



Feedstuff NIR analysis in farm to growth herd recording activity

ICAR 2011 Bourg en Bresse, June, 23rd 2011



dinamica generale®
weighing systems and NIR solutions



Rev A3.1

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Feeding System and Dairy Farms

The feeding process represents a great opportunity of improvement for all dairy farms:

- It is necessary for providing nutrients to animals;
- It is an A cost, actually the most important one!!!

Thousands of Euros can be lost annually through:

- Ingredients inventory shrinkage;

Improved inventory management: FIFO, new locations, ...

- Inaccurate weighing of components in the ration;

Accurate & easy to use weighing systems, data tracking ...

- Lack of knowledge of the actual Dry Matter and nutrients.

Now this is the real issue !!!



Forage variability

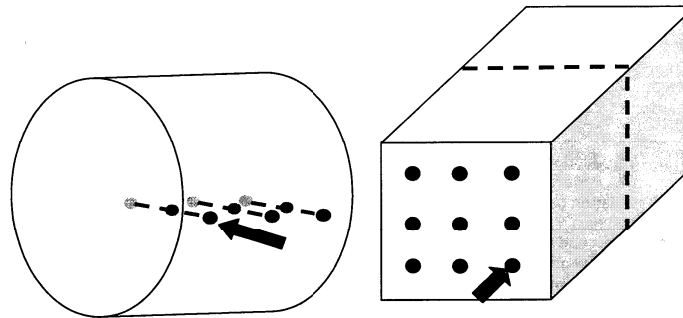


Figure 1. Sampling patterns of round and rectangular bales.

Variability of alfalfa hay bales

constituent	AVG	SD btwn bales	Min - max Btwn bales	SD Wthn bales
NDF	40.2	2.0	36.3 - 44.1	2.1
CP	17.2	0.8	15.7 - 18.7	0.8

Dr. Collins, 2000



DM % distribution in a CornSilage bunker



Prof.Berzaghi P., Dr. Serva L., 2006



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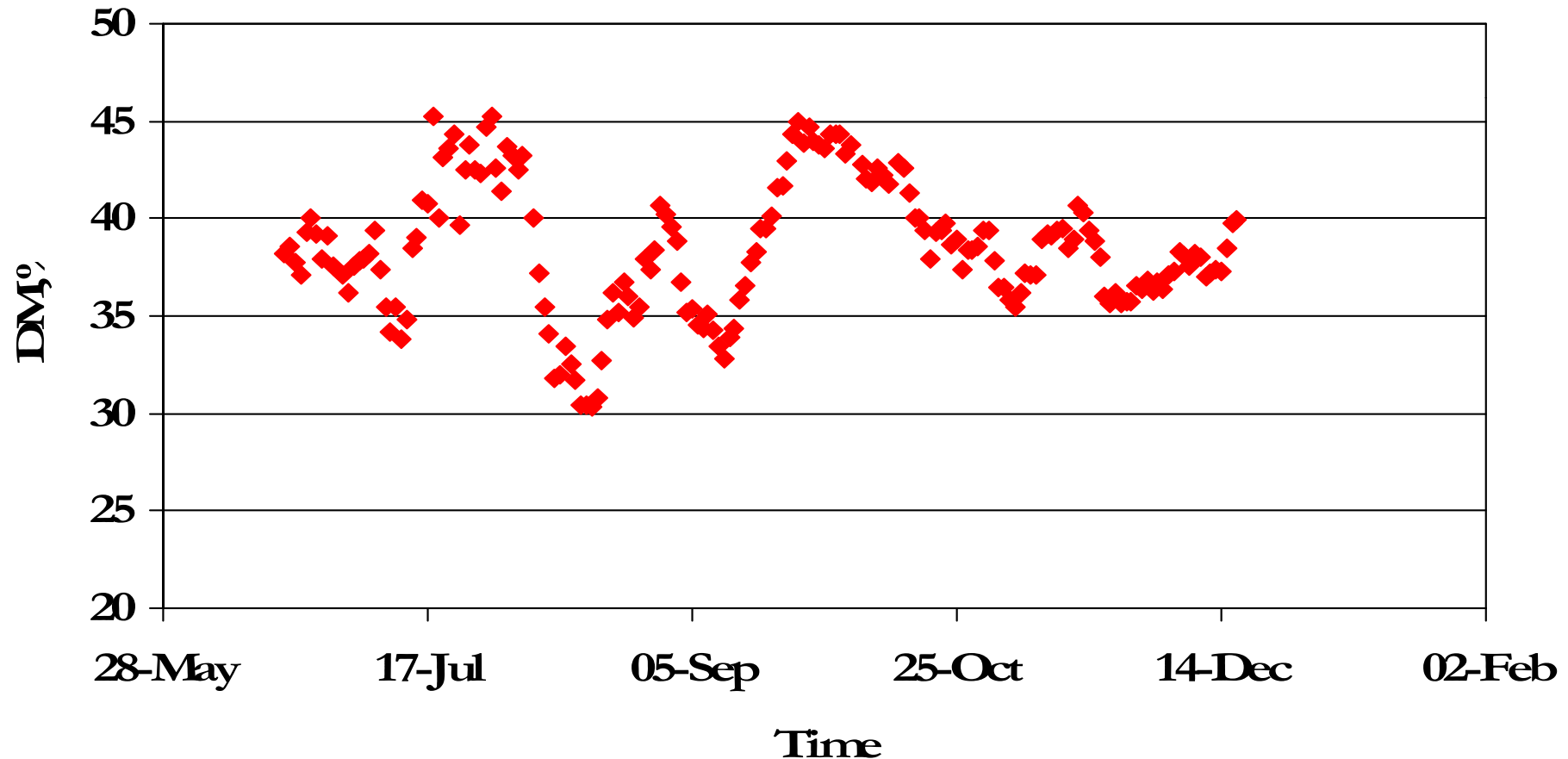


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Variation in forages over time

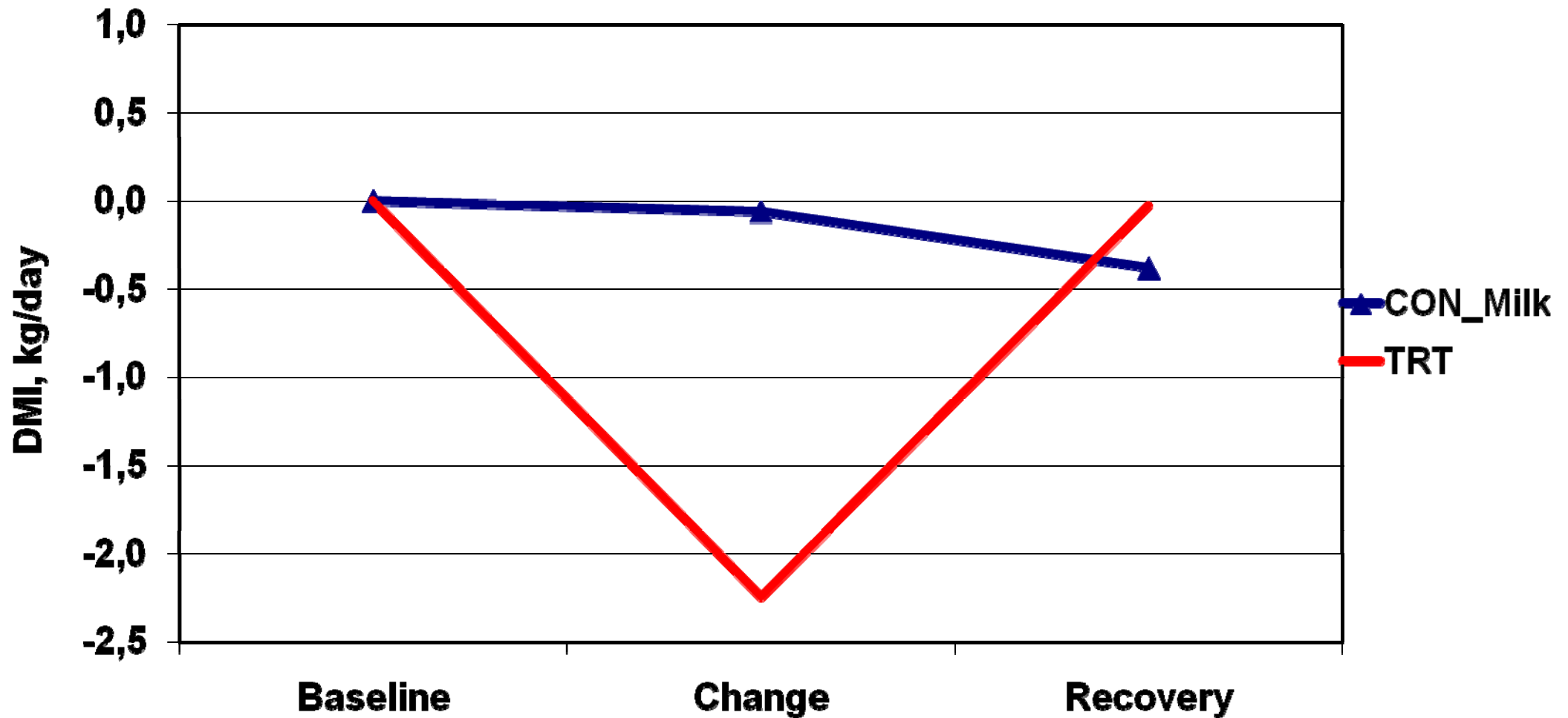
Changes in DM content of Alfalfa haylage – USDFRC Praire du Sac



(modified from Undersander et al., 2005)



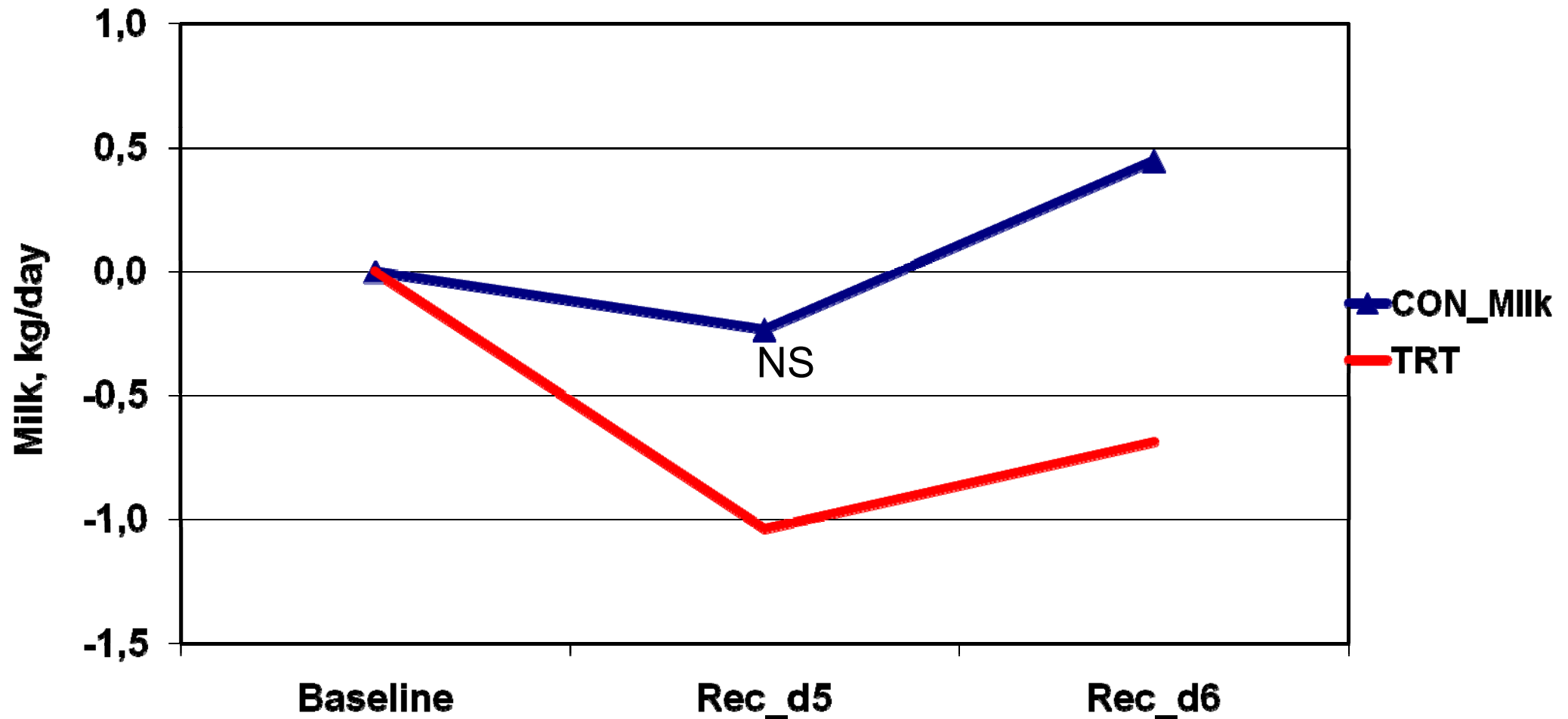
Changes in DM Intake relative to baseline



Prof.Mertens and Prof.Berzaghi, 2009



Changes in Milk Yield vs baseline



Prof.Mertens and Prof.Berzaghi, 2009



Forage Variability: we are used to...

Nutritionists know that there is a large nutrient variability in forages and ingredients that are being fed...

!!! Overfeeding most of the times!!!

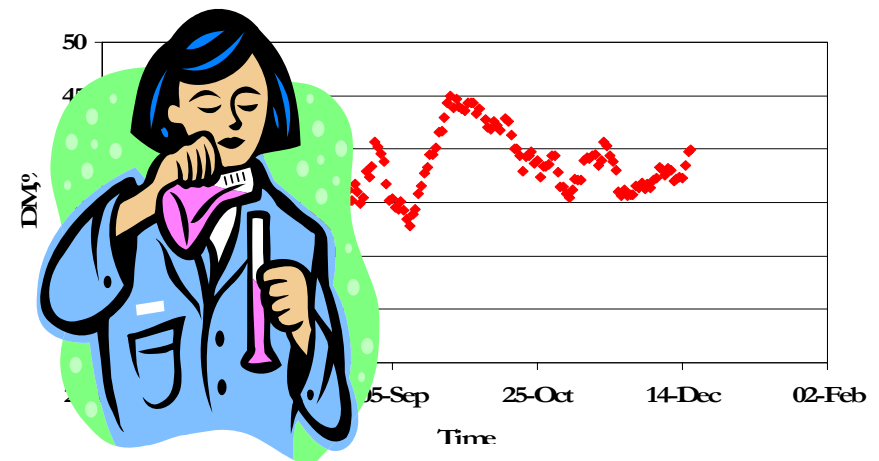
... so rations do include a safety margin with the intent of covering at least animal needs even in the worst case!!!



Forage Variability: an opportunity for...

Forage variability cannot be removed,
... but it can be managed thanks to ...

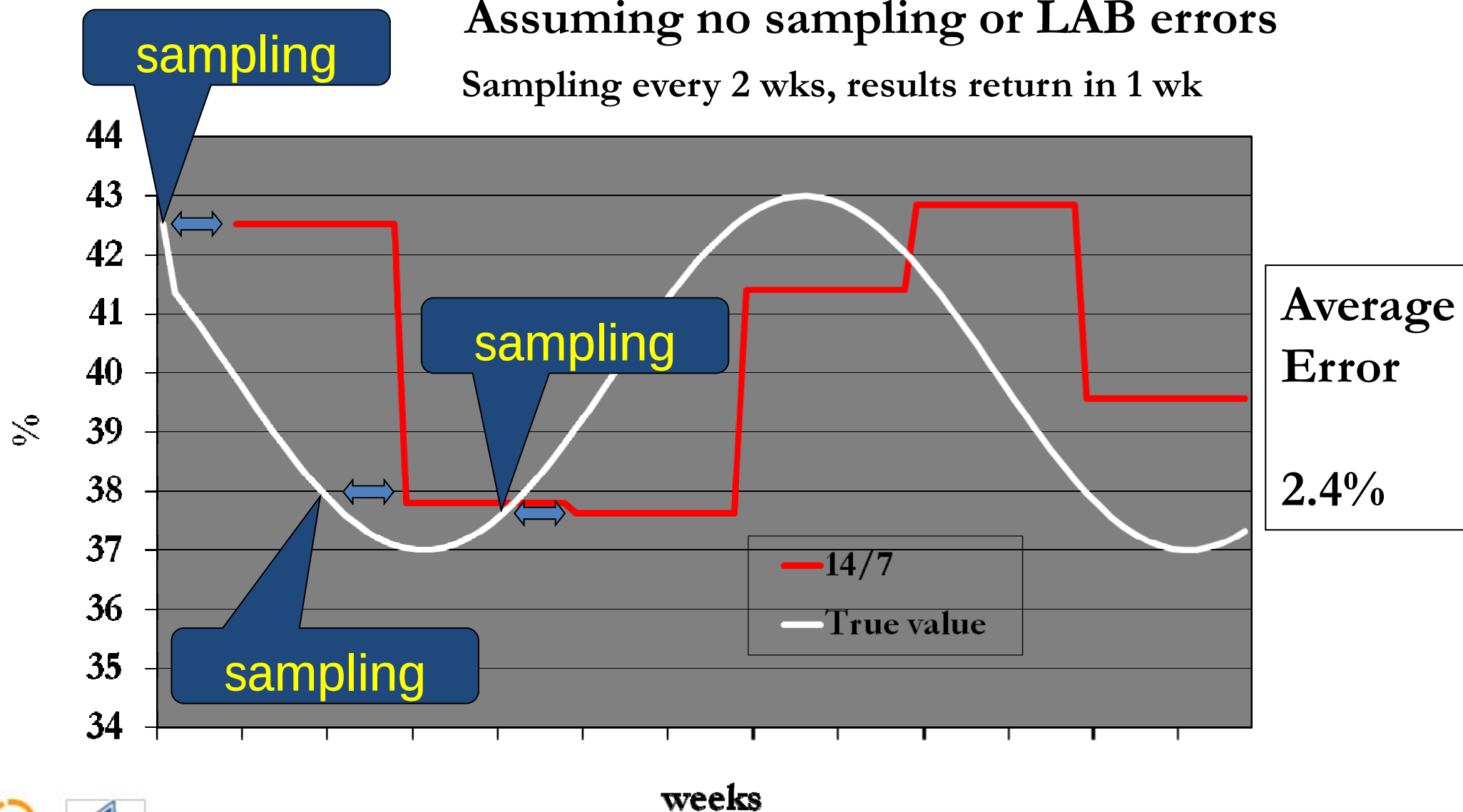
- **Good sampling protocol;**
- **Frequent sampling during the time;**
- **Accurate and fast analysis;**



Frequent and Fast analysis are critical for managing variability...

Assuming no sampling or LAB errors

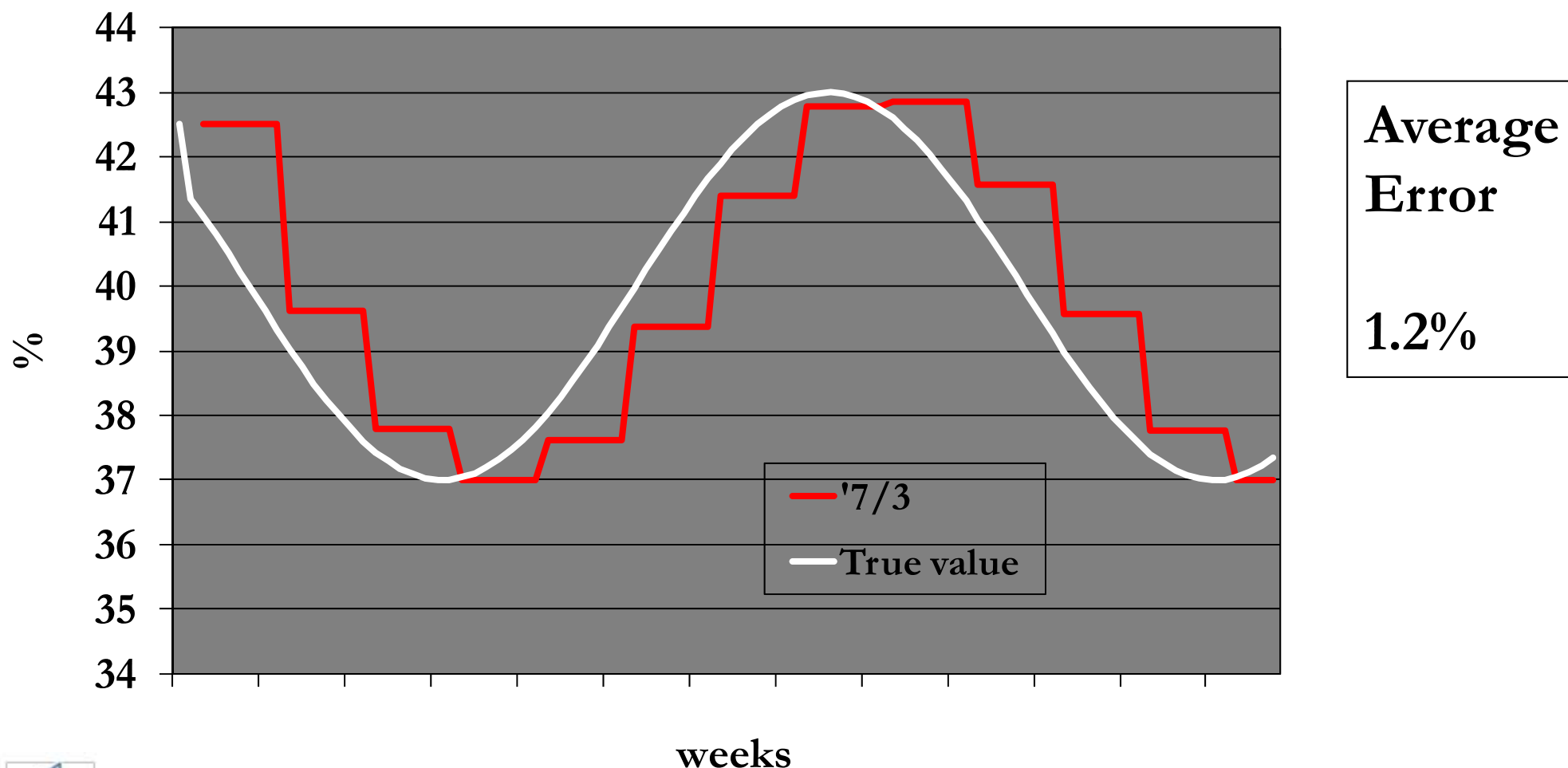
Sampling every 2 wks, results return in 1 wk



Frequent and Fast analysis are critical for managing variability...

Assuming no sampling or LAB errors

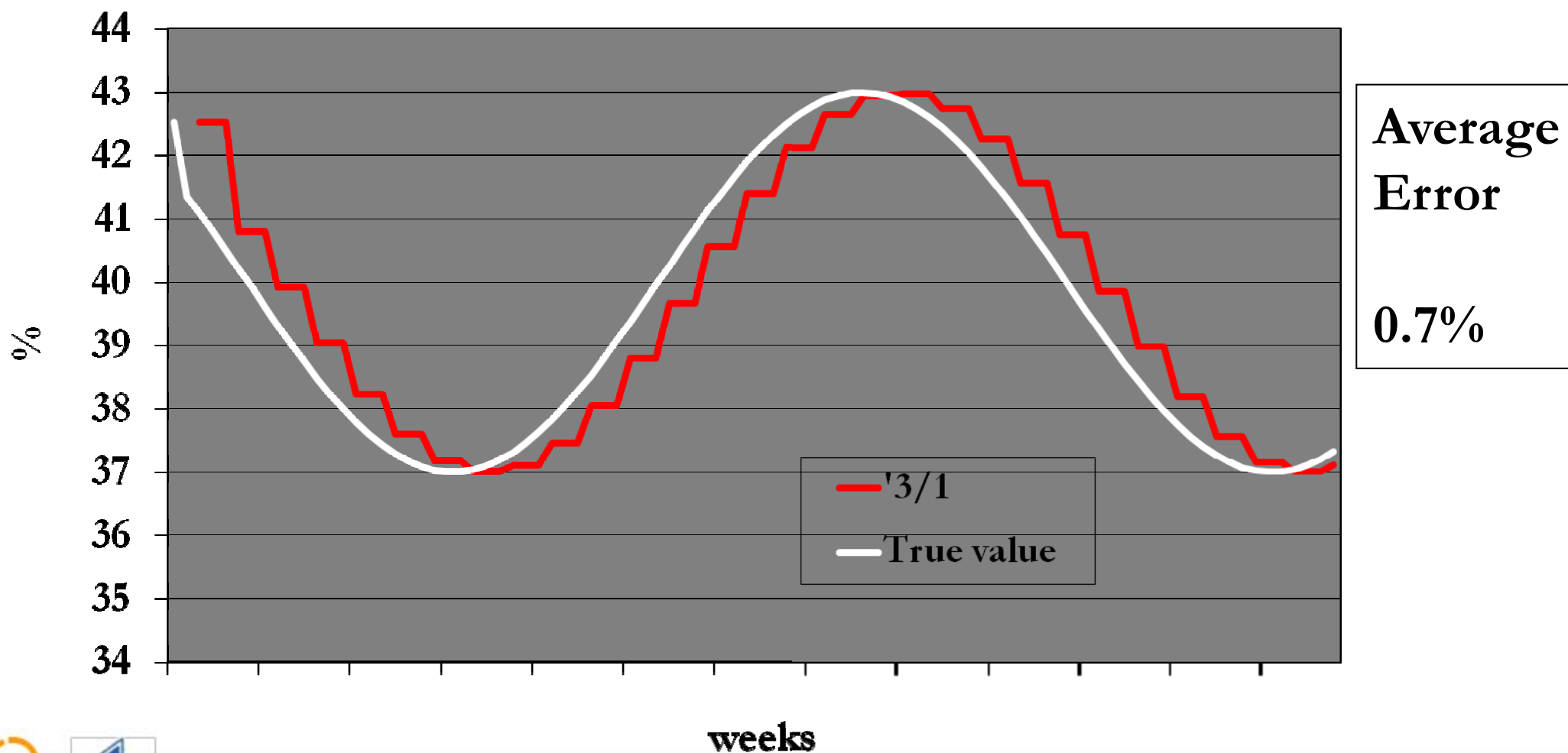
Sampling every 7 days, results return in 3 day



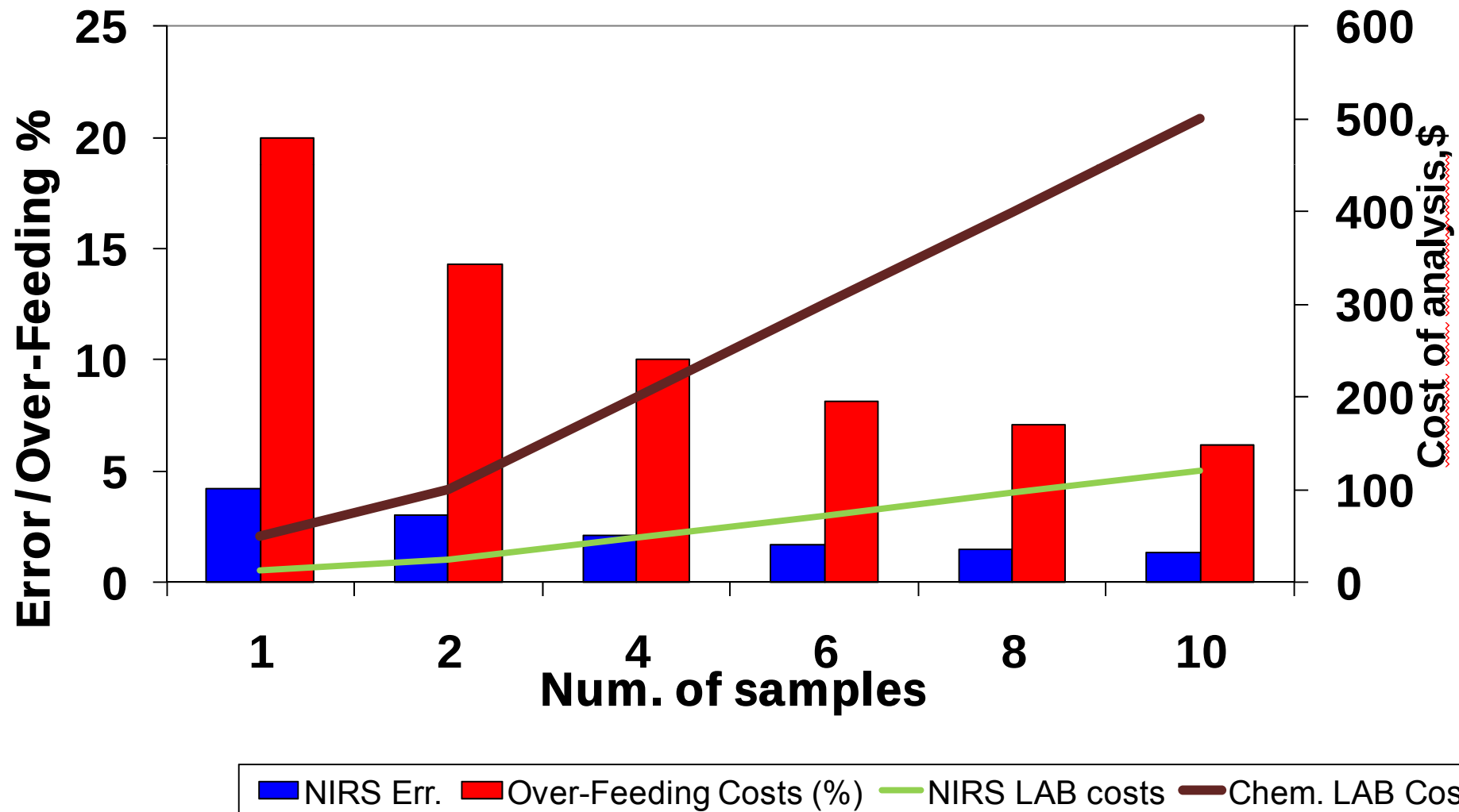
Frequent and Fast analysis are critical for managing variability...

Assuming no sampling or LAB errors

Sampling every 3 days, results return in 1 day



Over Feeding vs Analysis Costs



Managing Variability

- Sending samples in for wet chemistry analysis is an opportunity to do retrospective evaluation
 - Why the fat test dropped
 - Why the milk dropped
- NIR analysis can not fast enough – what now 2-4 days, but in the mean time a significant amount of the inventory is already done!!!

**Excellent for historical analysis ...
... a limit for an optimum management....**



How can dinamica generale® help out?

AgriNIR™



Trolley material: ABS

ABS provides a rugged and sturdy enclosure for optical and electronic components

Dimensions: 50 x 30 x 46 cm

Weight: 19 Kg

Portable & User Friendly

- Reduced dimensions and weight;
- Car powering connector available;
- Completely inside a trolley;
- Simple User Interface based on Soft keys and intuitive icons;
- Preloaded calibration curves;
- Spectra and Predictions saved on USB key.



AgriNIR™ Technical Data



Accuracy

Humidity or Moisture:	2 %
Starch:	3 %
Crude Protein:	3 %
ADF:	3 %
NDF:	3 %
Ash:	3 %
Crude Fat:	3 %

Working temperature: 0°C / +40°C

Power supply: 110 - 220 Vac
(external power supply included)

9 - 32 Vdc (lighter plug or vehicle battery clips included).

AgraNIR™ Technical Data



NIR analyzer ...for forages on farms

- Spectrometer based on InGaAs detector array;
- Temperature controlled (Peltier controller);
- Spectral Range: 1100-1700 nm;
- Dispersion: < 9,5 nm/pixel;
- Optical Fiber input $\varnothing$: 300 μ m;
- Tray and scanning chamber special designed for analysing forages;
- Fresh forages, humid and dry, can be sampled and without expensive pre-treatments.

AgriNIR™ Results

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Corn Silage

NIR Ready

	%AsIs	%DM
Moisture:	72.3 %	27.7 %
Starch:	7.2 %	26.0 %
Protein:	2.6 %	9.4 %
ADF:	8.2 %	29.5 %
NDF:	15.8 %	57.1 %
Ash:	1.3 %	4.8 %
Crude Fat:	0.8 %	2.8 %

1 2 3

MOISTURE (Humidity) value of the sample.

DRY MATTER value of the sample :
calculated as 100% - Moisture.

Chemical Parameters on DM

Chemical Parameters on AsIs



AgrıNIR™ Results

Dinamica Generale
Agrı NIR
Analyzer

Via Mondadori 15
46025 Poggio Rusco
Mantova - ITALY
tel. ++39 - 0386 - 52134

Customer Cod: 0
Company: DINAMICA

Sample ID: 1
Component Nr.: 1

"Corn Silage"

	%AsIs	%DM
Moisture:	74.2	25.8
Starch:	8.7	33.6
Protein:	2.3	8.8
ADF:	5.9	23.1
NDF:	10.6	41.1
Ash:	1.2	4.6
Crude Fat:	0.9	3.3

10:19:51 - 1/02/2011

Machine S/N: 1ZZ809YB

Printer Header

Customer Code and Company Name

ID of the Analyzed Physical Sample

ID of the Analyzed Component

Name of Analyzed Component

Analysis Results of Nutrients
on AsIs and on the Dry Matter

Date and time of the Analysis Execution

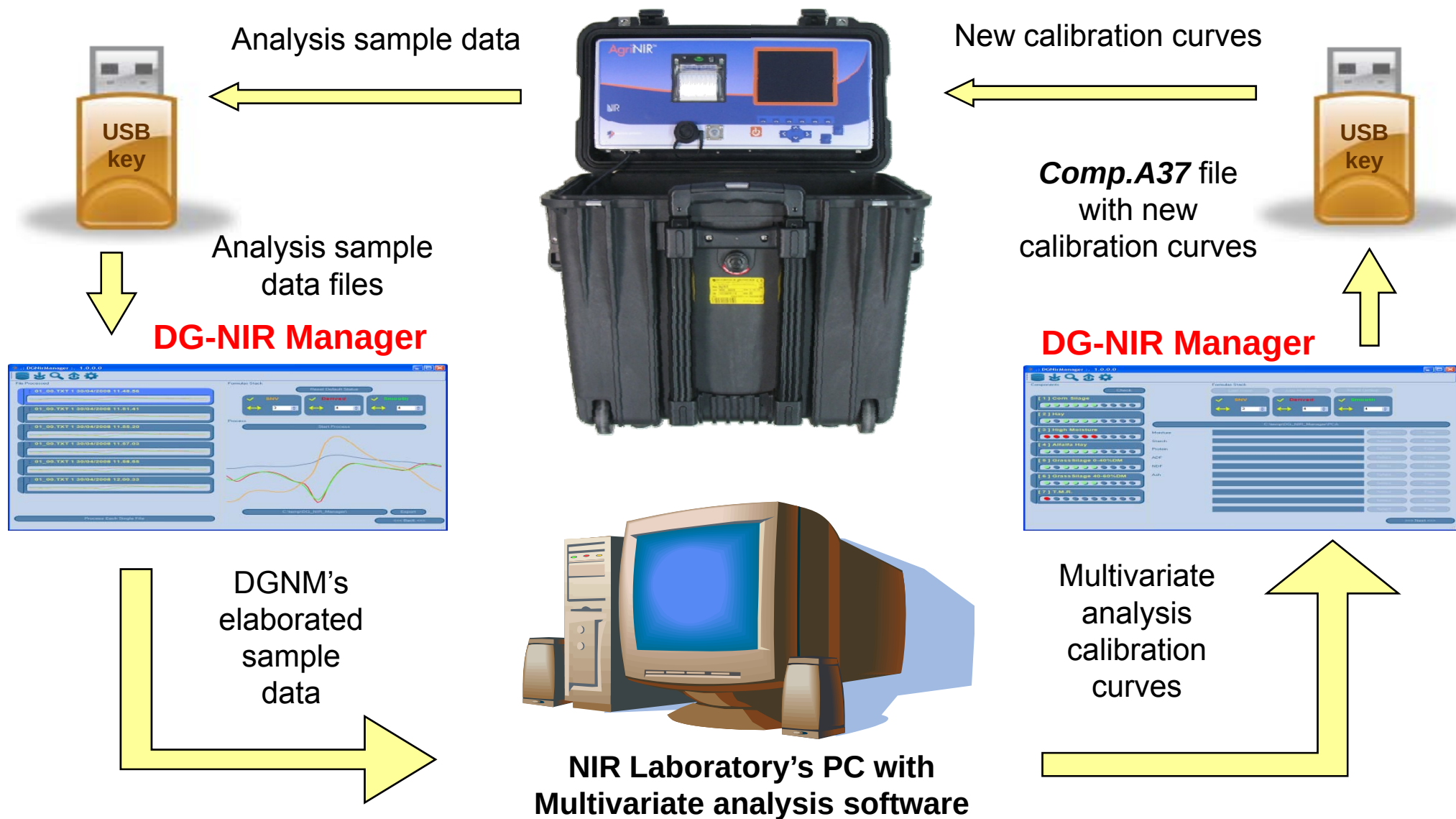


AgraNIR™: Calibration Curves

AgraNIR™ accuracy for DG standard calibrations package		NIR Chemical Parameters						
		Moisture (Humidity)	Starch	Crude Protein	ADF	NDF	Ash	Crude Fat (Ether Extract)
NIR Families	CORN SILAGE	±2,0%	±2,0%	±1,0%	±1,0%	±1,5%	±0,5%	±0,5%
	HAY	±1,0%	n.a.	±1,0%	±2,0%	±2,5%	±1,5%	±0,5%
	HIGH MOISTURE CORN	±2,0%	±3,0%	±1,0%	±1,5%	±2,5%	±0,5%	±0,5%
	ALFALFA HAY	±1,0%	n.a.	±1,5%	±3,0%	±3,0%	±1,0%	±0,5%
	GRASS SILAGE	±2,0%	n.a.	±1,5%	±2,0%	±2,5%	±1,5%	±0,5%
	T.M.R.	±2,0%	±2,0%	±1,0%	±1,5%	±2,0%	±0,5%	±0,5%
	SOYBEAN FLOUR	±1,0%	n.a.	±1,5%	n.a.	±1,5%	±1,0%	±1,0%



Calibration Curve Update - Process



AgraNIR™: Calibration Curves Update

Customer takes care of:

- Sampling;
- Spectra collection with AgraNIR™;
- Chemical analysis at Reference Lab

Dinamica generale / Conseil Elevage takes care of:

- Calibration Curve evaluation;
- Calibration Curve updating;



DG Vision...

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