



Introduction et présentation de la campagne LUCAS Soil 2022

Healthy soils for healthy food, people, nature and climate within the European Green Deal



*Luca Montanarella, EC Joint Research Centre
Land Resources Unit*



The strategy is closely linked and will contribute to other policy areas and initiatives



The EU vision for soil



By **2050**, all **EU soil ecosystems** are in **healthy condition** and are thus more resilient, which will require very decisive changes in this decade.

By then, protection, sustainable use and restoration of soil has become the norm. Healthy soils contribute as key solution to our big challenges to achieve climate neutrality, a clean and circular economy, revert biodiversity loss, safeguard human health, halt desertification and revert land degradation.

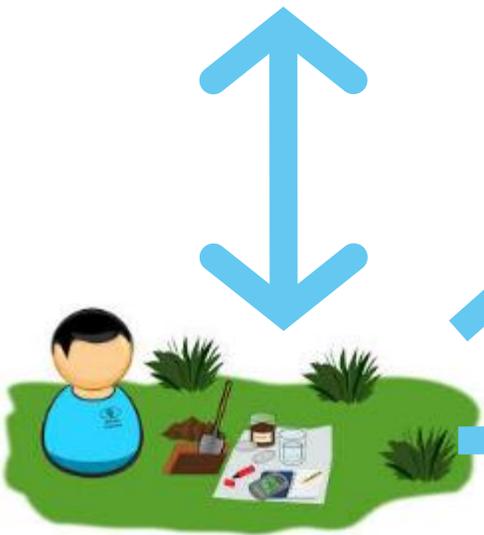
EU Soil Observatory: Key Objectives



Goal 3: Support to Research & Innovation



Goal 2: Monitoring of soil related policies



Goal 1: EU-Wide Soil Monitoring

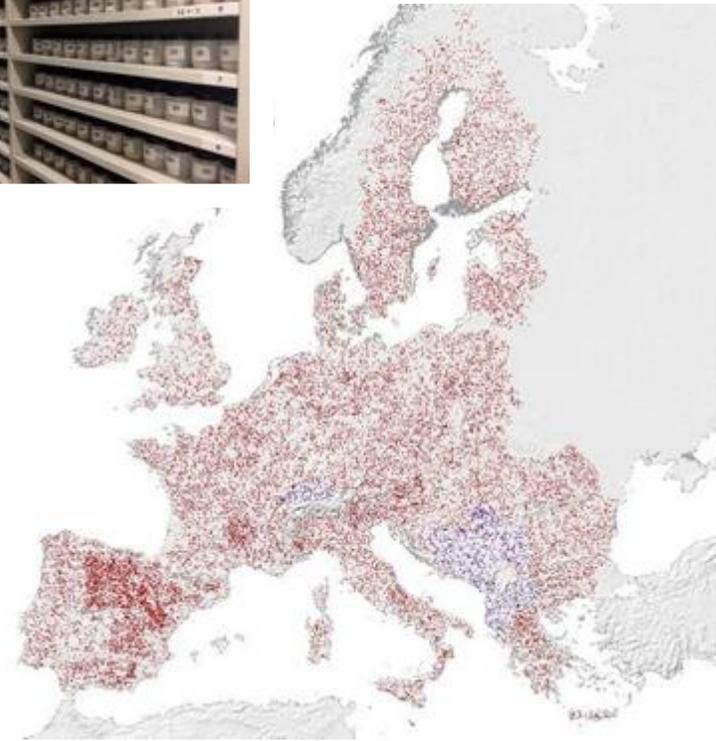


Goal 4: Provide an European Soil Forum

Goal 1: EU-Wide Soil Monitoring



From LUCAS (ca. 25,000 sites) to the EU Integrated Soil Monitoring (ISM) (ca. 250,000 sites)



LUCAS SOIL

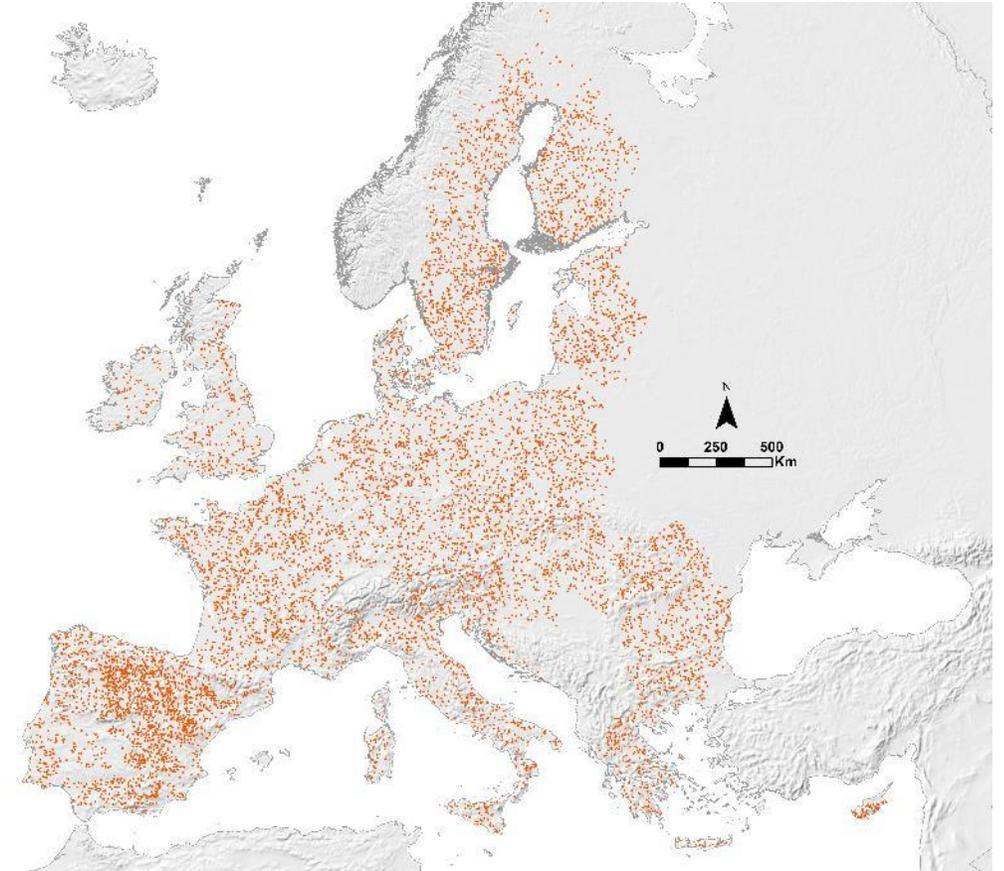
- Systematic approach for 25,000 locations across the EU
- Harmonized sampling protocol
- Standard analytical procedures to measure parameters
- Single laboratory
- Data from 2009, 2015, 2018, 2021/2022...
- EU/Regional statistics, point-based applications

Future expansion within the EUSO

- Systematic approach for ca. 250,000 locations across the EU
- Full integration of National soil monitoring systems

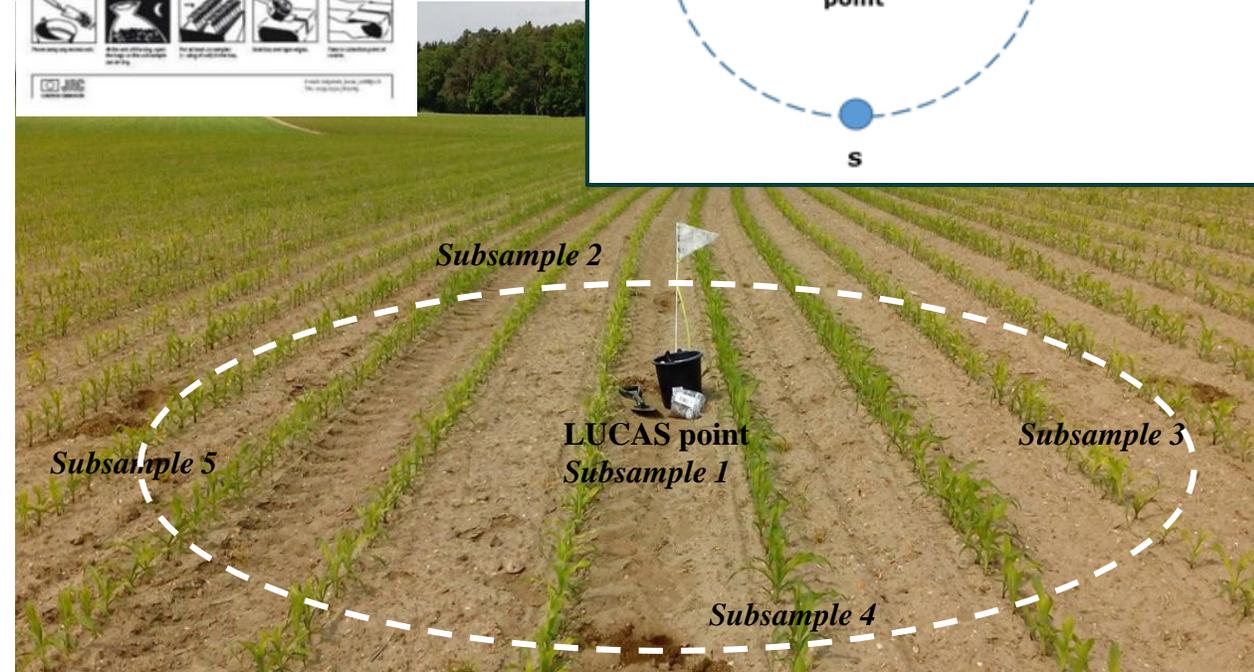
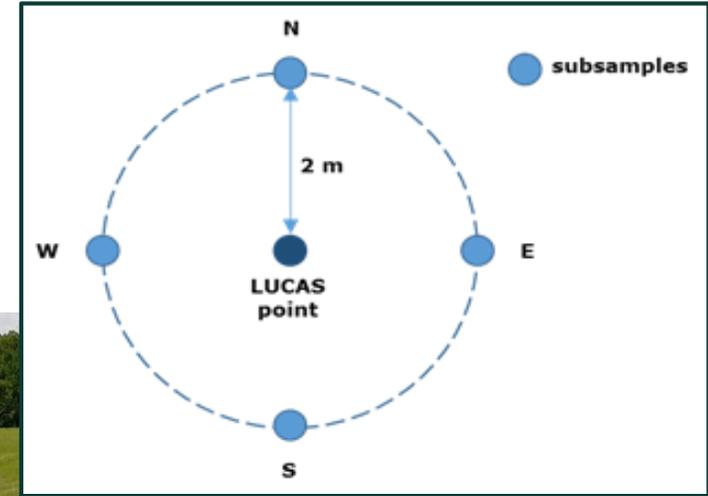
LUCAS Soil Module

- Subset of EUROSTAT LUCAS Land Use/Cover Survey
- Carried out 2009/2012, 2015, 2018
- 22,000 locations across EU
- c. Some data for AC & Switzerland
- Only harmonized soil data collection programme for EU
- Extending in scope
- Survey underway for 2022
- Methodology extended to Africa (Soils4Africa Project)



LUCAS Soil Module

- A **topsoil sample** from LUCAS Grid points
- Composite of **5 subsamples**
- **c. 2m from point**
- Mix in bucket
- Take out approx. weight: **500 g** (5 heaped trowels)
- Sampling equipment
 - Spade and trowel
 - Bucket
 - Meter stick
 - Plastic bags and ties
 - Labels
 - Box to store and transport samples



<https://ec.europa.eu/eurostat/web/lucas/lucas-photo-viewer>

The screenshot shows the Eurostat website interface for the LUCAS Photo Viewer. At the top, there is a navigation bar with the Eurostat logo, the tagline "Your key to European statistics", and links for Cookies, Privacy policy, Legal notice, My alerts, and Contact. A search bar is also present. Below the navigation bar, there is a breadcrumb trail: European Commission > Eurostat > Land cover/use statistics > Lucas photo viewer.

The main content area is divided into three columns:

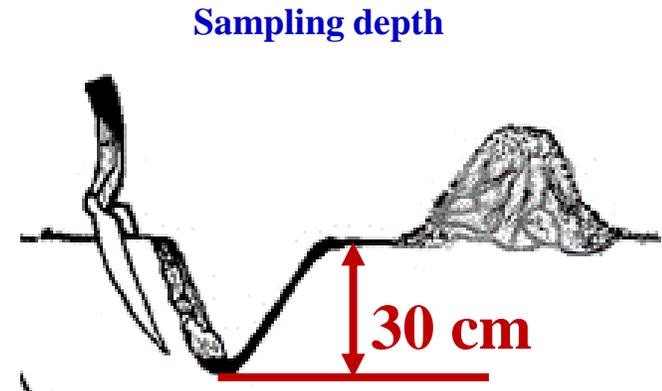
- LAND COVER/USE STATISTICS (LUCAS):** Contains a sidebar with navigation options: Overview, Data (Database, LUCAS Grid, Primary data), LUCAS PHOTO VIEWER (Order form, Publications, Methodology, Use cases, Links), and SEE ALSO (Help file, Order LUCAS Photos).
- LUCAS PHOTO VIEWER:** Features a title "The Statistical Atlas and the LUCAS photo viewer" and a map of Europe. The map displays LUCAS points and is overlaid with a statistical atlas interface. A pop-up window shows a grid of photos and associated data for a selected point.
- SEE ALSO:** Contains links for "Help file" and "Order LUCAS Photos".

Below the map, there is a text block explaining the Statistical Atlas and LUCAS points, followed by a text block describing the LUCAS Viewer's functionality, and a final text block mentioning an online form to order a larger collection of pictures.

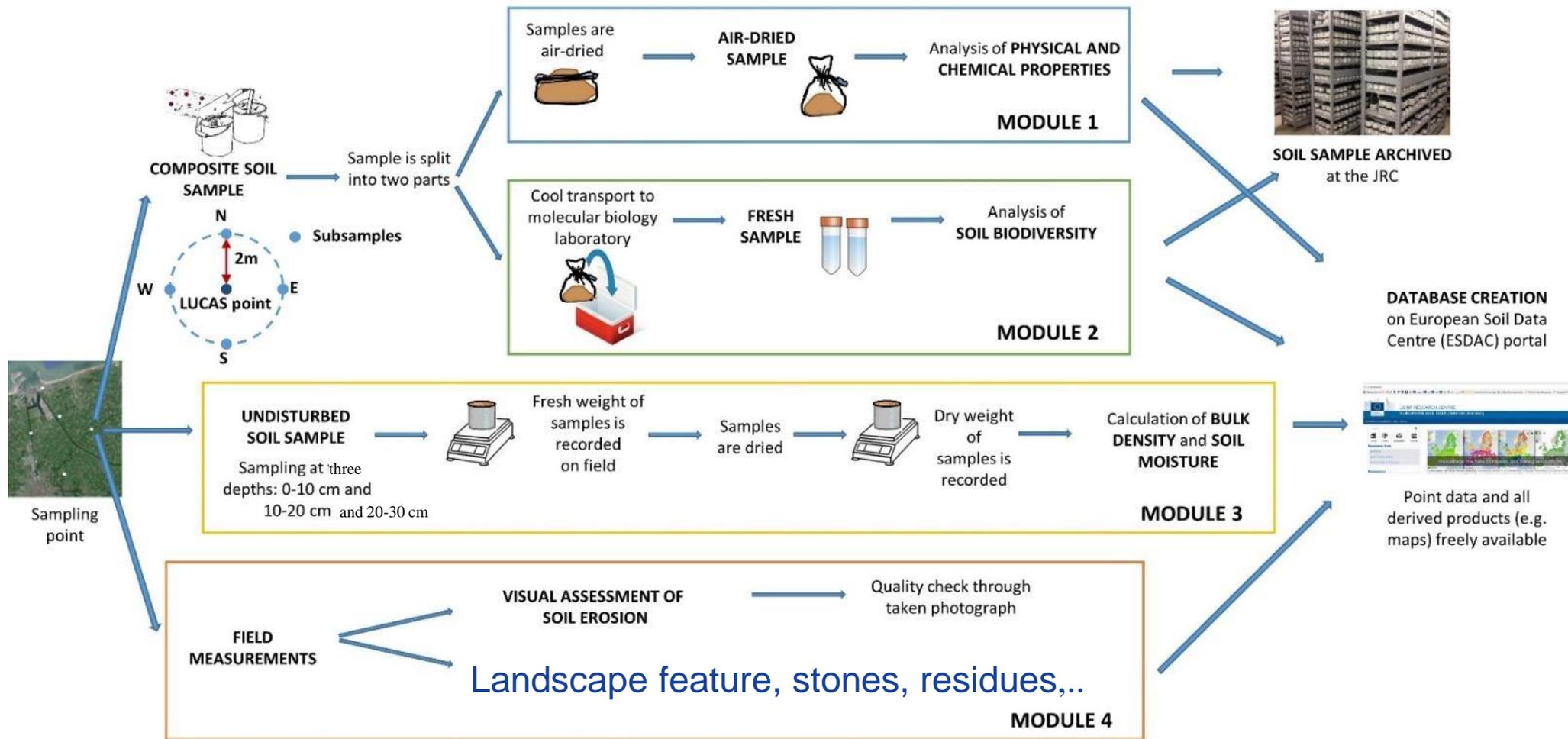
Standard sampling and analysis

Key aspects of the sampling:

- V-shaped hole
- Control of sampling depth: 0-30 cm
- Sub-sample and composite samples
- Parameters measured by single laboratory using ISO/CEN standard methods (when available)



LUCAS-Soil: field sampling



What happens to LUCAS samples

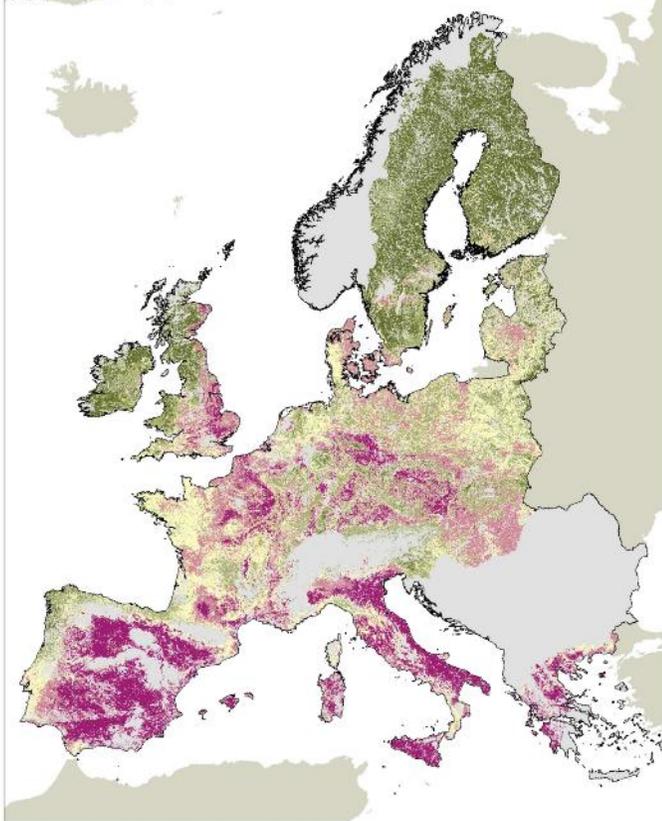
- Residues stored at JRC
 - >60,000 samples
 - 1000 frozen
- Researchers visit JRC to take soil samples for new analysis
- Long-term archive



LUCAS soil:2009-2018

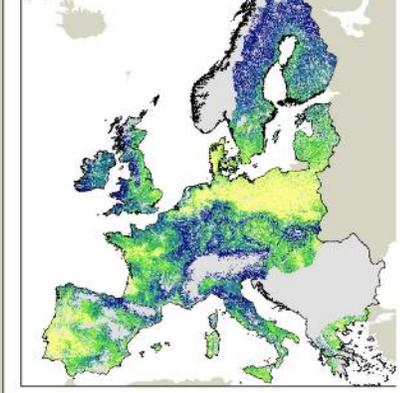


(a) Respiratory quotient



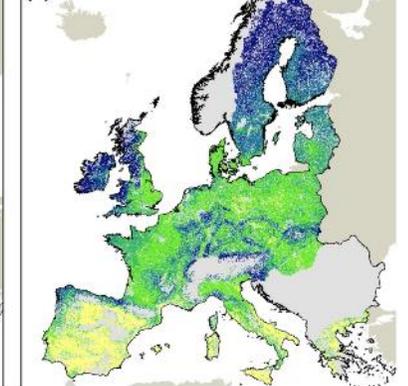
Respiratory quotient
 0.0003 - 0.0020
 0.0020 - 0.0031
 0.0031 - 0.0049
 0.0049 - 0.0073
 0.0073 - 0.0472

(b) Microbial biomass



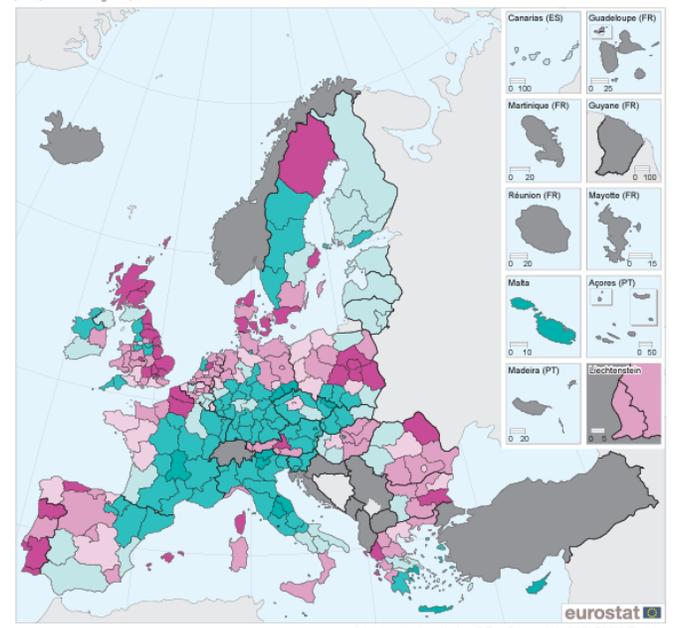
Microbial biomass
 95.94 - 220.91
 220.91 - 279.22
 279.22 - 345.86
 345.86 - 429.17
 > 429.17

(c) Potential basal respiration



Potential basal respiration
 0.1098 - 0.5288
 0.5288 - 0.9478
 0.9478 - 1.7857
 1.7857 - 3.0426
 > 3.0426

Map 12.6: Overall change in soil organic carbon stock for croplands, 2009-2015 (% by NUTS 2 regions)



EU = -0.04
 < -2.0
 -2.0 - < -0.5
 -0.5 - < 0.0
 0.0 - < 0.5
 0.5 - < 2.0
 ≥ 2.0
 Data not available

Administrative boundaries: © EuroGeographics © UN-FAO © Turkestat
 Cartography: Eurostat — GISCO, 07/2020

0 200 400 600 800 km

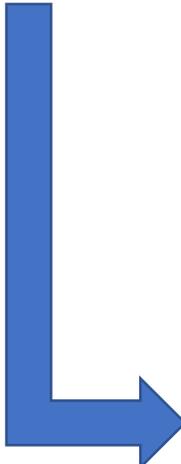


Smith et al 2021, Global Ecology and Biogeography. <https://doi.org/10.1111/geb.13371>

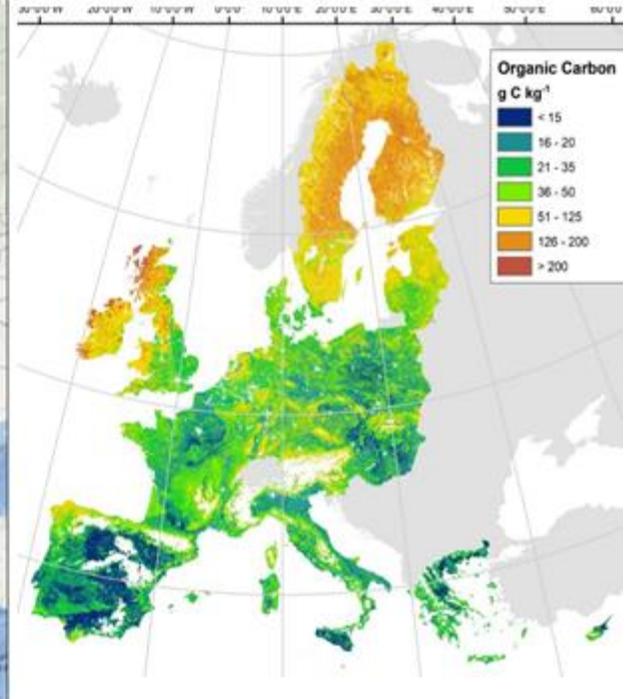
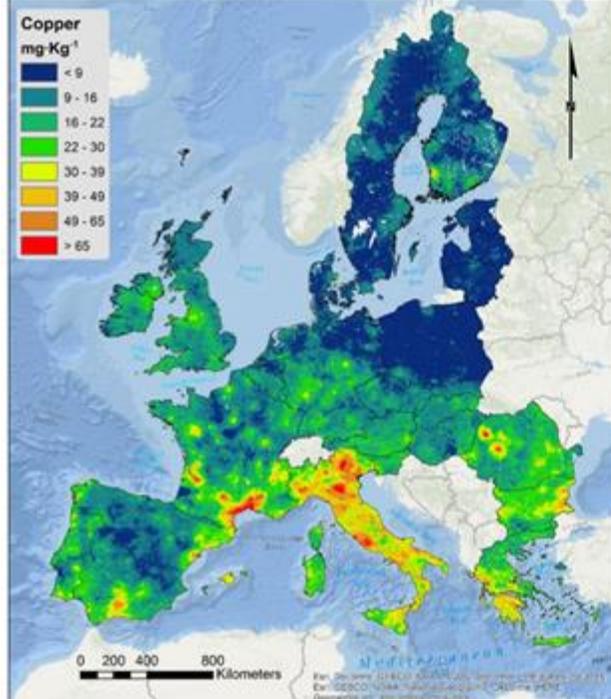
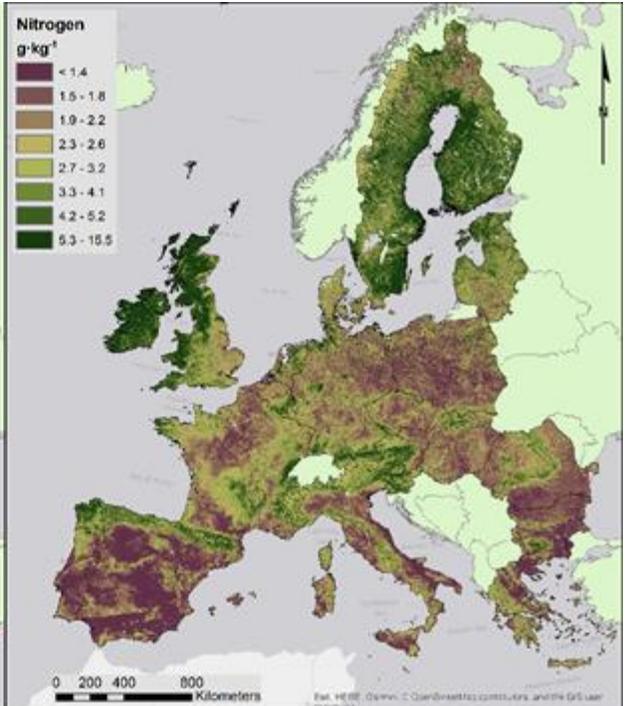
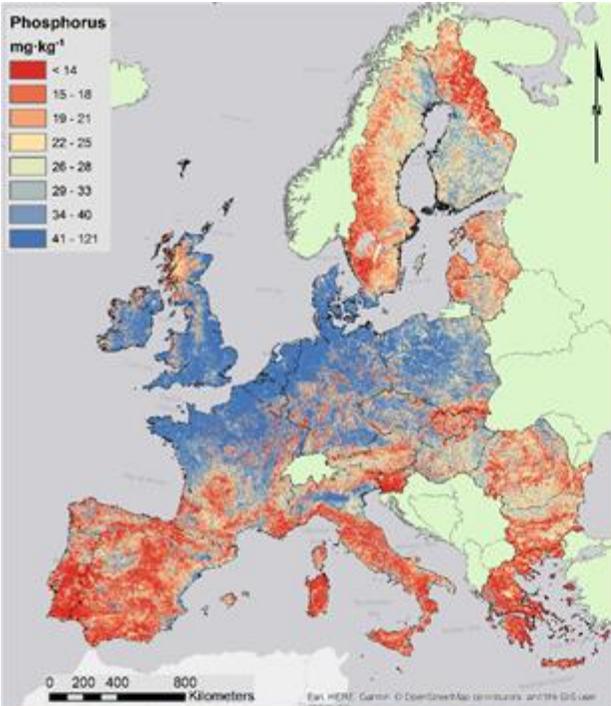
Note: EU excluding Croatia. The indicator shows the changes in soil organic carbon stocks in croplands between 2009 and 2015 for a depth of 20 cm, relative to 2009 levels. Changes were assessed by fitting a machine learning algorithm (Gradient Boosting Trees model) on measured organic carbon concentrations of samples taken during the 2009 (2012 for Romania and Bulgaria) and 2015 LUCAS surveys. While the results are presented for NUTS 2 regions, the area of cropland is smaller. Negative values indicate environmental degradation. Changes in soil organic carbon stocks generally occur slowly.
 Source: European Commission, Joint Research Centre (JRC)

Goal 1: EU-Wide Soil Monitoring

From monitoring chemical, physical and biological soil properties to modelling the spatial distribution of soil properties in the EU



- Coarse fragments
- particle-size distribution (clay, silt, sand)
- pH
- **Organic carbon**
- Carbonate content
- **Total nitrogen content**
- Extractable potassium content
- **Phosphorous content**
- Cation exchange capacity
- Electrical conductivity
- Heavy Metals
- Multispectral properties
- Pesticides (90 substances)
- Neonicotinoid insecticides
- **Fungicides (e.g. copper in soils)**
- Herbicides
- Antibiotics
- Soil Biodiversity



Soil in LUCAS 2022

Intensive discussion within EC 'land community' – during lockdown!

Key developments

- Meet increasing policy needs
- Supporting the needs of external users - Collaboration with Member States
- Questions regarding sampling framework of Soil module
- Updates to field sampling protocol



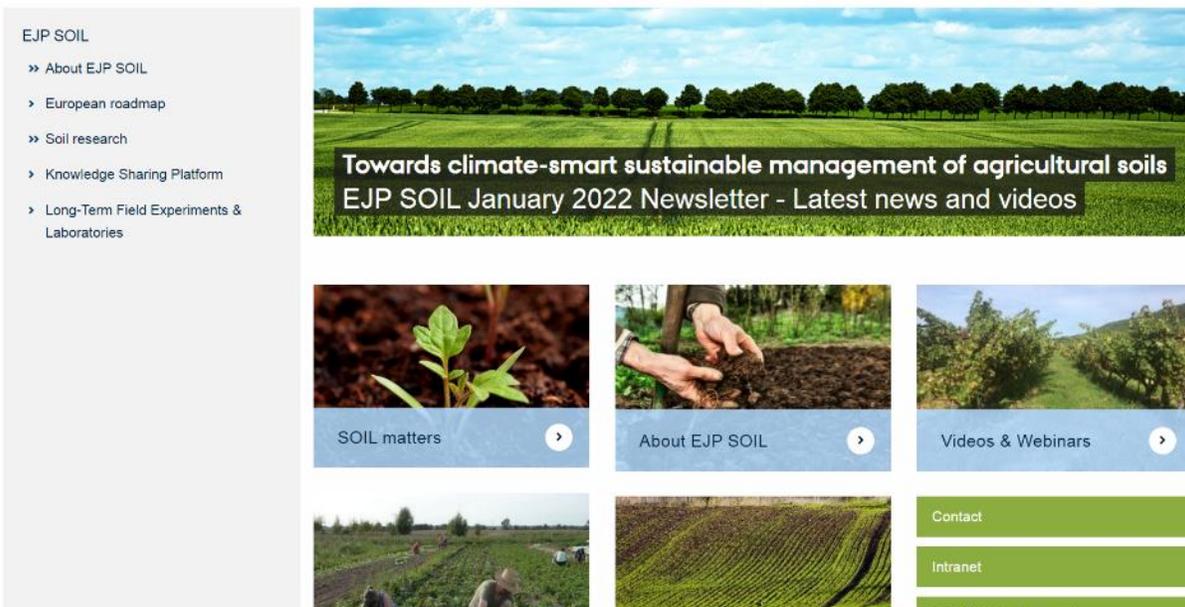
https://esdac.jrc.ec.europa.eu/public_path/u891/Proposal_paper_for_LUCAS2022_Soil-Final_xPUBSY.pdf



Collaboration with Member States

European Joint Programme on Agricultural Soils (EJP-Soil)

- Formal collaboration between EC and MS (€80 million)
- Harmonise LUCAS with MS monitoring systems



Alpine Convention Soil Information System

- Adopted LUCAS as a model for harmonized monitoring
- Alpine region under represented in LUCAS

- Invitation to propose some LUCAS GRID coordinates as part of the fixed pool
- No restrictions other than accessibility
- c. 550 locations specified for AT, BE, DE, EE, FR, IT, LV & SK

EU Soil Observatory

- Integrated soil monitoring system for EU

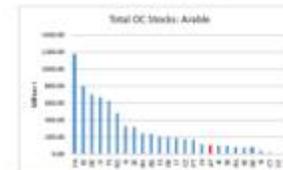
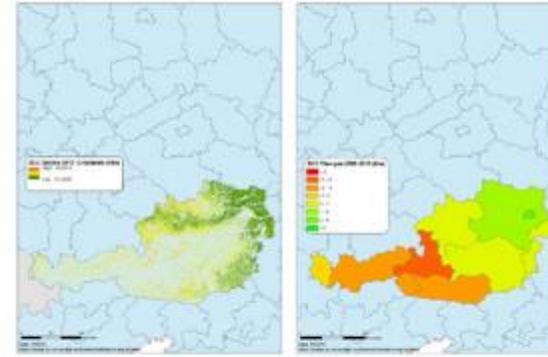


A EU Soil Indicator Dashboard: Indicators for Policy Options and Reporting

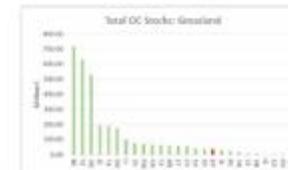


- EU Soil Thematic Strategy
- Common Agricultural Policy
- Zero Pollution Action Plan
- Circular Economy Action Plan
- Farm to Fork Strategy
- Climate Action
- EU Biodiversity Strategy
- SDG's Goals and Targets
-

Soil organic carbon stocks⁴



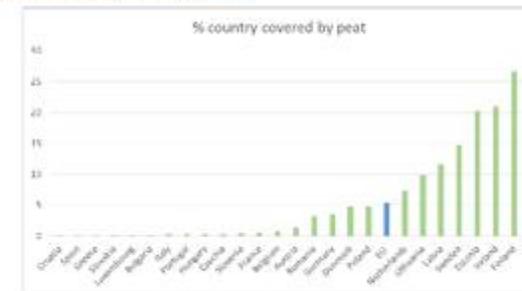
Cumulative soil organic carbon stocks – arable (Mt): 115.4



Cumulative soil organic carbon stocks – grassland (Mt): 64.2

Change in arable stocks 2009-2015 (Mt): 0.280

Change in grassland stocks 2009-2015 (Mt): -0.054



⁴ Panagos et al 2020. Soil-related indicators to support agri-environmental policies

⁵ Tanneberger et al 2017. The peatland map of Europe. DOI: 10.19189/MaP.2016.OM8.264

EUSO Goal 5: Scientific Debate & Citizen Engagement



Main elements of the EUSO FORUM



EU4SOILS

- Inclusive and open to all stakeholders:
 - Relevant Commission Services
 - European Agencies
 - International Organizations
 - Member States representatives
 - Farming Associations
 - Industry representatives
 - NGO's
 - Interested citizens

- Stakeholder Forum: 19-21 October 2021

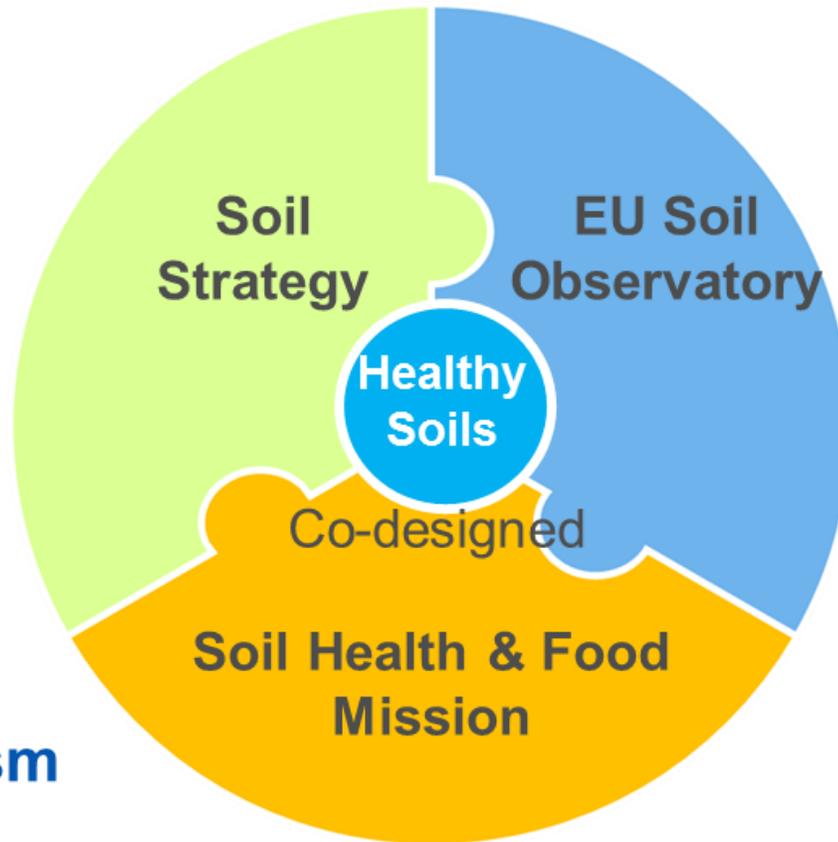
<https://ec.europa.eu/jrc/en/event/other-event/euso-stakeholders-forum>

- Setup of dedicated **Working Groups** on specific scientific and policy questions

Conclusions

Policy framework for action

Funding and coordination mechanism



Long-term reservoir of soil data and information

https://ec.europa.eu/environment/publications/eu-soil-strategy-2030_en

Thank you for your attention!

luca.montanarella@ec.europa.eu

ec-esdac@ec.europa.eu

 #EUSoil

EU SOIL
OBSERVATORY

<https://ec.europa.eu/jrc/en/eu-soil-observatory>

