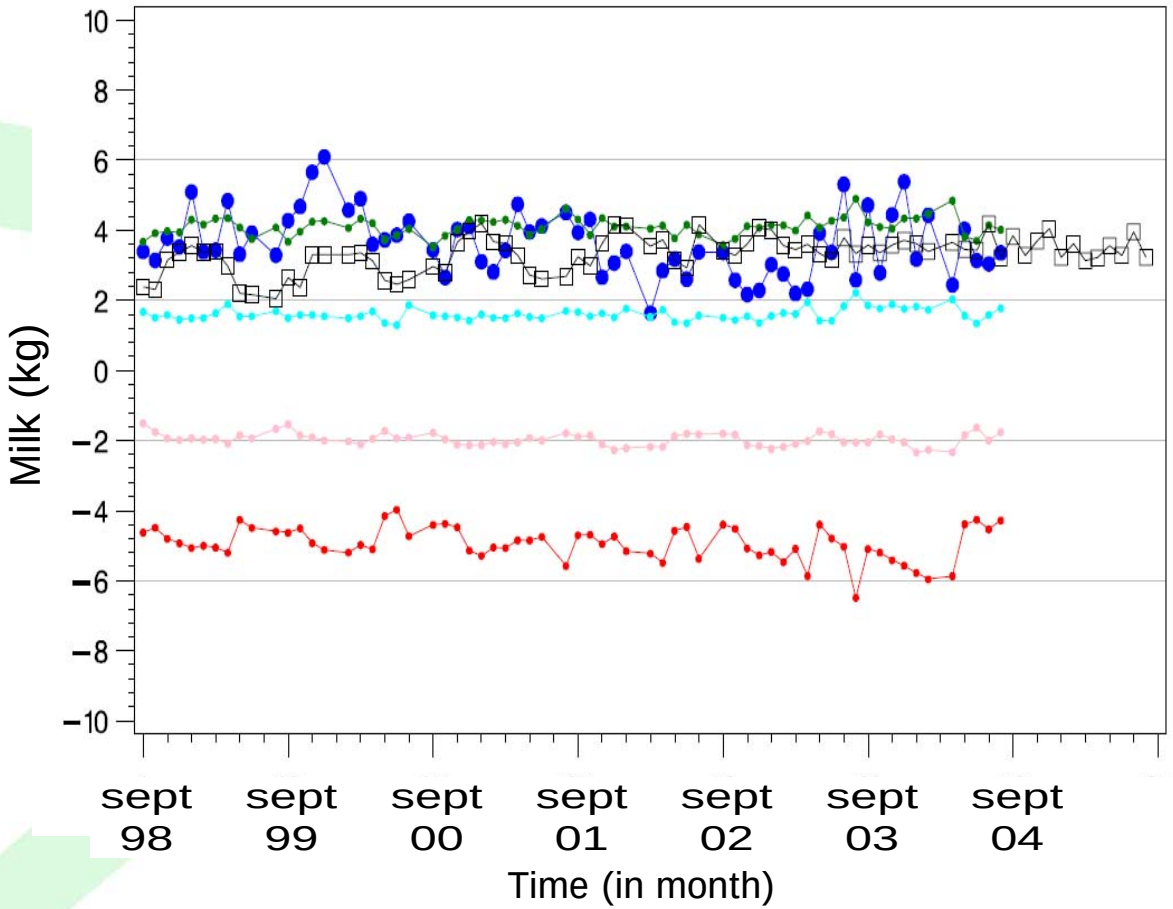
The **evolution** of the **HTD** effect **reflects** the changes in **conditions of production.**

To facilitate interpretation, it is possible to express HTD effects as **deviations from a reference group** (region, production system…)

- **general trend** = zero mean

⇨ Shows **strengths** and **weaknesses** of the herd

HTD effect for Milk as deviation from region mean

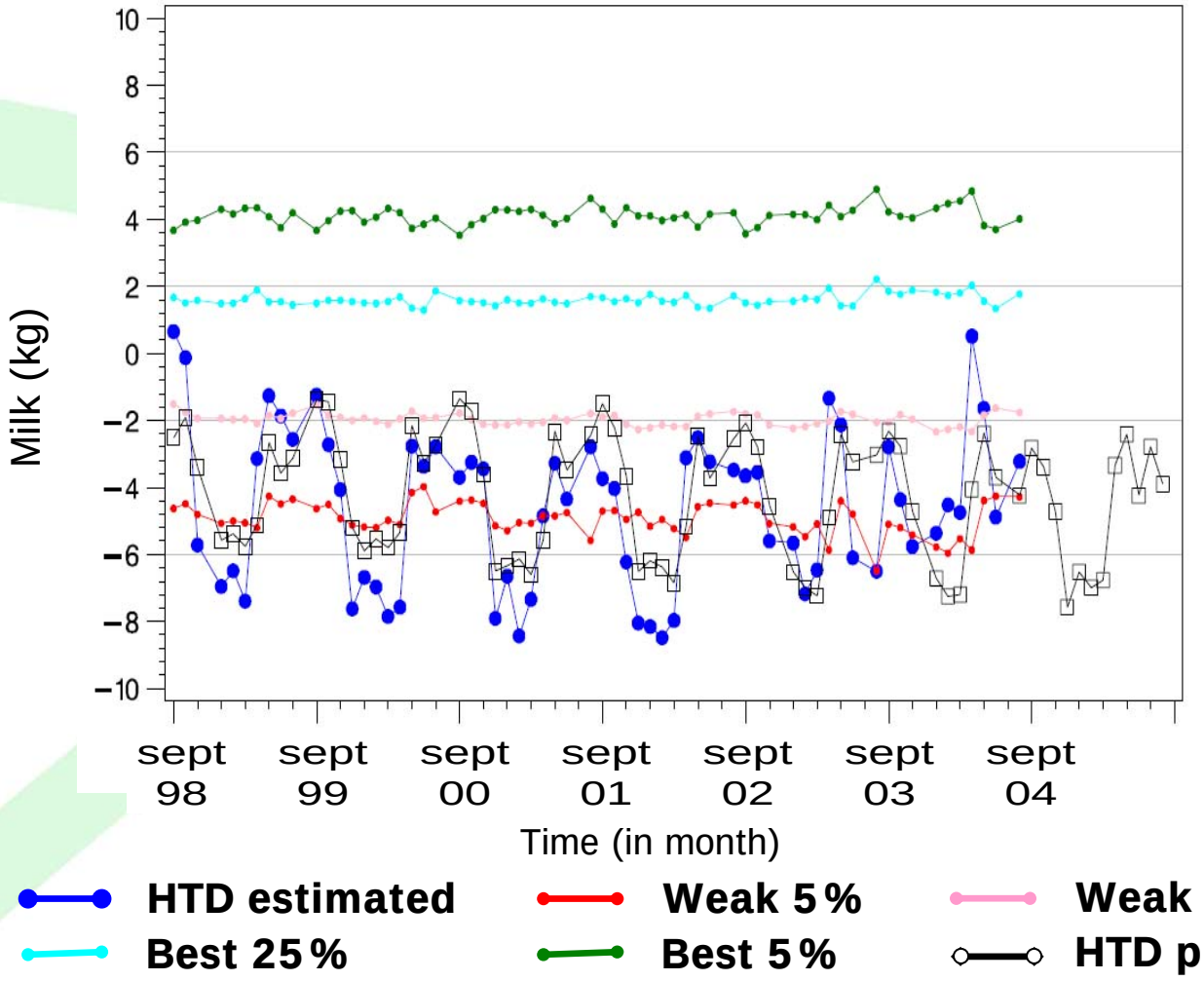


Stable management, follows the mean **seasonal variations**

Between **best 25% and 5% herds**

⇨ + 4 kg Milk with respect to the regional mean.

HTD effect for Milk as deviation from region mean

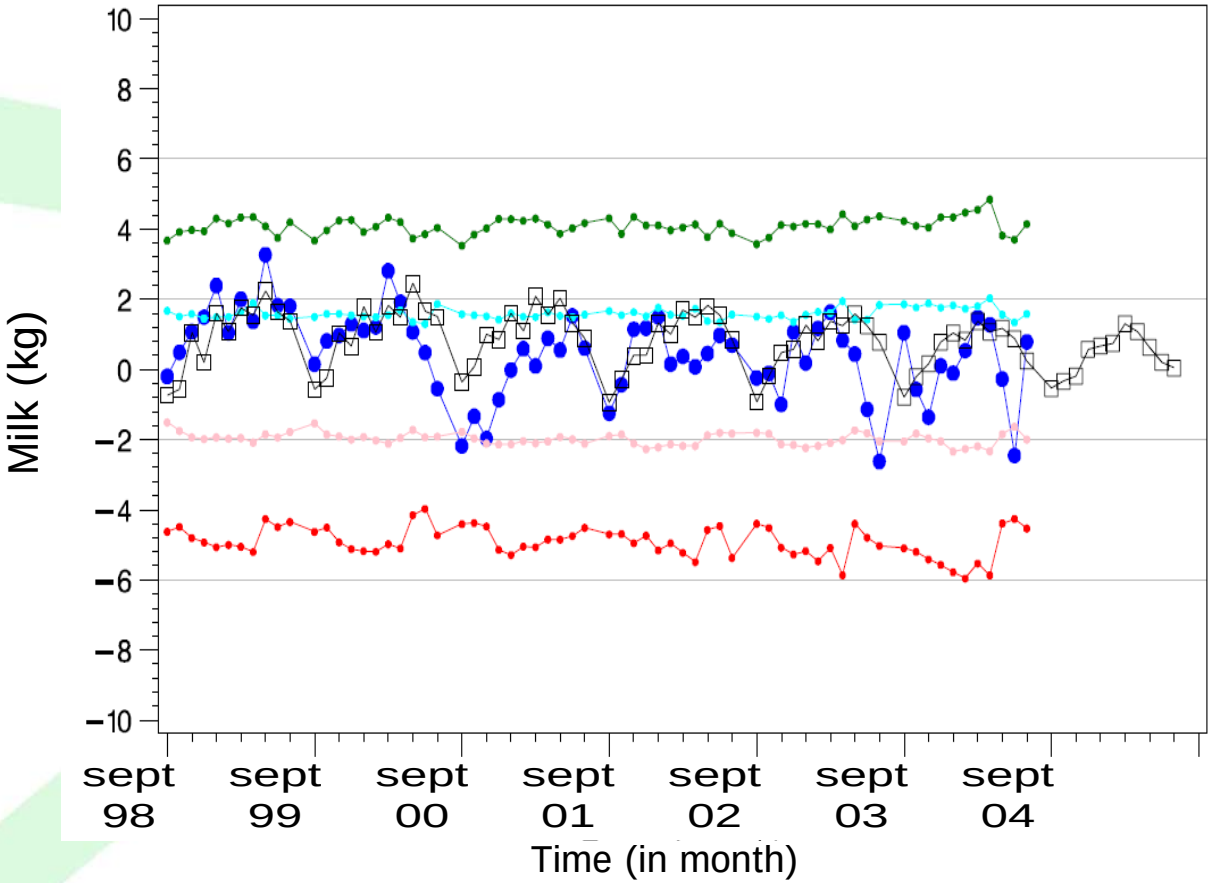


Weak level, **with very bad winter management**

(-6 to -8 kg)

Better summer management (-2kg)

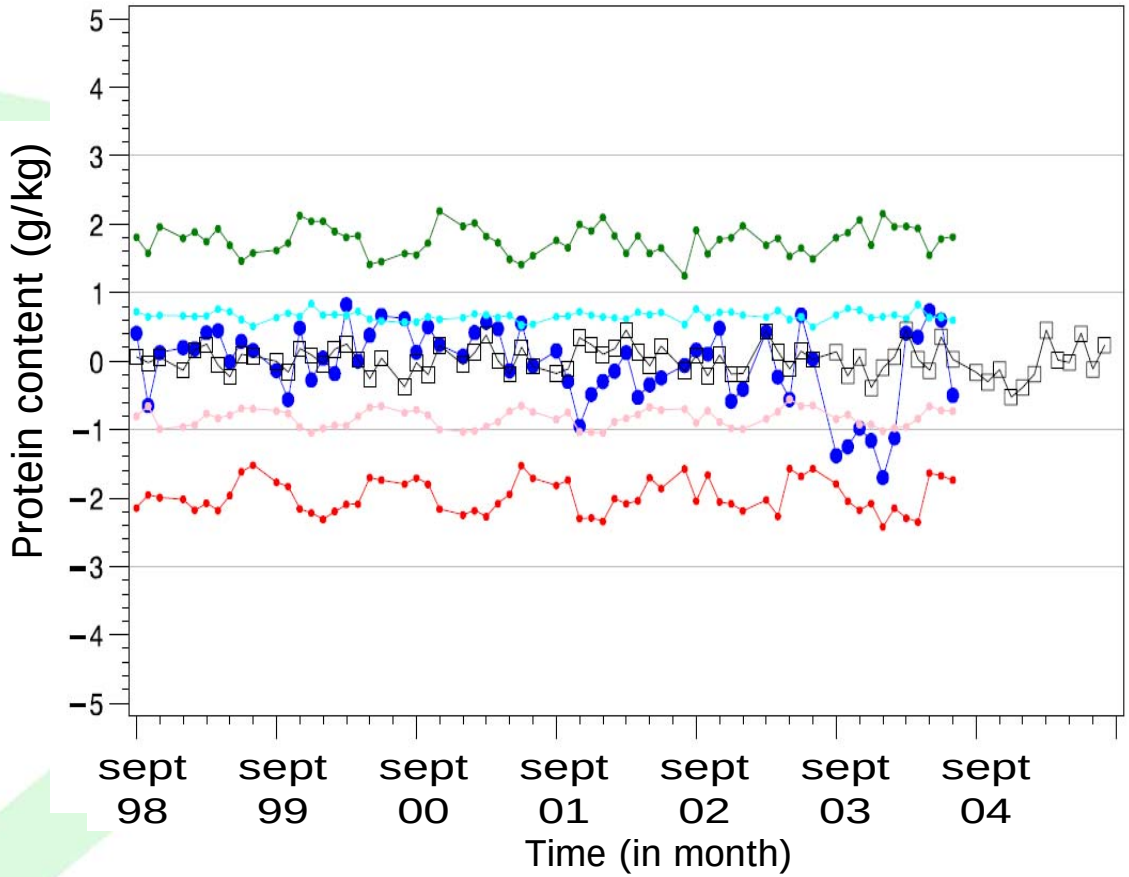
HTD effect for Milk as deviation from region mean



Among 25% best for **winter** management, but not as good in summer

⇨ displays areas for improvements

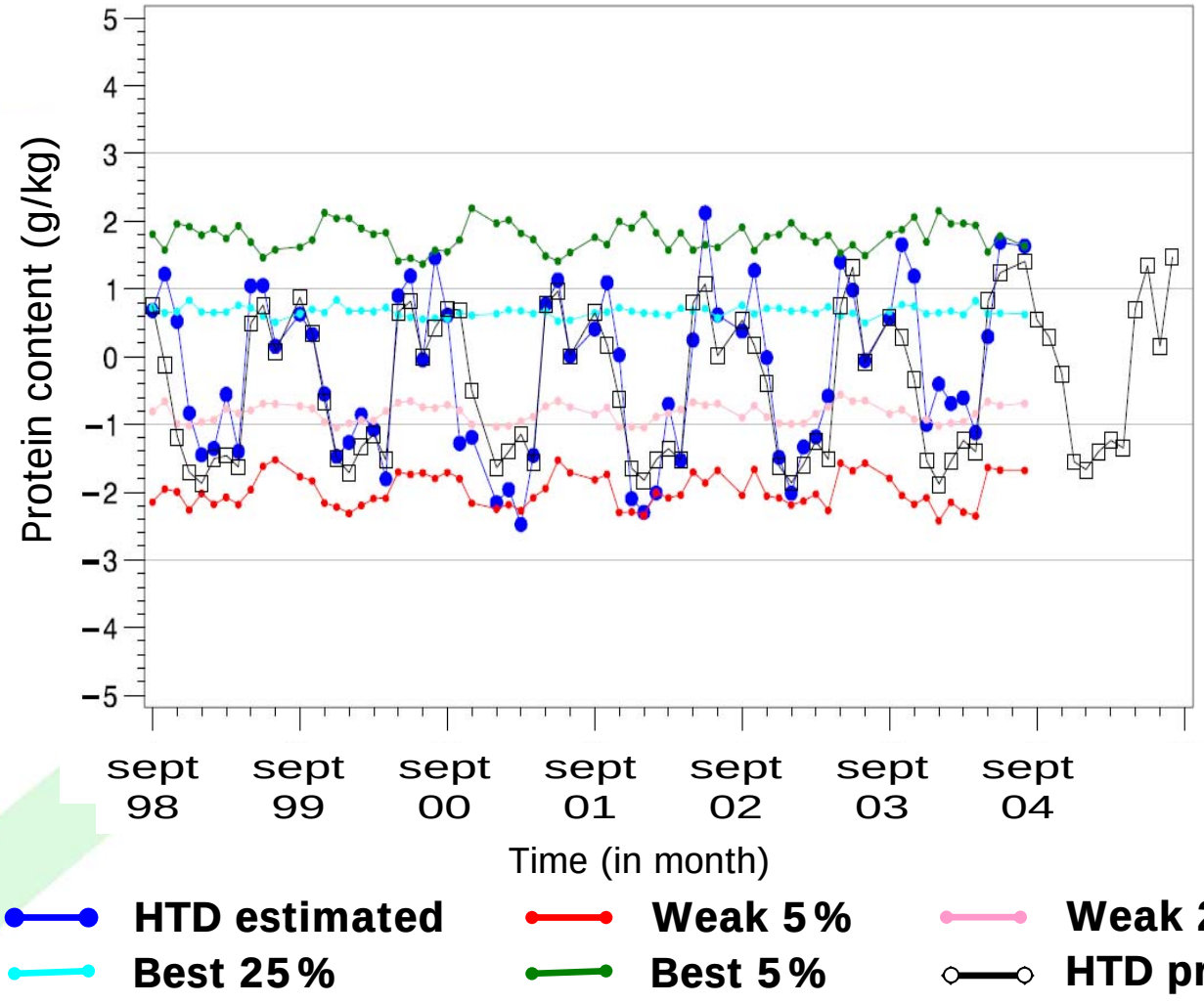
HTD effect for Protein % as deviation from region mean



Follows the mean **seasonal variations**, except between sept 03 and february 04

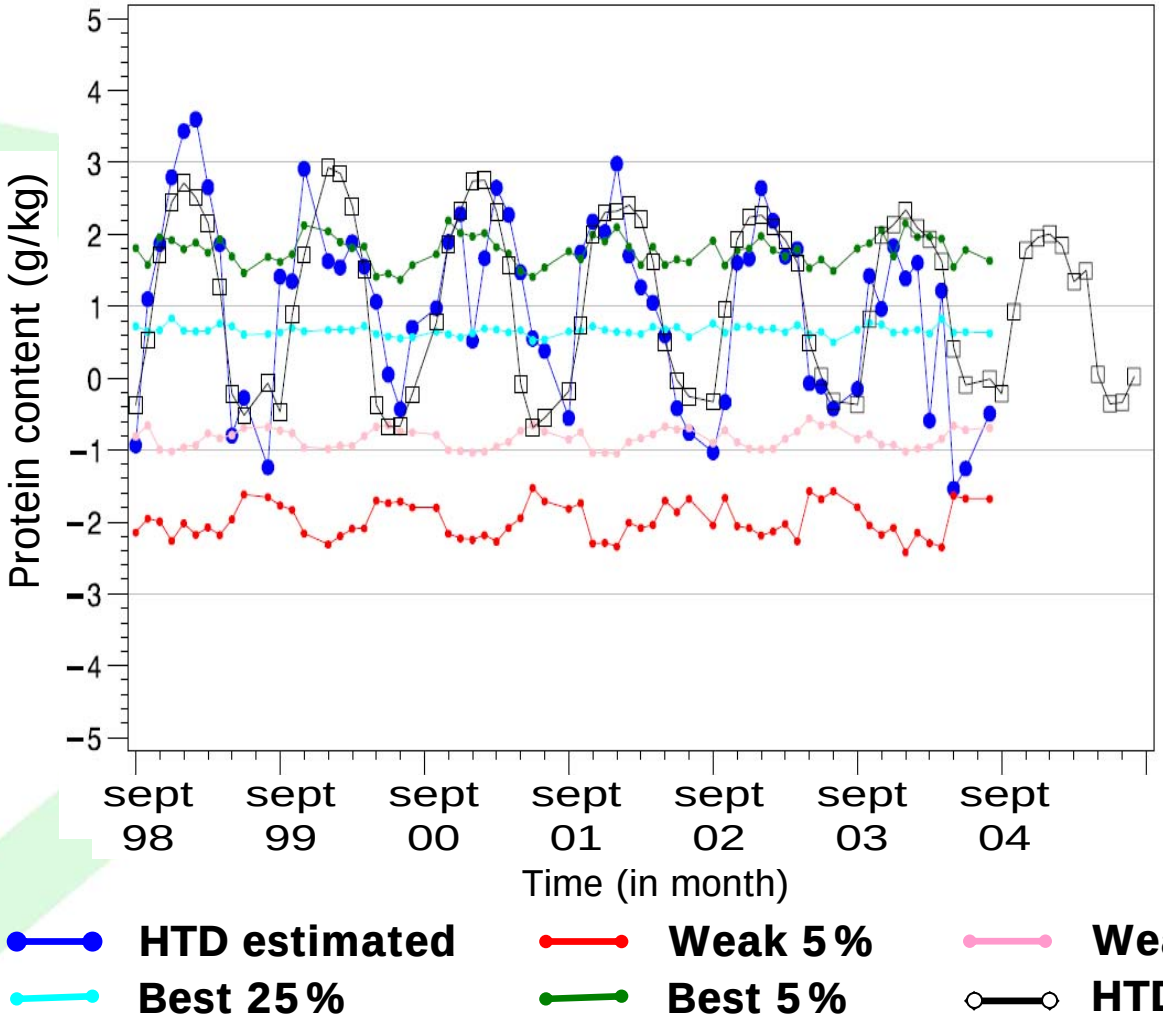
Due to the heatwave ?
(low quantity and quality forage)

HTD effect for Protein % as deviation from region mean



Bad winter
Protein content level (-1,5 g/kg)
but **good summer**
(+ 1,0 g/kg)

HTD effect for Protein % as deviation from region mean



Excellent winter Protein content (among 5% best) but **not as good in summer** (among 25% lowest)

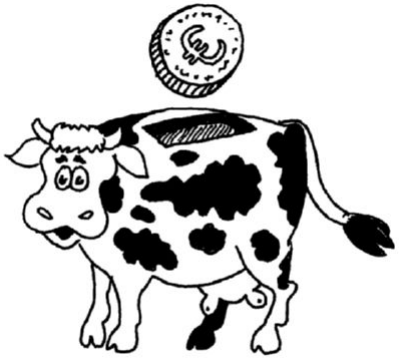
Conclusion

☞ **Possible** to use method like **Koivula**'s one to **forecast HTD** with a **satisfactory prediction ability**

☞ Interesting to develop **management tools**

- combining **complementary sources of information** (breeders and/or milk organisation **and** estimated effects from genetic evaluation)
- **full use** of all **information** already **available**

Help breeders and their technicians to **improve herd management** and the **farm income**



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