MEDAPHON - Monitoring Soil Biological Activity by using a novel tool: EDAPHOLOG-System - system building and field testing
LIFE08 ENV/H/000292

Project description

Environmental issues

Beneficiaries

Administrative data

Read more

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Project description:

Background

Soil is defined as the top layer of the earth’s crust. It is formed by mineral particles, organic matter, water, air and living organisms. It is a complex, variable and living medium. As well as providing a habitat for many species it performs many vital ecosystem functions including production of food and biomass, filtration of water and transformation of substances such as carbon and nitrogen.

However, the quality of soils is threatened by processes of erosion, loss of organic matter, compaction, salinisation, landslides, contamination and sealing. This soil degradation is accelerating in the EU in the face of global warming, inappropriate land use, pollution and inadequate river management, causing negative effects on human health, natural ecosystems and climate change, as well as on our economy. Furthermore, soil can be considered a somewhat non-renewable resource since it takes hundreds of years to produce a few centimetres of soil.

Many policy areas are relevant to preserving good quality soils, including water, chemicals, industrial pollution, nature protection and agriculture. However, to encourage even greater and more specific work on soils, the European Commission launched a Soil Thematic Strategy in 2006. This seeks to promote and encourage four branches of work around preserving soil quality: awareness-raising, research, integration and legislation.
Objectives

The MEDAPHON project aimed to build and test a new soil environmental monitoring tool. The project sought to deliver a tool which could measure parameters of the soil biota to assess soil biological and microbiological activity, soil ecological degradation and soil biodiversity from field to landscape level. It hoped to enable scientists to prepare very detailed and large-scale mapping of soil quality in a very efficient way.

Through the tool, the project sought to provide monitoring and spatial delineation of soil biological degradation and contamination, ecological control of agricultural practice, detection of soil biodiversity hot spots. By providing scientists with good quality, up-to-date data, the project hoped to enable soil experts to know when, where and how to intervene to protect soil quality.

It thus sought to address the fact that there was no cost-effective and reliable method for assessing soil quality on a large scale previous to the project and make an important contribution to the achievement of the overall goals of the EU Thematic Soil Strategy.

Results

The MEDAPHON project successfully built and tested a sound soil monitoring tool called the EDAPHOLOG System. This system, tested at lab level, allows covering the whole methodological process of the biological monitoring of soils: sampling, data collecting and handling, data evaluation and publication.

The EDAPHOLOG System uses innovative sampling probes to continuously monitor biological activity of soil dwelling microarthropods. The system is based around counting micro-arthropods entering mesh tubes in the soil – soil pin traps. The project developed a new sensor to accurately count the animals and was able to classify trapped mesofauna into functional groups such as bacterial feeders, fungal feeders, plant feeders, predators and omnivores.

In response to a challenge facing accurate monitoring of microarthropods in the soil, the project developed devices to prevent soil particles entering the tubes and being counted erroneously. Techniques to prevent this included use of a small pot within the metal tube and surrounding the mesh tubes with clay balls held in place with another plastic mesh.

The project also developed an electro-technical device using copper-zinc electrodes for estimating microbiological activity in soil with different moisture content. The laboratory tests showed significantly different readings from control soils and sterilized soils. This suggests that the device can differentiate levels of soil microbial activity and provide greater soil biological activity analyses than has previously been possible.

A data transmission system was developed in parallel with the sensors. This was made up of radio transmitters, data loggers, a central database, controlling software and a Java web application, Edaphoweb. This provided for GIS-based mapping, data analysis and internet-based publication. Testing of this system
using the 200 probes across 50 sites demonstrated the feasibility of large-scale, real-time monitoring of soil quality and identification of problem locations.

The device can operate for several months without human intervention, as monitoring data are transmitted via internet and sensors remotely controlled. This user-friendly and cost-efficient technology should moreover facilitate improved knowledge of which soils are at most risk of degradation and which therefore require protecting interventions, showing great potential for improving approaches to soil protection in the EU.

Further information on the project can be found in the project's layman report and After-LIFE Communication Plan (see "Read more" section).

Environmental issues addressed:

Themes

Industry-Production - Agriculture - Forestry
Land-use & Planning - Soil and landscape protection

Keywords

agricultural method, soil degradation, biodiversity, monitoring system

Natura 2000 sites

Not applicable

Beneficiaries:

Coordinator
Institute for Soil Sciences and Agricultural Chemistry, Centre for Agricultural Research, Hungarian Academy of Sciences

Type of organisation
Research institution

Description
The research institute of soil science and agricultural chemistry of the Hungarian academy of sciences (CAR HAS) is the national scientific centre for soil science, agro-chemistry and soil biology. The institute is primarily responsible for research in these fields – providing significant applied research,
education, advisory and information activities, as well as extensive national and international co-operation.

Partners
None

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Administrative data:

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<tr>
<th>Project reference</th>
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<td>Duration</td>
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                   | Nyugat-Dunantul(Hungary Magyarország)  
                   | Del-Dunantul(Hungary Magyarország)  
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                   | Del-Alfold(Hungary Magyarország)  
                   | Extra-Regio(Hungary Magyarország)  
                   | Associated Hungary (H)(Hungary Magyarország)  |

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Read more:

- **Leaflet**
  Title: "Take a look in soil with Edapholog system"  
  Author: Miklós Dombos  
  Year: 2012  
  Editor: CAR HAS  
  No of pages: 2

- **Poster**
  Title: "Edapholog: An automatized system for monitoring numerical abundance and body size distribution of soil meso-fauna" (1.37MB)  
  Author: Csongor Gedeon, Oxána Banszeg, Tibor Hambek, Mikló  
  Year: 2012  
  Editor: MTA TAKI, CAR HAS  
  No of pages: 1

- **Project web site**
  Project's website

- **Publication: After-LIFE**
  Title: After-LIFE Communication Plan  
  Author: Miklós Dombos  
  Editor: CAR HAS  
  No of pages: 2

- **Publication: Layman report**
  Title: Layman report (2.62MB)  
  Year: 2012  
  Editor: CAR HAS  
  No of pages: 20

- **Publication: Layman report**
  Title: Layman report  
  Editor: CAR HAS  
  No of pages: 20
Publication: Proceedings
Title: "Summary and relevance of MEDAPHON project to the green week theme of resource efficiency" (282 KB) Year: 2011 Editor: Green Week Exhibition (Brussels, 24-27 May 2001) No of pages: 4

Publication: Technical report
Title: Project's Final technical report Year: 2013 Editor: CAR HAS No of pages: 59

Slides Presentation
Title: "Results of a country-scale survey on the effects of agricultural practives on soil mesofauna in Hungary" (1.3MB) Author: Miklos Dombos, Csongor Gedeon, Peter Laszlo, Jozse Year: 2012 Editor: Research Institute for Soil Science and Agricultur No of pages: 14

Slides Presentation
Title: "Monitoring Soil Biological Activity by using a novel tool: EDAPHOLOG-System -system building and field testing" (4.22MB) Author: Dombos Miklós Year: 2010 Editor: MTA TAKI No of pages: 33