Effect of corn silage chemical analysis and ration adjustment frequency on milk production and profitability

G. E. Valergakis[1], E. Souglis[2], G. Zanakis[3], G. Arsenos[1], G. Banos[1]

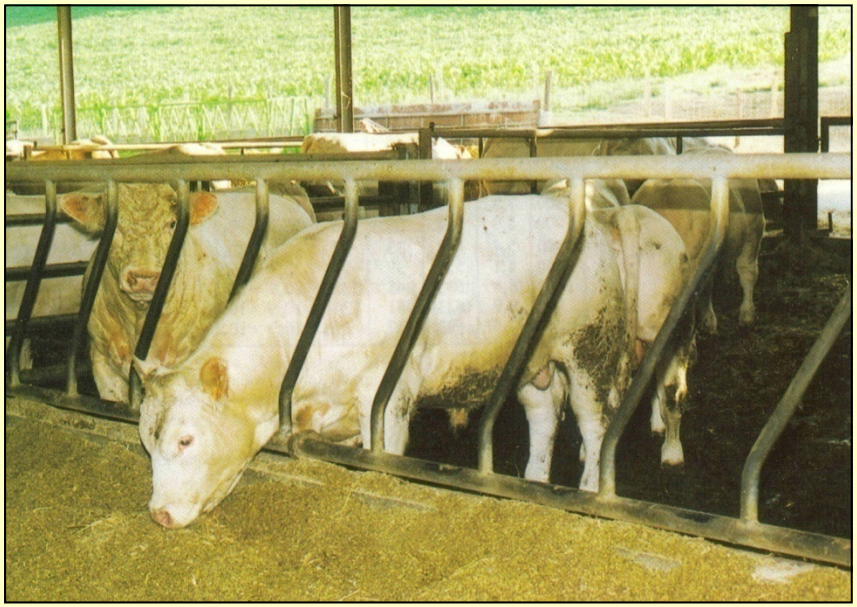
[1]Department of Animal Production,
Faculty of Veterinary Medicine, Aristotle University of Thessaloniki,
[2]American Farm School of Thessaloniki, [3]Pioneer Hi-Bred Hellas

Corn silage

Basic ingredient of cattle diets in most countries

Dairy cows

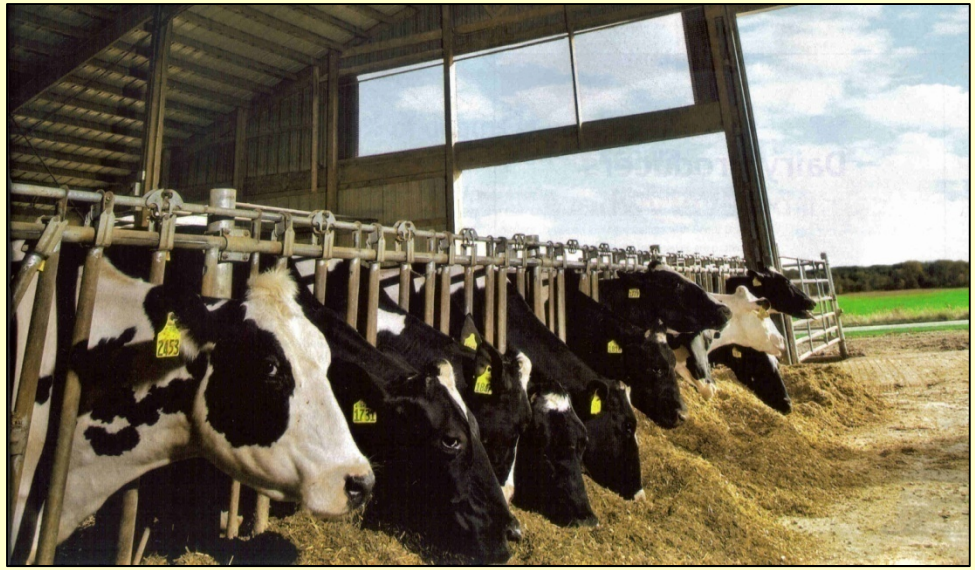
up to 60-65% of ration DM

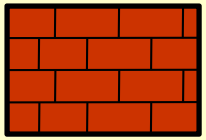


Beef cattle

up to 80-85% of ration DM

Corn silage

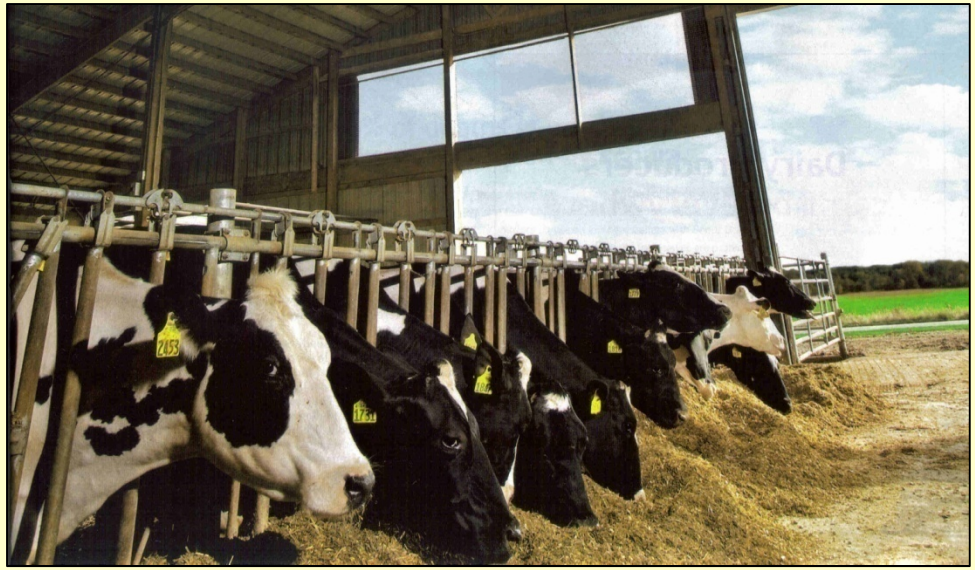


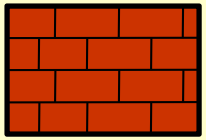
Variability →  **Balanced rations**

↑

year, country, region, field, weather conditions, crop maturity etc

Corn silage



Variability →  Balanced rations

Chemical analysis

Aim of the study

- **To evaluate under field conditions:**

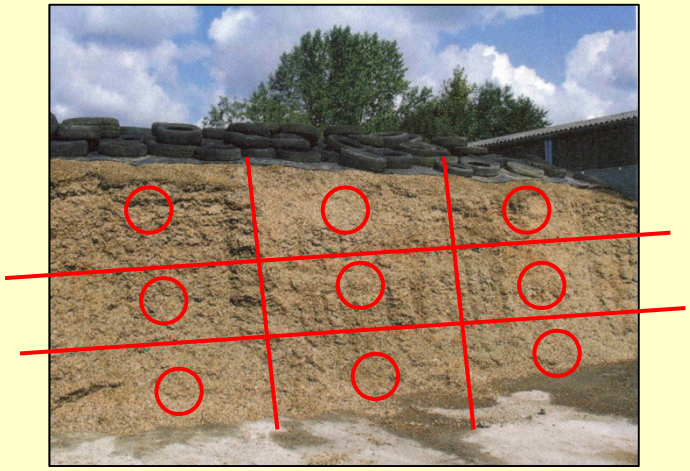
  - Accuracy of book values (NRC-2001 and INRA-2007)

  - Frequency of chemical analysis and ration adjustments

- **There are *"rules of thump"* and *"recommendations"* but no specific data!**

Materials and methods

- **Weekly samplings from the silos of the American Farm School's dairy (3 years, 16 silos, 186 samples).**
- **Corn was harvested from the same field each year.**
- **The same person collected all samples.**

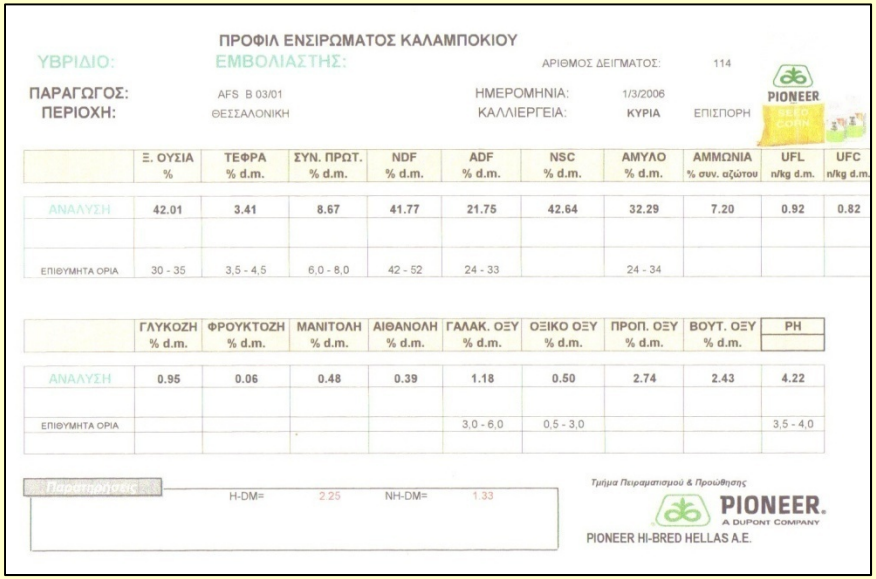


Materials and methods

Analysis by NIRS

(Pioneer Hi Bred Hellas SA)

FOSS Holographic Grating Series Model 5000



ΠΡΟΦΙΛ ΕΝΣΙΡΩΜΑΤΟΣ ΚΑΛΑΜΠΟΚΙΟΥ

ΥΒΡΙΔΙΟ: ΕΜΒΟΛΙΑΣΤΗΣ: ΑΡΙΘΜΟΣ ΔΕΙΓΜΑΤΟΣ: 114

ΠΑΡΑΓΩΓΟΣ: AFS B 03/01 ΗΜΕΡΟΜΗΝΙΑ: 1/3/2006

ΠΕΡΙΟΧΗ: ΘΕΣΣΑΛΟΝΙΚΗ ΚΑΛΛΙΕΡΓΕΙΑ: ΚΥΡΙΑ ΕΠΙΣΠΟΡΗ

PIONEER

	Ξ. ΟΥΣΙΑ %	ΤΕΦΡΑ % d.m.	ΣΥΝ. ΠΡΩΤ. % d.m.	NDF % d.m.	ADF % d.m.	NSC % d.m.	ΑΜΥΛΟ % d.m.	ΑΜΜΩΝΙΑ % συν. αζώτου	UFL n/kg d.m.	UFC n/kg d.m.
ΑΝΑΛΥΣΗ	42.01	3.41	8.67	41.77	21.75	42.64	32.29	7.20	0.92	0.82
ΕΠΙΘΥΜΗΤΑ ΟΡΙΑ	30 - 35	3,5 - 4,5	6,0 - 8,0	42 - 52	24 - 33		24 - 34			

	ΓΛΥΚΟΖΗ % d.m.	ΦΡΟΥΚΤΟΖΗ % d.m.	ΜΑΝΙΤΟΛΗ % d.m.	ΑΙΘΑΝΟΛΗ % d.m.	ΓΑΛΑΚ. ΟΞΥ % d.m.	ΟΞΙΚΟ ΟΞΥ % d.m.	ΠΡΟΠ. ΟΞΥ % d.m.	ΒΟΥΤ. ΟΞΥ % d.m.	PH
ΑΝΑΛΥΣΗ	0.95	0.06	0.48	0.39	1.18	0.50	2.74	2.43	4.22
ΕΠΙΘΥΜΗΤΑ ΟΡΙΑ					3,0 - 6,0	0,5 - 3,0			3,5 - 4,0

H-DM= 2.25 NH-DM= 1.33

Τμήμα Πειραματισμού & Προώθησης

PIONEER. A DUPONT COMPANY

PIONEER HI-BRED HELLAS A.E.

DM, Ash, CP, NDF, ADF, NSC,

Starch, NH_3%N, Alcohols,

Fermentation acids, pH

Materials and methods

- **NRC-2001 software**

Total Mixed Ration for 45.5 kg (100 lb) of milk (3.5% fat, 3.0%protein)

	Book values	
	NRC-2001	INRA-2007
Corn silage	30.0	30.0
Alfalfa hay	3.0	3.0
Wheat straw	0.5	0.5
Whole cottonseeds	2.0	2.0
Sugar beet molasses	1.0	1.0
Corn grain	4.8	4.35
Soybean meal – expellers	1.8	1.8
Soybean meal – solvent, 44%	2.2	2.7
Sunflower meal	1.5	1.5
Fat	0.3	0.3
Supplements	0.5	0.5

Materials and methods

- **NRC-2001 software**

Total Mixed Ration for 45.5 kg (100 lb) of milk (3.5% fat, 3.0%protein)

	Book values	
	NRC-2001	INRA-2007
Corn silage	30.0	30.0
Alfalfa hay	3.0	3.0
Wheat straw	0.5	0.5
Whole cottonseeds	2.0	2.0
Sugar beet molasses	1.0	1.0
Corn grain	4.8	4.35
Soybean meal – expellers	1.8	1.8
Soybean meal – solvent, 44%	2.2	2.7
Sunflower meal	1.5	1.5
Fat	0.3	0.3
Supplements	0.5	0.5

Materials and methods

Simulation study: Farmers' strategies

Book values (BV)

Analysis on silo opening (ASO)

Monthly analysis (MA)

Materials and methods

Simulation study: Farmers' strategies

Book values (BV)	Analysis on silo opening (ASO)	Monthly analysis (MA)
No ration adjustment	No ration adjustment	No ration adjustment
Daily adjustment of total ration offered based on orts	Daily adjustment of total ration offered based on orts	Daily adjustment of total ration offered based on orts
Adjustment of amount of CS offered based on weekly analysis for DM	Adjustment of amount of CS offered based on weekly analysis for DM	Adjustment of amount of CS offered based on weekly analysis for DM

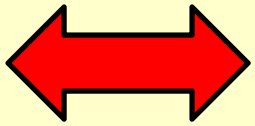
Materials and methods

- **3-year comparison** (157 weeks, transitions between silos included)

What was actually fed (analyses results) **vs.** **What was supposed to be fed**

Effect on:

- ***Predicted milk production (PMP)***
- ***Income over feed cost (IOFC)***



Analysis of Variance

Results

BOOK VALUES

	No ration adjustment	Daily adjustment of TMR offered based on orts	Adjustment of the amount of CS offered based on weekly analysis for DM
PMP	*P<0.001*	*P<0.001*	*P<0.001*
IOFC	*P<0.001*	*P<0.001*	*P>0.05*

INRA-2007 was significantly more accurate!

Results

NO daily or weekly RATION ADJUSTMENTS

Book values (BV) < **Analysis on silo opening (ASO)** < **Monthly analysis (MA)**

Results

NO daily or weekly RATION ADJUSTMENTS

Book values (BV)	<	Analysis on silo opening (ASO)	<	Monthly analysis (MA)
PMP		*P<0.001*		*P<0.001*
IOFC		*P<0.05*		*P<0.001*

Results

NO daily or weekly RATION ADJUSTMENTS

	Analysis on silo opening (ASO) < Monthly analysis (MA)
PMP	*P<0.001*
IOFC	*P<0.05* *8.5 cents/cow/day !* *26 €/cow/lactation!*

Results

Book values (BV)

Daily adjustment of total ration offered based on orts

P>0.05

Adjustment of amount of CS offered based on weekly analysis for DM

Analysis on silo opening (ASO)

Daily adjustment of total ration offered based on orts

P>0.05

Adjustment of amount of CS offered based on weekly analysis for DM

Monthly analysis (MA)

Daily adjustment of total ration offered based on orts

P>0.05

Adjustment of amount of CS offered based on weekly analysis for DM

Results

Book values (BV)	Analysis on silo opening (ASO)	Monthly analysis (MA)
Daily adjustment of total ration offered based on orts	Daily adjustment of total ration offered based on orts	Daily adjustment of total ration offered based on orts
P>0.05	P>0.05	P>0.05
Adjustment of amount of CS offered based on weekly analysis for DM	Adjustment of amount of CS offered based on weekly analysis for DM	Adjustment of amount of CS offered based on weekly analysis for DM

- Daily adjustment of total ration offered was supposed to be 100% accurate...
- In practice, it is a labour intensive and fairly inaccurate task!
- Adjustment of amount of CS offered based on weekly analysis for DM was usually more profitable (0-7 cents/cow/day)!

Results

Analysis on silo opening (ASO)

Daily adjustment of total ration offered based on orts

Adjustment of amount of CS offered based on weekly analysis for DM

P>0.05

Monthly analysis (MA)

Daily adjustment of total ration offered based on orts

Adjustment of amount of CS offered based on weekly analysis for DM

Both significantly better than using book values

but no differences were detected between them

Results

Analysis on silo opening (ASO)		Monthly analysis (MA)
Daily adjustment of total ration offered based on orts	⟷	Daily adjustment of total ration offered based on orts
	P>0.05	
Adjustment of amount of CS offered based on weekly analysis for DM	⟷	Adjustment of amount of CS offered based on weekly analysis for DM

- Silos were rather small: they were fed out in 2.8 months...

- Corn silage was about 40% of DM (10.5 kg/cow/day)...

Conclusions

- **INRA-2007 more accurate than NRC-2001 but still, analyses are necessary to verify it on every farm!**

- **If no daily or weekly ration adjustments are made, monthly analyses are highly profitable!**

Conclusions

- **Weekly sampling of CS for DM and adjustment of the amount offered is preferable to daily adjustment of TMR offered!**

- **Monthly analysis may be better than analysis on silo opening only, for larger silos and when feeding large quantities of corn silage!**

Acknowledgments to our partners

American Farm School of Thessaloniki

Pioneer Hi Bred Hellas SA

Department of Animal Production
Faculty of Veterinary Medicine, AUTH


Many thanks
for your attention!