

Using low-cost NIRS method for helping smallholder to detect nutritional deficiencies and imbalances

Authors [V. Avit^{1,2,3}, A. Flori^{1,2}; R. Impens⁴; H. Aholoukpe⁵; S. Vrignon-Brenas^{1,2}]

1 ABSys, Univ Montpellier, CIHEAM-IAMM, CIRAD, INRAE, Institut Agro, Montpellier, France

2 CIRAD, UMR ABSys, F-34398, Montpellier, France

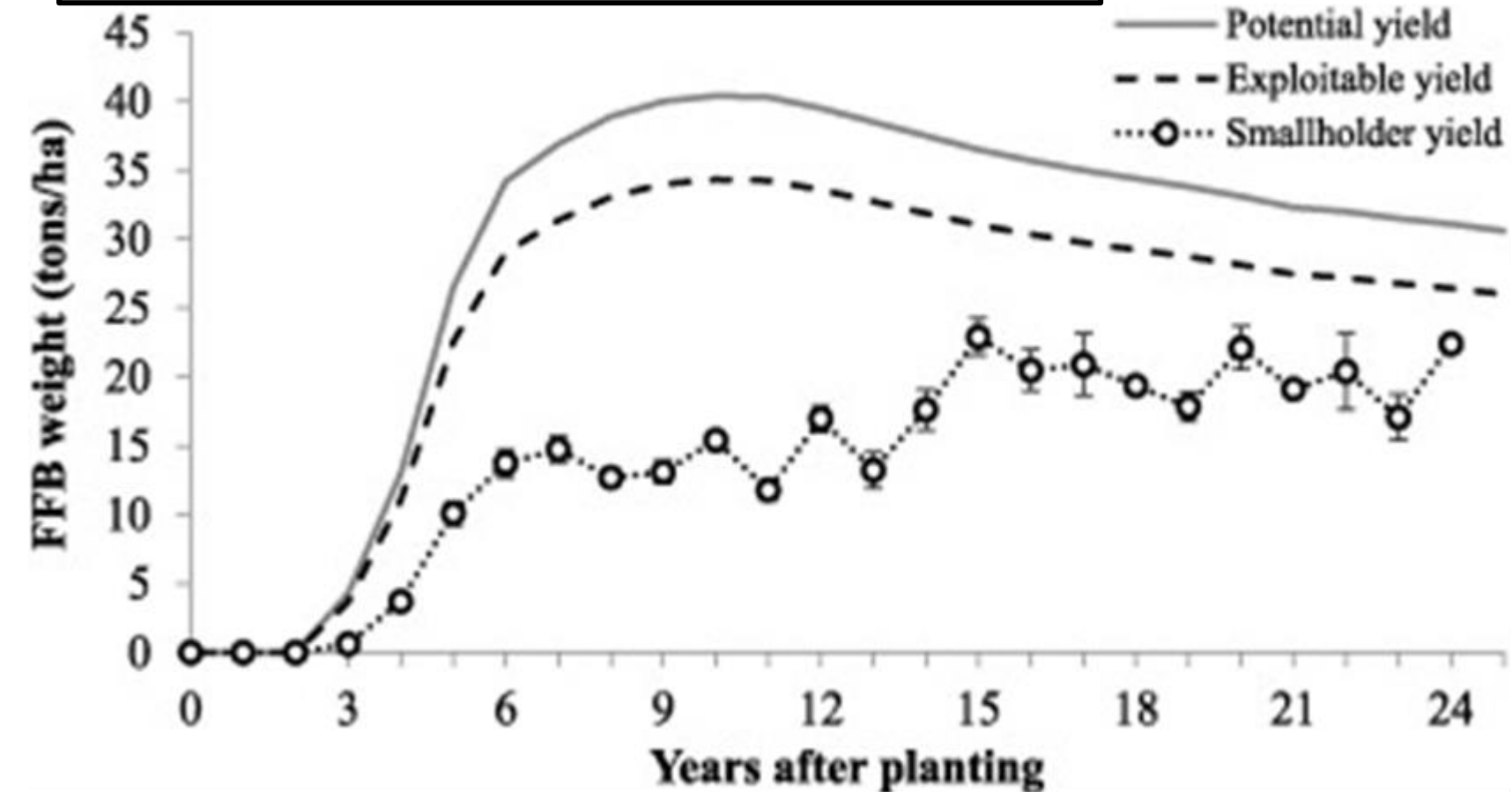
3 SADEF, France

4 Presco Plc, Benin/Sapele Road, Benin-City, Edo State, Nigeria

5 CRA-PP/INRAB, Agricultural Research Centre on Perennial Plants of the National Agricultural Research Institute of Benin, BP 01, Pobè, Benin



Yield gap for smallholders



Euler et al., 2016

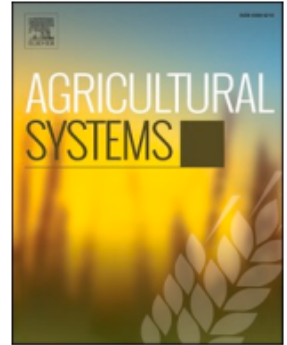




Contents lists available at [ScienceDirect](#)

Agricultural Systems

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



First things first: Widespread nutrient deficiencies limit yields in smallholder oil palm fields

Hendra Sugianto^a, Juan P. Monzon^{a,1}, Iput Pradiko^b, Fatima A. Tenorio^a, Ya Li Lim^a, Christopher R. Donough^a, Sunawan^a, Suroso Rahutomo^b, Fahmuddin Agus^c, James Cock^d, Joni Amsar^e, Rana Farrasati^b, Ridho Iskandar^f, Juan I. Rattalino Edreira^a, Shofia Saleh^g, Heri Santoso^b, Antonius P. Tito^h, Nadib Ulfariaⁱ, Maja A. Slingerland^j, Patricio Grassini^{a,*}

Precision agriculture in oil palm plantations: diagnostic tools for sustainable N and K nutrient supply

Bernard Dubos^{1,*}, Victor Baron¹, Xavier Bonneau¹, Olivier Dassou², Albert Flori¹, Reinout Impens³, Jean Ollivier¹ and Lénaïc Pardon¹

¹ CIRAD, UPR Systèmes de pérennes, 34398 Montpellier, France

² CRA-PP /INRAB, BP 01, Pobè, Benin

³ SIAT, Presco-Plc, Benin City, Nigeria

Near infrared (NIR) spectroscopy as a rapid and cost-effective method for nutrient analysis of plant leaf tissues

Jeremy Aditya Prananto^{a,*}, Budiman Minasny^a, and Timothy Weaver^b

^aSydney Institute of Agriculture, School of Life and Environmental Sciences, The University of Sydney, Sydney, NSW, Australia

^bCSIRO Agriculture and Food, Narrabri, NSW, Australia

*Corresponding author: e-mail address: jpra4577@uni.sydney.edu.au

Could NIRS represent a low-cost alternative for smallholders ?



Objectives :

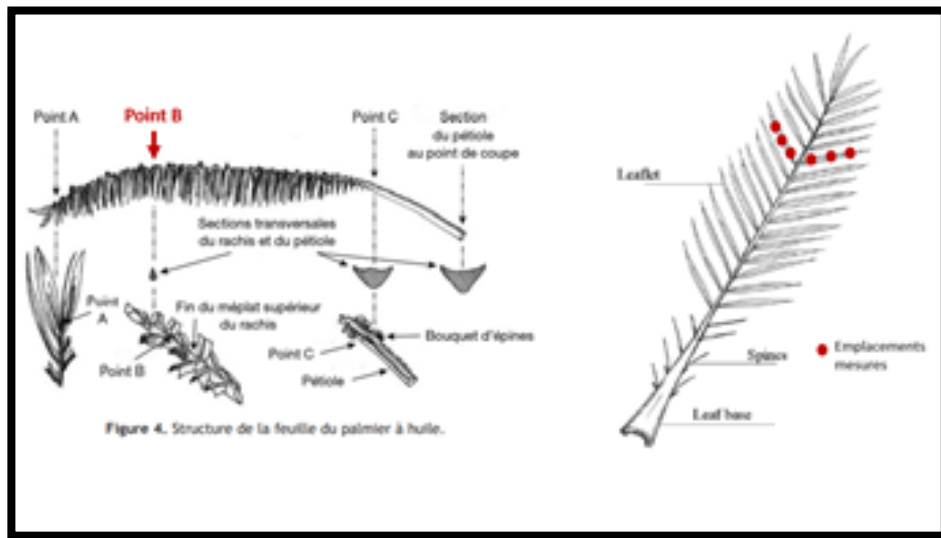
- **Is it possible to obtain usable information on oil palm nutritional status with low-cost NIRS ?**
- **Can it be carried out directly on site ?**
- **Can it be a quantitative approach ? A discriminant approach ?**



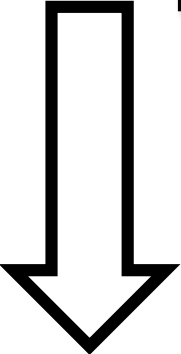
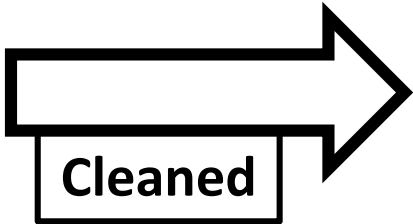
4 plots : 3 Benin, 1 Nigeria

100 samples

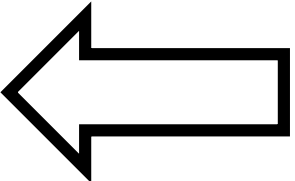




Leaflets



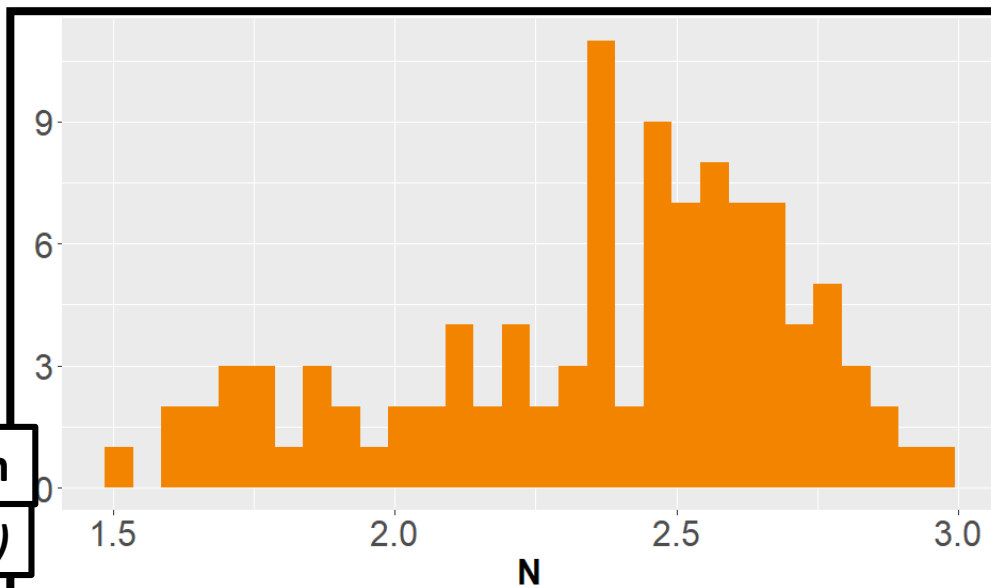
Transport, Dried & grinded



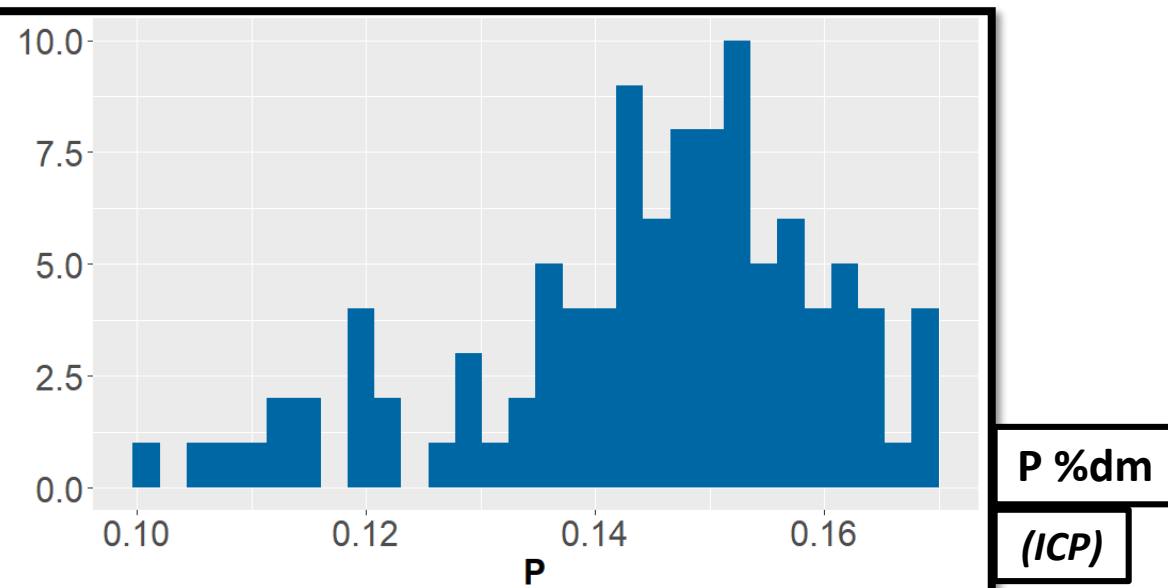
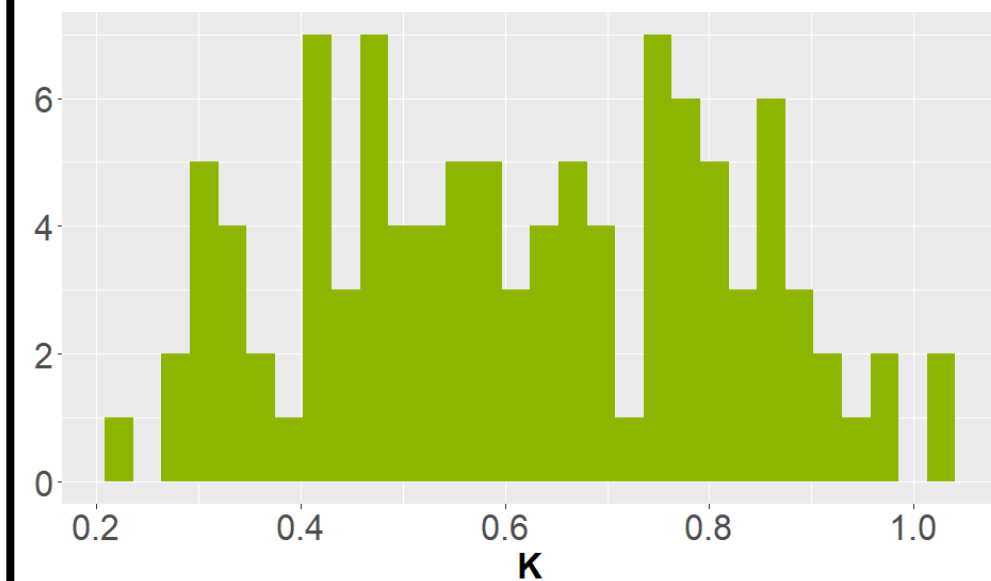
N, P, K, Mg

Nirone S2.2
1750-2150nm
100 samples, 1200 spectra

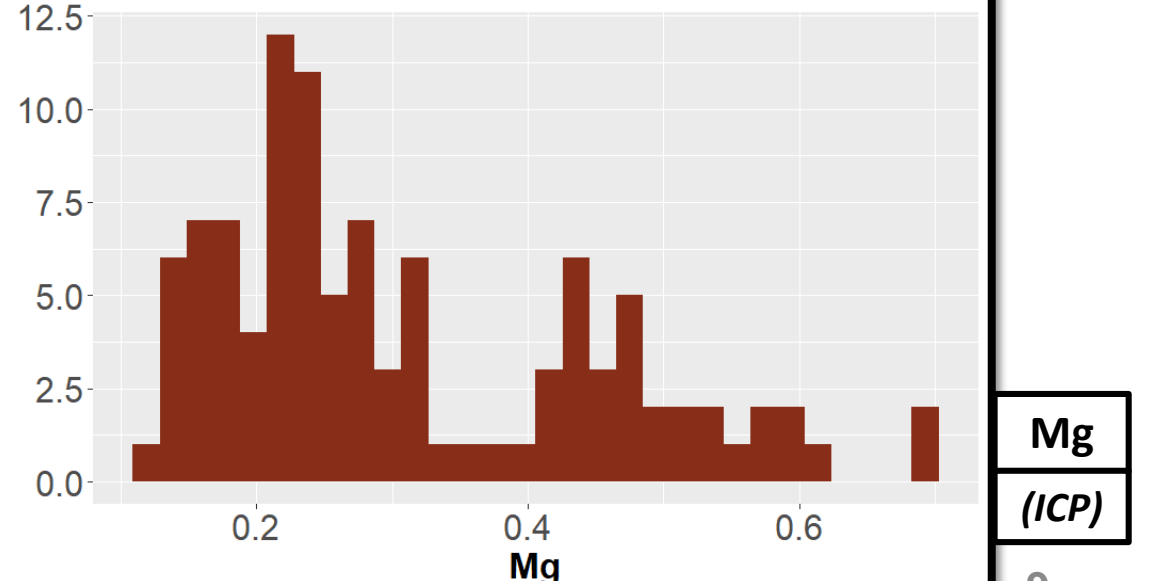
N %dm
(Dumas)



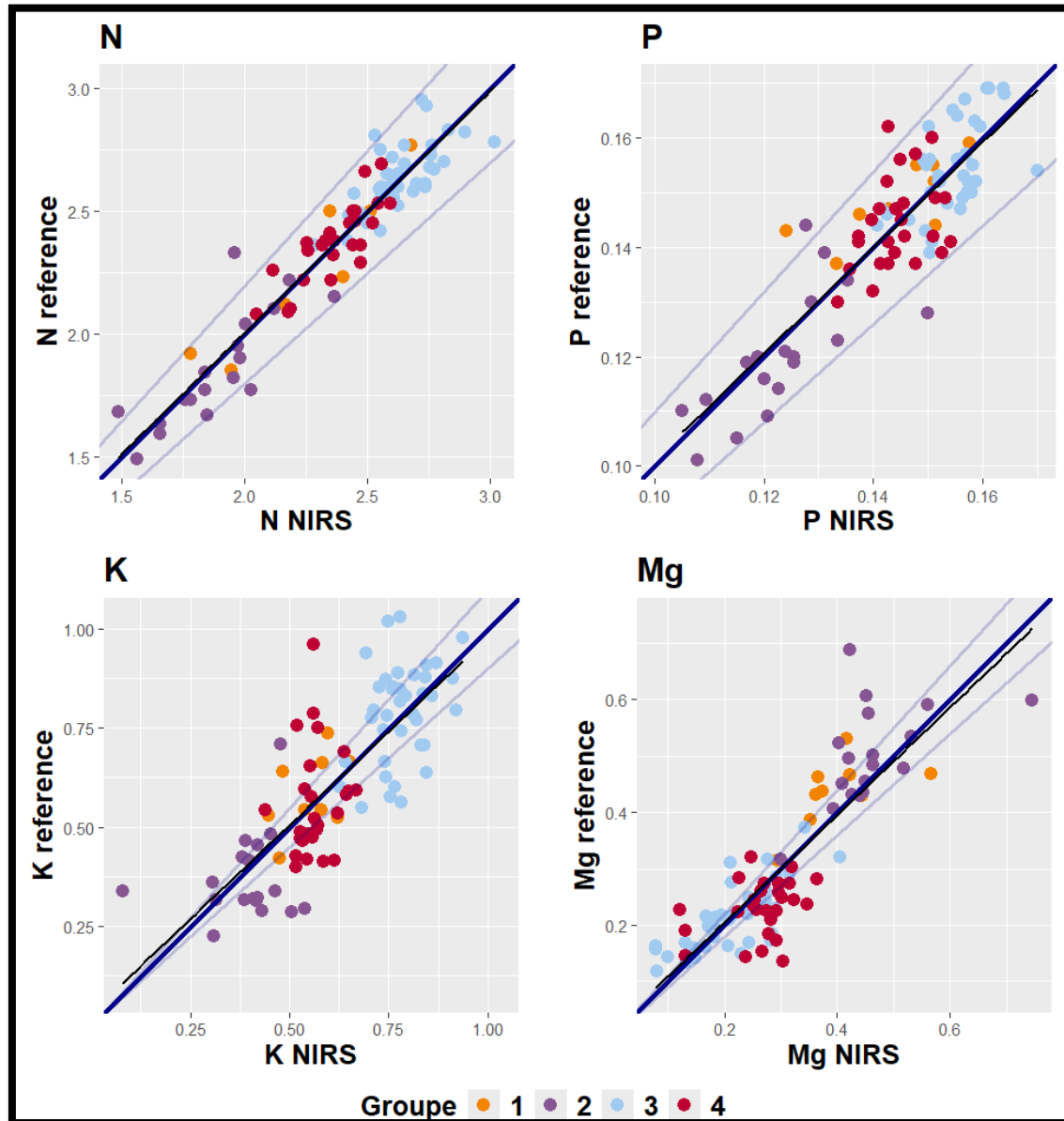
K
(ICP)



P %dm
(ICP)



Mg
(ICP)

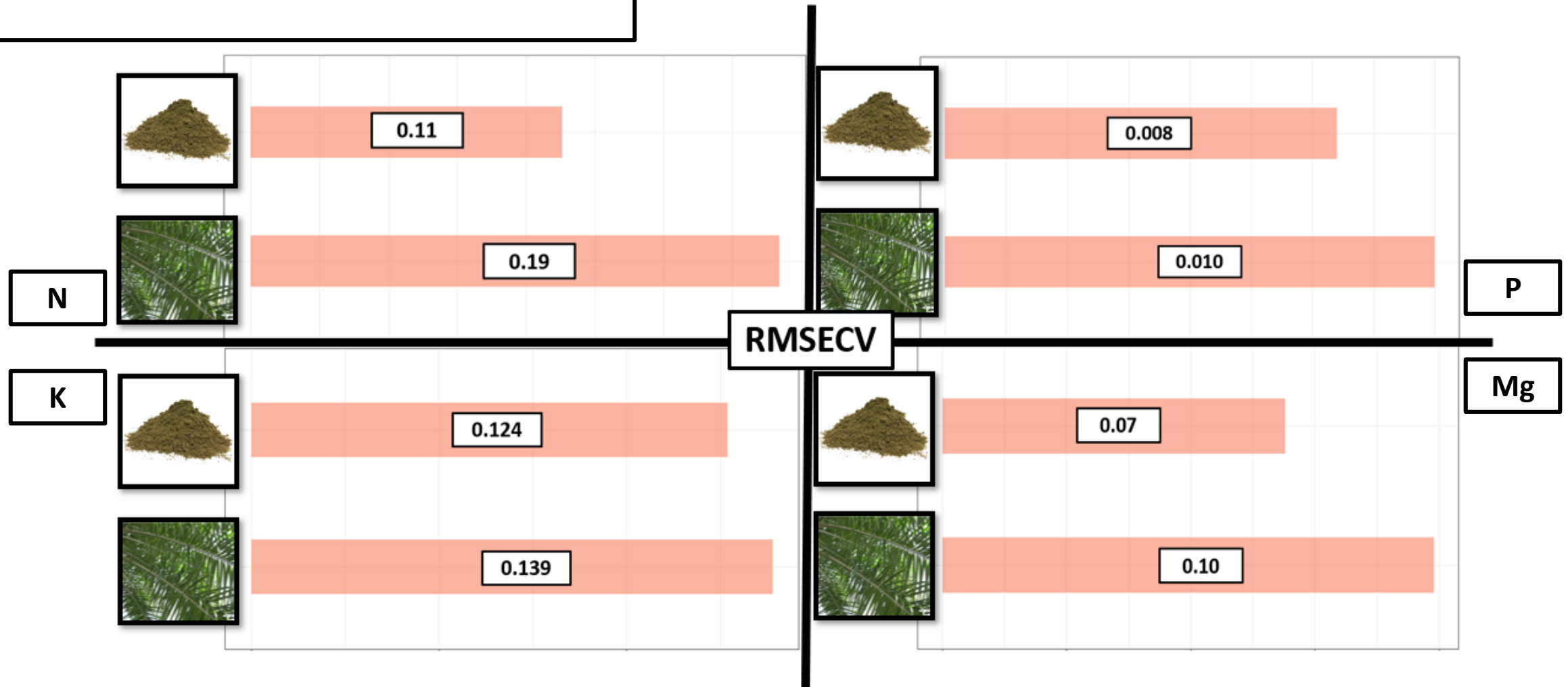


Observed vs predicted (PLS models) regressions for N, P, K, Mg on fresh leaves

	RMSECV	R2	RPD
N	0.110	0.89	3.08
P	0.008	0.75	1.91
K	0.124	0.61	1.62
Mg	0.069	0.74	1.96



Can it be carried out directly on site ?



The RMSECV (error) increase on fresh leaves

K

>0.7
%dm

9%

n=6

65%

n=26

91%

n=58

35%

n=14

<0.7
%dm

Actual

Predicted

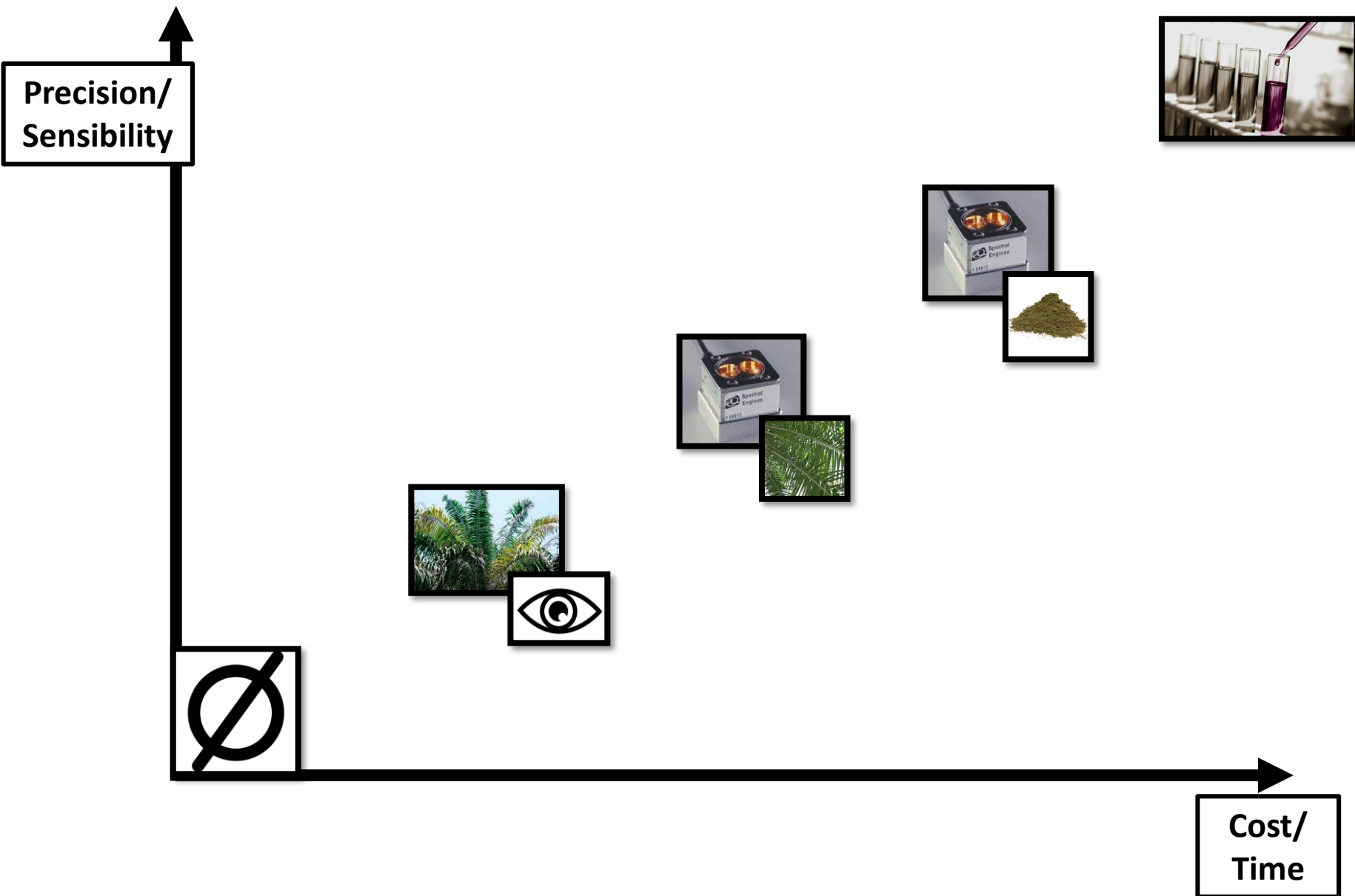
A discriminant approach

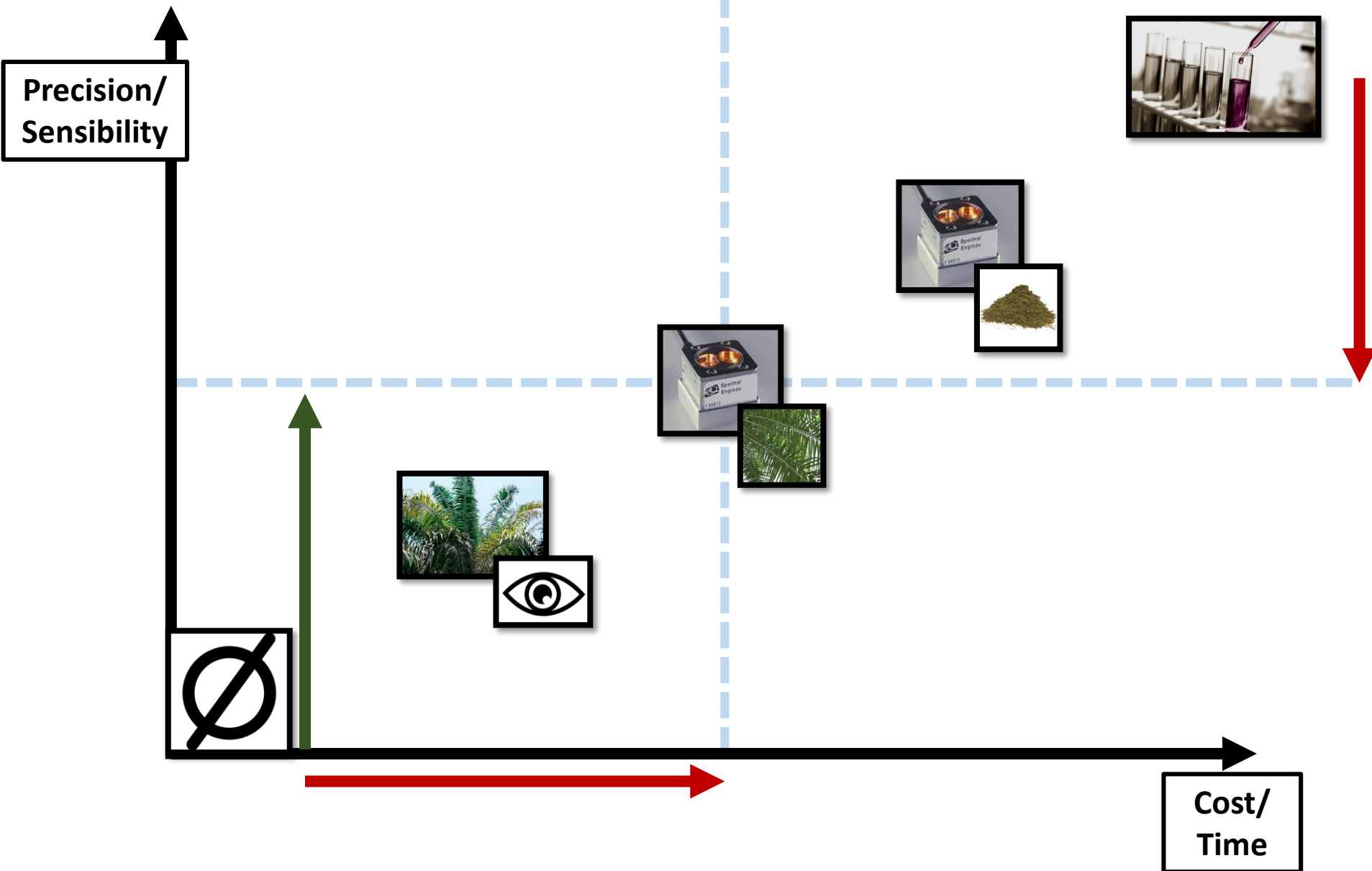


- Low-cost NIRS give nutritional informations on N, P, K and Mg

- Measurements can be carried out directly on-site on fresh leaves, at the cost of a bigger error

- Thoses less precise results can still be used, and a discriminant approach is possible







Thank you for your attention



PRESCO PLC

