



# Crossing grazing calendars and bulk milk analysis : is on-field validation for grass-diet in cattle possible ?

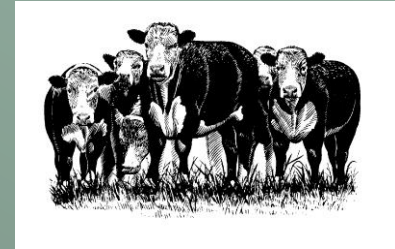
K. Dichou, C. Nickmilder, A. Tedde, G. Conter, R. Reding, A. Marvuglia, H. Soyeurt



# Grazing calendars



7 Farms  
Over 2019-2020



# Workflow – database and hierarchical clustering

DB\_Pasture n=526  
+- 3 days around available  
milk analysis



Pasture time



%GRASS



%Filling

Clustering

Clusters

Low

Pasture traits

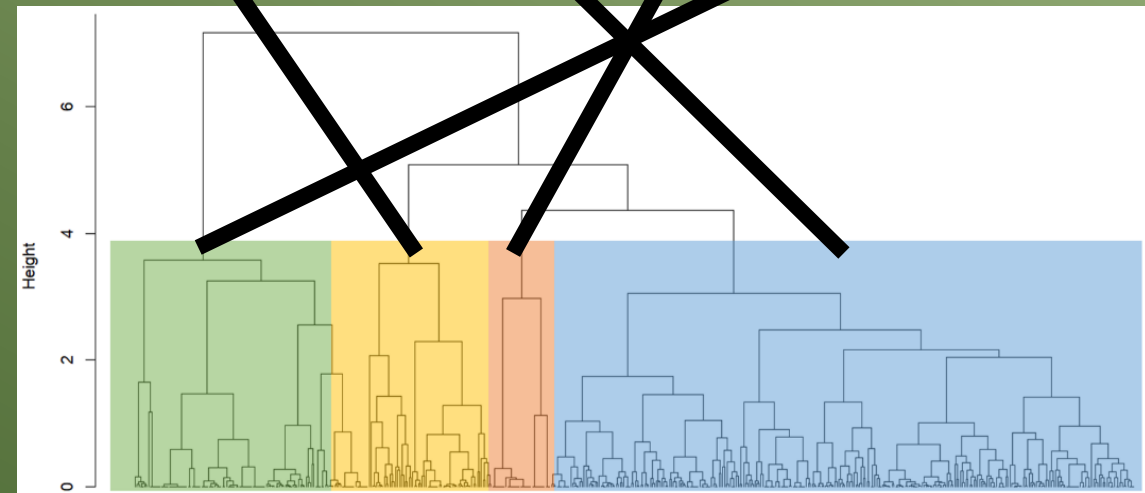
High

Cluster 4

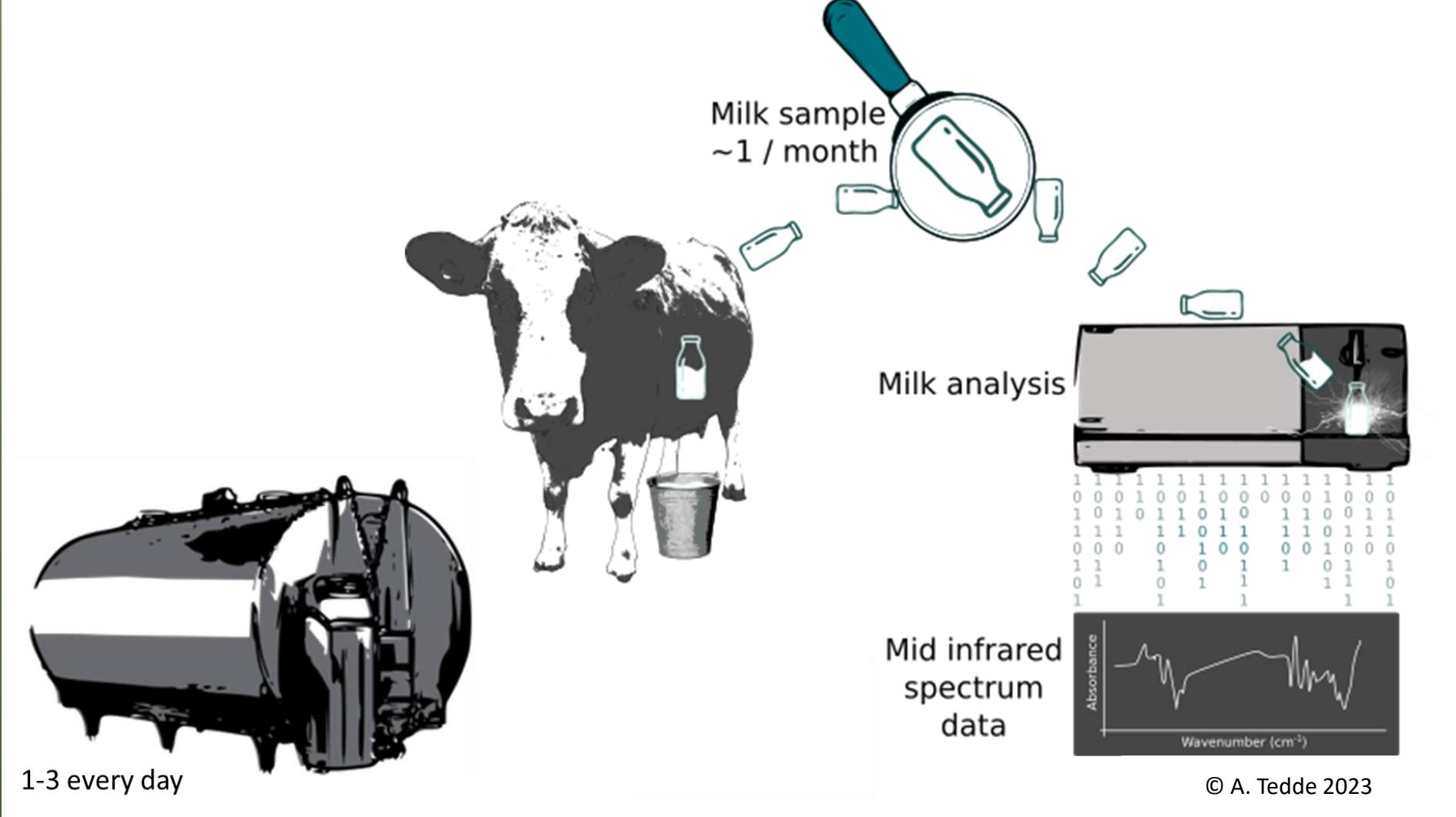
Cluster 1

Cluster 3

Cluster 2



# Bulk milk analysis



1-3 every day

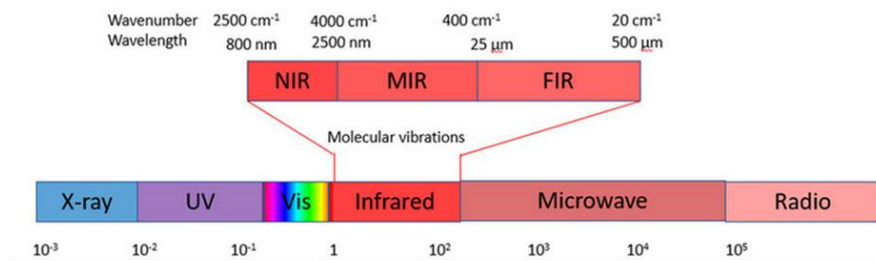
Milk sample  
~1 / month

Milk analysis

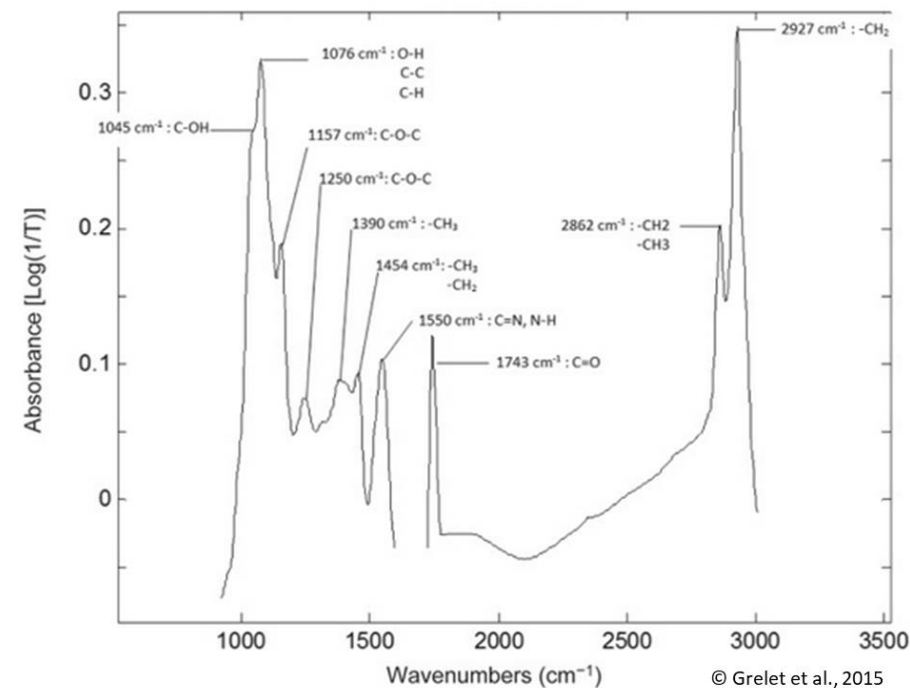
Mid infrared  
spectrum  
data

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# Bulk milk analysis



MIR spectra  
=  
Absorption of infrared  
radiation at frequencies  
associated with the  
vibrations of specific  
chemical bonds.



# Bulk milk analysis



A ball-and-stick molecular model is shown at the top left, and a cluster of yellow, crystalline mineral structures is at the bottom left. The central area contains four overlapping light blue circles labeled with chemical symbols: 'FA' (top), 'Ca' (left), 'Mg' (bottom), and 'K' (right).

A blue yogurt cup with a red lid and a strawberry illustration is at the top right. Below it is a color-coded pH scale strip ranging from 0 to 14. The central area features two overlapping blue circles labeled 'Titrable acidity' (top) and 'pH' (bottom).

A patch of green grass is at the bottom left. Above it are two overlapping yellow circles labeled 'P' (left) and 'Urea' (right).

A large pink circle contains the word 'Isocitrate' in white text. A green circular icon with a white plus sign is located at the top right of the circle.

A large green circle contains the text 'Protein efficiency' in white.

# Workflow - ANOVA

Clusters

Components of interest

Low

Pasture traits

High

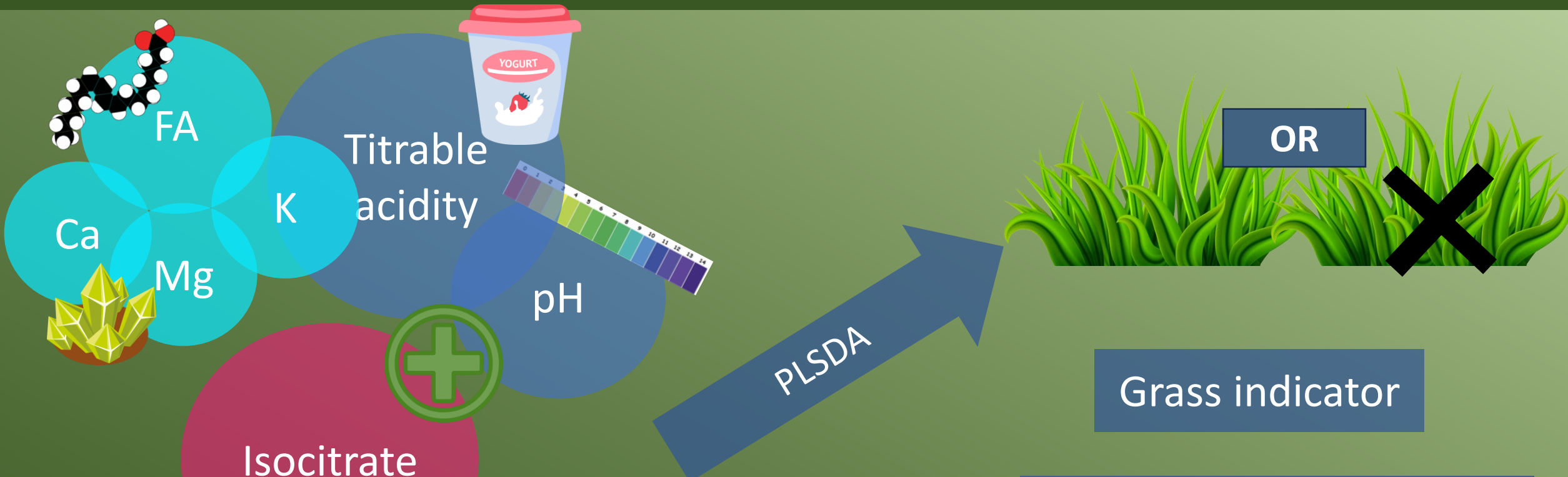
Cluster 4

Cluster 2

DB\_milk n=75

FT-MIR based-traits	Unit	GRASS	NoGRASS	p-value
Milk yield	kg/day	24.00	27.33	***
C14:1	g/dL	0.04	0.05	*
C16	g/dL	1.15	1.30	*
Total of C18:1 trans	g/dL	0.15	0.13	***
MCFA	g/dL	2.03	2.24	*
Total of trans FA	g/dL	0.20	0.17	***
Ca	mg/kg	1174.82	1257.21	**
P	mg/Lkg	975.67	1017.16	*
K	mg/kg	1489.80	1496.56	***
Mg	mg/kg	102.77	107.05	***
Urea in milk	mg/L	154.40	176.00	***
Protein efficiency	%	16.22	14.26	*
pH	/	6.62	6.60	**
Titration acidity	Dornic Degree	14.78	14.35	**
Isocitrate	mmol/L	0.15	0.17	***

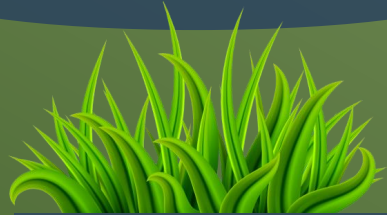
# Workflow - PLSDA



Models	Final_Model
Cluster	GRASS vs NoGRASS
Sampling	upsampling
Accuracy	0.92
Kappa	0.79
Sensitivity	0.95
Specificity	0.89

# Results

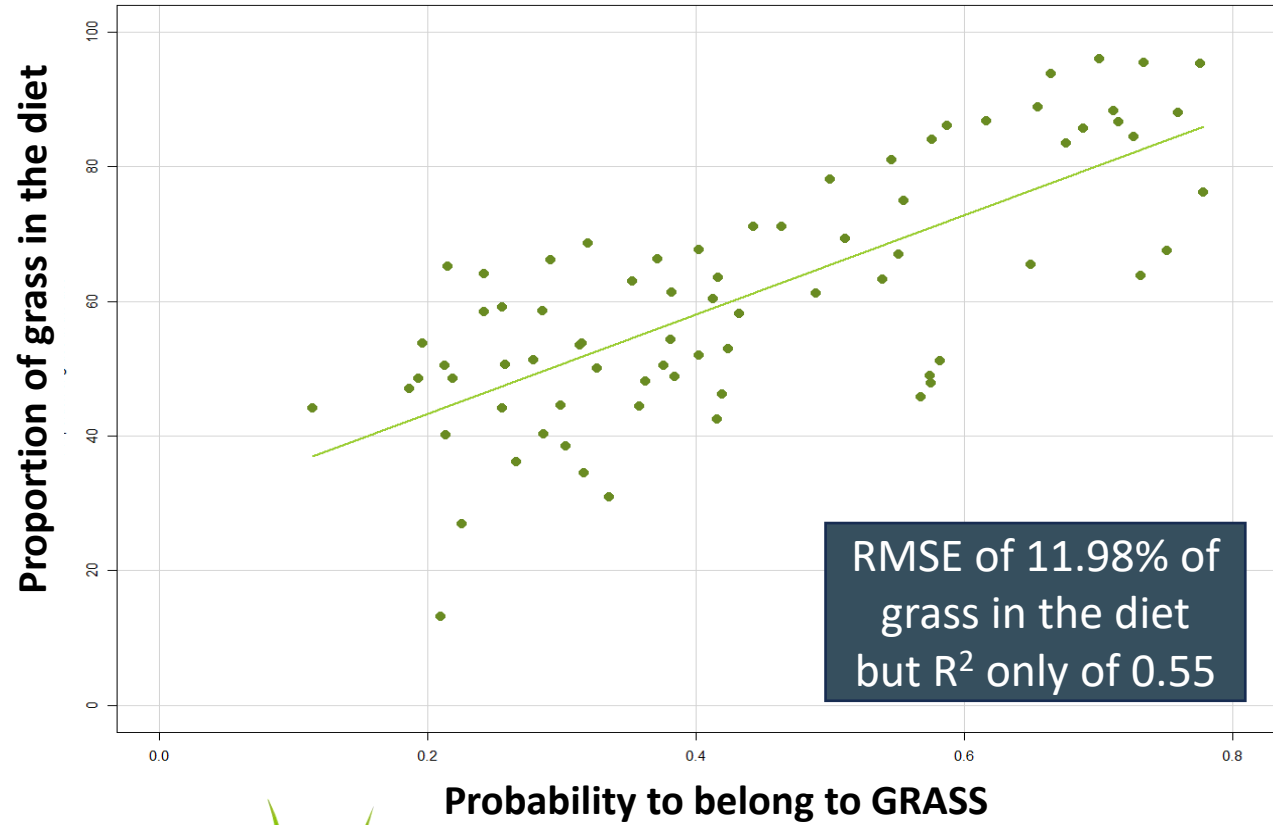
DB\_Pasture n=526



%GRASS



Prediction of the proportion of GRASS in the diet



PLSDA



OR



Probability to belong to GRASS cluster

# Conclusion

- Grass based diet can be assessed through milk analysis
- Equation could be used routinely on sample



## Thanks to our partners and colleagues on the projects

- WALLESmart, SPW, [grant number D65-1435]
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- SIMBA project, F.R.S-FNRS (Belgium), [T.0221.19]

Contact :

[killian.dichou@uliege.be](mailto:killian.dichou@uliege.be)