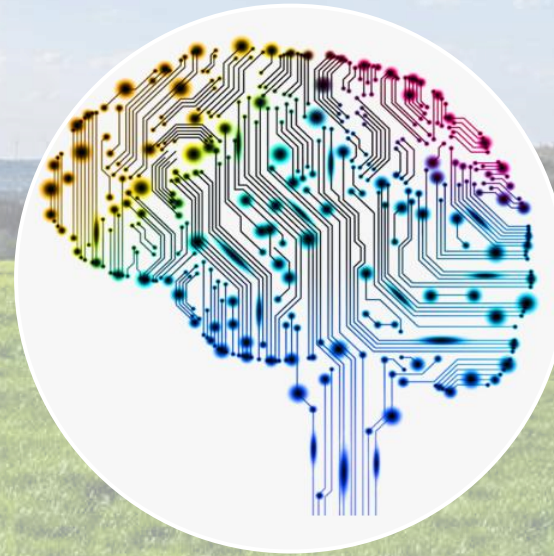


Robustness of derivative-based AI pipelines for inferring herbage consumption from milk FT-MIR indicator

K. Dichou, D. Veselko, A. Marvuglia, H. Soyeurt



Context



Grazing certification

Grazing calendars



Context

Bulk Tank Milk
FT-MIR spectral
predictions

Availability

Automatic

Low-cost

Context

Bulk Tank Milk
FT-MIR spectral
predictions

Grazing indicator

Context

Bulk Tank Milk
FT-MIR spectral
predictions

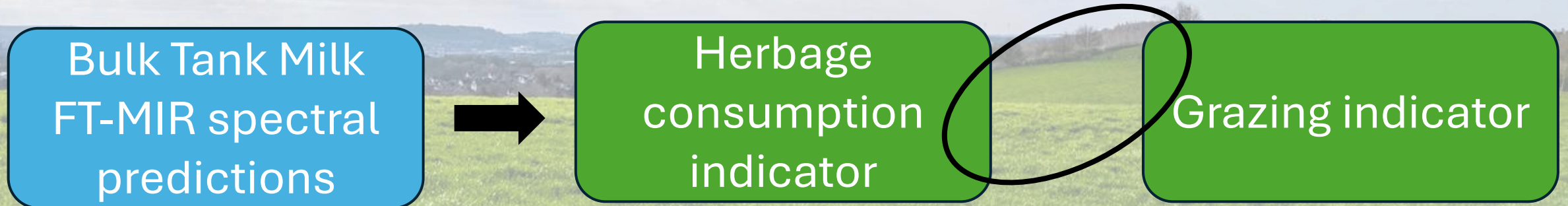


Herbage
consumption
indicator

Grazing indicator

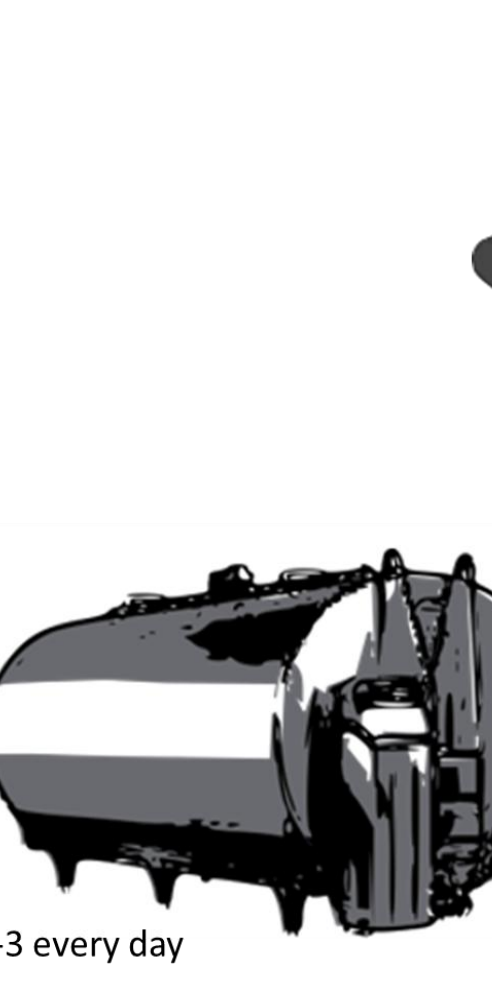
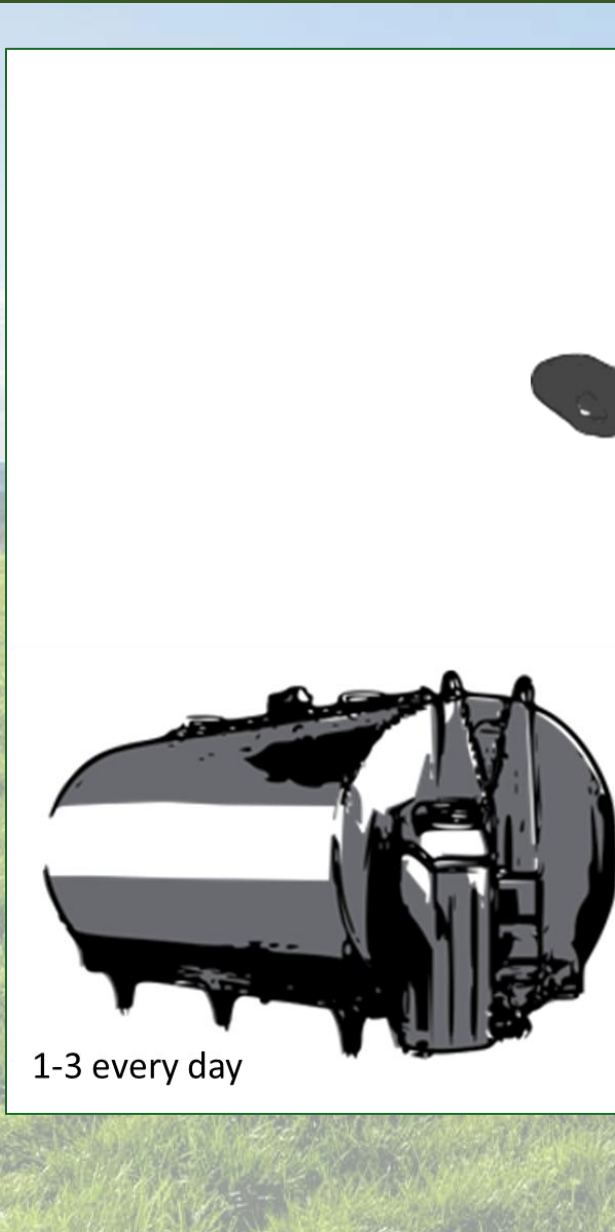


Context



The diagram illustrates the integration of different data sources for milk quality monitoring. It features several key elements:

- Milk Carton:** A carton labeled "MILK" with a magnifying glass over it, representing quality inspection.
- Cow:** A cow with a milk bucket, labeled "1-3 every day", representing daily milk production data.
- Milk Sample:** A bottle labeled "Milk sample ~1 / month", representing periodic sampling for analysis.
- Milk Analysis:** A machine labeled "Milk analysis" that processes the sample.
- Mid infrared spectrum data:** A plot showing "Absorbance" vs "Wavenumber (cm⁻¹)", representing spectral data used for quality assessment.



1-3 every day



Milk
~1

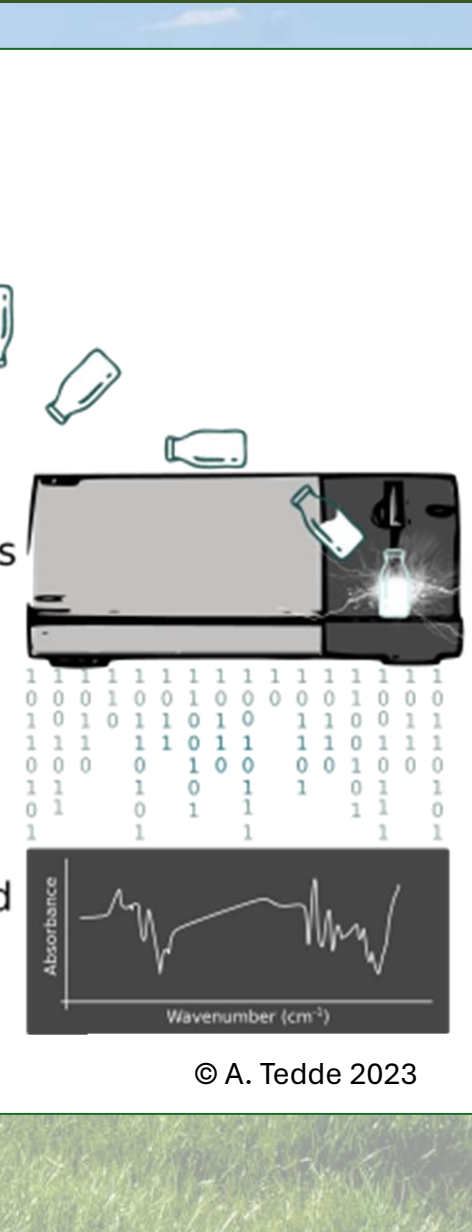


A black and white illustration of a cow standing in a field. A small milk bottle is attached to its side, and a bucket is hanging from its rear. The cow is facing forward, and the background shows a simple horizon line.



Milk sample
L / month

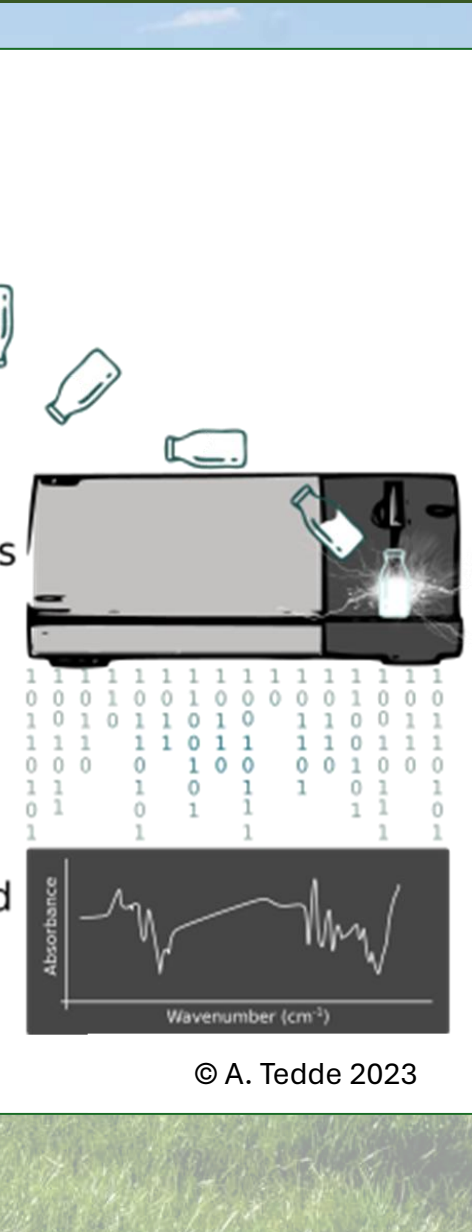
Milk analysis



Milk sample
L / month

Milk analysis

Mid infrared
spectrum
data



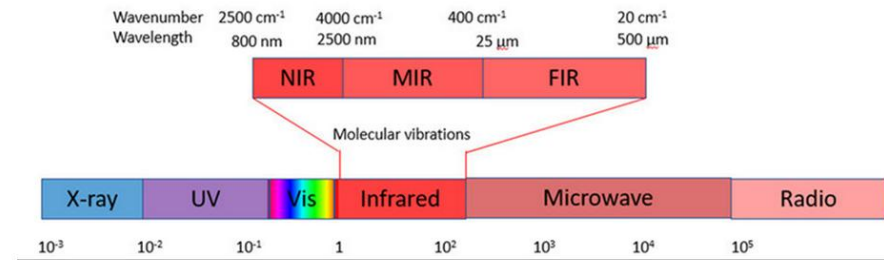
Bulk milk analysis



Milk analysis

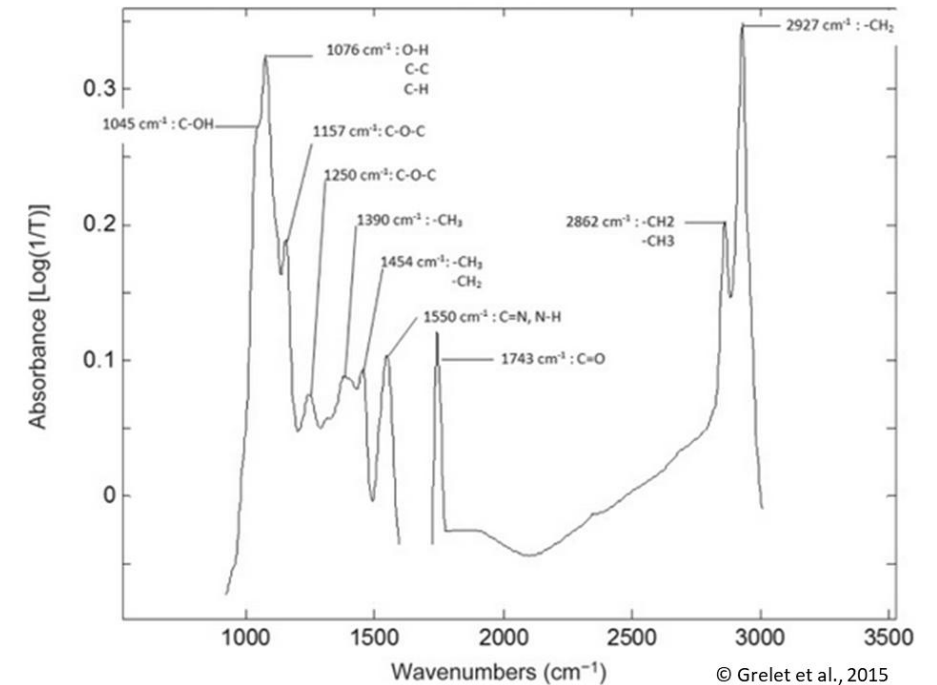


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© Foss

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



Herbage indicator



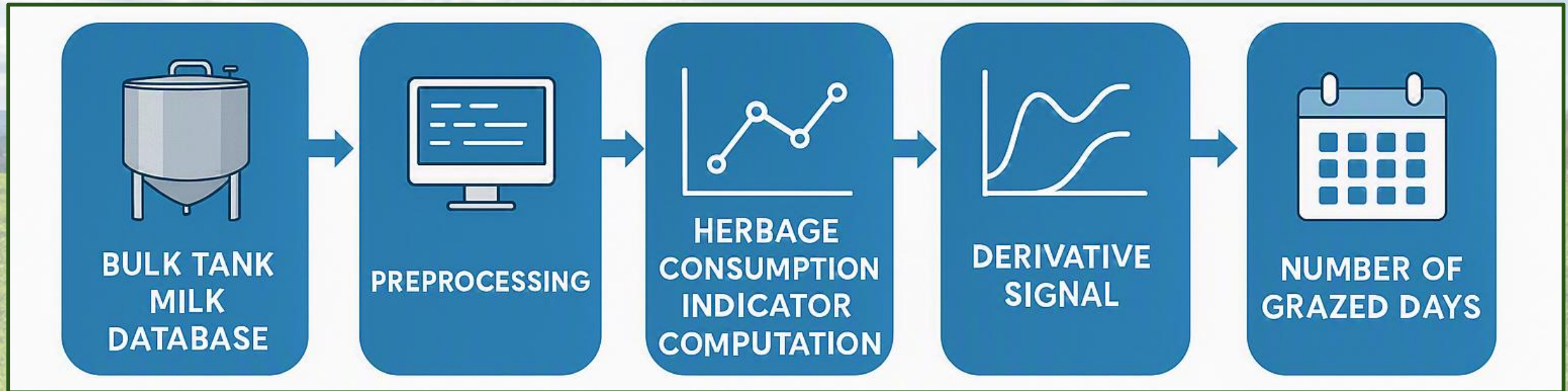
Modeling feed herbage proportion and modeling of the likelihood of feeding strategies focused on grazing and herbage consumption using milk Fourier-transform mid-infrared spectral analysis

Killian Dichou ¹, Charles Nickmilder ², Gérard Conter ³, Romain Reding ⁴, Antonino Marvuglia ⁵,
Hélène Soyeurt ²

Affiliations + expand

PMID: 40912556 DOI: [10.3168/jds.2025-26794](https://doi.org/10.3168/jds.2025-26794) 

Workflow



(Illustration generated with Microsoft Copilot)

Dataset



20 330 bulk tank milk
analyses

Data availability :
every 1 – 3 days

2181 farms

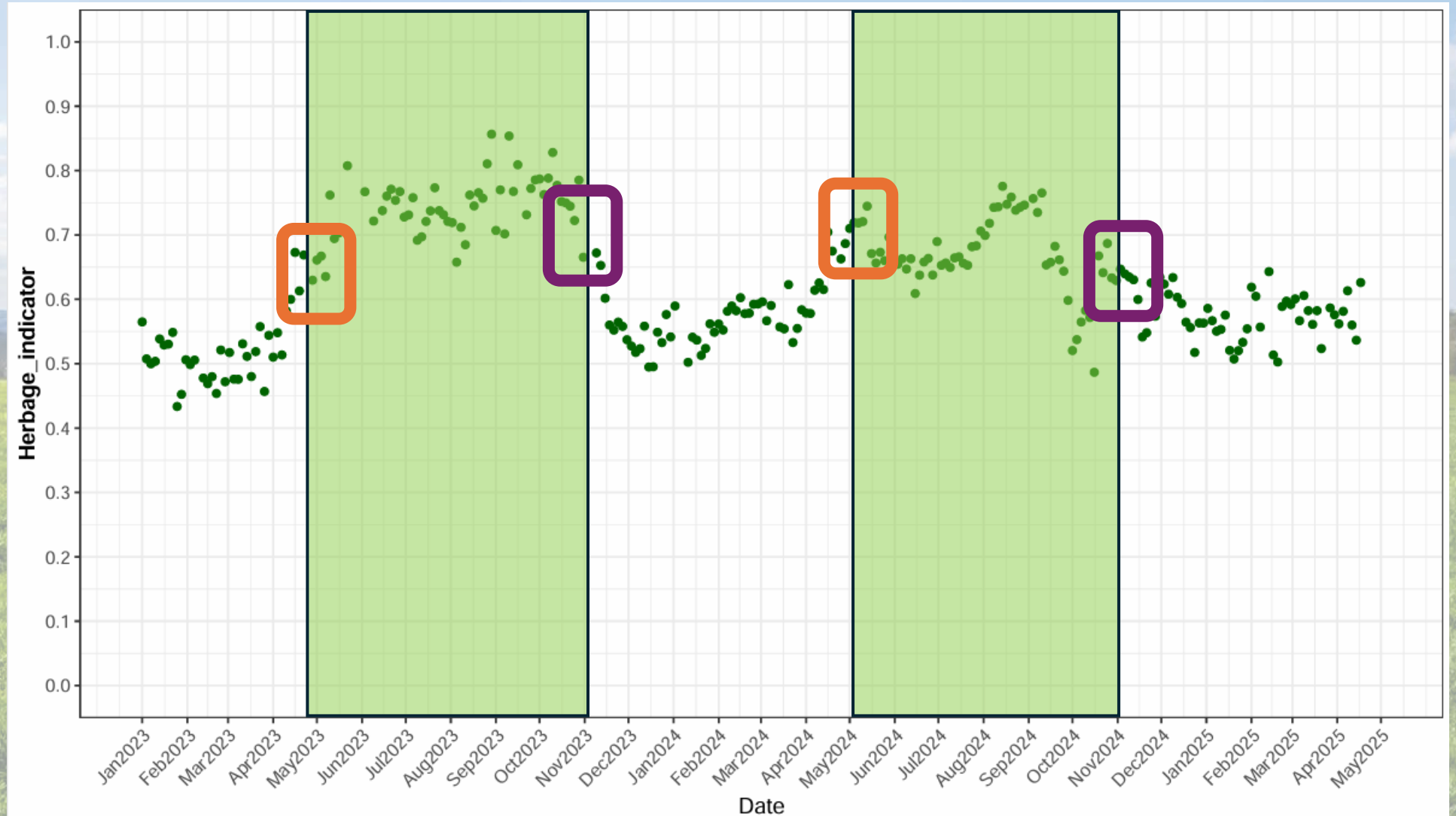
2023-2024

The data – Herbage consumption indicator

Pasture

Start

Stop



Effect of the parameters (2024)

Mean expectation : 210 days (april-october)

Observations to smooth	Observations to compute derivative	Days on pasture (mean $\pm$ SD)	Number of detected periods (mean $\pm$ SD)
4	4	193.48 $\pm$ 45.82	3.86 $\pm$ 1.67
7	4	196.18 $\pm$ 44.77	4.00 $\pm$ 1.64
10	4	196.27 $\pm$ 44.66	4.00 $\pm$ 1.64
4	7	206.47 $\pm$ 43.43	4.26 $\pm$ 1.66
7	7	210.71 $\pm$ 42.54	4.42 $\pm$ 1.62
10	7	210.88 $\pm$ 42.31	4.43 $\pm$ 1.62
4	10	216.37 $\pm$ 41.32	4.44 $\pm$ 1.41
7	10	222.19 $\pm$ 39.52	4.64 $\pm$ 1.38
10	10	222.29 $\pm$ 39.57	4.64 $\pm$ 1.38

Conclusion

- interpretable baseline for detecting transition regimes
- consistent range of value



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

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