

## APPENDIX II – Methods of soil analysis

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Sample preparation and the analysis for particle-size distribution. Atterberg limits, soil reaction, electrolytic conductivity and chloride were done at the Land Protection Service laboratory at Kew. Some of the chemical analyses were performed there also, but during 1983, in line with a government decision, this function was taken over by the State Chemistry Laboratory (SCL). Set out below are the soil profile numbers from which the various analyses were done at SCL.

Available P	-	from profile 1015
Available K	-	from profile 1052
Organic C	-	from profile 1052
Nitrogen	-	from profile 1040
Exch. cations	-	from profile 1079

All results are expressed in terms of oven-dry soil passing a 2-mm round-hole sieve, except gravel, which is reported as a percentage of the air-dry field sample.

**Particle-size analysis:** Plummet balance method of Hutton (1956) with sand separation by hand decantation. The I.S.S.S. size fractions were separated: i.e. coarse sand 2-0.2 mm, fine sand 0.2-0.002 mm and clay <0.002 mm.

**Electrolytic conductivity (EC 25°C):** A 1:5 soil:water suspension was shaken for 1 hour and, after temperature equilibration, conductivity was measured with a dip cell and direct-reading meter. Results are reported as microsiemens per centimetre ( $\mu\text{S}/\text{cm}$ ).

**Soil reaction (pH):** By glass electrode and digital pH meter on the above suspension.

**Chloride (Cl):** By solid-state chloride electrode and millivoltmetre on the same suspension, calibrated with potassium chloride standards.

**Organic carbon (Org. C):** Wet-combustion technique of Walkley and Black, described by Piper (1942). These are reported without a recovery factor but the factor 1.3C:N was used to calculate carbon:nitrogen ratios.

**Total nitrogen (N):** Kjeldahl method.

**Hydrochloric acid extract for phosphorus and potassium (P, K):** 4 g of soil was refluxed for 4 hours with 20 mL 6M hydrochloric acid, with subsequent filtration and dilution of the filtrate to 200 mL. Phosphorus was determined by a colorimetric method using molybdenum blue (Hutton, person communication) and potassium by atomic absorption.

**Available Phosphorus (P avail):** Extraction with 0.5 M sodium bicarbonate at pH+8.5 and 1:10 soil:extractant ratio (Olsen, et al 1954). Method adapted for automatic analysis.

**Available potassium (K avail):** 2.5g soil was shaken for 1 hour with 50 mL 0.05 M hydrochloric acid. After settling overnight to clear, an aliquot was diluted for potassium determination by atomic absorption (Skene 1956).

**Exchangeable cations:** By extraction method of Tucker (1974), also described by Loveday (1974). Synopsis: Soluble ion removal by 10% ethanediol in ethanol. Cation displacement by ammonium chloride in ethanol-water (2:1) at pH 8.5. Cation determinations by atomic absorption. Cation exchange capacity by measurement of ammonium ion displaced from the treated soil by a potassium nitrate-calcium nitrate solution.

**Atterberg limits:** Methods employed were taken from Australian Standard 1289:

Liquid limit	AS 1289 C1.1
Plastic limit	AS 1289 C2.1
Plasticity index	AS 1289 C3.1
Linear shrinkage	AS 1289 C4.1