

Executive Summary

The National Soil Database has produced, for the first time, a national baseline database of soil geochemistry including data point maps and spatial distribution maps of major nutrients, major elements, essential trace elements, trace elements of special interest and minor elements. In addition, this study has generated a National Soil Archive, comprising both dried soil samples and a nucleic acids (DNA) archive as well as sampling and location information for each sampling point. The terms of reference for this physical archive are presently being drawn up by the EPA, Teagasc and NUIG. This National Soil Archive represents a considerable research resource. The report and archive will provide Ireland with a sound, well structured baseline of soil geochemical properties relevant to environmental, agronomic and health related pressures and against a background of increasing soil protection policies.

The National Soil Database generated baseline soil geochemical maps (point and spatial distribution) of Ireland, and has begun an interpretation of these in a pedological context. This study also applied large-scale microbiological analysis of soils for the first time in Ireland and in doing so also investigated microbial community structure in a range of soil types.

A number of key outcomes relating to the National Soil Database are worth mentioning.

- Geographical coherence of the geochemical results and a strong relationship with the underlying geology.
- Evidence of land use, anthropogenic and climatic effects.
- A strong relationship between parent material and microbial data.

The database has relevance with respect to environmental, agronomic and health related issues. Further benefits of the National Soil Database will arise from disseminating the findings to a wider audience including policy makers and stakeholders. As such, it will contribute to improved decision making and policy development in relation to the sustainable management of Irish soils and also for other environmental media including water and air.

The National Soil Database and Archive has and will contribute to national and international soil research initiatives. To date, two new EPA-funded projects (SoilC: Measurement and Modelling of Soil Carbon Stocks and Stock Changes in Irish Soils (2005-S-MS-26) and Crébeo: A National Project on Soil Biodiversity (2005-S-LS8-M1)) are directly linked to the National Soils Database and its Archives. Furthermore, the National Soil Database is linked to an international soils research project - 'Environmental Assessment of Soil for Monitoring' (ENVASSO - Contract No. 022713). The main objective of this European funded project is to harmonise existing national datasets, to form a central reference point to assess current soil status and to ensure sustainable management in the future. There is considerable potential for further linkages with the large scale EU funded Framework Programme 7 (FP7).

Based on the findings of this study, a number of recommendations for the enhancement of the existing *National Soils Database* and archive can be summarised as follows:

- It would add value to the database if the samples were analysed for a range of "available" and/or biologically active elements as well as for environmentally important organic chemicals.
- The geochemical database should be subjected to further interrogation to aid future soil geochemical risk assessment and management.
- An additional 10 copies of the nucleic acids archive should be created and stored to prevent damage to the archive as a result of frequent thawing and freezing.
- The south-east region of Ireland should be sampled to complete the nucleic acids archive.
- DGGE (Denaturing gradient gel electrophoresis) should be performed on more samples.
- The effect of the soil type and parent material on soil's microbial community should be evaluated systematically using the available data.
- A TELLUS-type project such as that in Northern Ireland (<http://www.bgs.ac.uk/gsni/sectors/Tellus/home.htm>) would provide valuable geochemical data if undertaken in the Republic.

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Glossary of chemical symbols and associated abbreviations

Al	aluminium
As	arsenic
Ba	barium
Ca	calcium
Cd	cadmium
Ce	cerium
Co	cobalt
Cr	chromium
Cu	copper
Fe	iron
Ga	gallium
Ge	germanium
Hg	mercury
K	potassium
La	lanthanum
Li	lithium
Mg	magnesium
Mn	manganese
Mo	molybdenum
Na	sodium
Nb	niobium
Ni	nickel
P	phosphorus
pH	soil acidity
Pb	lead
Rb	rubidium
S	sulphur
Sb	antimony
Sc	scandium
Se	selenium
SOC	soil organic carbon
Sn	tin
Sr	strontium
Ta	tantalum
Th	thorium
Ti	titanium
Tl	thallium
U	uranium
V	vanadium
W	tungsten
Y	yttrium
Zn	zinc