

# Characterising the biodiversity and functioning of European soils

December 5 2014

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World Soil Day (Dec 5, 2014) concludes a week-long series of events in Dijon bringing together international scientists. The results of the European EcoFINDERS project, coordinated by INRA, were revealed for the occasion. This project helped create standardised methods of measuring soil biodiversity, and as a result, vital data on the health of Europe's soils were gathered. The analyses also characterised the relationship between biodiversity, soil functioning and ecosystem services.

The European EcoFINDERS project, which has just wrapped up and was coordinated by INRA, aimed to increase the scientific and operational understanding necessary when planning European policy on sustainable land management. The project's results are a significant contribution to the characterisation of European [soil](#) biodiversity and its biological function. Standardised measurement methods were developed, particularly for soil sampling procedures, the molecular characterisation of [microbial biodiversity](#) (taking into consideration the variety of European environmental conditions), and the molecular identification of soil microfauna.

## A benchmark of soil microbial diversity

The scientists studied the microbial biodiversity of European soils using samples from 81 sites covering various climatic zones (Atlantic, boreal, continental and Mediterranean and Pannonian) as well as different soil

types and uses. They were able to identify a series of bioindicators for soil quality that were approved for their sensitivity, reliability and economic value. The results also made it possible to establish a benchmark that can now be used to interpret biological soil analyses. The biodiversity of European soils varies according to their physical and chemical properties, particularly pH levels. It also varies according to how the soil is used, with the optimum agricultural systems being those that encourage the development of many plant species over time or in the area.

## **Soil biodiversity and climate change**

Research within the EcoFINDERS project clearly showed the influence biodiversity has on an essential carbon cycle function: the mineralisation of organic matter. This process frees up minerals necessary for plant nutrition and emits carbon dioxide (CO<sub>2</sub>), a contributing factor of climate change. The importance of this function rises as [microbial diversity](#) increases.

The EcoFINDERS work also revealed major differences between European soils and their capacities to eliminate [nitrous oxide](#) (N<sub>2</sub>O), a potent greenhouse gas, from the atmosphere. These variations were linked to the diversity and abundance of a new group of micro-organisms that consume nitrous oxide, and the physical and chemical properties of soils that promote the growth of these micro-organisms were determined. This research made it possible to identify molecular bioindicators showing the capacity of European soils to convert N<sub>2</sub>O into N<sub>2</sub> without leaving behind harmful by-products.

## **Quantifying the value of soil biodiversity**

A conceptual framework was created to quantify the value of soil

biodiversity and the corresponding ecosystem services. This framework takes into account the value of services provided as well as that of ecological insurance, which contributes to the sustained provision of these services – especially agricultural productivity – at a time of uncertainty related primarily to global change.

This project, the largest of its kind in the world, helped generate unique data on the current biological quality of soils in Europe and to establish the normal range of variation in [biodiversity](#) according to physical and chemical properties and soil uses. A database dedicated to European [soil biodiversity](#) and its range of variation was created and will be maintained by the European Commission (JRC Ispra).

The data from the EcoFINDERS project will provide promising leads that will need to be tested in various agricultural, climatic and territorial situations. The end objective will be to develop modelling-based decision-making tools to identify the best strategies according to priorities and taking a multi-player approach that integrates national and European regulations.

Provided by INRA France

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