

La spectroscopie proche infrarouge au CRA-W

(non exhaustif ...)

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Walloon Agricultural Research Centre
Gembloux, Belgium





**Quality and
Authentication of
Products Unit
(Unit QAP)**

**Walloon Agricultural
Research Centre**

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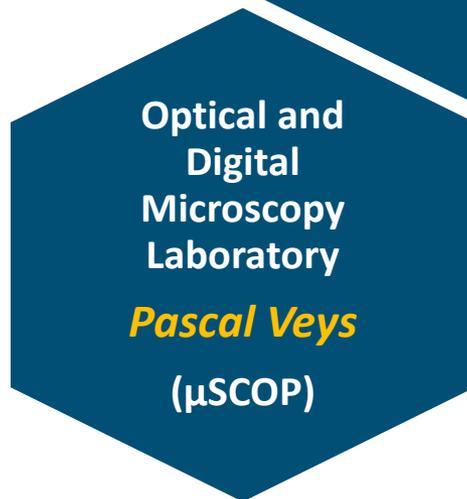
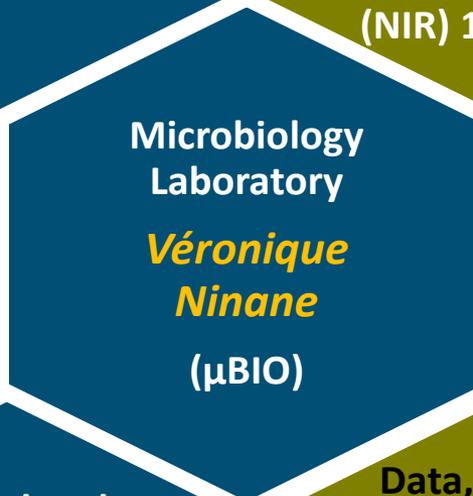
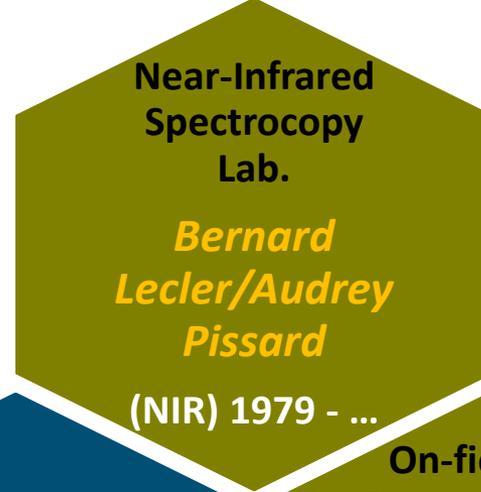
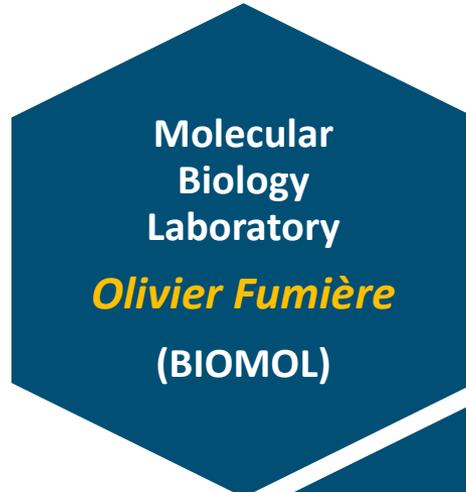
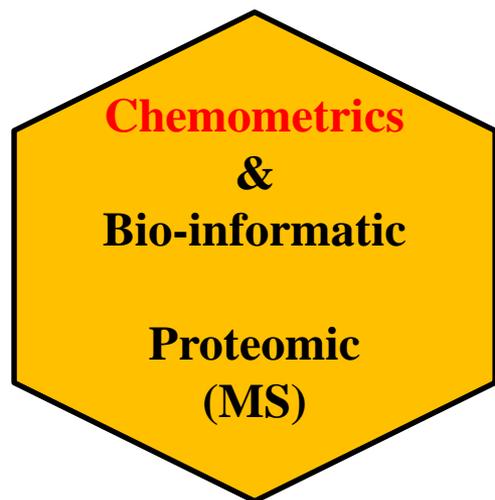
***« An active and innovative
Unit involved in the
development of sustainable
methods to reinforce and
assess the quality and
authentication of
agricultural and agro-food
products »***

2020 - ...



QAP Unit

30 staff members committed to develop and to validate, analytical methods and tools



1979-80

1997

2001

2007

2008

2021

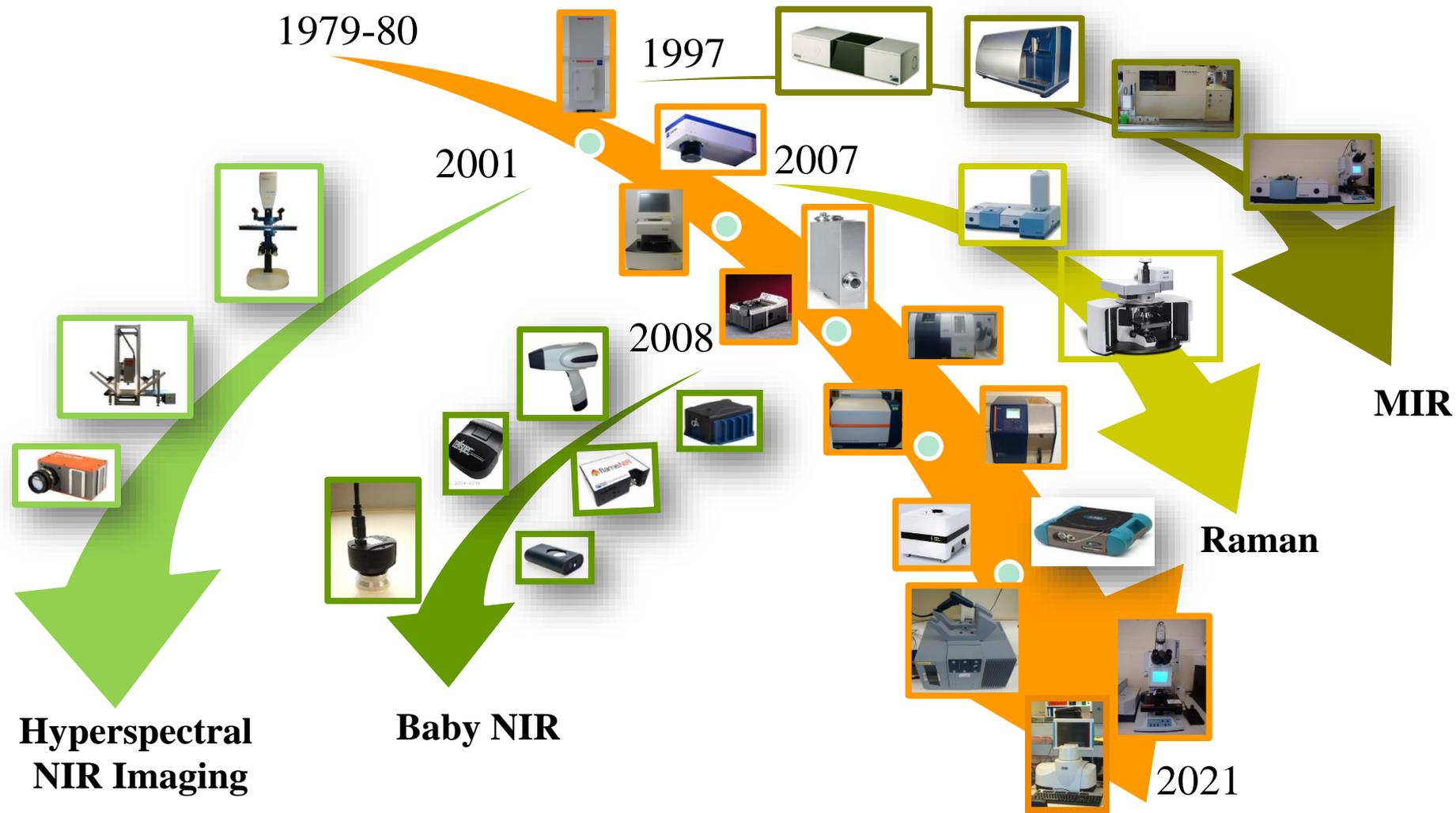
MIR

Raman

Hyperspectral
NIR Imaging

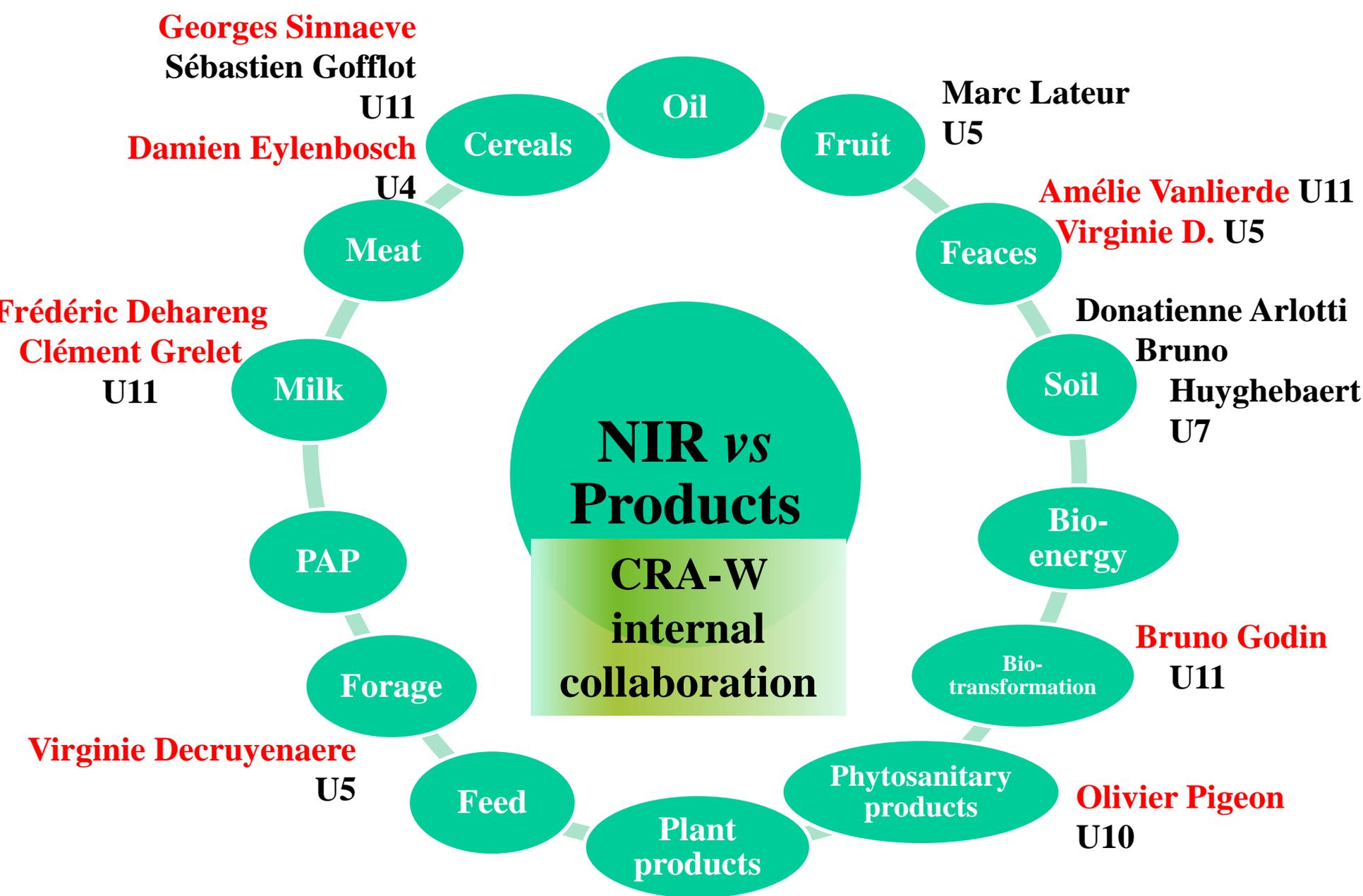
Baby NIR

NIR benchtop, on-line,
microscope



Quality and authentication of products Unit





4 MAIN RESEARCH FIELDS

PRECISION
AGRICULTURE

PRECISION
LIVESTOCK
FARMING

RISK
MANAGEMENT

UNDERSTANDING
PRODUCTS

**Analysis in the
fields and orchards**

PHENWHEAT
Cereal phenotyping

BEETPHEN
*Sugar beet
phenotyping*

FIRST
Potato phenotyping

INVITE
*Evaluation of
varieties in Europe*

**Analysis in the farm
and in the industry**

EFFORT
Lab Farm

INDIGGES
GHG

ECOAFRICA
IAEA-Feces
*Efficiency of tropical
forages*

**Analysis in the
laboratory**

EURL-AP *
*European Laboratory
for Animal protein*

FARMYNG
Insect meal

ANTAGONIST
*Microbiology
identification*

WBI-MOST
*Contaminants
And Impurities*

**Analysis in the
Laboratory**

LNR-OGM
LNR-Feed Additives

**IAEA-Handheld
Baby-NIR**

BELCOBRA
Cocoa and Chocolate

DSM
NIR expertise

REQUASUD
NIR network

CADDY-NIR
Food

FERTIWALIM
Bovine Fertility

TERA4ALL - Thz

POLBEES - Bee

INnovations in plant Variety Testing in Europe

<https://www.h2020-invite.eu/>

2019-2024



Research of rapid methods
to select new apple cultivars
presenting high nutritional quality



2 **Develop new phenotyping and genotyping tools** to assess bioindicators related to better adaptation to more sustainable crop management practices and variable climatic conditions; as well as to enhance the speed, accuracy and efficiency of variety testing. (WP2 & WP3)



XDS (FOSS NIRSystems, Inc.)



From laboratory to orchards

From laboratory to field



PhenWheat : A field phenotyping platform for wheat trials

UMONS

LIÈGE université
Gembloux
Agro-Bio Tech



Transition of dairy farming toward a better efficient use of fodder resources



Sampling of corn silage

Sampling of haylage bale



Corn silage (April 12 2018), red points on silo front represent sampling points.

Haylage bale, red points represent sampling points.

The CRAWLSPEC initiative

Bases de données spectrales

- Développement d'une base de données (Protospec) avec 47,393 spectres NIR importés
- Facilité de recherche de spectres/appareil/produit/DQ(série d'échantillon)

The screenshot displays the ProtoSpec web interface. At the top, there are navigation tabs for 'Products', 'Projects', 'Clients', and 'DQ', with 'ProtoSpec' in the top right corner. Below the navigation is a search section titled 'Search by projects'. It features a dropdown menu labeled 'Effort' and a text input field 'All year(s) selected'. A red box highlights the 'Effort' dropdown, and an arrow points to a larger red box containing the text 'Recherche de spectres IR par projet'. Below this is a green search area with two input fields: 'FieldSpec4_CP' and '94.06 - Maize silage wh'. A red box highlights these fields, and an arrow points to another larger red box containing the text 'Recherche de spectres IR par appareil et par produit'. A 'SEARCH' button is located between the two input fields. Below the search area is a 'Results' section. It features a table with a green header 'FieldSpec4_CP'. The table has columns for 'N°', 'Level 2', 'Level 1', 'Constituent(s)', 'Number of spectra', and 'Download'. The first row of data shows '1' in the 'N°' column, 'Fresh silages' in 'Level 2', 'Maize silage wh' in 'Level 1', 'Const' in 'Constituent(s)', and '5700' in 'Number of spectra'. There are 'JDX' and 'CSV' buttons under the 'Download' column.

FieldSpec4_CP					
N°	Level 2	Level 1	Constituent(s)	Number of spectra	Download
1	Fresh silages	Maize silage wh	Const	5700	JDX CSV

The CRAWLSPEC initiative :

Spectra Data Base System Project

Historical Data set	#inserted
FEED	84 413
FORAGE	54 572
BRUKER	84 410
Total	223 395

Projets	#inserted
DSM	114 628
Effort	36 071
CaddyNir	4 457
U05Obtention	7 992
Total	163 148

GRAND TOTAL : 386 543

Status 2020

Field-deployable Analytical Methods to Assess the Authenticity, Safety and Quality of Food

TOPICS ▾ SERVICES ▾ RESOURCES ▾ NEWS & EVENTS ▾ ABOUT US ▾

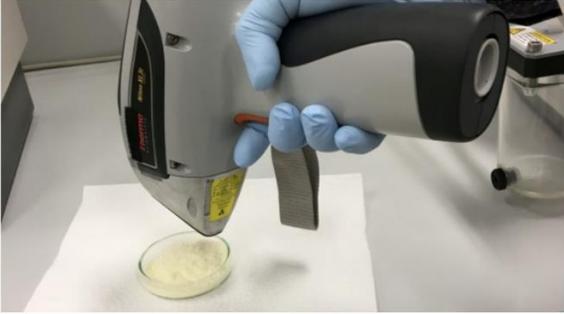
Search

Home / Press / Press releases / New IAEA Project Looks at Portable Detection Equipment to Help Prevent Food Fraud

New IAEA Project Looks at Portable Detection Equipment to Help Prevent Food Fraud

2017/21
Vienna, Austria

JUN
9
2017



Related resources

- Food Safety and Quality
- Food and Environmental Protection Laboratory
- Nuclear Instrumentation
- Coordinated Research Activities

A new IAEA project looks to enable countries to quickly detect fraud and contamination in milk and vegetable oils with the help of low-cost, portable tools, such as this X-ray fluorescence detector.
(Photo: IAEA)



Collaboration avec l'Agence Internationale de l'Energie Atomique

Web-based tools for managing spectral data-bases

IAEA | Upload Tool



International Atomic Energy Agency

Login

Email address

Enter your password

Show password

Login

Forgot your password ?

Welcome to the
IAEA Shared Analytical Data Library
Upload Tool



IAEA
International Atomic Energy Agency

Protocols



Analytical procedure using MicroNIR



Procedure for scanning the milk powder samples

using a Viavi MicroNIR.

Table of contents

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Preparation before sample analysis	3
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Export the spectral data	6
Share the spectral data files	8

Introduction

The aim of this document is to propose a procedure for scanning the milk powder samples using a Viavi MicroNIR. You will find :

- Requirements for the use of the instrument ;
- Explanations on the device preparation before sample analysis ;
- Instructions for the analysis itself ;
- Recommendations for exporting spectral data from the device ;
- Guidelines for uploading spectral data using « IAEA Shared Analytical Data Library Upload Tool » web interface.

Take the time to go through the entire document before starting the analyses.

For help and support, please contact

Olivier Minet at o.minet@cra.wallonie.be or Philippe Vermeulen at p.vermeulen@cra.wallonie.be

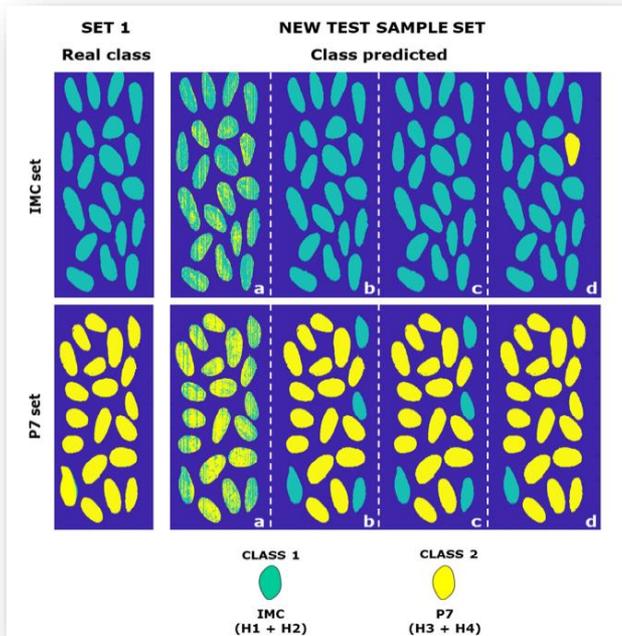
Training boxes





Cruz-Tirado, J.P. , Fernandez Pierna, J.A. , Rogez, H. , Fernandes Barbin, D. & Baeten, V. (2020). **Authentication of cocoa (*Theobroma cacao*) bean hybrids by NIR-hyperspectral imaging and chemometrics**. Elsevier : Food Control, 118 : 107445: 1-13.

To benefit from HSI advantages for high throughput analysis : to go to batch segmentation



Need of traceability and authentication tools

BelCobra project : WBI/CAPES

Chemometrics– what's new?

Rapid & specific regression methods

Local Calibration by Percentile Selection (LCPS)
Local Calibration by Customized Radii Selection (LCCRS)

Local PLS based on global PLS scores



Analytica Chimica Acta
Volume 933, 24 August 2016, Pages 50–58



Regression models based on new local strategies for near infrared spectroscopic data

F. Allegrini^a, J.A. Fernández Pierna^b, W.D. Fragoso^c, A.C. Olivieri^a, V. Baeten^b, P. Dardenne^b

Received: 24 October 2018 | Revised: 19 December 2018 | Accepted: 16 January 2019
DOI: 10.1002/cem.3117

RESEARCH ARTICLE

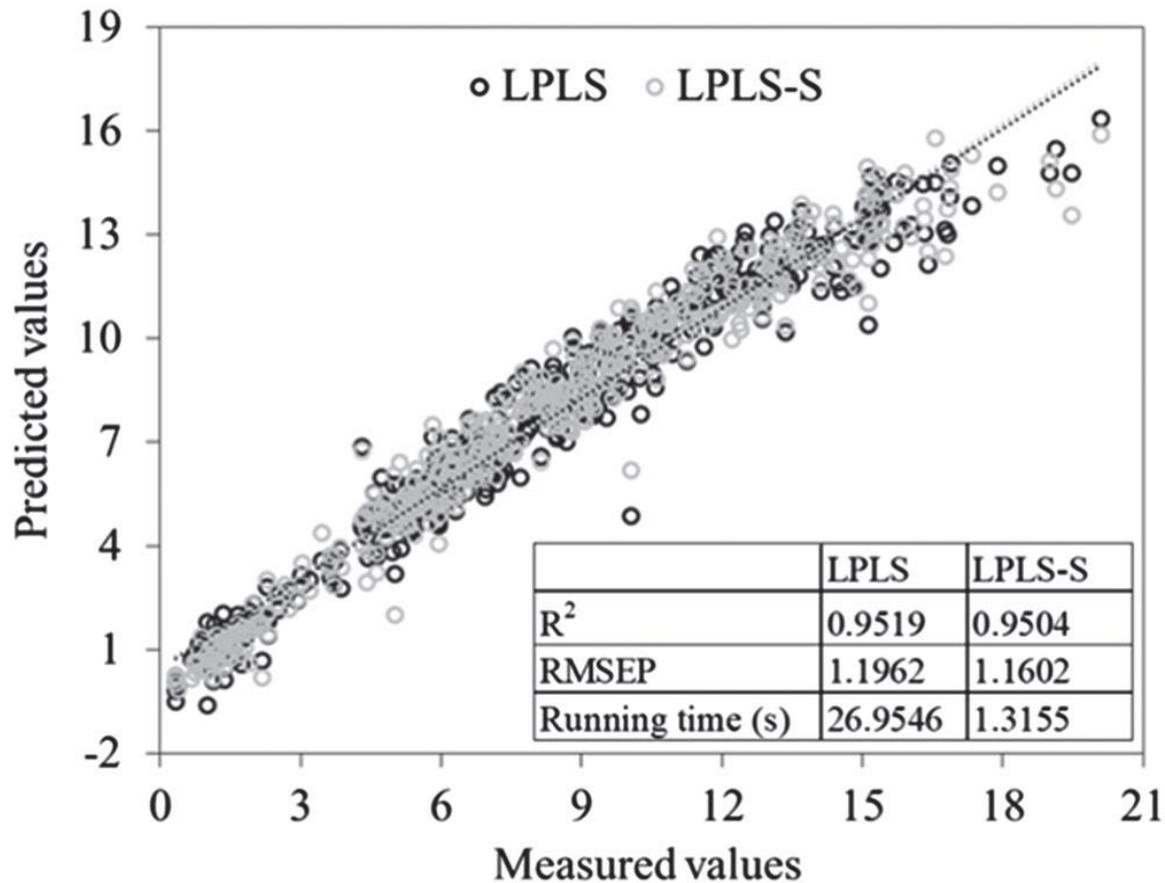
WILEY CHEMOMETRICS

Local partial least squares based on global PLS scores

Guanghai Shen^{1,2} | Matthieu Lesnoff^{3,4} | Vincent Baeten² | Pierre Dardenne² | Fabrice Davrieux^{5,6} | Hernan Ceballos⁷ | John Belalcazar⁷ | Dominique Dufour^{6,7,8,9} | Zengling Yang¹ | Lujia Han¹ | Juan Antonio Fernández Pierna²

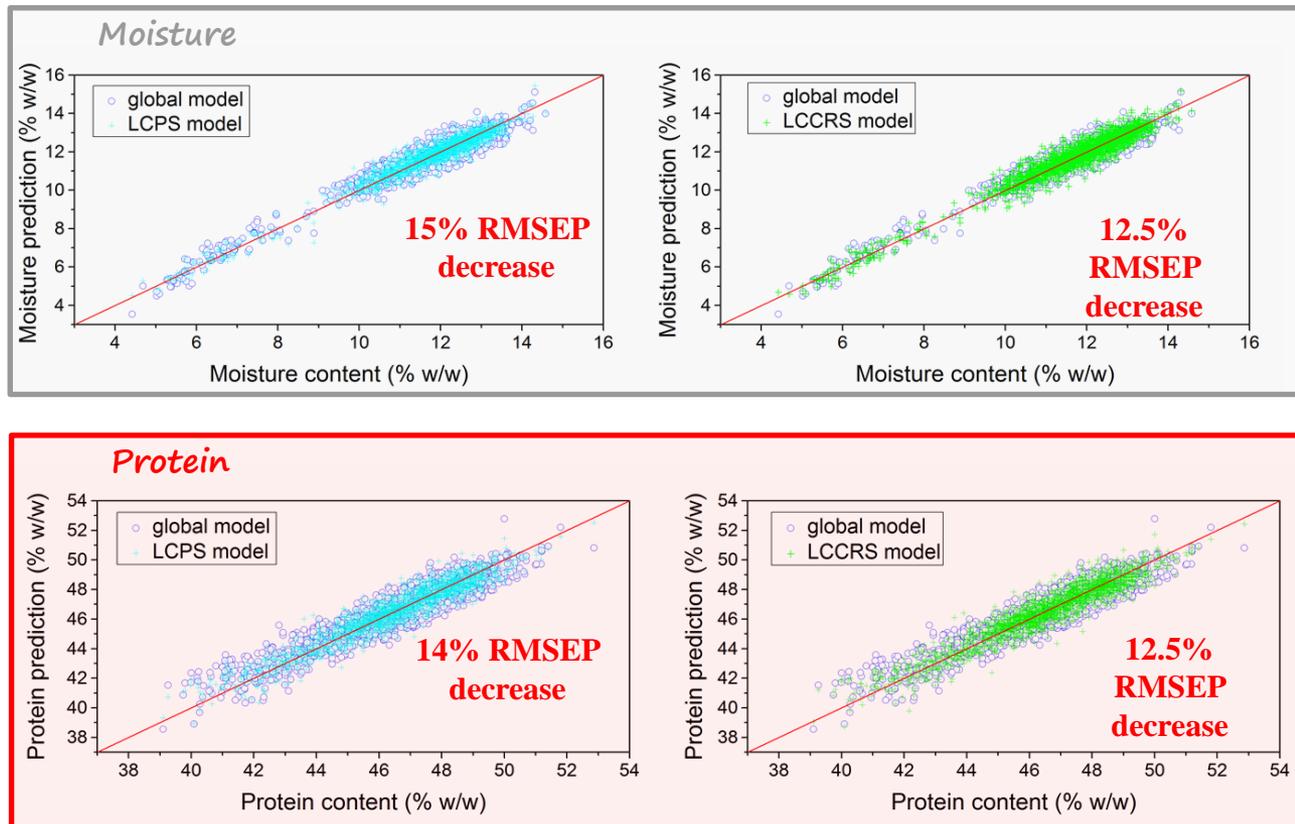
Chemometrics– what's new?

Local regression modelling

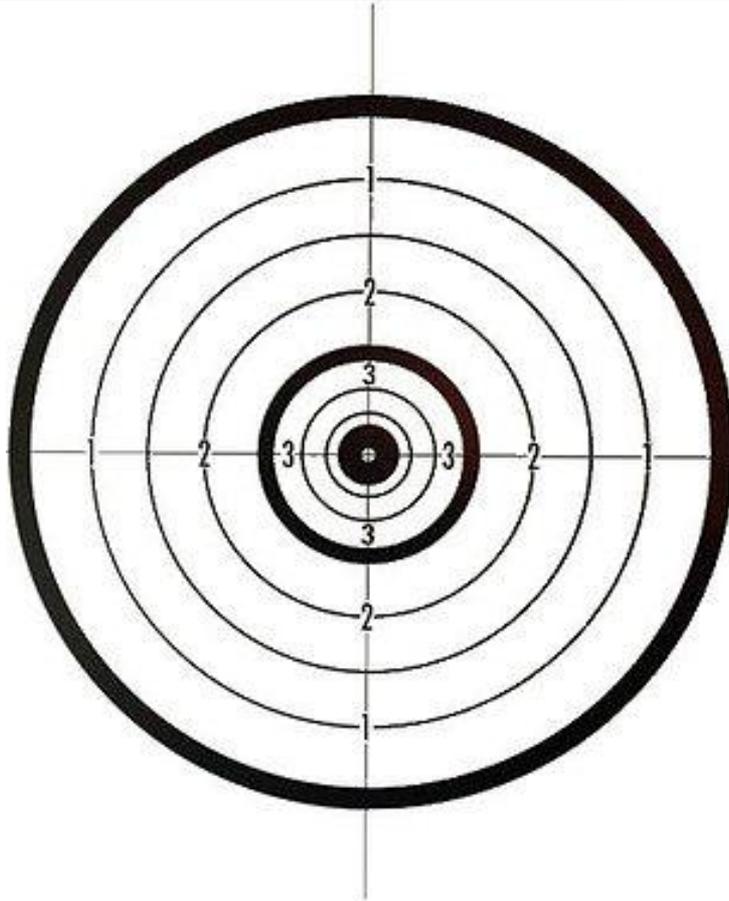


Chemometrics – what's new?

Local regression modelling



Target versus untarget



Targeted detection



Untargeted detection

Much more food fraud could be detected by using Near-infrared spectroscopy says researchers from the Department of Food Science at University of Copenhagen. Credit: Sørensen et al.

Source : Sørensen et al., The use of rapid spectroscopic screening methods to detect adulteration of food raw materials and ingredients, *Current Opinion in Food Science*. (2016). DOI: [10.1016/j.cofs.2016.08.001](https://doi.org/10.1016/j.cofs.2016.08.001)

UNTARGETED ANALYSIS

 Chemometrics and Intelligent Laboratory Systems
Volume 152, 15 March 2016, Pages 157–162

Use of a multivariate moving window PCA for the untargeted detection of contaminants in agro-food products, as exemplified by the detection of melamine levels in milk using vibrational spectroscopy ☆

J.A. Fernández Pierna, D. Vincke, V. Baeten, C. Grelet, F. Dehareng, P. Dardenne

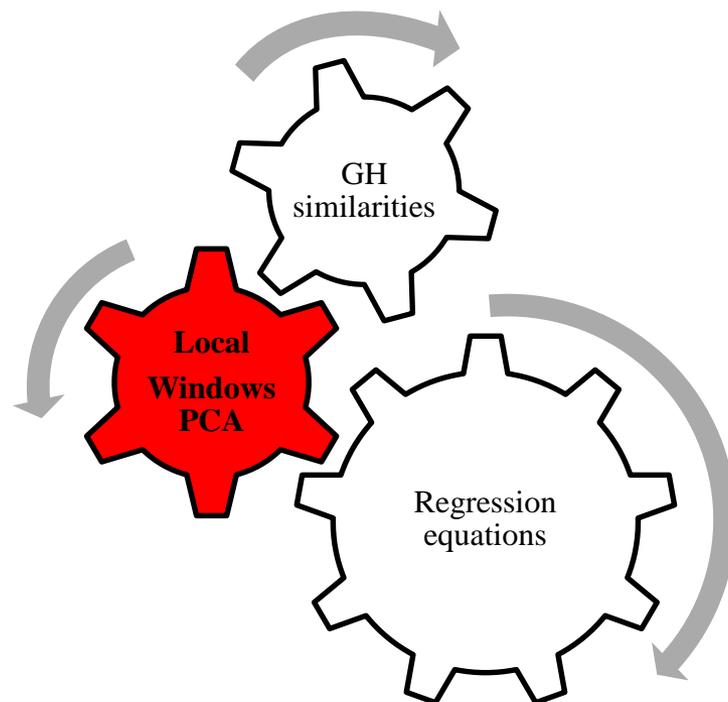
Local Window Principal Component Analysis (LWPCA)

 Food Control
Volume 119, January 2021, 107459

Chemometric non-targeted analysis for detection of soybean meal adulteration by near infrared spectroscopy

O.Ye Rodionova^a, J.A. Fernández Pierna^b, V. Baeten^b, A.L. Pomerantsev^a

One Class modelling



Food Chemistry 189 (2015) 2–12

Contents lists available at ScienceDirect

 Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem



NIR fingerprint screening for early control of non-conformity at feed mills

Juan Antonio Fernández Pierna^{a,*}, Ouissam Abbas^a, Bernard Lecler^a, Patrick Hogrel^b, Pierre Dardenne^a, Vincent Baeten^a

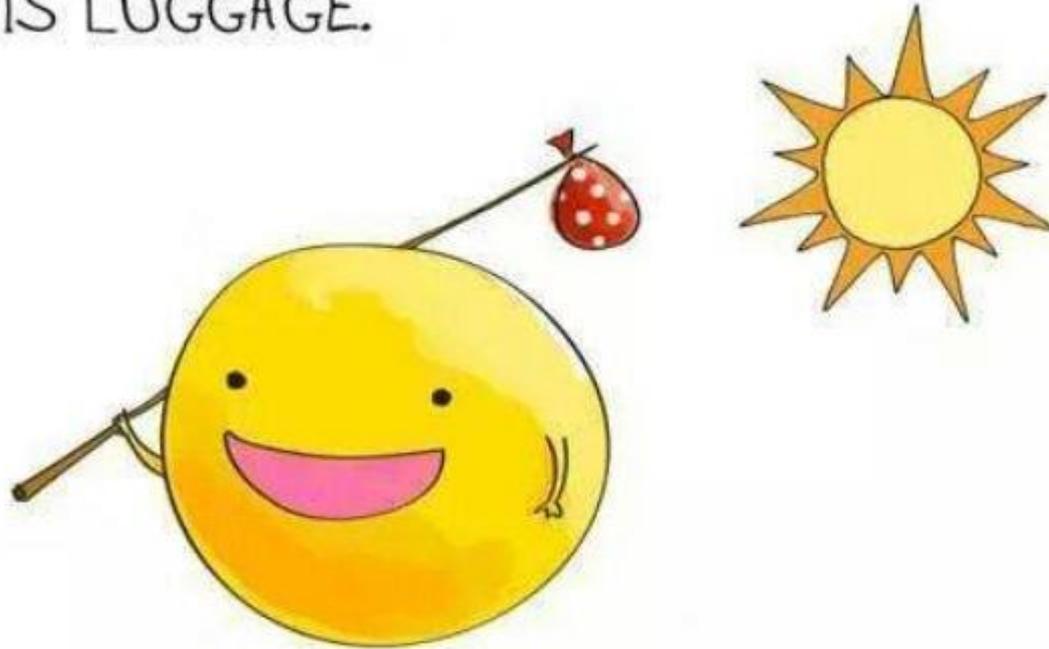
U12 staff involved in spectroscopy and chemometric : A team at your service

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Philippe Vermeulen
Damien Vincke
Abigaël Anselmo
Benoit Scaut
Maxime Joissains
Stéphane Brichard
Olivier Minet

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Lisa Plasman
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Nicaise Kayoka Mukendi
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Vincent Baeten

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Bruno Godin, Donatienne Arlotti, Clément Grelet, Damien
Eylenbosch, ..., Amélie Vanlierde, Marc Lateur, **Bernard Lecler &**
Pierre Dardenne

A PHOTON CHECKS INTO A HOTEL AND
IS ASKED IF HE NEEDS ANY HELP WITH
HIS LUGGAGE.



”NO, I’M TRAVELLING LIGHT.”

<https://www.pinterest.fr/pin/72128031508013467/>