OptiMIR: new tools for a more sustainable dairy sector

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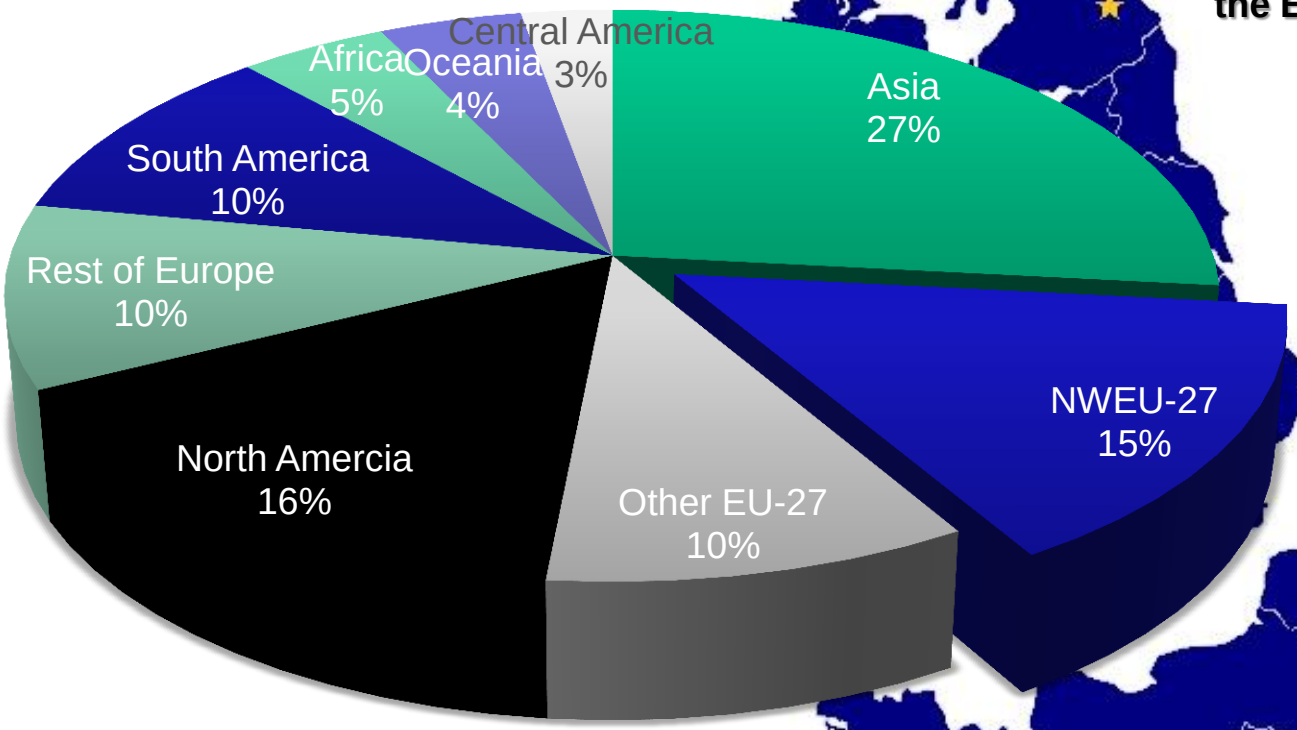
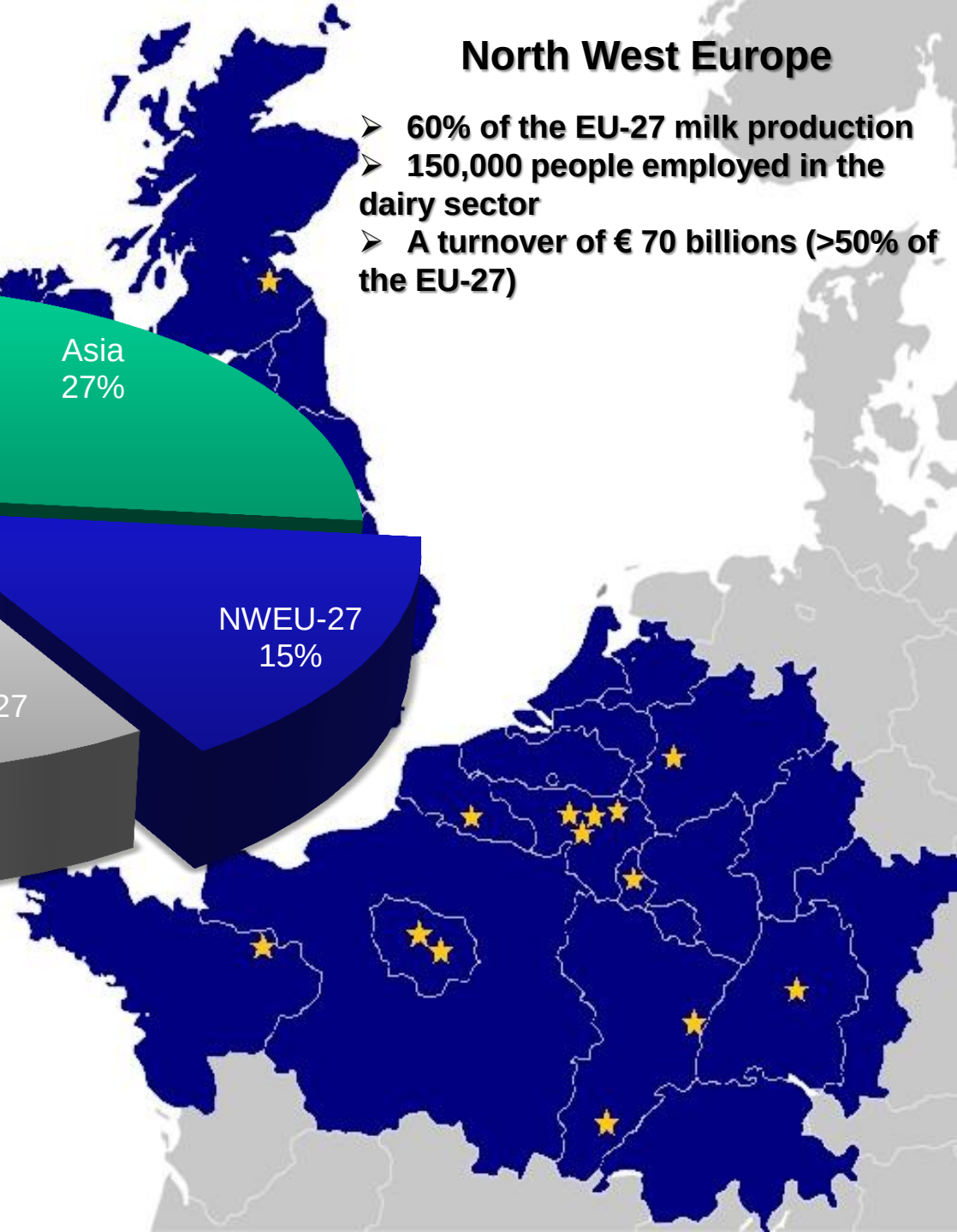
North West Europe

- 60% of the EU-27 milk production
- 150,000 people employed in the dairy sector
- A turnover of € 70 billions (>50% of the EU-27)





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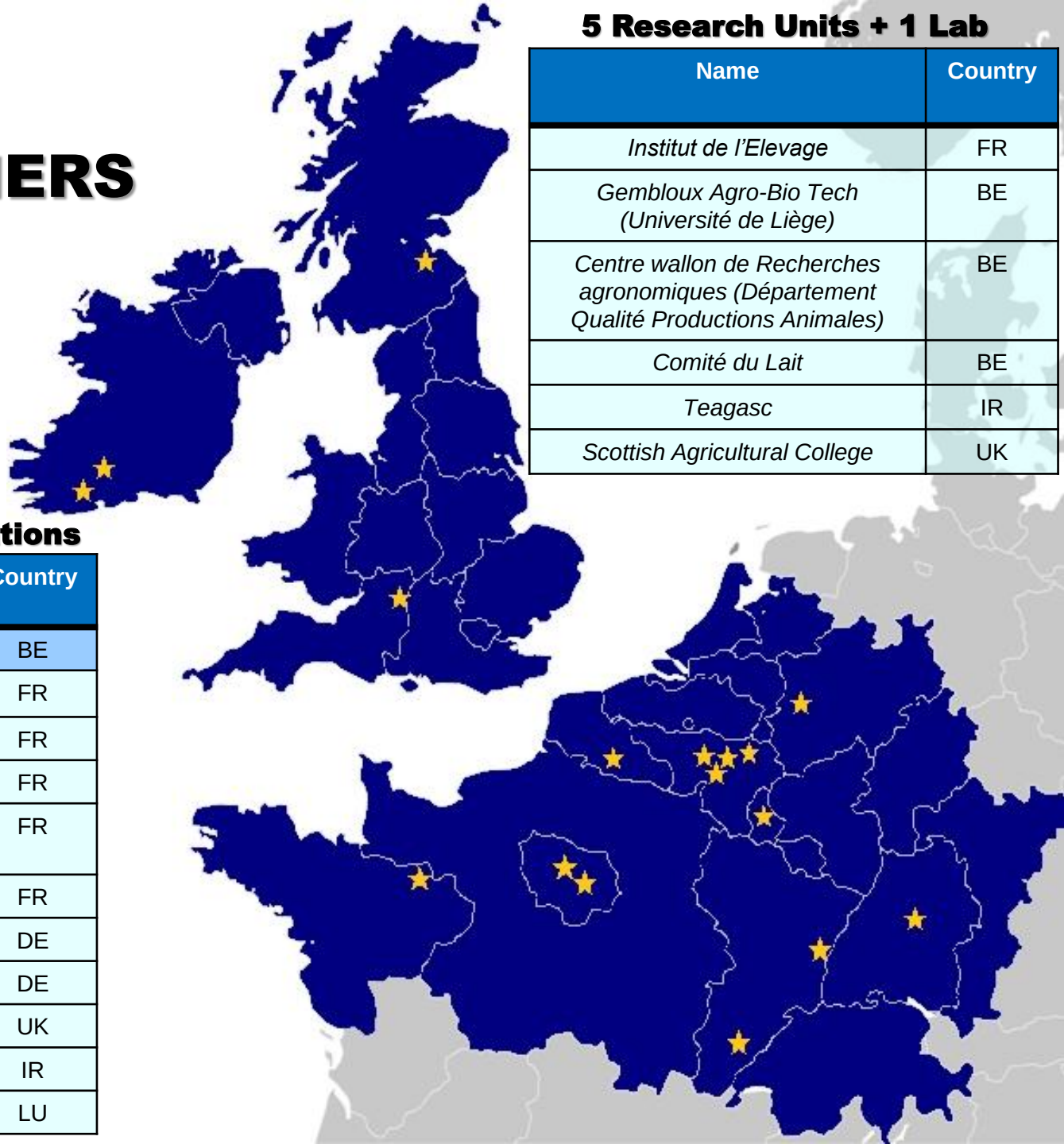
PARTNERS

5 Research Units + 1 Lab

Name	Country
Institut de l'Elevage	FR
Gembloux Agro-Bio Tech (Université de Liège)	BE
Centre wallon de Recherches agronomiques (Département Qualité Productions Animales)	BE
Comité du Lait	BE
Teagasc	IR
Scottish Agricultural College	UK



11 Milk Recording Organizations

Name	Country
Association Wallonne de l'Elevage	BE
Chambre régionale Agriculture Alsace	FR
ADECL62 (Pas-de-Calais)	FR
CLASEL (Sarthe & Mayenne)	FR
SCL du Doubs et du territoire de Belfort	FR
France Conseil Elevage	FR
LKV Baden-Württemberg	DE
LKV Nordrhein-Westfalen	DE
National Milk Recording	UK
Irish Cattle Breeding Federation	IR
CONVIS	LU

AIMS

To improve the profitability and sustainability of the dairy sector by providing milk producers with innovative standardized management tools based on association between MIR milk records and cows' status :

- To reduce the costs of production through improved daily herd management for example :
  - costs of feeding with energetic balance indicator
  - veterinary costs with early diagnosis of mastitis
  - costs of semen straws with insemination predictor

- To bring opportunities to access competitive markets by measuring quality traits linked to higher added value (e.g. low-cost measure of food label claims).

- To decrease the impact on the environment (quantification of methane and nitrogen production).

OBJECTIVE 1

To share experience, knowledge and existing expertise in milk sector

We need priority areas and the state of the art in each area

Fertility
Nutrition
Health
Ecology
Milk quality
…

→ **PRIORITY AREAS**

→ **STATE OF THE ART**

Work packages of the Project

WP 1 : Guidelines - Define priorities and state of the art in achieving profitability and the sustainability of the dairy sector

WP2 : Development - To develop operating prototype of tools relevant to priorities defined in WP1

WP 3 : Implementation, Validation & Roll-out : to provide stakeholders with a low-cost, users friendly and up-to-date access to validated web-tools through a private web-account

A 1 : Sector's Survey

A 2 : Experts' Group

OBJECTIVE 2

To pool the resources of milk recording organizations and research centres on the priority areas defined and on MIR milk spectra

Animal Identification and Movement

Herd management

Fertility recording

Milk recording

Health recording

Feeding data collection

…

+

Milk spectral MIR data

=

POOLED DATABASE

OptiMIR

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Breed List
- Breed list code
- Breed name

Breed
- Breed code
- Breed
- Percentage of breed X
- Breed X
- Percentage of breed Y
- Breed Y

BCS
- BCS code
- Animal ID
- Scoring date
- Score

Movement
- Movement code
- Animal ID
- New herd code
- Date of entry
- Date of removal
- Cause of removal code
- Old herd code

Cause of removal
- Cause of removal code
- Cause of removal

Owner
- Owner code
- Name
- Adress
- Zip code
- City
- Country code

Country
- Country code
- Country name

Reproductive event
- Reproductive event code
- Reproductive event

Animal
- Animal ID
- Herd code
- Sex
- Breed code
- Sire ID
- Dam ID
- Date of birth
- Name
- Cross reference ID
- Movement code

Herd
- Herd code
- Zip code
- City
- Owner code
- Milk recording protocol code
- Herd book member
- Height above sea level
- Management code

Reproduction
- Reproduction Code
- Animal ID
- Date of reproductive event
- Reproductive event code
- Bull ID
- Operator code

Health diagnosis
- Health diagnosis code
- Animal ID
- Health event code
- Intervening person code
- Date of health event

Milk recording protocol
- Milk recoording protocol code
- Adhesion starting date to milk recording protocol
- Milk recording protocol name
- Recording interval
- Milking per day

Operator
- Operator code
- Operator

Calving
- Calving code
- Reproduction code
- Animal ID
- Calve ID
- Lactation number
- Calving date
- Calving ease code
- Dry date

Rations
- Ration code
- animal ID
- Survey date
- Feed lot number
- Feed code
- Grass height at survey date
- Feed amount
- Grazing time

Health event
- Health event code
- Health ev

Intervening person
- Intervening person code
- Intervening person

Feeding system
- Feeding system code
- ummer feeding system
- /inter feeding system
- ccross the year silage feeding
- dditional purchase of forage
- Total forage land (ha)
- Grassland proportion
- Fodder proportion(%)

Management
- Management code
- Housing system code
- Reproduction system code
- Feeding system code
- Milking system code

Milking system
- Milking code
- Milking system

Feed analysis
- Feed code
- Feed name
- Feed type
- Grazing stage

Housing system
- Housing code
- Housing system
- Indoor housing
- Type of bedding/standing

Reproduction system
- Reproduction system code
- Natural mating

Routine MIR samples spectrum
- MIR sample spectrum code
- Milk recording code
- Calving code
- Date of analysis
- Conductance index
- Conductance value
- Milk laboratory analyser brand
- Milk laboratory analyser code

Milk recording
- Milk recording code
- Calving code
- Test date
- Sampling moment
- Sampling operator code
- Milk yield at 24-h
- Fat rate at 24-h
- Protein rate at 24-h
- Urea at 24-h
- Lactose at 24-h
- Somatic cell scores at 24-h
- Cause affecting milk production on test-day code
- Method used to estimate 24-h code
- Date or milk analysis sample
- MIR spectrum code

Method used to estimate 24-h
- Method used to estimate 24-h code
- Method used

Conductance index
Conductance value
Milk laboratory analyser brand
Milk laboratory analyser code

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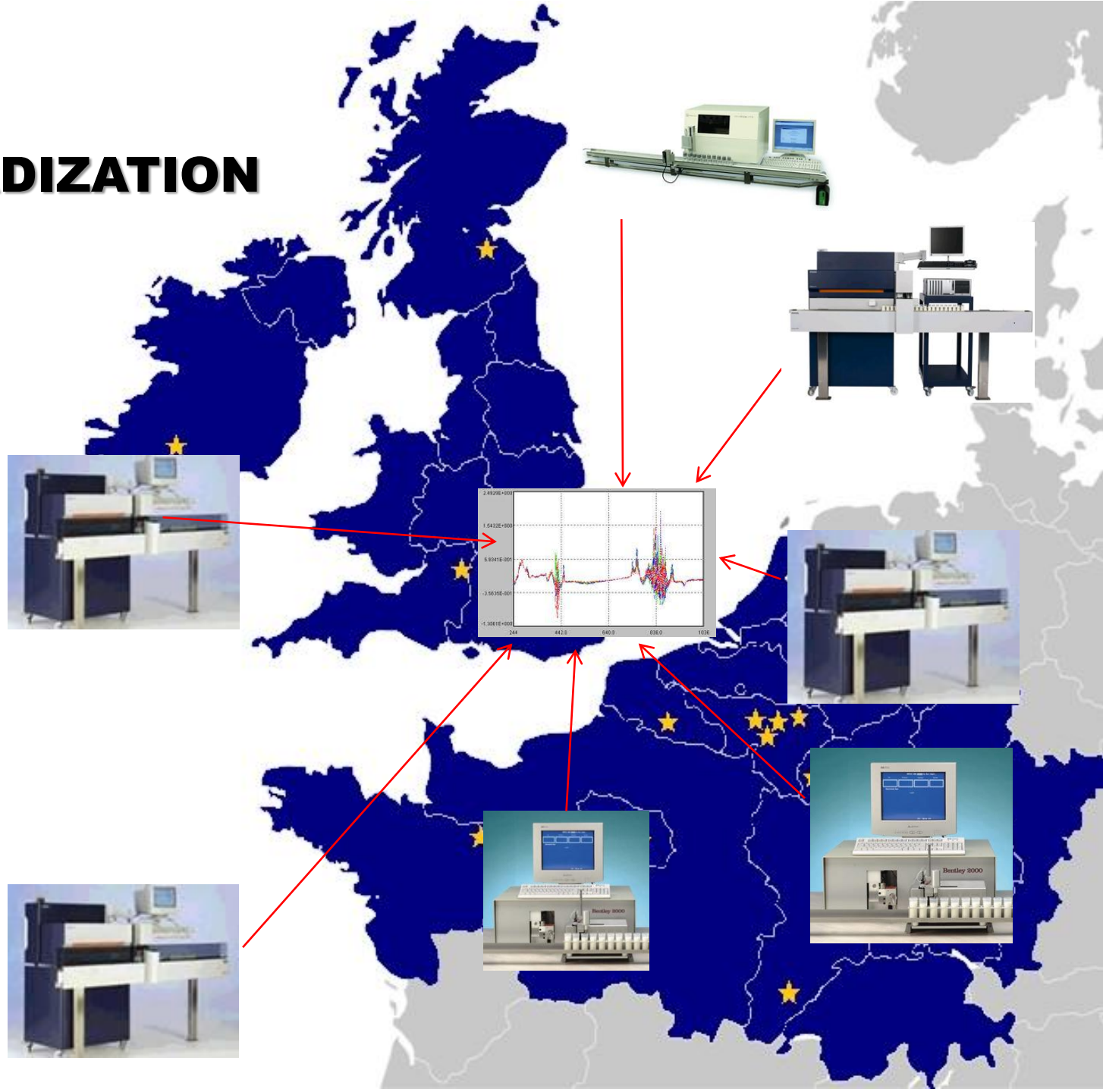
STANDARDIZATION



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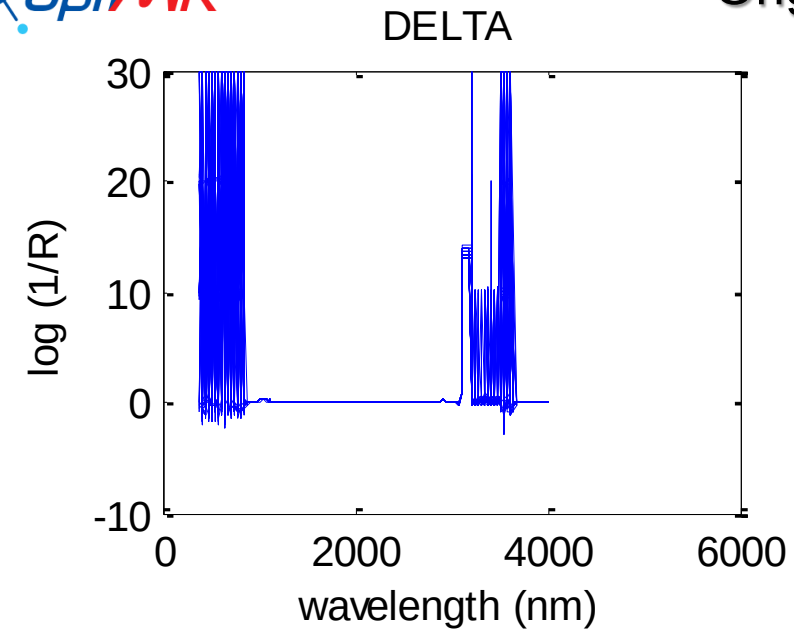
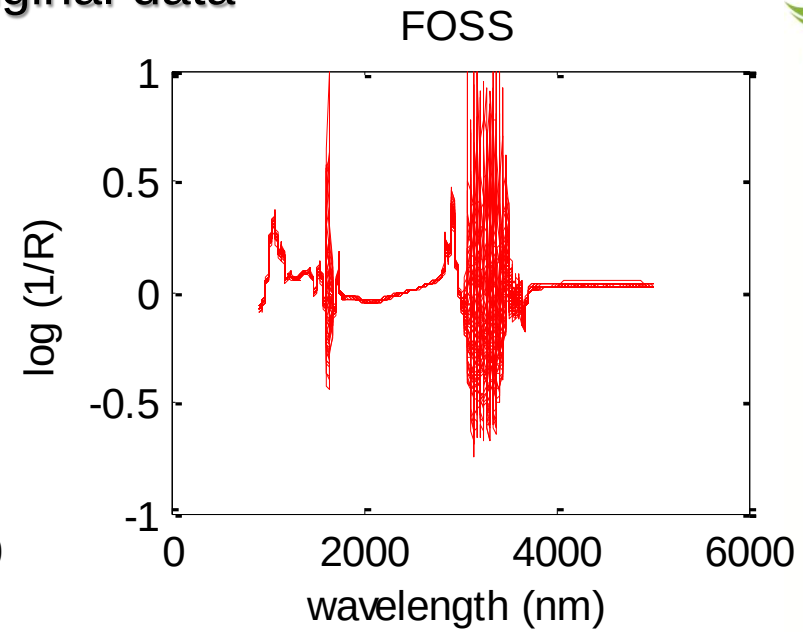
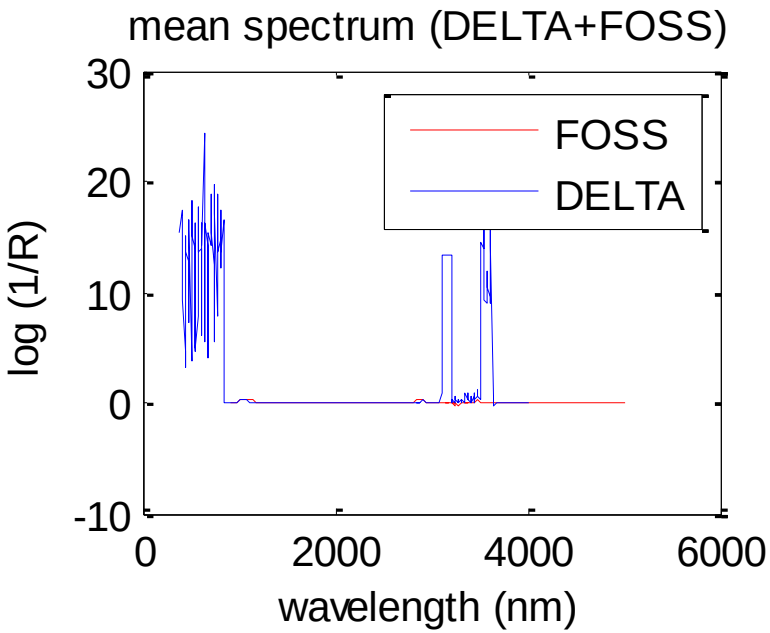
Example of 70 samples measured with 2 different instruments (Delta & Foss)

Original data

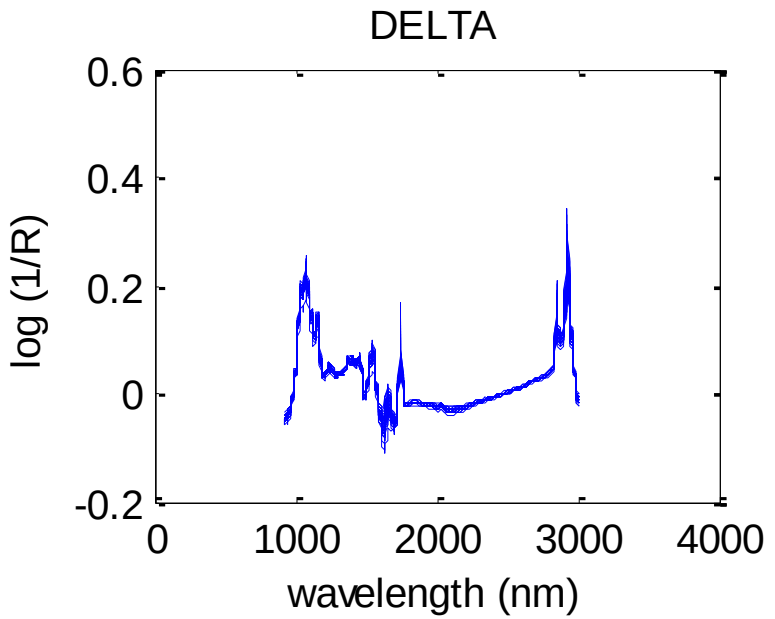


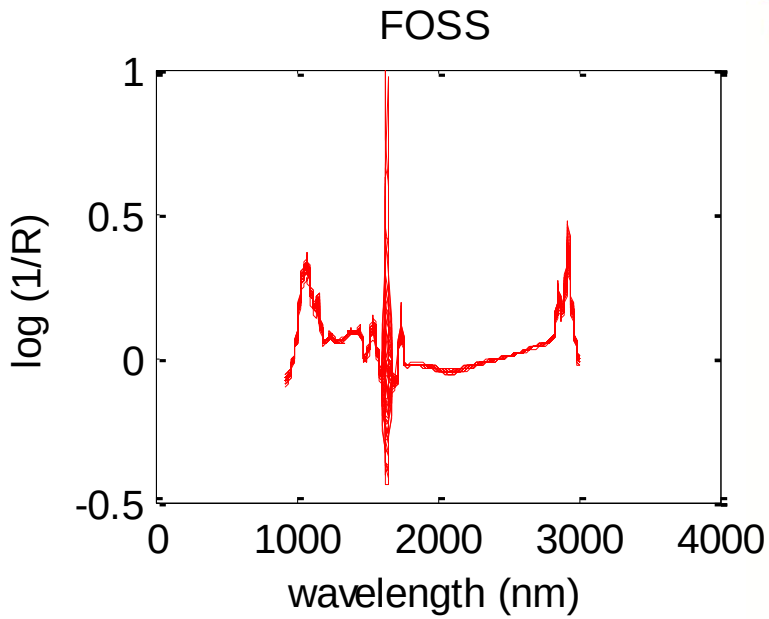


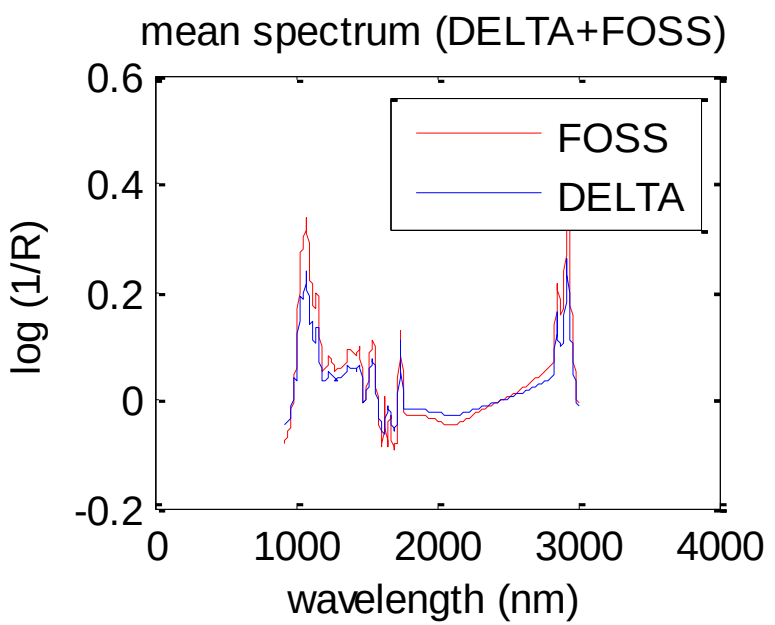


Foss: 1060 wavenumbers not fixed step
Delta: 935 wavenumbers not fixed step

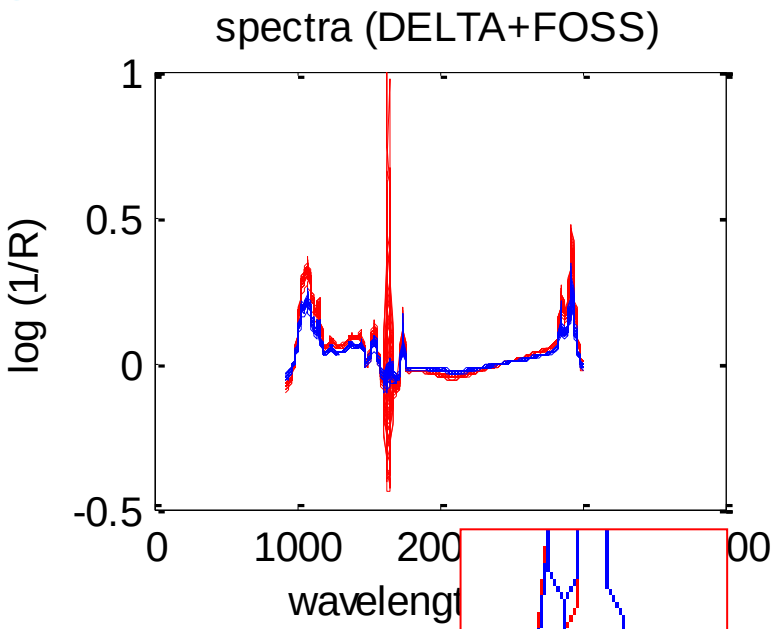
Original data removing part of the spectra

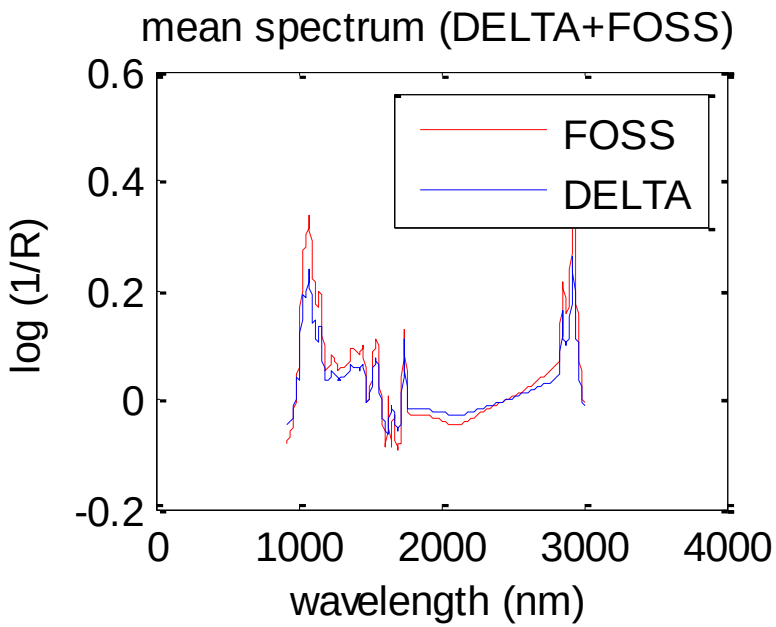


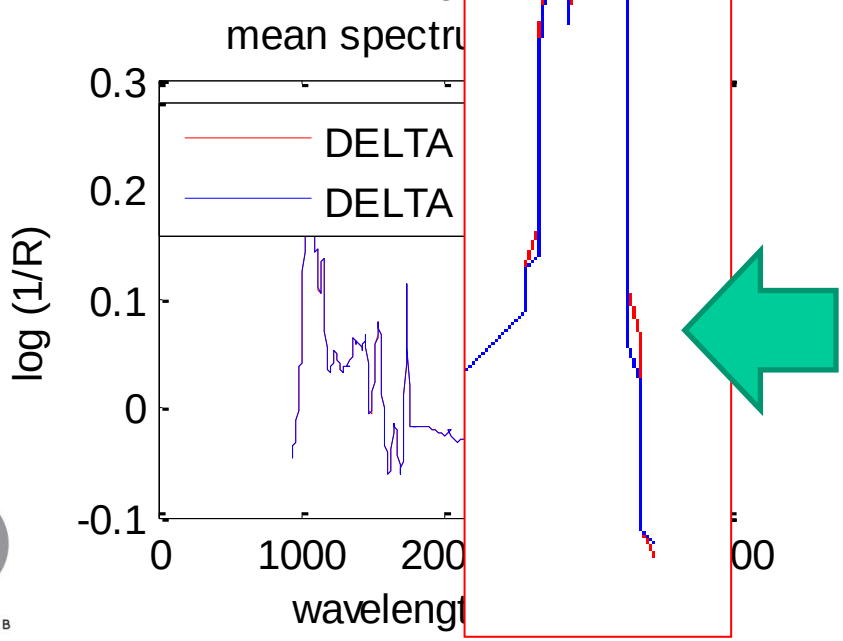




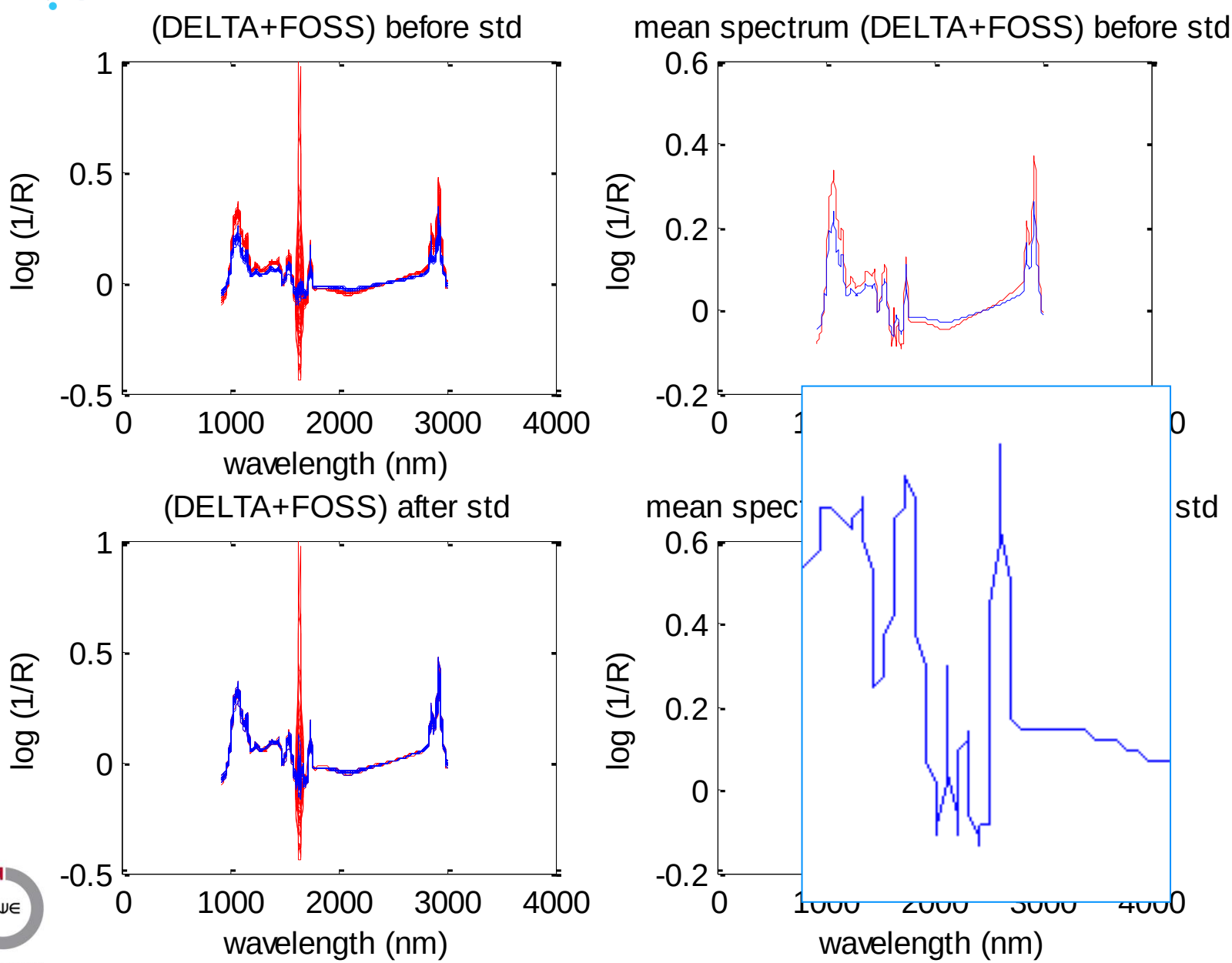
Data after interpolation of DELTA spectra to the FOSS range







Data after PDS of DELTA spectra



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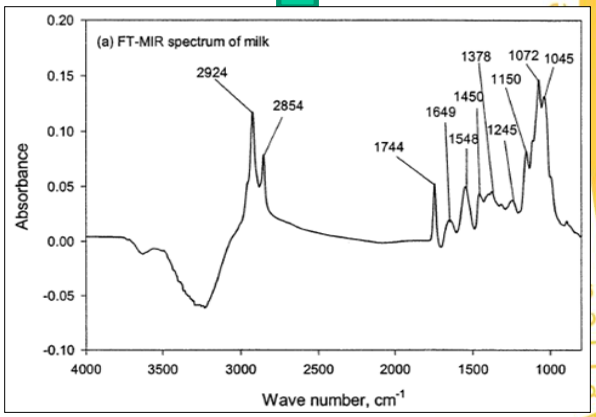
OBJECTIVE 3

To identify relevant associations between animal phenotypes and the shape of MIR milk spectra

Pregnant cows …
Cows with a negative energy balance…
Cows with mastitis …
Cows producing few methane …
Cows giving milk with nice fatty acid profile …
…

New performance indicators based on MIR



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OptiNIR

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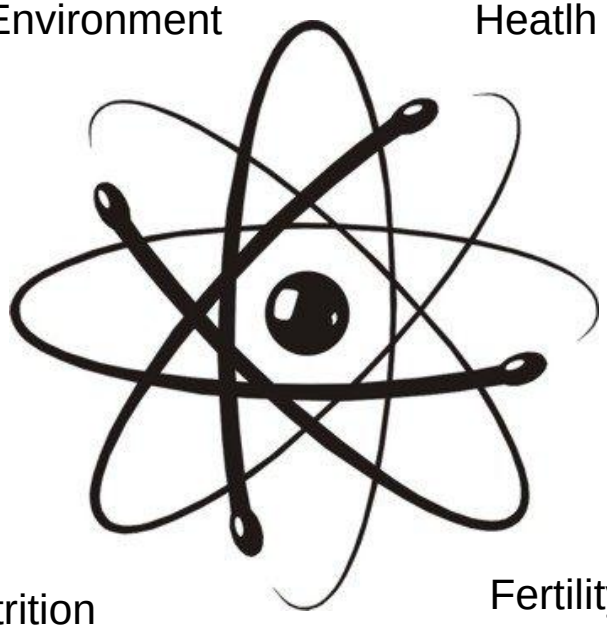
SAC

Environment

Heatlh



teagasc

Agriculture and Food Development Authority

INSTITUT DE L'ELEVAGE

gembloux agro bio tech

Nutrition

Fertility

UNIVERSITÄT HOHENHEIM

Walloon Agricultural Research Centre

nwe

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OBJECTIVE 4

To develop an operating prototype of web-based tools

Pregnancy diagnosis…
Evaluation of energy balance…
Early detection of mastitis…
Estimation of methane production…
Measurement of fatty acids…
…

INFORMATION TOOLS

ADVISORY & DECISION MAKING TOOLS

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A 3 : Creation and maintenance of a transnational database

A 4 : Design and development of statistical tools to be publically available on OptiMIR website

A 5 : Selection of new dairy management indicators based on relationship between MIR milk spectra and animal characteristics (spectral indicators)

A 6 : Prototype tools' design using A5

OBJECTIVE 5

To test, validate and implement the set of web-based tools on all Milk Recording Organizations' data-system

Pregnancy diagnosis…
Evaluation of energy balance…
Early detection of mastitis…
Estimation of methane production…
Measurement of fatty acids…
…

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ADVISORY & DECISION MAKING TOOLS

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WP 3 : Implementation, Validation & Roll-out : to provide stakeholders with a low-cost, users friendly and up-to-date access to validated web-tools through a private web-account

- A 7 : Test & upgrade of the set of tools in pilot farms
- A 8 : Implementation of the validated tools from A7 on every MRO's data-processing-system to provide dairy farmers with an access to the OptiMIR tools via the web
- A 9 : Popularization, promotion and training

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Conclusions

OptiMIR is an innovative Approach

- Large co-operation between MRO's and research institutions specialized in animal sciences and infrared spectroscopy
- Exploration and use of the all infra-red spectrum resulting from routine milk analysis as indicator of the cows' status
- Harmonization of the data collected by the various MRO's allowing a better validity of the management tools developed for all the areas of North West of Europe and their various systems of production

http://www.optimir.eu

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