

DEVELOPMENT OF NIRS METHOD FOR ROUTINE ASSESSMENT OF SUGARCANE QUALITY IN REUNION ISLAND



**11th GERMPLASM AND BREEDING & 8th MOLECULAR
BIOLOGY WORKSHOPS**

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Context

- eRcane breeding program
 - require 8,000 cane analysis per year (increasing)
 - Seek for efficiency

- Sypecar

- aims at studying High Fibre Cane for energetic production
- joint project with Cirad (funding : UE + Cirad)
- 1 component = Development of NIRS for Fibre and Energetic value

→ semi-automatic NIRS device set up at eRcane



eRcane conventional method



Stalk cane shredding



Pulp Pressing



Plug Weighted



Juice Collected



Juice Filtration



Brix reading



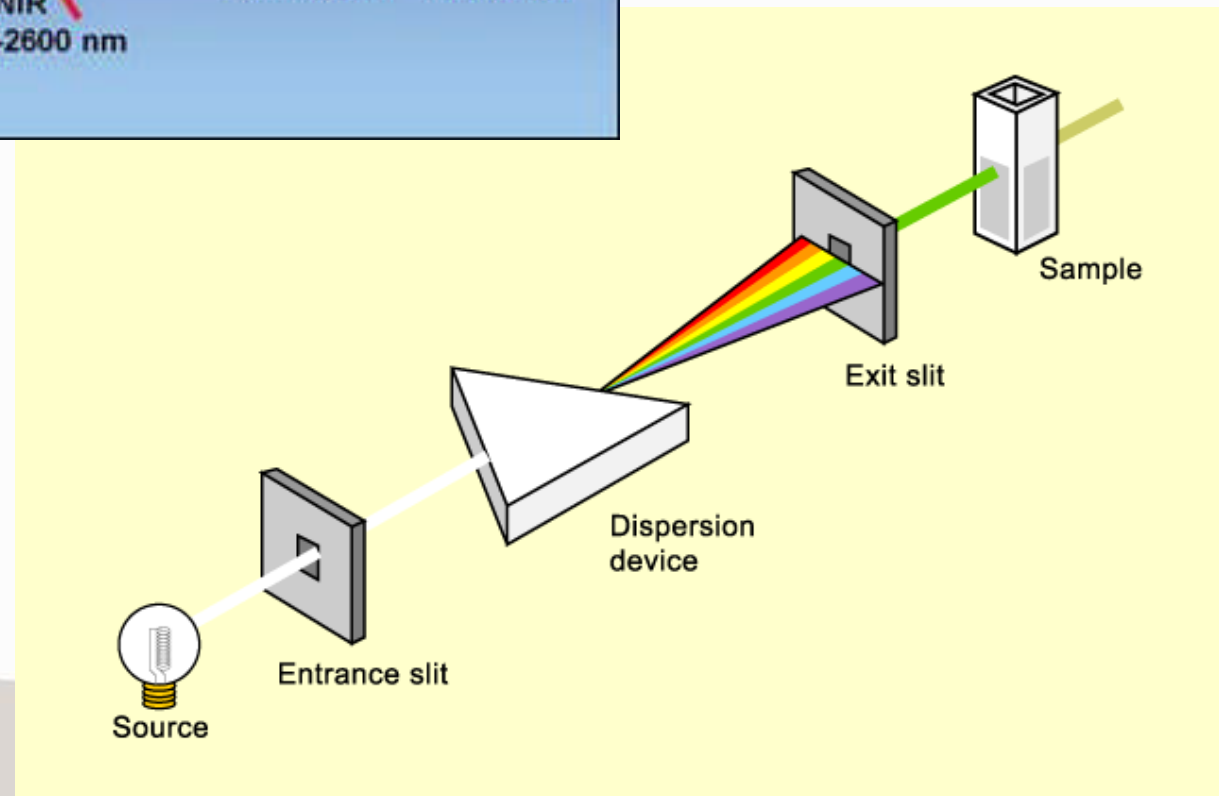
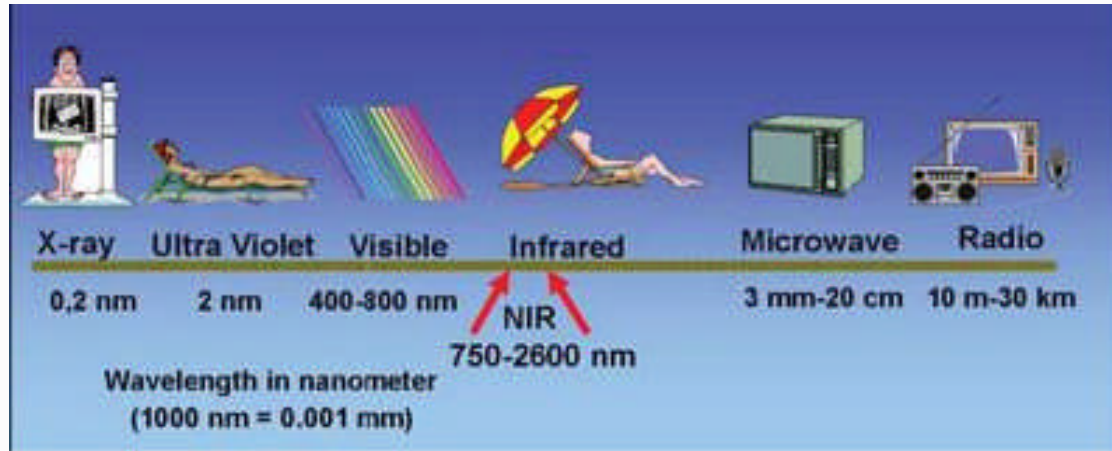
Pol reading

eRcane conventional method

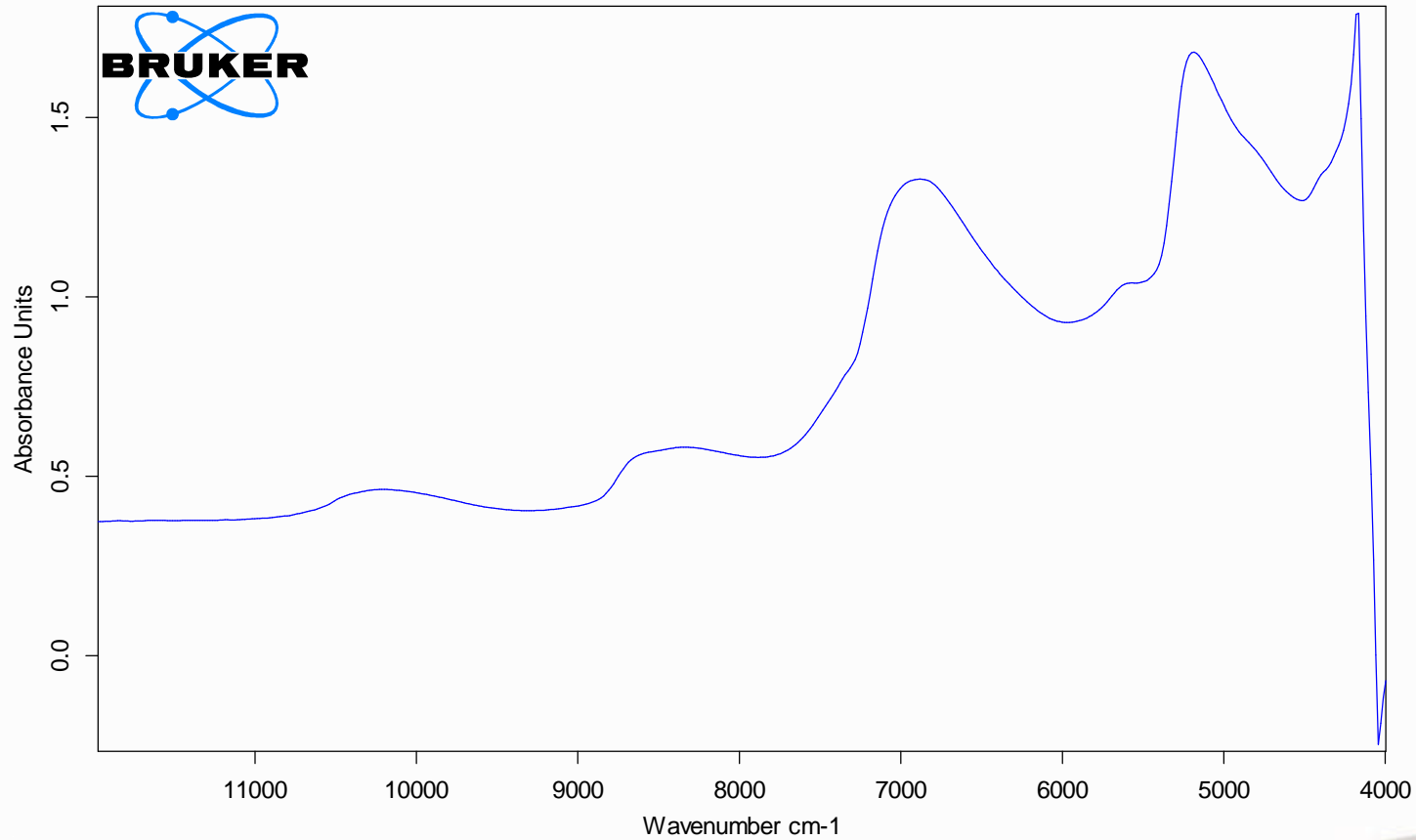
- Analyses line operation
 - 8,000 samples per year
 - 5 workers
 - 2 and ½ day per week, during 5 month
 - Stalk cane samples : 5 – 12 kg
 - Pulp analysed : 500 gr
 - 1 analyse : 3 min

- Measured parameters :
 - Brix (soluble dry mater) of juice
 - Pol (sugar content) of juice
 - Purity (pol/brix*100) of juice
 - Fibre content of cane
 - SE (Extractible Sugar) of cane

What is NIR Spectroscopy?



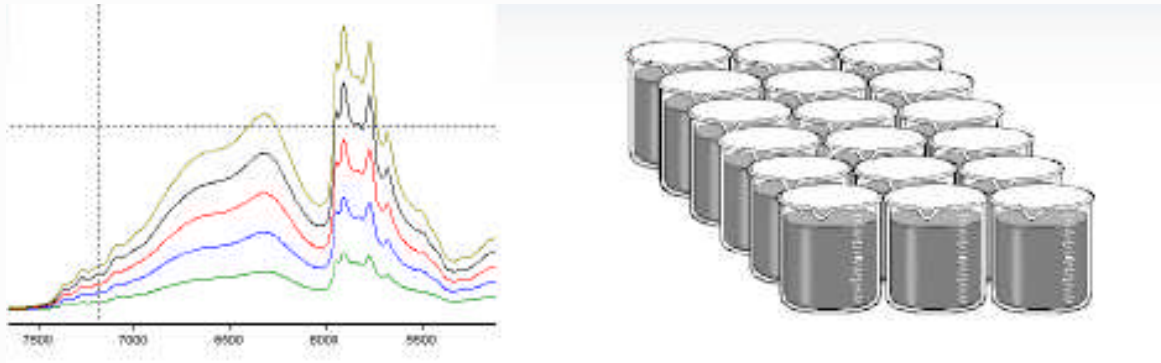
Resulting spectrum



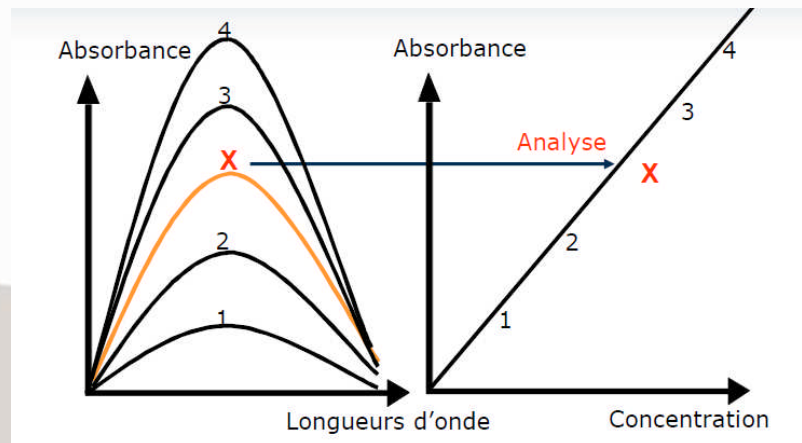
C:\CERF\NIRS\CPS\CPS SCV\CPS Data\Calibration\Base Complète\2014_ES_S08-B1_R570.0 2014_ES_S08-B1_R570 *OPUS Lab for Liqui 18/07/2014

What is NIR Spectroscopy?

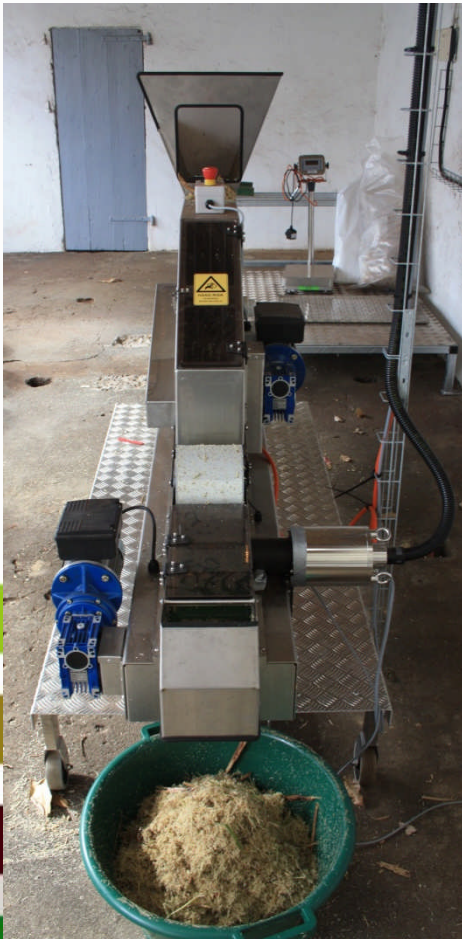
- Indirect Method



Spectrum + Wet Chemistry
= Calibration equation



CPS - Bruker



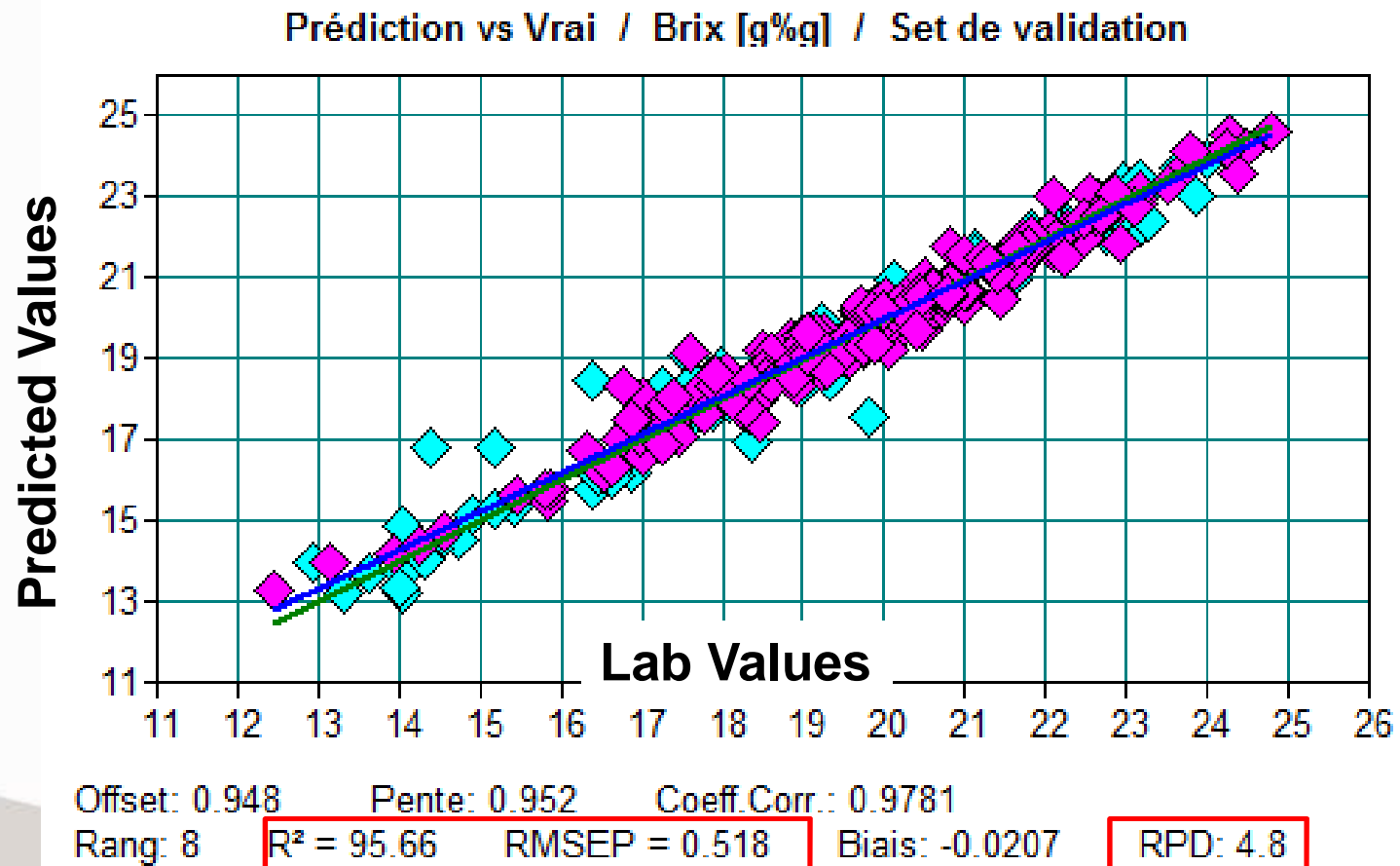
- Cane Preparation System
 - (Shredder)
 - Conveyor
 - Spectrometer (Matrix F)
 - Computer + software



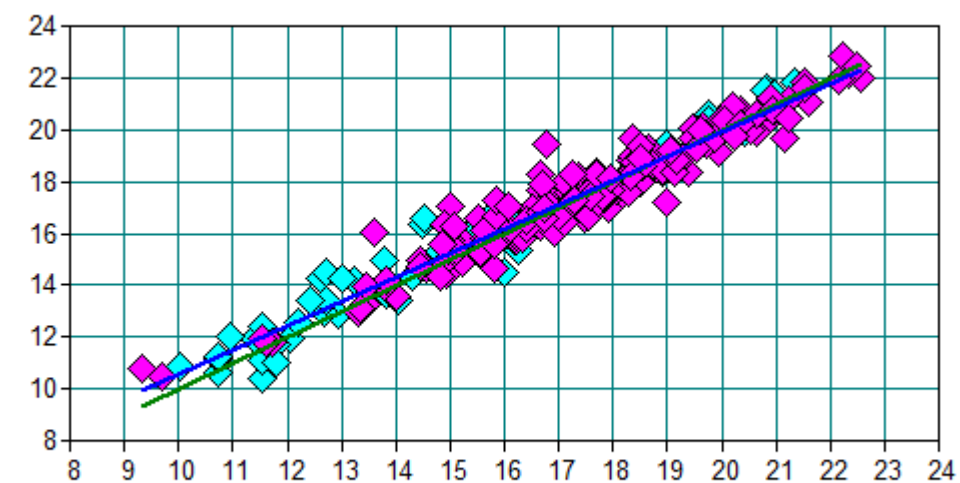
- 2 workers
- Larger sample : 3-12 kg of pulp
- 1 sample : 1 min

Calibration results

- Validation

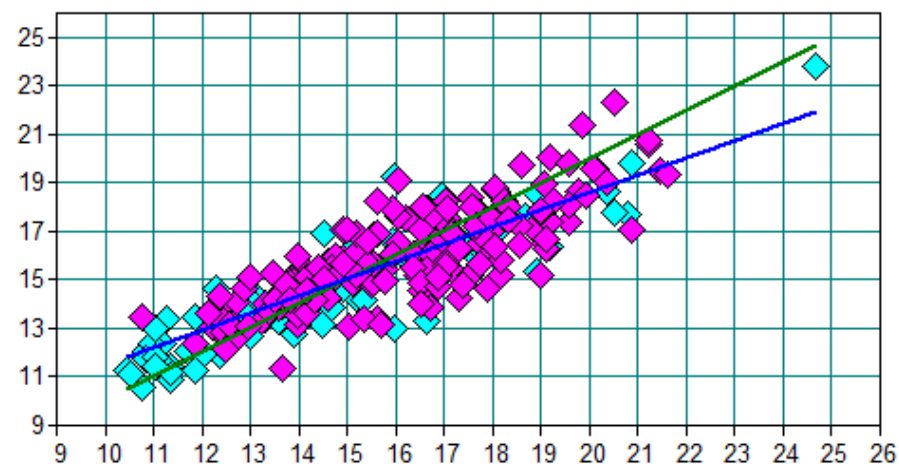


Prédiction vs Vrai / Pol Cal [g%g] / Set de validation



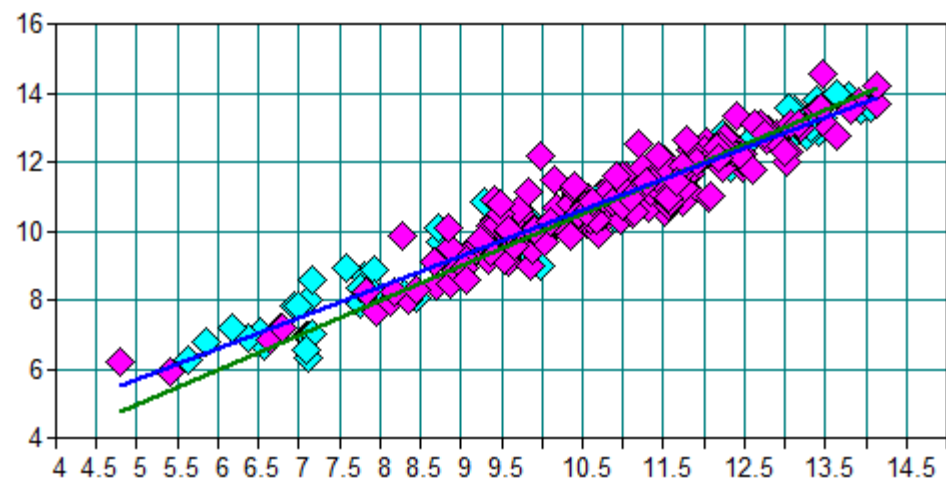
Offset: 1.247 Pente: 0.933 Coeff.Corr.: 0.9731
 Rang: 10 $R^2 = 94.52$ RMSEP = 0.634 Biais: -0.101 RPD: 4.33

Prédiction vs Vrai / Fibre [%Canne] / Set de validation



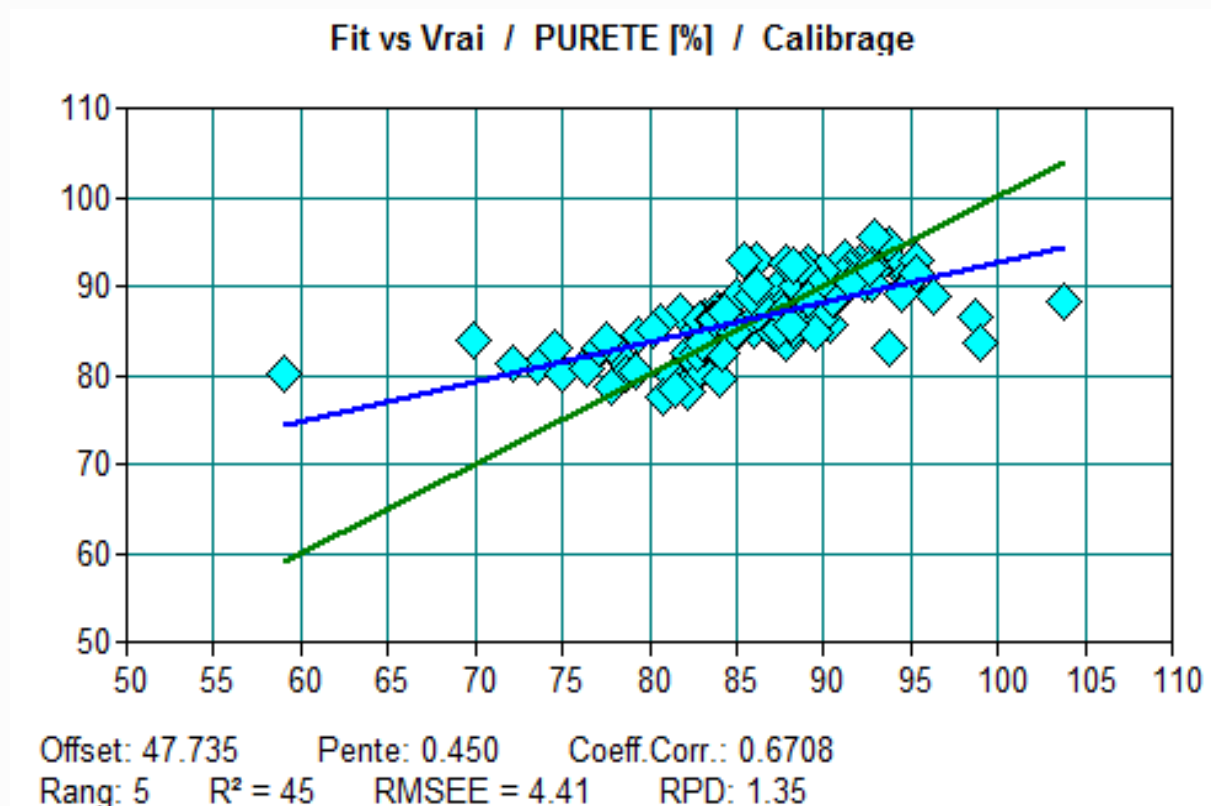
Offset: 4.339 Pente: 0.714 Coeff.Corr.: 0.8512
 Rang: 9 $R^2 = 72.22$ RMSEP = 1.37 Biais: 0.123 RPD: 1.9

Prédiction vs Vrai / SE [%Canne] / Set de validation



Offset: 1.236 Pente: 0.892 Coeff.Corr.: 0.9573
 Rang: 10 $R^2 = 91.28$ RMSEP = 0.545 Biais: -0.0998 RPD: 3.45

Calibration results



- Purity ($\text{pol/brix} \times 100$) performs poorly
→ This parameter will be compute from brix and pol values

Calibration results

	Brix of Juice	Pol of Juice	SE of Cane	Fibre Content of Cane
Unit	g/100g	g/100g	g/100g	g/100g
Samples number (Calibration Set – Validation Set)	785 (501- 261)	785 (501-261)	785 (501-261)	785 (501-261)
Minimum	12.45	9.49	5.30	10.68
Maximum	25.15	22.78	14,37	25.02
SD	2.07	2.26	1.56	2.28
SEL	0.14	0.15	0.42	1.84
R ²	0,957	0,945	0,913	0,722
RMSEP	0,518	0,634	0,545	1.37
RPD	4.8	4.33	3.45	1.9

Development prospects

2014 : first handling / development

- Routine analysis using CPS from 2015 campaign (july)
- Implementing calibration database with early stage breeding clones
- Calibration performance monitoring and improvement



Thank you

