On Farm near infrared (NIR) analysis……..

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Feeding goals

- Maximize animal performances;
- Maintaining good health conditions;
- Optimize feed efficiency/reduce pollution;
- Maximize farm profitability;

Diet preparation

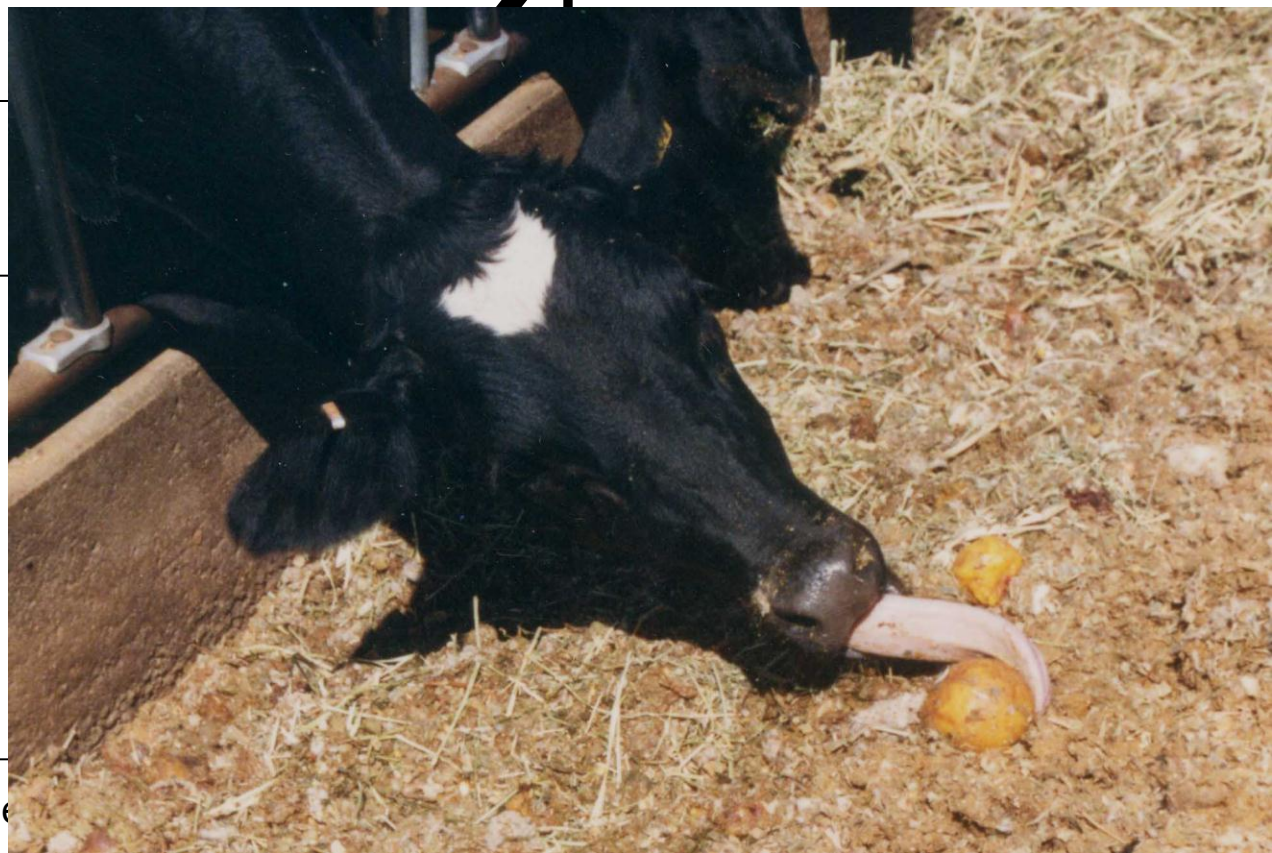
Diet ???

Animal sorting

Changes in feed composition

Feed variability

Formulation



Diet preparation

Always consider that there are always at least 3 diets available

- Computer formulated diet
- Diet actually prepared by the farmer
- Dieat actually eaten by the animal

Forage variability

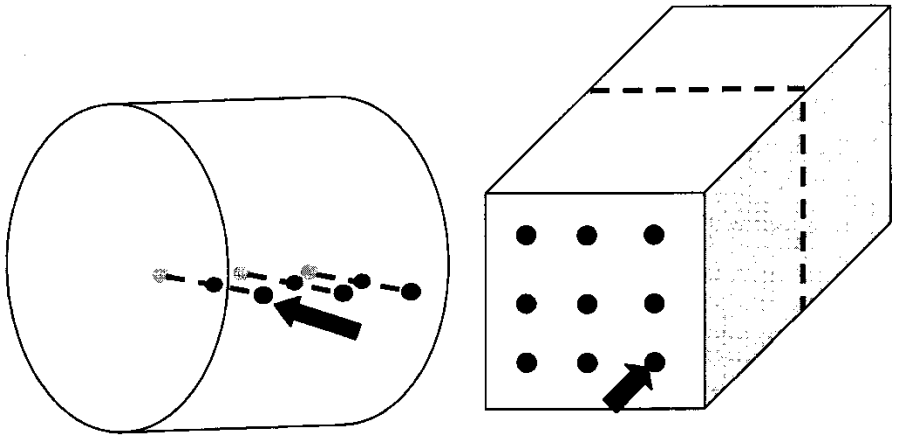


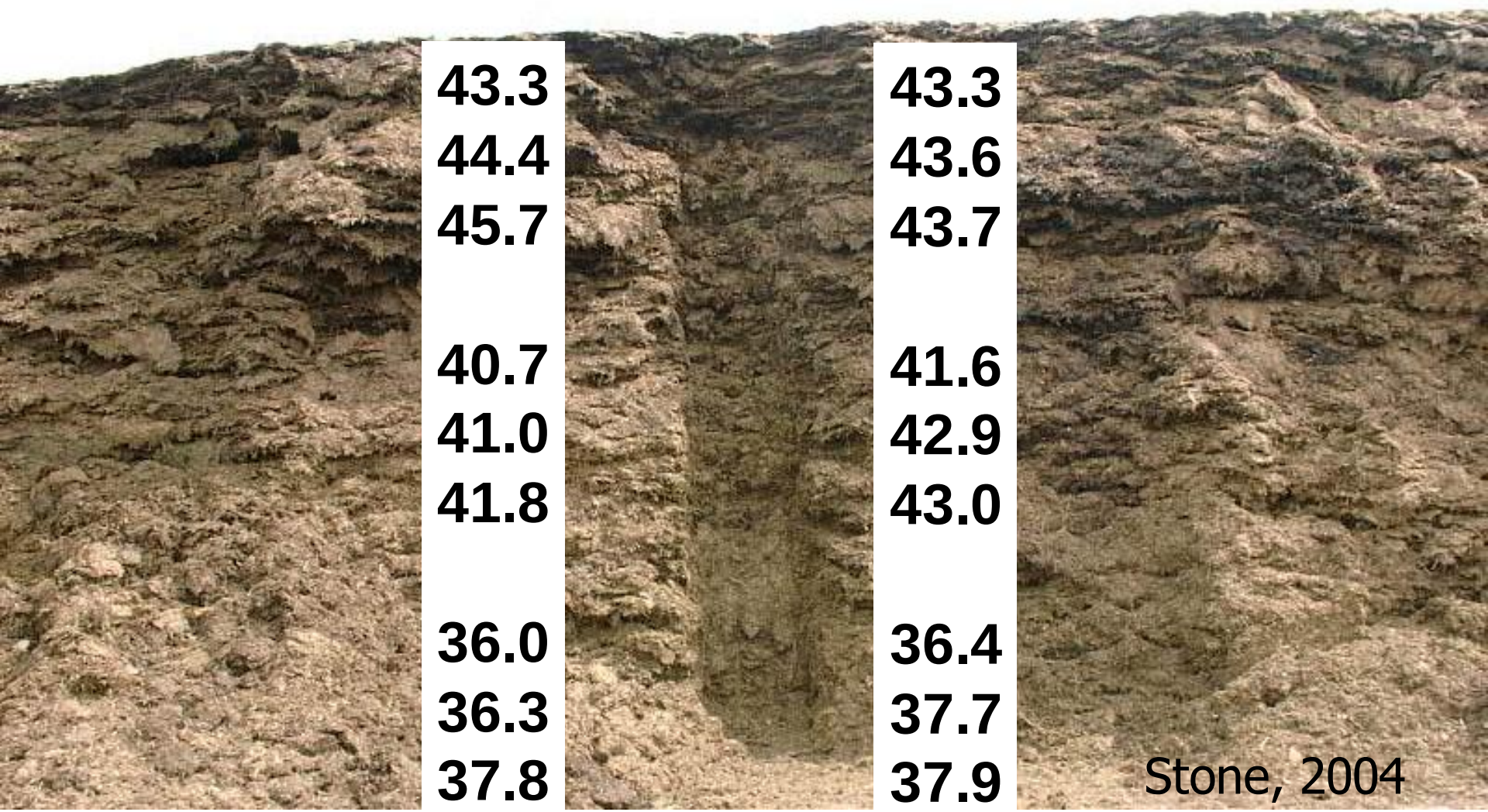
Figure 1. Sampling patterns of round and rectangular bales.

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

Collins, 2000

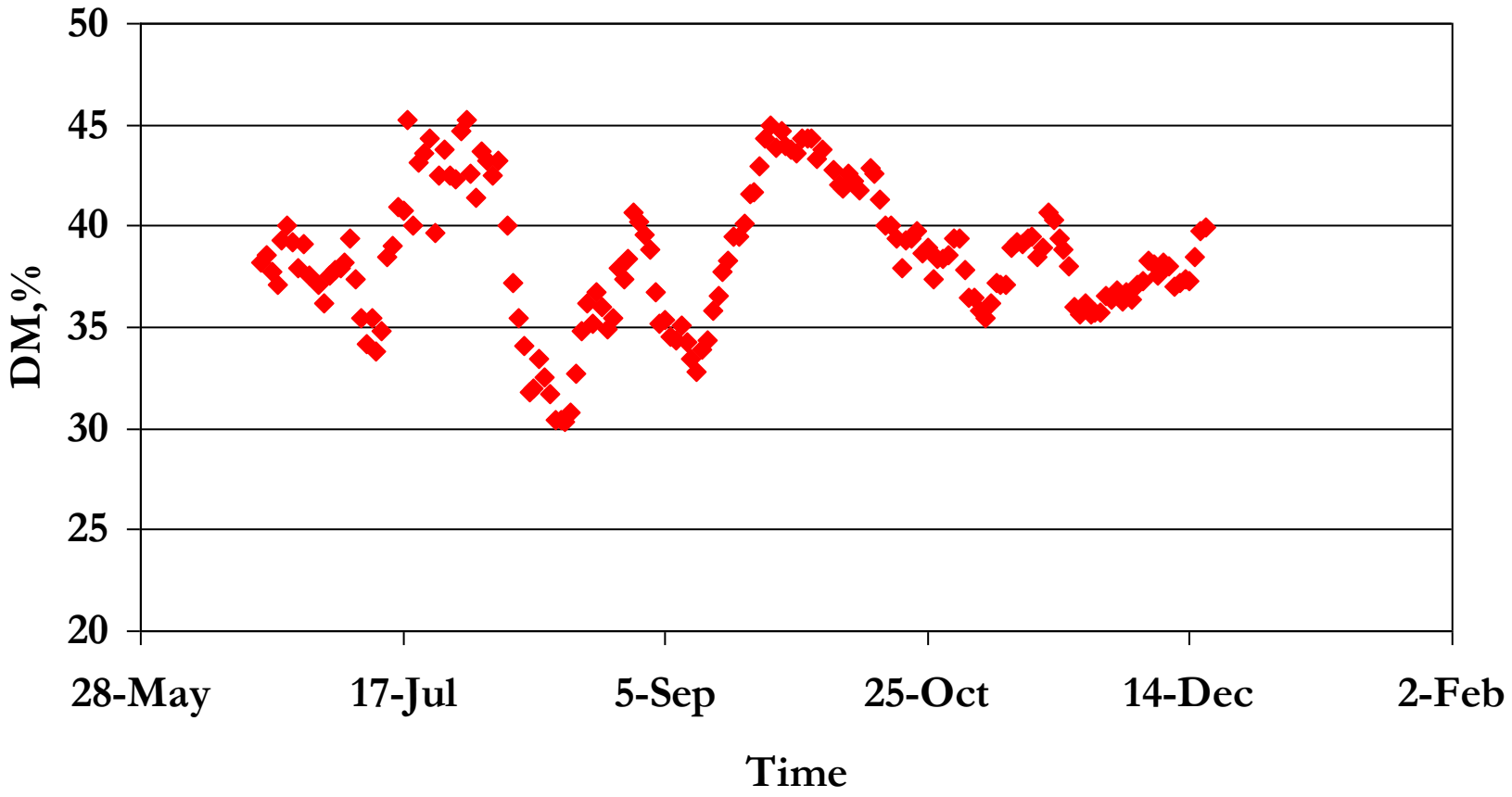
Haylage NDF – Sampling and Laboratory Consistency Evaluation



Forage variability, DM%

Berzaghi et al., 2004

Variation over time



Changes in DM content of Alfalfa haylage – USDFRC Praire du Sac (modified from Undersander et al., 2005)

Feed quality control program

- Managing feed variability requires:
  - Accurate and Frequent sampling
  - Accurate analytical method
  - Rapid return of analysis
  - Simple to implement
  - Low cost

Accurate analitycal method

Wet chemistry

- Accurate analitycal method ✓
- Rapid return of analysis X
- Simple to implement X
- Low cost X

Alternatives???

Organic Nutrients

- **NIR= Near Infrared Spectroscopy**

Mineral Nutrients

- **XRF= X-Ray Fluorescence**

Near IR analysis (NIR)

- Based on absorbtion propertis of IR 'light' which depends on the composition of the samples;
- Obtained in about 1 minute (or less), without destruction of the sample;
- It requires specific calibration by product, that must be updated on a regular base.

Accuracy of NIR ???

NIR is a secondary method based on regression using a primary method (reference data).

An NIR prediction can NEVER be more accurate than a reference analysis.

Laboratory Accuracy

Reference Method

NIR

##.#
REF

Accuracy

##.#
NIR

Farm accuracy

Farm Accuracy

Reference Method

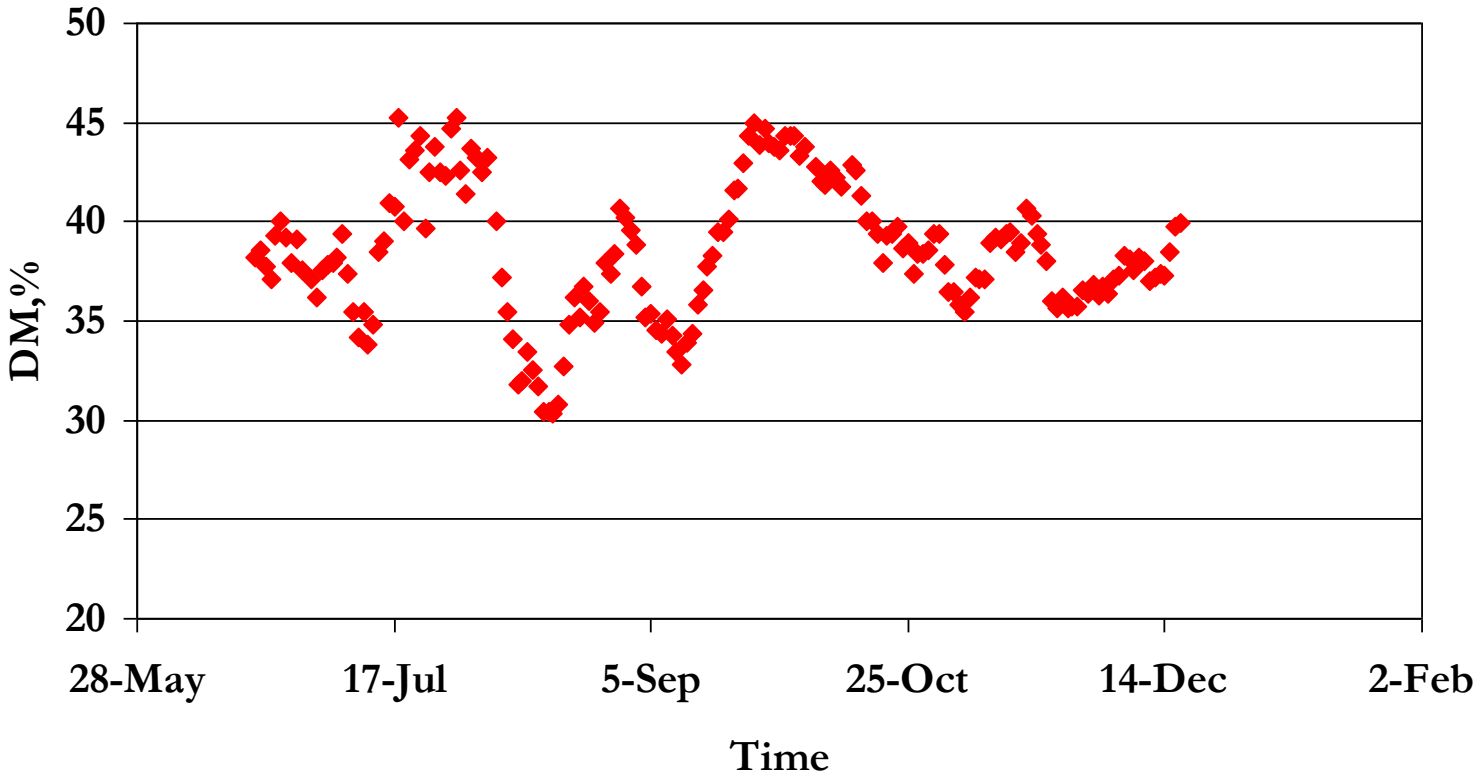
NIR

Accuracy

##.#
REF

##.#
NIR

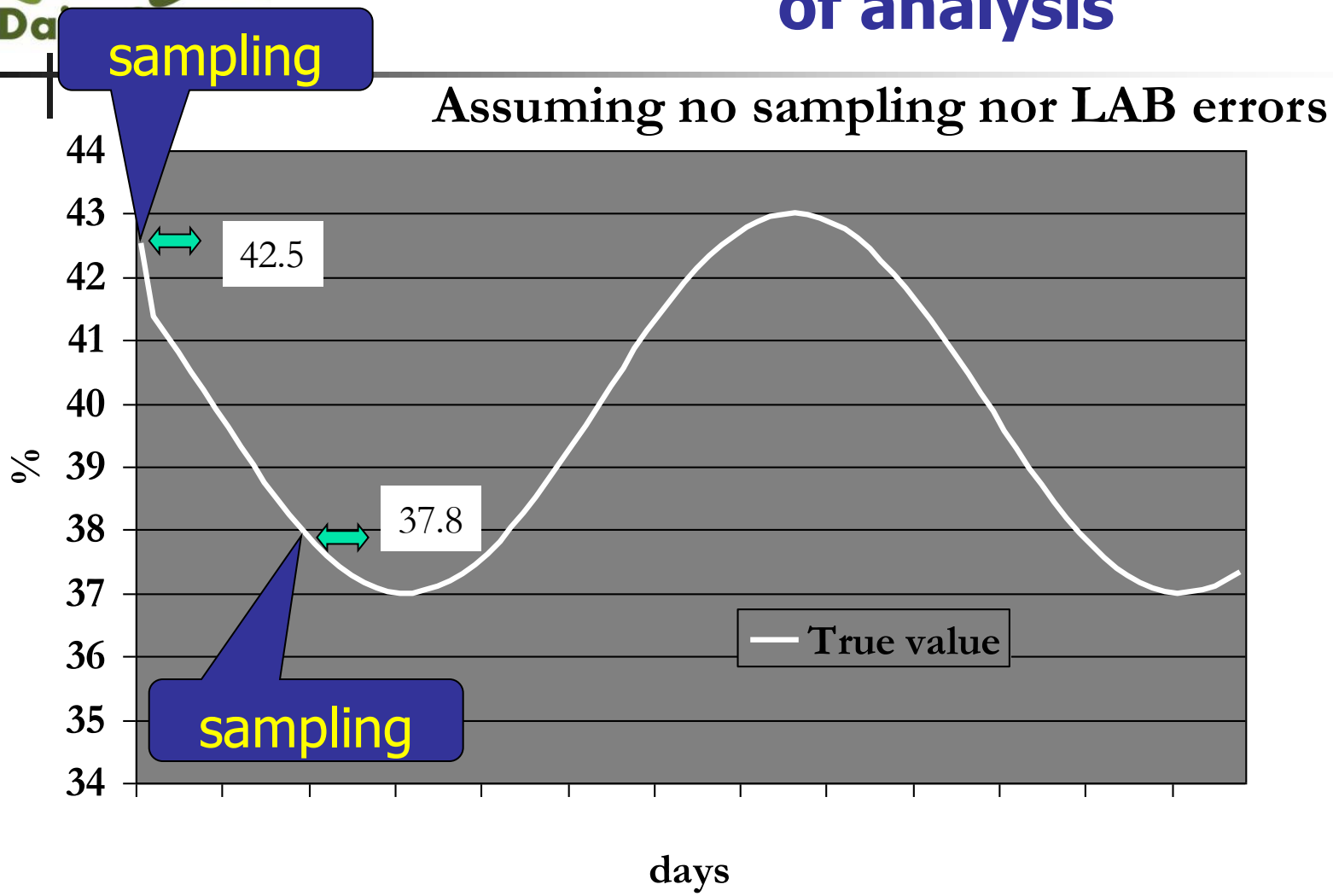
Variation over time



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

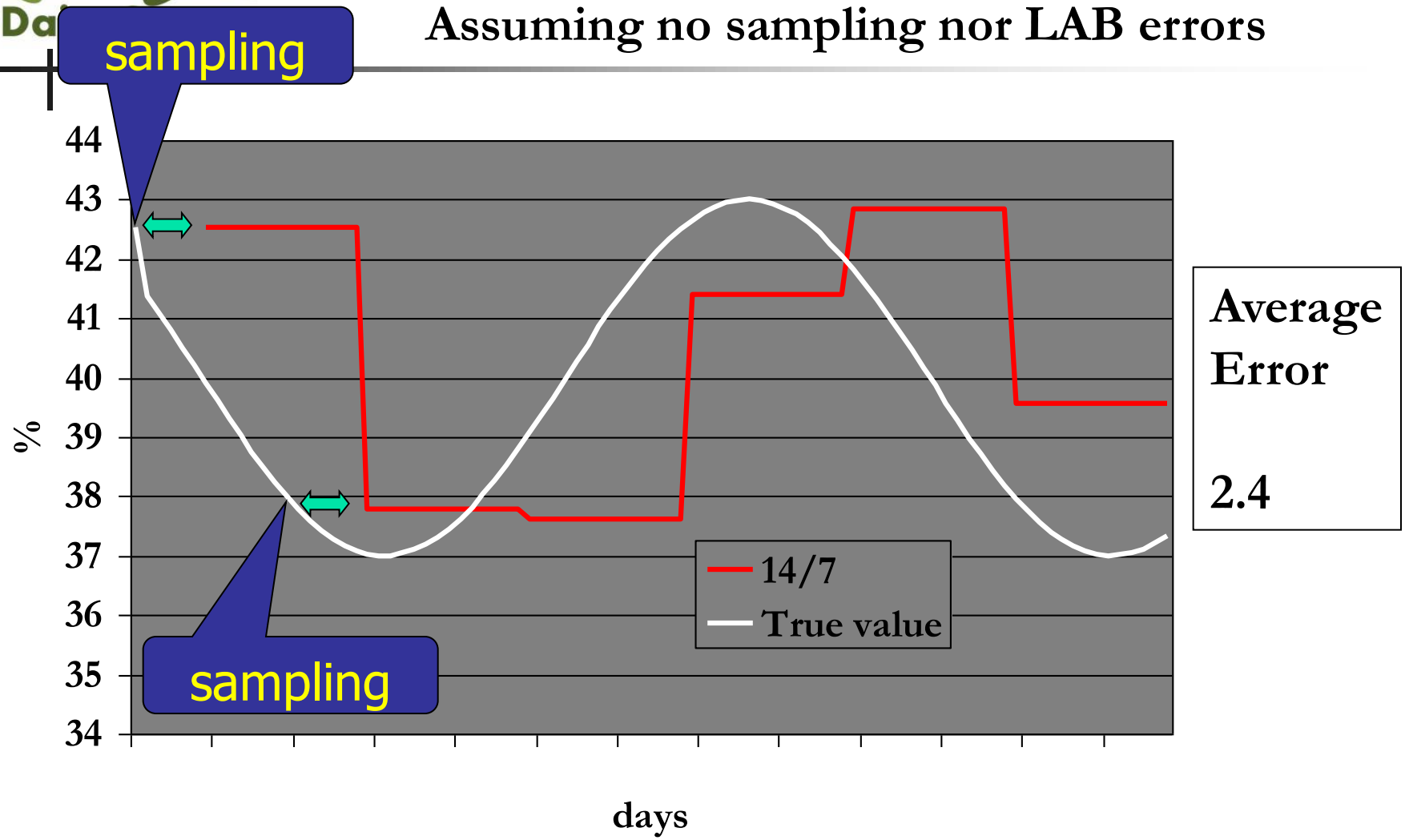
(modified from Undersander et al., 2005)

Accuracy also depends on frequency of analysis



Accuracy and changes in feed composition

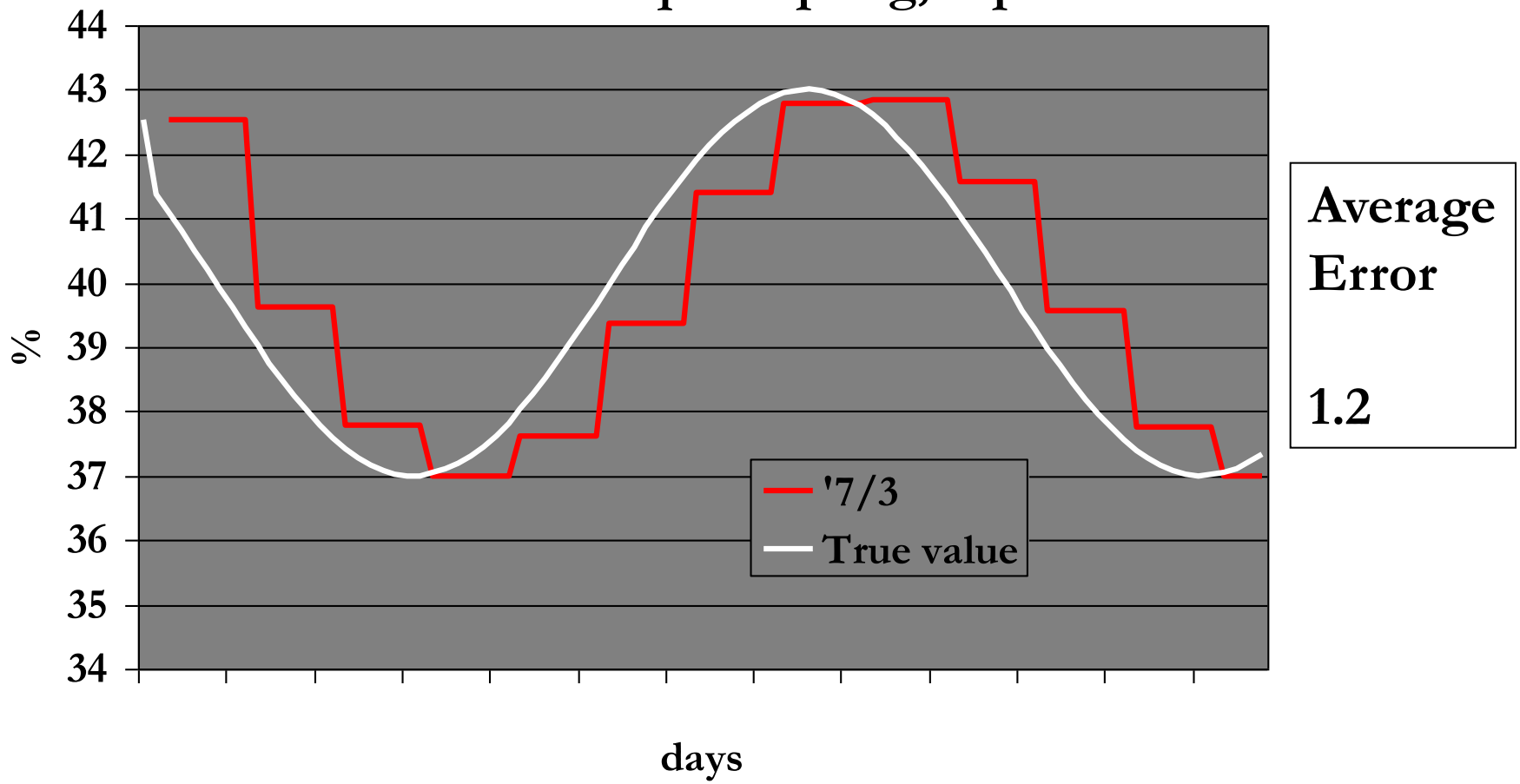
Assuming no sampling nor LAB errors



Accuracy and changes in feed composition

Assuming no sampling nor LAB errors

More freq. sampling, rapid return



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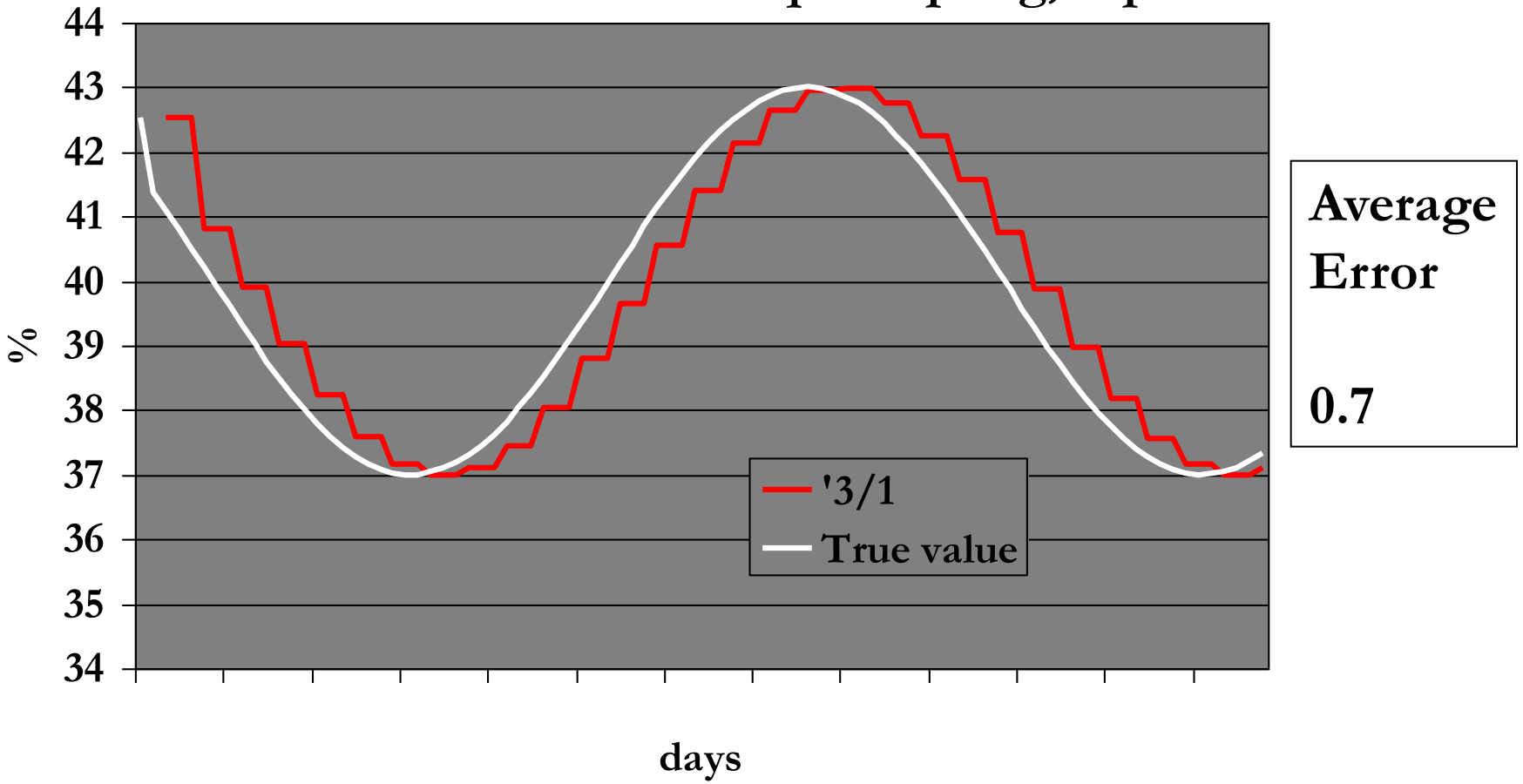


Feed managment value

A Feed Control Program on the Farm

is worth $0.27/cow/day (St-Pierre, 2006)

or

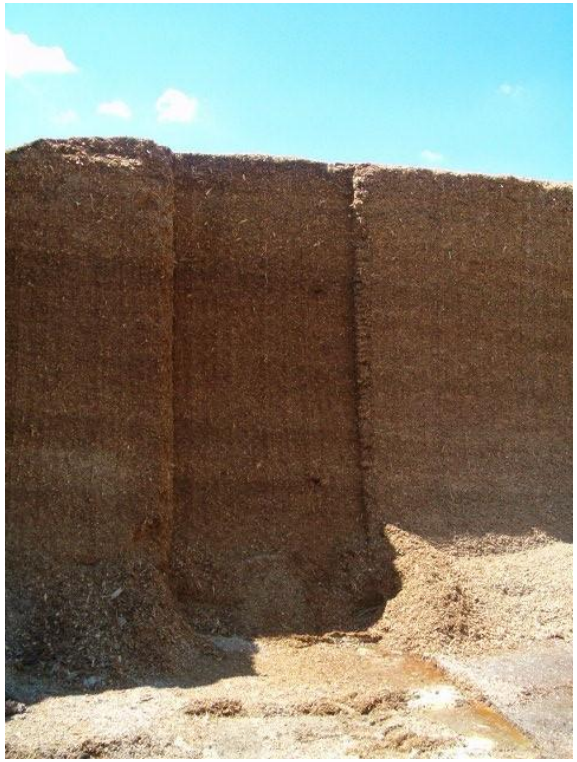
Compared to production of about 1kg of milk/d

On-farm NIR analysis…

Challenges

- Complex analytical system in the hands of laboratory unskilled professionals
- Samples preparation…. May not be an option
- Calibration maintenance….expensive for just an instrument

Data flow



Conclusions

- On Farm analysis can improve feeding consistency with potential benefit for animal health and the environment
- NIR is a mature technology that can be brought out of labs and into farms
- NIR **must** be integrated with feed management software to minimize feeding costs, maximize animal performance , improve farm profitability and animal care

Plans for the Future

learn from mistakes

strive for improvements…

….to make animals and farmers happy