Instituto Nacional de Tecnología Industrial

Ministerio de Industria — Presidencia de la Nación

Eurachem — A focus for analytical chemistry in Europe

PT program for Argentine soil analysis

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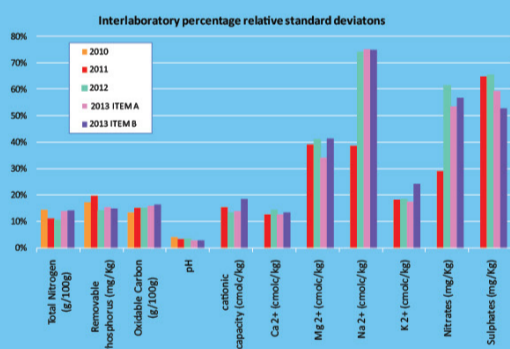[2] Instituto Nacional de Tecnología Industrial, Pdo. de San Martín, Argentina.

INTRODUCTION

Agriculture and grain commercialization represent a relevant proportion of economical activities in Argentina. An extended group of laboratories analyzes the soil composition, in order to optimize agriculture decisions as the best time to sowing, or the type or amount of fertilizers. So, the quality of the results delivered from these laboratories has a relevant economic impact. However, their analytical reliabilities are variable. There was not much evidence of technical competence available up to a few years ago. The soil composition presents high geographic variability and the application of analytical methods have particularities in different countries. Fertilization criteria depend on these specific variables. Therefore, the existent global interlaboratory offer in soils did not responded exactly to the national needs, and it was necessary to design a national PT scheme.

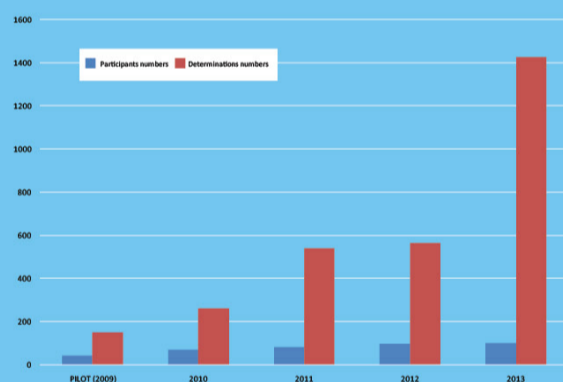**TARGET** 157.4 10^6 t in 2020
(Strategic National Plan)

proinsa

Argentina

Table 1: Percentage relative standard deviations by evaluated parameters in the period 2010-2013

Interlaboratory percentage relative standard deviatons

Evolution of the number of participants and measurements (2009 -2013) laboratories with continuous participation 139 laboratories in the database.


PROINSA (National PT Program of Soils for Agriculture). Created by the Ministry of Agriculture, with the participation of other public institutions as the University of Buenos Aires, the National Institute of Agriculture Technology (INTA) which advises to the producers on best sowing practices and the National Institute of Industrial Technology (INTI), the National Institute of Metrology in Argentina which is experienced in PT organization.

GENERAL COORDINATION	Ministry of Agriculture	Registration and confidential coding;
		Database management
		Results reception
		Reporting at consulter group of the program global results
		Training and activities promotion.
OPERATIONAL COORDINATION (technical and evaluative coordination)	National Institute of Agriculture Technology (INTA)	Collection of items
		Homogeneity and Stability analyses
		Preparation and distribution of test items
		Stock and handing test items
	National Institute of Industrial Technology (INTI)	Homogeneity and Stability data evaluation
		Statistical evaluation
		Performance report
	Argentina Association of Soil Sciences (AASS)	Methodological assistance and consulting
		Training
ADVISER GROUP	Methodological Support Systems (SAMLA)	Evaluation of the program development.

Detailed examination of the results has been made for some specific analytes: comparison of different methodologies in order to detect significant differences, correlations between pairs of samples to detect systematic effects, evolution of reproducibility standard deviations, among others. All this information is extremely useful in future improvement tasks.

Results obtained

PROINSA was launched in 2010, with the participation of 69 laboratories. In the last round performed in 2013 this number had grown to 98. The most relevant soil analytes, as the content of removable P, oxidable C, nitrates, sulphates, total N, Ca^2, Mg^2, Na^-, K^+, and pH were measured in each round. For most analytes, the overall performance was acceptable when compared to the customers needs. Reproducibility figures are comparable to those achieved in other global PT schemes as Wageningen Evaluating Programs for Analytical Laboratories (WEPAL) either in terms of classical standard deviations or in robust alternatives as the algorithm A given in the ISO 13528 standard or the MAD.

Results from laboratories with continuous participation since 2010 were analyzed independently. In general, they got slightly lower spread than the others.

Phenoldisulfonic acid method correlation between test item A and B

$R^2 = 0{,}847$
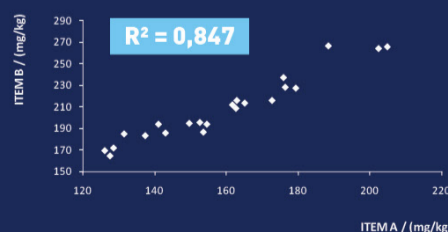
Snedd method correlation between test item A and B

$R^2 = 0{,}696$
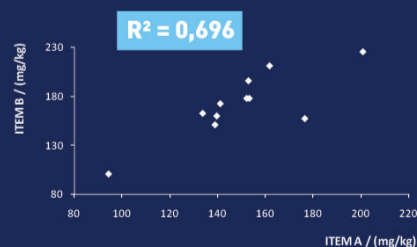
Conclusions and Future actions

The continuous participation in the PT program allows the self assessment and improvement of the laboratories. However, after 4 rounds, we can say that further actions are needed. The reproducibility figures should be improved for some relevant analytes. The results show that training/technical Assistance is needed to promote improvement. A training program will be launched this year.

Also, more strict criteria of performance should be used in the next rounds for some analytes. Standard deviations taken from precision experiments will be adopted in place of Algorithm A.

The initial period 2009-2013, allows to have evidences of laboratory performances. The standard deviation of the laboratories has remained approximately constant over the years (Table 1). However for the next stage it becomes necessary tending to improve the overall performance. In general performance figures (e.g. Z-scores) have been good, given that dispersion estimates are calculated from the laboratories results (Algorithm A) Now, it is planned to estimate the reproducibility standards deviations by other ways, in order to obtain more strict performance criteria. For instance, experiments assessing accuracy to be performed by expert laboratories (ISO 13528: 2005; part 6.5).

Besides that it is planned to prepare test items on more than one concentration level in order to obtain a more complete information about the competence in the application of the methodologies on the full measurement ranges