Forestry & (semi)natural lands focusing on the Balkans & neighbouring countries; „NATI00NS”, 01. 07. 2024

SOIL-CHALLANGES in the REGION
Developing measurable site specific and time-lapse soil health parameters

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Member of Mission Board for Soil Health and Food, 2021

#HorizonEU #MissionSoil

MISSION FOR SOIL HEALTH AND FOOD

Introduction

- We live in a world of **rapid social, economic and ecosystem changes**, facing major environmental challenges such as global warming, soil-fertility- and biodiversity-loss and pressures on natural resources.

- Addressing these topics requires **world-class ecosystem research** by a well-connected, extensive **community of experts**, supported by **advanced sites and facilities**, openly shared and easily accessible data and capacity building programmes.

Adaptation to climate change, including societal transformation

Healthy oceans, seas, coastal and inland waters

5 mission areas

Cancer and human health

Climate-neutral and smart cities

Soil health and food

https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme/mission-area-soil-health-and-food_en

The soil-degradation is one of the main concern…

Soil is a renewable energy source, but how to **measure the quality**, so as to renew, regenerate them with ecosystem functioning.

Soils are threatened globally, and in EU:

- **2.8 million potential contaminated sites**
- **65-75% of agricultural soils** with nutrient inputs at levels risking eutrophication (fertilizer nutrients)
- **24%** of land with unsustainable **water erosion** rates
- **23%** of land with high density subsoil indicating **compaction**
- **25%** of land at High or **Very High risk** to **desertification** in Southern, Central and Eastern Europe (2017)

Land degradation is further exacerbated by the effects of climate change

HEALTHY SOIL IN HEALTHY PLANET

Key principles

- Practical solutions instrumental to the Green Deal, SDGs through Farm to Fork, Bioeconomy Strategy, CAP, Climate Pact, Biodiversity strategies
- Citizens engagement to stimulate a change in the mindset
- Soil as continuous ecosystem service
- Interdisciplinary and system driven scientific approaches and actions

Key goals

- Increased % of healthy soil in EU & achieved land degradation neutrality
- Adequate quantities of healthy food, feed and circular biobased products
- Capturing carbon and reducing GHG emission
- Protecting and preserving biodiversity
- Reducing contamination
- Reporting mechanisms in place for all Member States

Phase 1

Knowledge capitalisation and enhancement

Assessment of significant KPIs and mapping + lighthouse farms analysis

Phase 2

Co-design and implementation of solutions

Agro-system living labs (ALL)

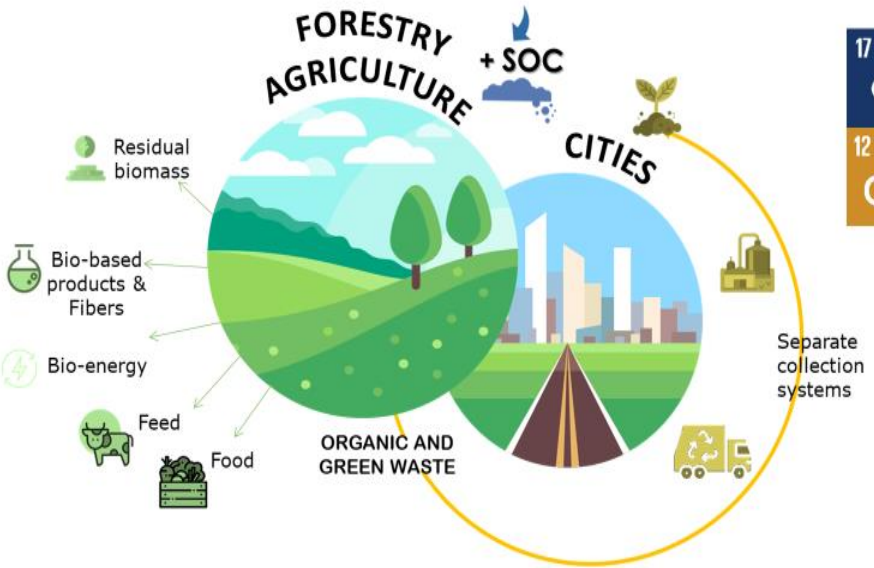
Phase 3

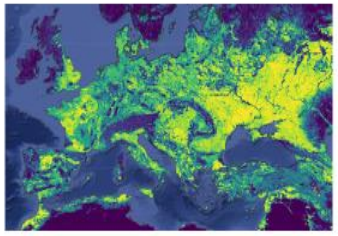
Impact assessment &improving feedback

KPI assessment against baseline: local, regional, national and EU level

Possible KPIs:

- Land use & management
- Net Primary Productivity, Land cover;
- **Soil organic matter (SOM): soil organic carbon stock;**
- Soil structure: water infiltration, soil compaction;
- **Soil biodiversity: microbial and soil animal communities**
- Soil nutrients
- Soil pH and chemistry
- Soil contaminants





R&D&I development
Policy/Supporting/Incentive schemes

Training and dissemination
Certification & Standardization

Caring for soil is caring for life – What to achieve?

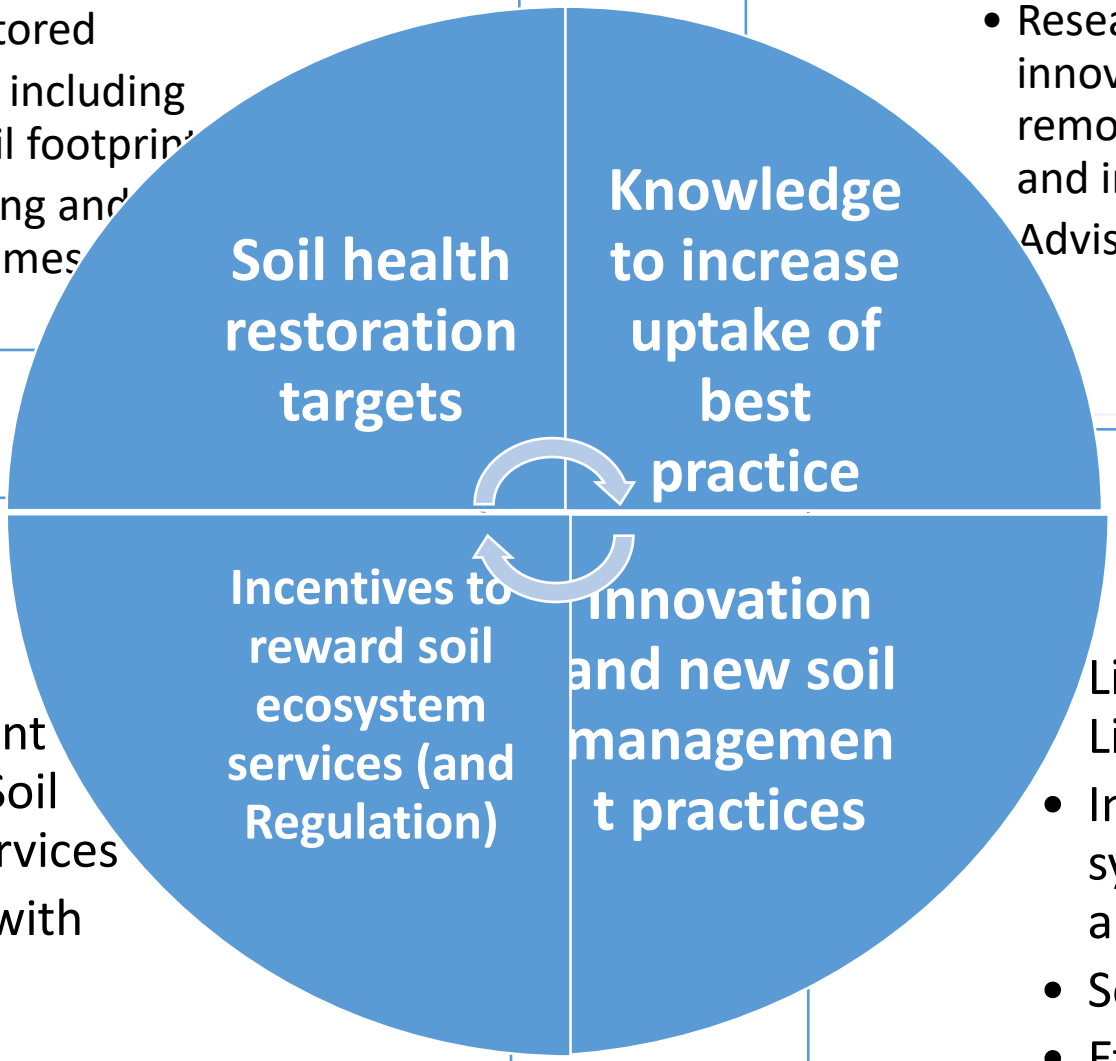
- **at least 75% increase in healthy soils**
- **restore 50% of degraded land**
- conserve **soil organic carbon stocks** (e.g. in forests, permanent pastures, wetlands)
- stop **soil sealing** or increase re-use of urban soils
- **reduce soil pollution,** with at least **25% area of EU farmland under organic agriculture**,
- a **5-25%** of land with **reduced risk from eutrophication, pesticides, anti-microbials**, etc.
- **prevent erosion** on **30 to 50%** of land
- double **restoration of polluted** brown field **sites**

Implementation framework for mission Soil Health and Food (4 layers")

- 6 Soil Health Indicators
- X ha of soil restored
- 6 or 7? Impacts including no export of soil footprin
- Active monitoring and evaluation schemes Member States

- Improved data and information
- Research and innovation to remove barriers and increase uptake

Advisory services



- Encouragement payment for Soil Ecosystem Services
- Partnerships with industry
- CAP
- Soils Directives

Lighthouses & Living Labs

- Integrated systems approach
- Soil biome
- Effective new technologies

How to meet the mission objectives of Soil Jealth and Food?

- co-creation, testing and demonstration of solutions in **living labs and lighthouses**
- **research and innovation**
- closely **monitoring** the status of soils
- strengthening **independent advisory services** for farmers and foresters
- **encouraging changes to policies** and day-today practices of land managers, industries and consumers:
- **Soil health depends on the actions**!

Healthy soils and parameters of sustainable use

Soil-health indicators	SDG
1. **Plant-cover** (ratio, tillage methods, type of plants)	**SDG 2, 13** (reduction of hunger, climatic changes)
2. **Soil structure, porosity, plasticity** (water-holding capacity, soil-biology, glomalin)	**SDG 6** (The water protection)
3. **Soil organic Matter (SOM), Carbon sequestration** (humus-quality, stability)	**SDG 13** (reduction of GHG)
4. **Biodiversity** (the soil food web, soil flora and fauna)	**SDG 15** (life in the soil)
5. **Nutrient availability in soil** (macro, meso, microelements, malnutrition, functional starvation)	**SDG 2, 6 és 3** (Geochemical circulation of elements)
6. **Soil pH, CEC;** (salinity, acidity, heavy metals toxicity, pollution)	**SDG 3, 15** (adaptability, health)

Value of soils – main parts of the research

PRODUCTION
food, feed, textiles, wood and other bio-based products

CLIMATE
healthy soils are the largest carbon storage on Earth and can play a role in mitigating climate change

BIODIVERSITY
there are more organisms in a handful of soils than humans on the planet

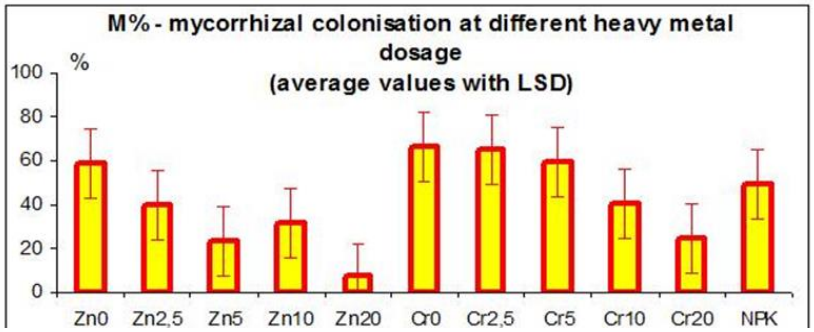
WATER
healthy soils filter water and can prevent floods and droughts

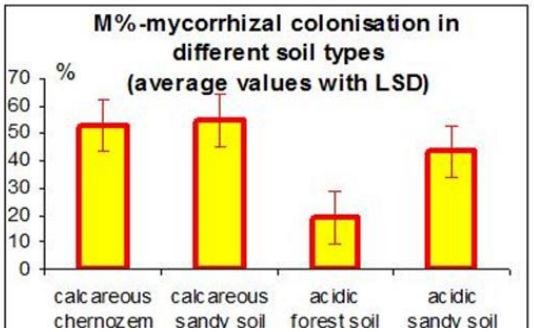
NUTRIENT CYCLING
C, N, P and other nutrients are stored, transformed, and cycled in healthy soils

LANDSCAPES
supporting the quality of our landscapes and greening of our towns and cities.

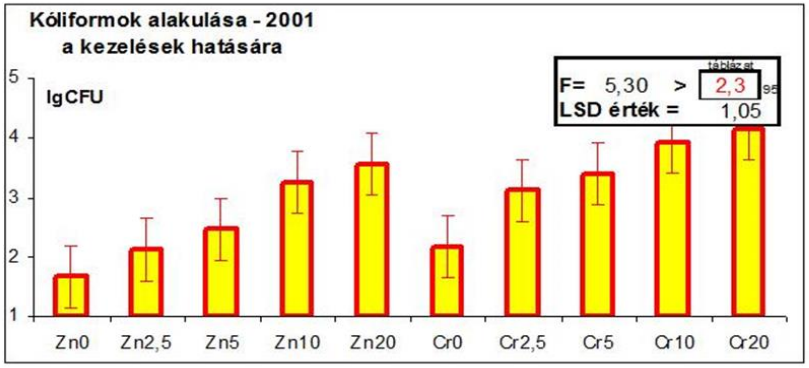
Soil Organic Matter – The risk and the food-quality

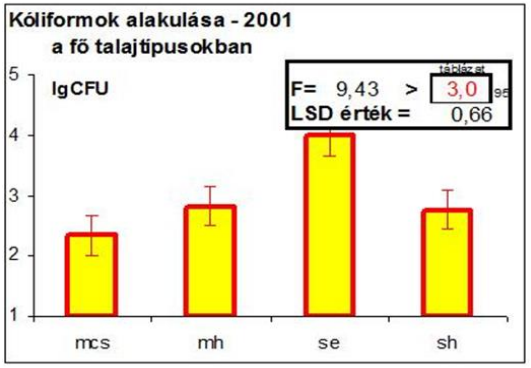
Accumulation of toxic heavy metals on a long-term level





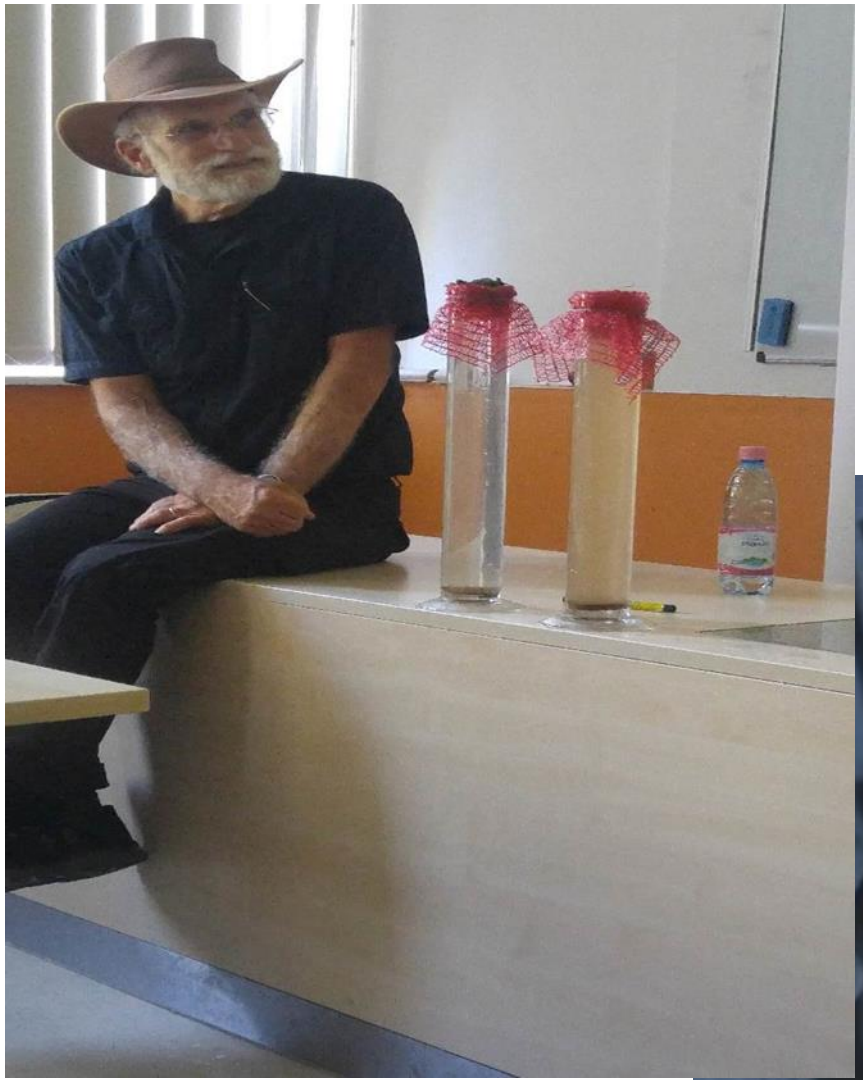
Micorrhiza fungi loss





Potentials of food-safety microbes

Measurable parameters for soil-degradation – i.e. the aggregate-stability!



Ray Weil, University of Maryland, USA examining soil degradation

No-till
Organic
soil

Intensive
tillage,
pesticide

Trustable ecological research fields are needed. Forests as real value and modells.

INTERNATIONAL LONG TERM ECOLOGICAL RESEARCH-Critical zones and the Socio-ecological changes in one.

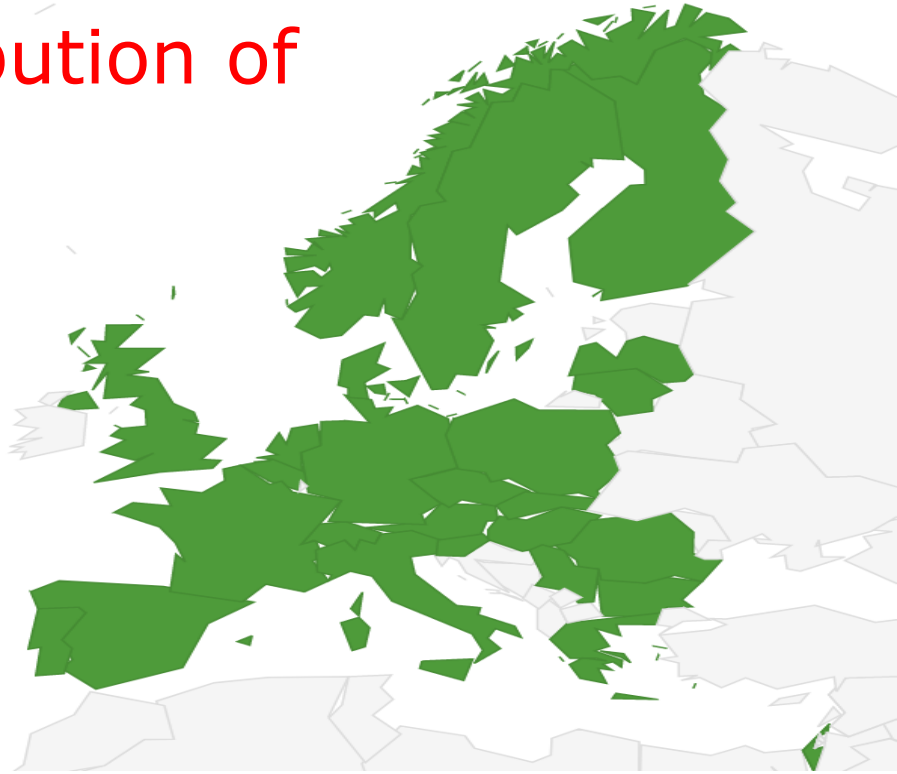
European supported ILTER network from 2002. Preparatory phase project 2020-2025.

Towards a whole-system approach for ecosystem science, 23-27 June, Tampere, Finland

https://elter-ri.eu/science-conference

Potentials to the Contribution of the BALKAN Countries

Plant to reach >500 sites and >50 larger LTSER (Long-Term Socio-Ecological Research) **platforms across Europe**



Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom

DIRT (Detrital Input and Removal Treatment)

Sites with DIRT Plots

Sites with Dirt Plots (from Left to Right): H.J. Andrews Experimental Forest (OR, USA), Santa Rita Experimental Range (NM, USA), University of Wisconsin Arboretum ("Francis Hole DIRT plots")(WI, USA), Kellogg Biological Station (MI, USA), Bousson Experimental Forest (PA, USA), Harvard Forest (MA, USA), Sikfokut Forest (Hungary), Huitong Experimental Forest (China).

Partners in ILTER - DIRT experiments:

- Hungarian University of Agriculture and Life Sciences, Dept of Agri-Environmental Studies
- Debrecen University, Hungary
- BIOdeTECHT Ltd, Biology and Technology of Soil-Environmental Protection

Potentials to join EU-and National-funded projects – find the partners!

- Towards climate-smart sustainable management of agricultural soils, European Joint Partnership (EJP) about the Soils

EJP SOIL
European Joint Programme

CIRCASA

4 POUR 1000

Soil Mission Support

Coordination of International Research Cooperation on soil carbon sequestration in Agriculture

NATIOONS

vállalatok
eit
felsőoktatási intézmények
kutatóközpontok

NŐK A TUDOMÁNYBAN
WOMEN AND SCIENCE
OKTATÁS KUTATÁS ÜZLET EDUCATION RESEARCH BUSINESS

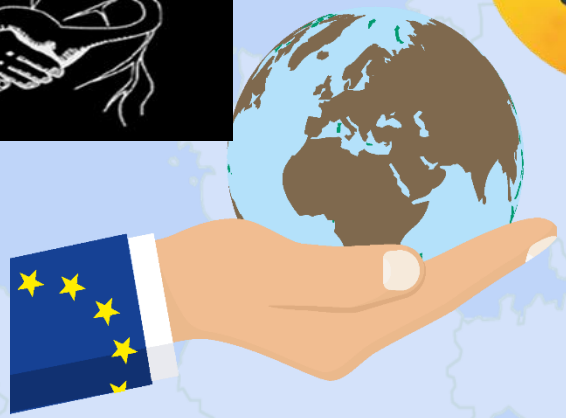
BEST4 SOIL

The symbiosis as real functioning!

- The **mission oriented research** created the basics of already known element and to see what are still missing.
- The **innovative aspects** are to involve all the elements from the society and to increse the awareness of poeople about our life and environment.
- **Multifactorial, ecological way of thinking and diverse sites**, knowledge and societal situations are needed.
- The **long-term monitoring** is a tool for the real understanding (SME independent partners are important in projects)
- Focus for the **food aspects** (quality and safety) – mnitoring tools are required!

Caring for soil is caring for life

Find your symbiont partners!



Sustainable Development Goals

Green Deal

- Farm to Fork and
- EU Biodiversity Strategy for 2030
- Circular Economy

http://ec.europa.eu/mission-soil

Thank you for your attention!

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