## PREPARATION AND USE OF SOIL AND PLANT REFERENCE MATERIALS TO IMPROVE THE QUALITY OF CHEMICAL ANALYSIS AT THE SOILS AND FERTILISERS RESEARCH INSTITUTE (SFRI)

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but others, e.g. soils and plants, must be prepared in-house.

Some reference materials can be purchased

**1. Reference materials at SFRIt** 

Soil and plant testing for nutrients is a major activity for the Institute and a requirement for the ACIAR project. It is assumed that an accurate result for the reference material indicates an accurate result for the samples analysed side-by-side with them. This process is described as quality control.



2. Collecting the Hanoi soil and plant reference materials

The soil: 200 kg of Red River alluvial soil was taken from Bac Ha village, Tho An commune, Dan Phuong district, Hanoi which had been fallowed for more than 10 years.

The cabbage: 100 kg of fresh cabbage was collected from the street market outside SFRI.

#### 3. Treatment of the reference materials

**3.1.** Soils were sieved to remove plant debris and stones. Cabbages had the veins removed. Samples were dried, ground, carefully mixed and divided into two parts. Half of each sample was sent to Australia to become an inter-laboratory proficiency sample. This would provide target values for later use in testing the accuracy of methods and for quality control.

**3.2.** The remainder was split into containers: 100 containers of soil ~500 g each and 60



containers of cabbage ~50 g each.

**3.3.** Containers were stored in a chest freezer at -20°C to maintain the integrity.

**3.4.** The homogeneity of the materials was evaluated by analyzing total N (4 replicates/ container) for all containers. N was chosen as the index because it is poorly distributed in the natural materials.

# 4. Homogeneity and comparison of the SFRI and ASPAC N measurements

The following Kjeldahl N measurements were made by SFRI without knowledge of the Australian values results



#### Plant - Compare N% (mean)

**5.** Comparison of the SFRI and Australian values



### **Comparison of other parameters with ASPAC**

	Parameter	SFRI Statistics		SFRI/Australia comparisons	Comparison with Australian values
		No. Reps	10	8.04 (37) A	Acceptable
	pHH2O	Mean	7.96		
		CV%	0.21		
	OC (%)	No. Reps	20	0.44% (33)	Acceptable
		Mean	0.459		
		CV%	2.18		
	Total N (%)	No. Reps	20	0.064% (39)	Acceptable
		Mean	0.064		
		CV%	4.31		
	Total P2O5 (%)	No. Reps	20	P 0.036% (22) P2O5 0.08%	Acceptable
		Mean	0.090		
		CV%	2.07		
	Bray-2 P (mg/kg)	No. Reps	20	No corresponding data but Bray-1 is 1.4 mg P/kg (8) or 3.2 mg P2O5/kg	
		Mean	33.9		
		CV%	0.49		Acceptable
	Available K as K2O (mg/100 g)	No. Reps	18	Exch K (cmol/kg) 0.10 (33) 4.7 mg K2O/100 g	Acceptable
		Mean	4.24		
		CV%	0.95		
	CEC meq/100 g or cmol/kg	No. Reps	20	No corresponding data but Σexcats ~10 cmol/kg (25) No direct co The values ballpark	No direct comparison
		Mean	13.2		The values are in the
		CV%	1.4		ballpark



CV: Coefficient of variation; SFRI: Soils and Fertilizers Research Institute;

ASPAC: Australasian Soil and Plant Analysis Council

#### **5. Conclusions and future plans**

**5.1.** The homogeneity of the materials reached the target CVs for use as in quality control

**5.2.** The SFRI and Australian values means are very close showing that the SFRI results are accurate

**5.3.** During 2016 the reference samples will be used to test the accuracy of the tests for exchangeable soil cations and for Na, K, Ca and Mg in plants

5.4. During 2017 the above procedures will be extended to the micro nutrients Mn, Fe, Zn, Cu, Ni and Mo in plants using AAS.If time permits a colorimetric test for B will be established

**5.4.** The quality of results for samples will be assured for methods that have been shown to be accurate using side-by-side analysis with the reference samples

**5.5.** To improve their worth the reference materials will be sent to other labs in MARD and be used to test inter-laboratory performance



N%



NSW











