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Biodiversity in Soil Health and Carbon Cycling

ECOMONDO 2023
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Soils are beautiful and provide multiple ecosystem and productive services



Provision of fiber



Aesthetics



Provision of wood



Provision of support
for animals



Carbon storage and
greenhouse gas
regulation



Cultural identity



Provision of food



Regulation of pests and
disease populations



Filtering of nutrients
and contaminants



Heritage values



Provision of support
for human



Flood mitigation



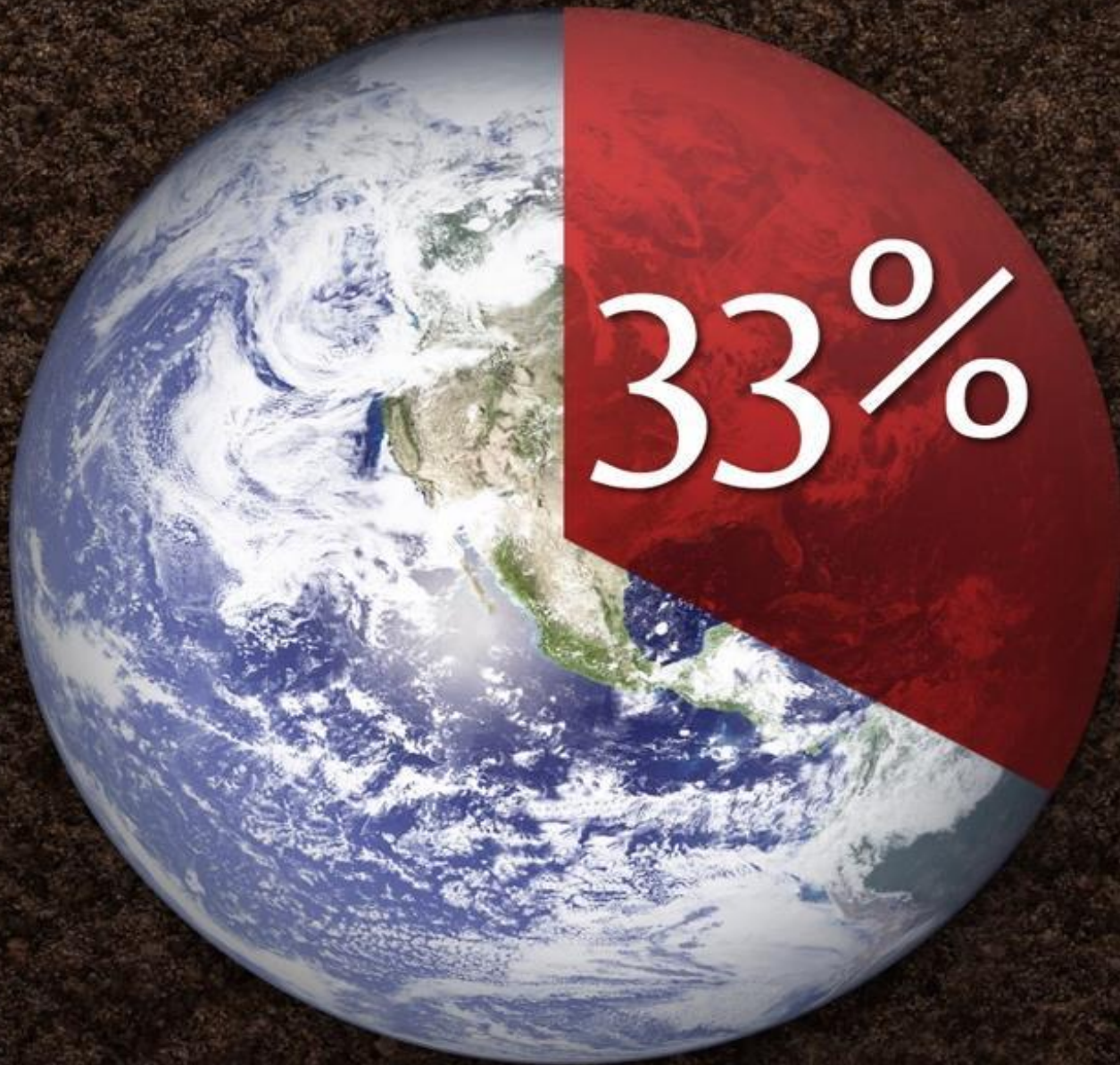
Detoxification and
recycling of wastes



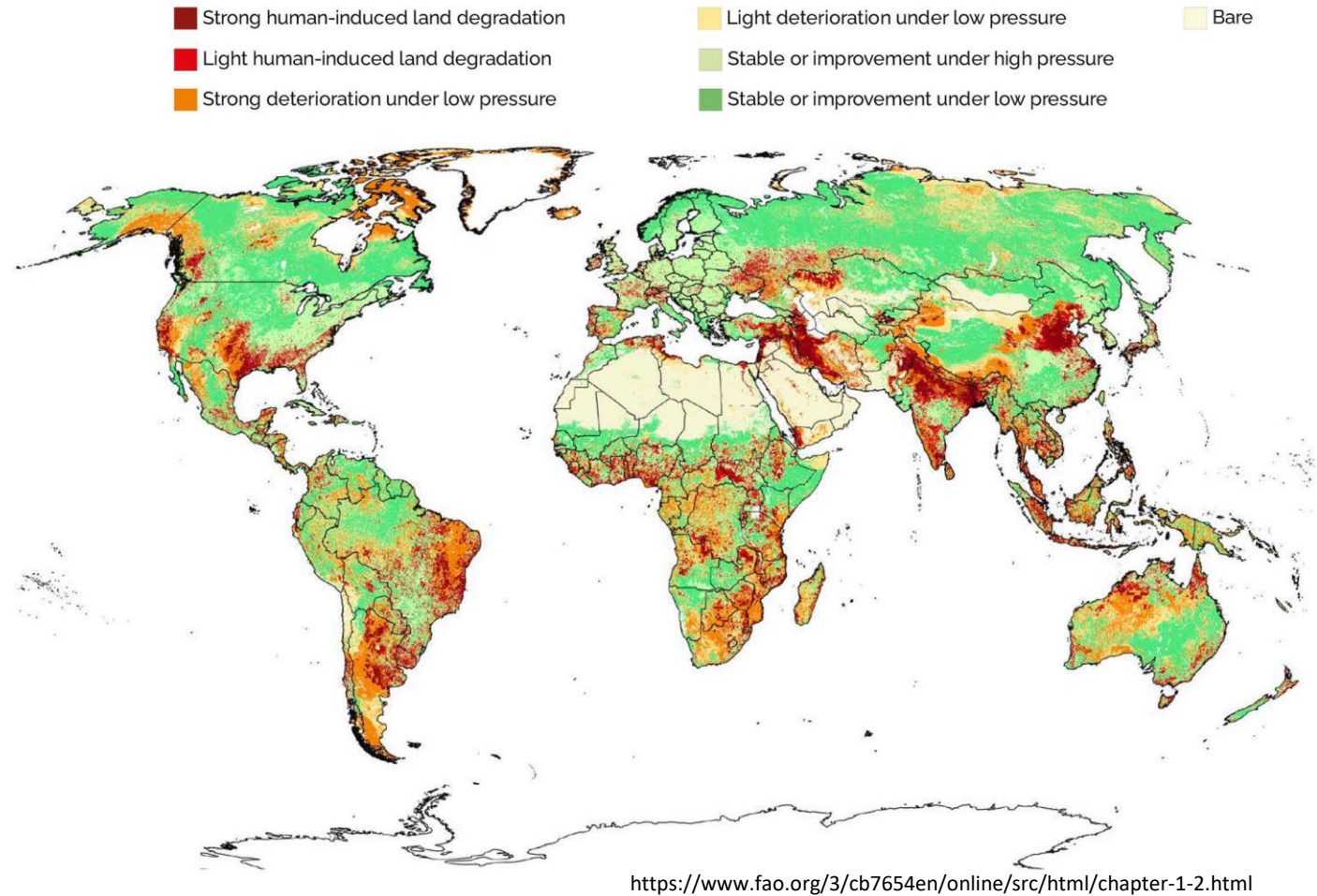
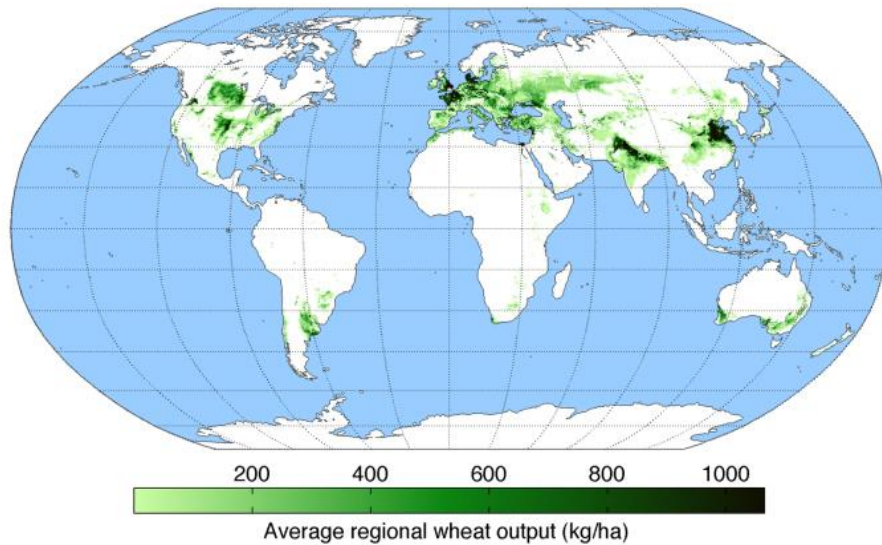
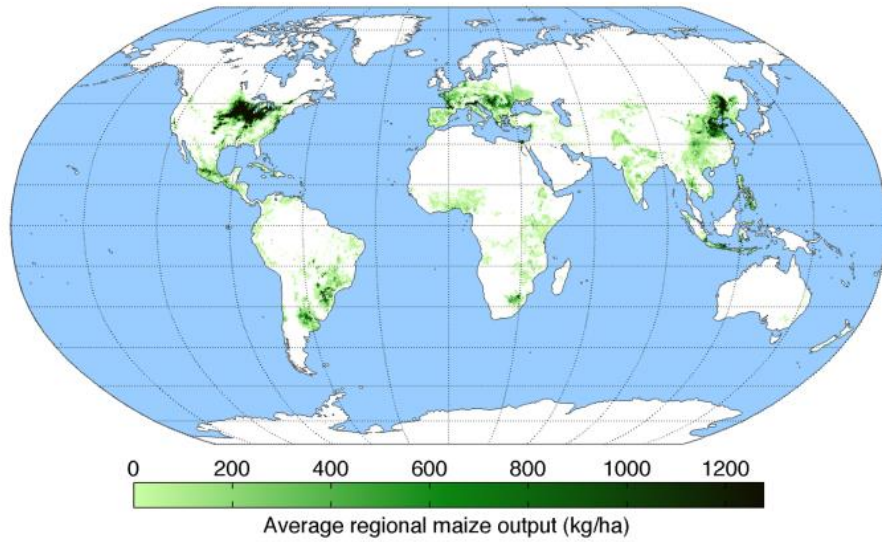
Recreation



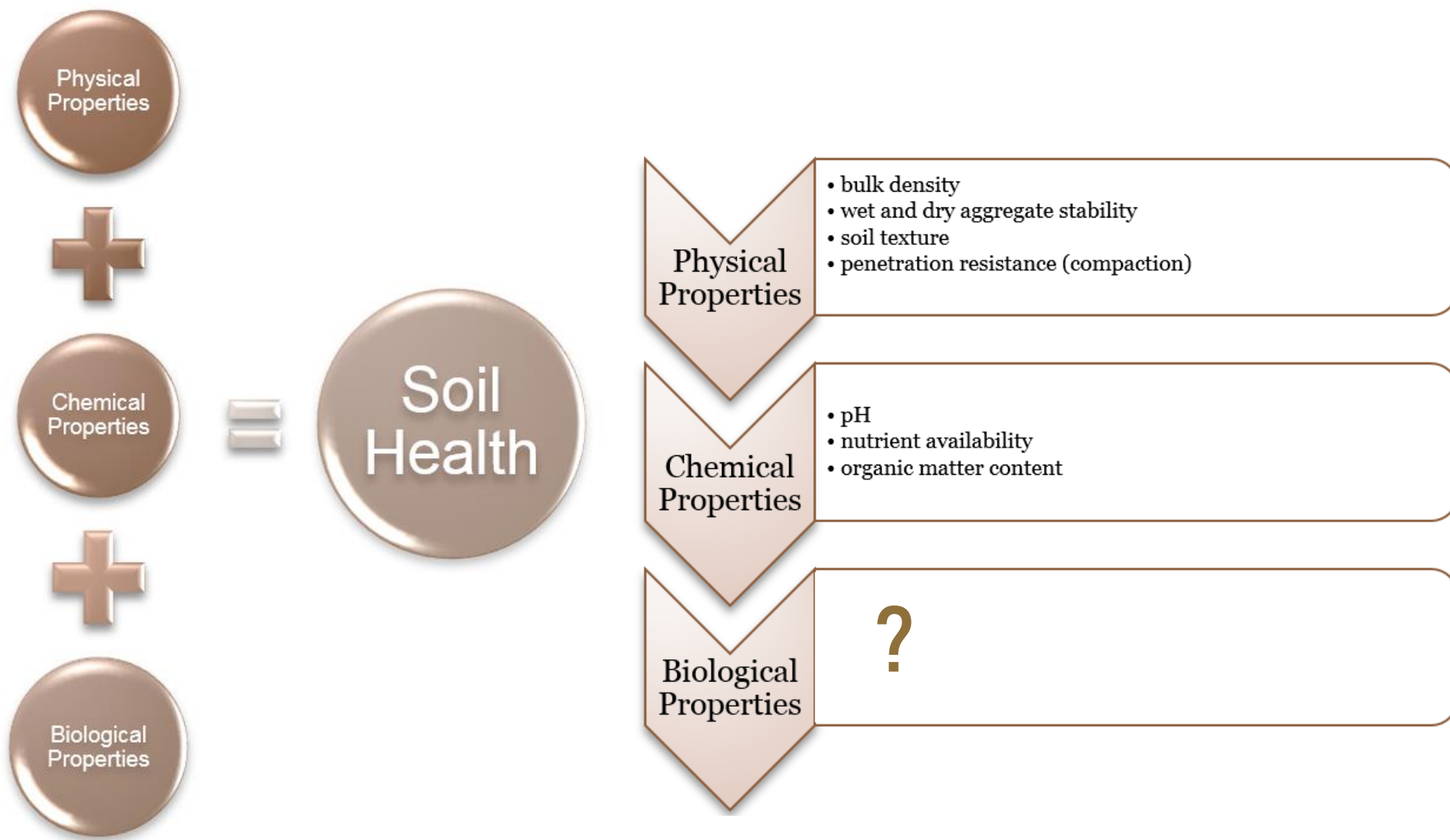
Provision of raw



Over 90 percent of
soils could become
degraded by 2050 if
business as usual
continues



Soils that are responsible for the four major staple crops of the world (sugarcane, maize, rice, and wheat; left) are some of the most degraded (above)





Soil is home
to ~60%
of the species
on Earth

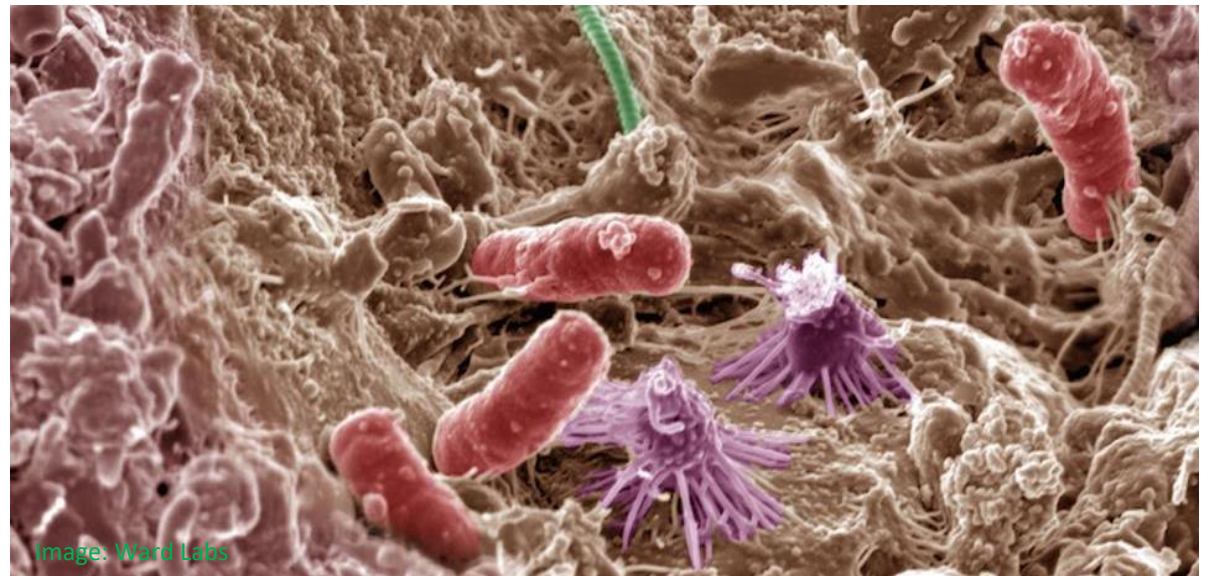


Image: Ward Labs

Anthony, M. A., Bender, S. F., & van der Heijden, M. G. (2023). Enumerating soil biodiversity. *Proceedings of the National Academy of Sciences*, 120(33), e2304663120.

Aboveground and belowground biodiversity

An inseparable interaction

Above-ground food web

Pollinators



Herbivores



Energy and matter



Energy and matter

Litter transformers

Saprophagous macrofauna

Ecosystems engineers

Symbiotic beneficial associations

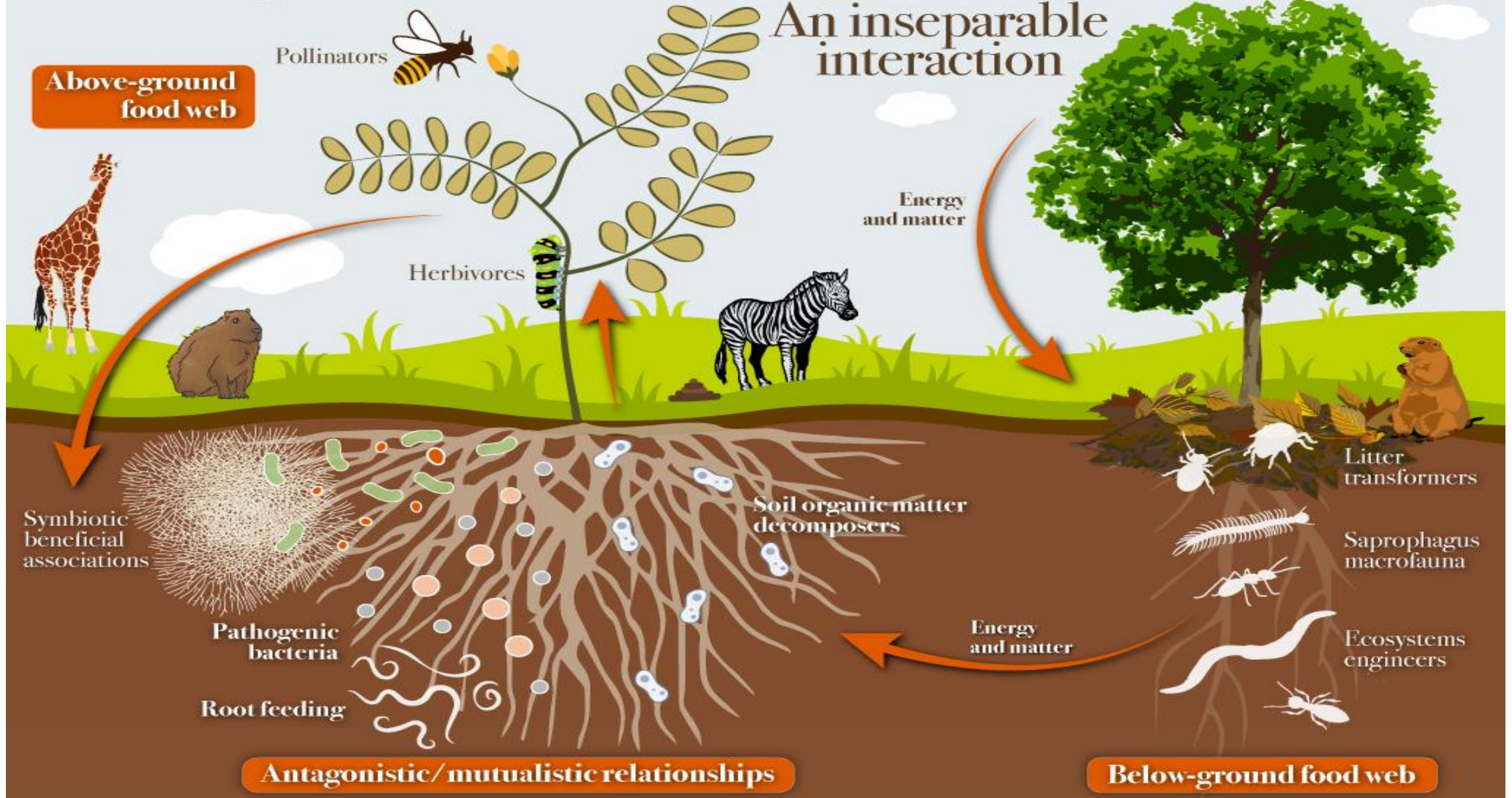
Pathogenic bacteria

Root feeding

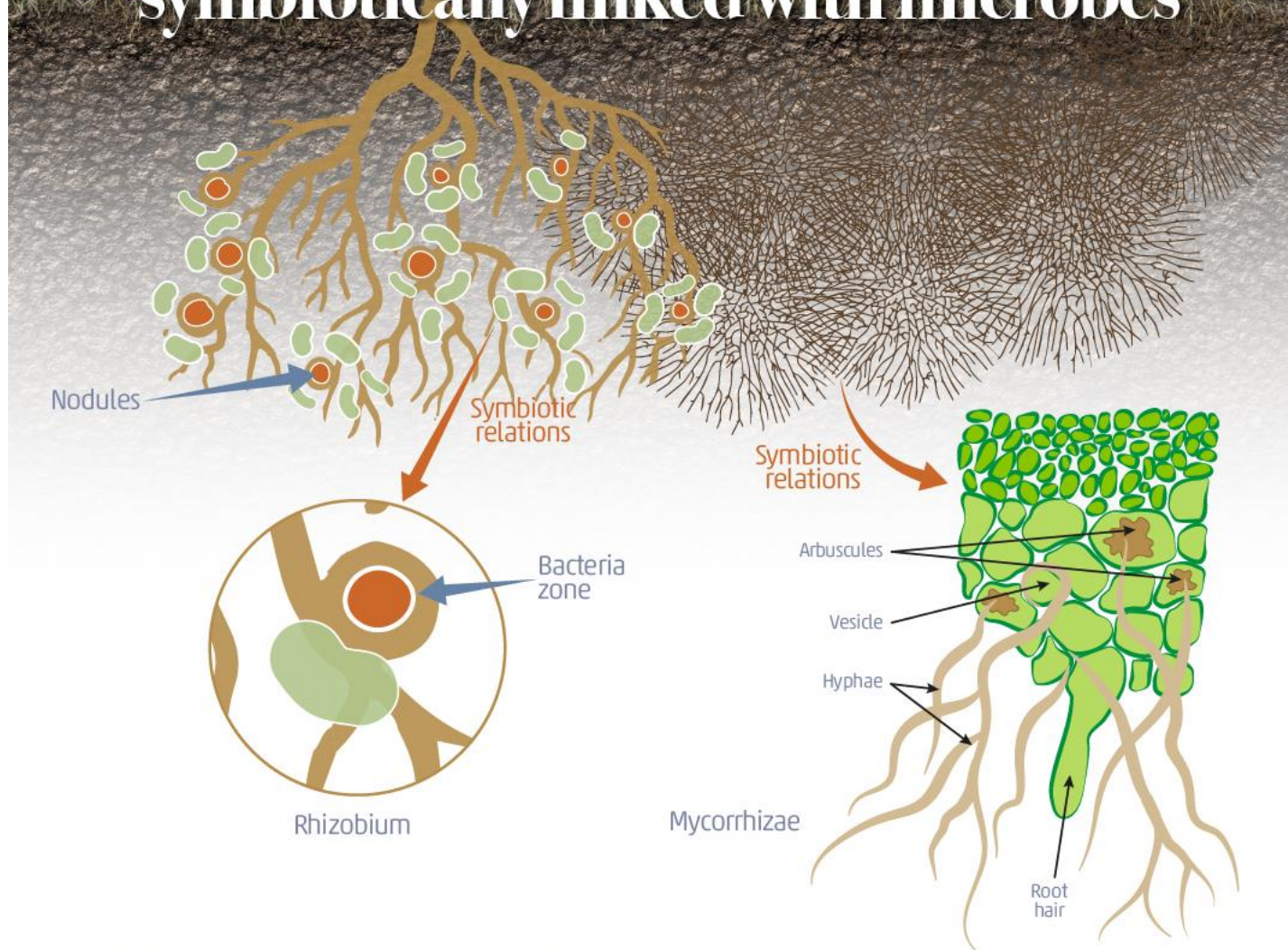
Soil organic matter decomposers

Antagonistic/mutualistic relationships

Below-ground food web



The Rhizosphere: 80% of plant species are symbiotically linked with microbes

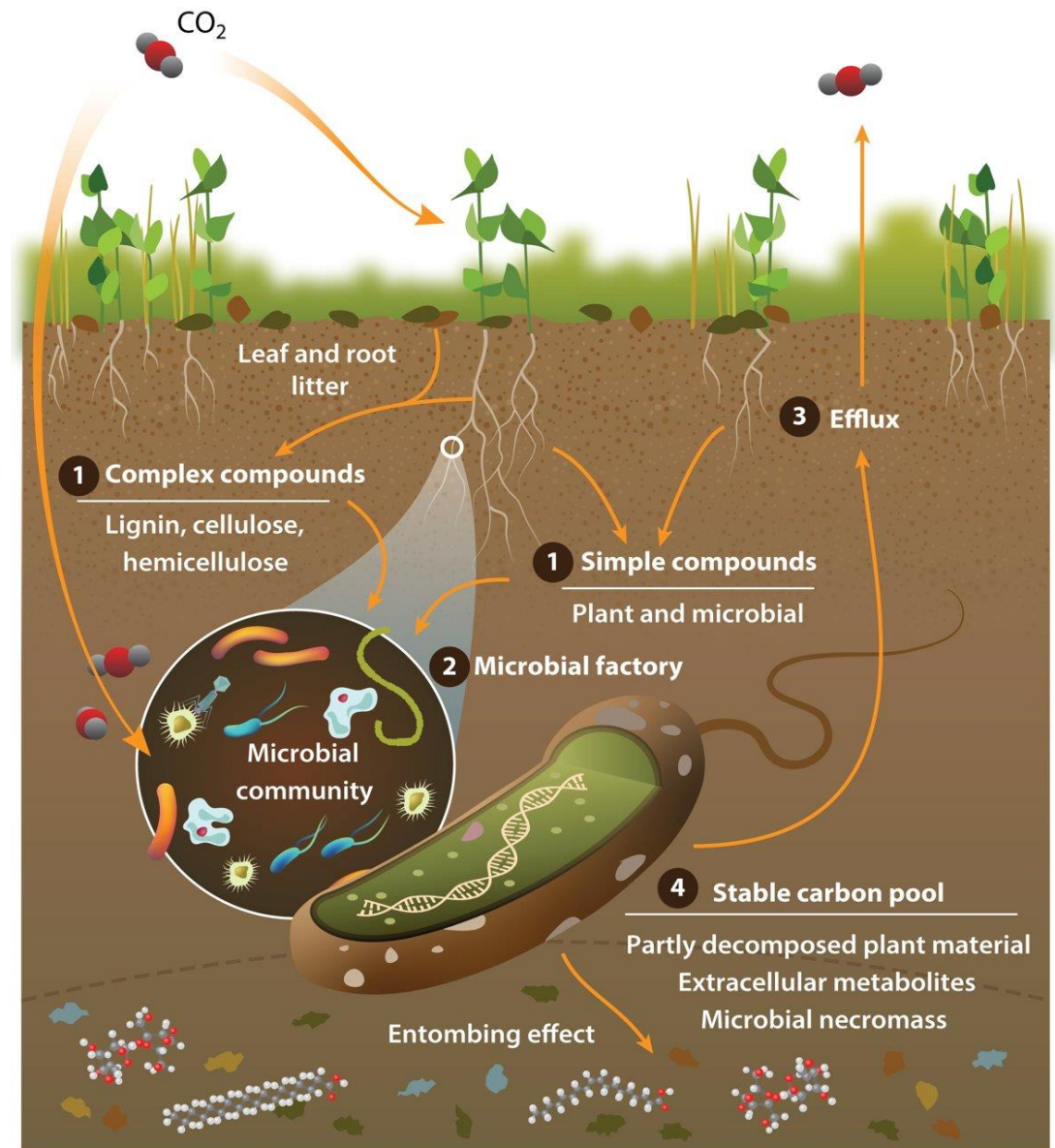
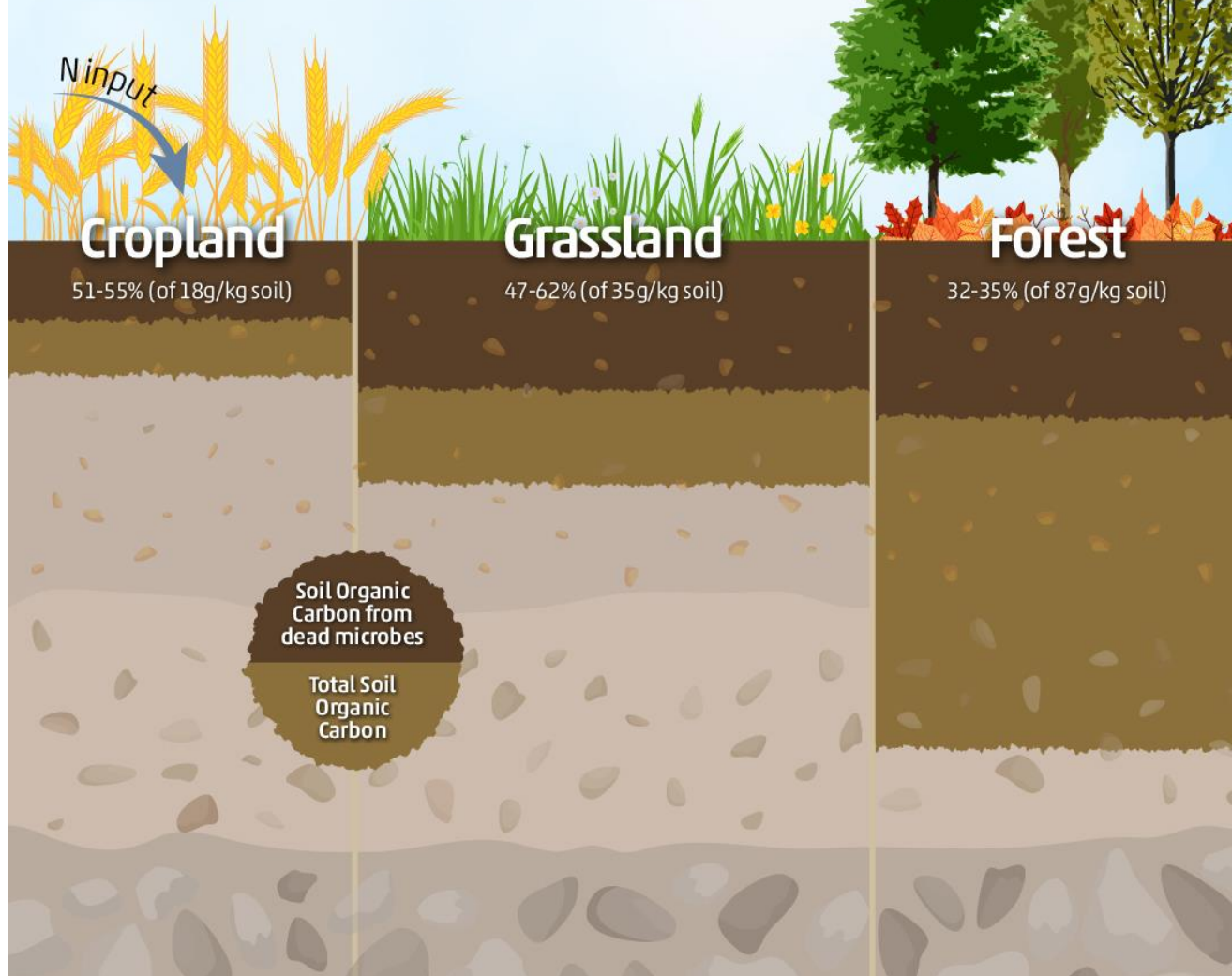


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GLOBAL SOIL
PARTNERSHIP

Up to **60%**
of soil organic carbon
comes from dead microbes



Soil Biodiversity cannot be considered a separate discipline from soil science

Soil biodiversity
assessment
should be part of
Soil Surveys

We only know
about 1% of
soil biodiversity



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**GUIDELINES FOR
SOIL DESCRIPTION**





Convention on Biological Diversity

Distr.
LIMITED

CBD/SBSTTA/24/L.7/Rev.1
19 March 2022

ORIGINAL: ENGLISH

SUBSIDIARY BODY ON SCIENTIFIC,
TECHNICAL AND TECHNOLOGICAL ADVICE
Twenty-fourth meeting
Geneva, Switzerland, 14-29 March 2022
Agenda item 7

REVIEW OF THE INTERNATIONAL INITIATIVE FOR THE CONSERVATION AND SUSTAINABLE USE OF SOIL BIODIVERSITY AND UPDATED PLAN OF ACTION

SCOPE AND PRINCIPLES

19. **FAO is invited to facilitate the implementation of the plan of action**, and it is intended to align activities on soil biodiversity more closely with other FAO-related activities including the **International Network on Soil Biodiversity** and the **Global Soil Biodiversity Observatory**, to monitor and forecast the conditions of soil biodiversity and soil health as well as with regional and country offices in order to create synergies and provide broader support. The full implementation of the plan of action at the national and subnational levels will depend on the availability of resources.

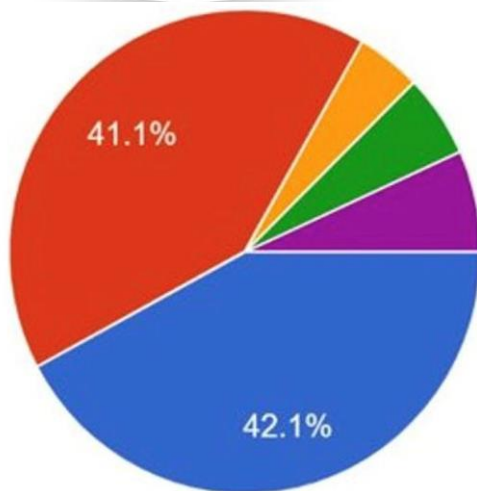


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International Network on Soil Biodiversity



- **WG 1:** measurement, assessment and monitoring of soil biodiversity.
- **WG 2:** sustainable use and management, and conservation of soil biodiversity.
- **WG 3:** economics of soil biodiversity.
- **WG 4:** policies and legal instruments related to soil biodiversity.





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International Network on Soil Biodiversity



Global Soil Partnership

| | | | | | | | | |
|---|----------|----------|-----------------------|------|--------------------|---------------|------------------------|-----------|
|  | Overview | Partners | Regional partnerships | ITPS | Technical networks | Areas of work | Soil Doctors Programme | Resources |
|---|----------|----------|-----------------------|------|--------------------|---------------|------------------------|-----------|



International Network on Soil Biodiversity

The International Network on Soil Biodiversity (NETSOB) was established in December 2021 **to promote the sustainable use and conservation of soil biodiversity** and to bring experts in this field and existing initiatives together to form the human talent that contributes to the implementation of the Global Soil Biodiversity Observatory (GLOSOB).

For more information contact: [Jacob Parnell](#) and the [GSP Secretariat](#).

NETSOB functions and duties

Why a network?



Objectives of the NETSOB



NETSOB working groups



The governance of NETSOB



Strategic partners



How can I join the network?



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Assess, Monitor and
Forecast status of Global
Soil Biodiversity

WHAT

- Standardized Bioindicators
- Best Practices for Conserving Biodiversity
- National Coordination and Capacity
- Global Database

HOW

Countries Adopt Standards
and Begin Monitoring
Initiative



GLOSOB

GLOBAL SOIL BIODIVERSITY OBSERVATORY

MISSION

Best Information for
Decision-Makers



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Status of Soil Biodiversity Information

GUIDELINES FOR SOIL DESCRIPTION



- Soil biodiversity missing from Soil Surveys.
- Few national soil biodiversity surveys, isolated from conventional soil surveys.
- Some global and regional initiatives: SoilBON, EUSO-LUCAS.
- Taxonomic insufficiency & lack of standards.
- Few soil-dwelling species have been evaluated.
- Soil biodiversity cannot be expressed by one single indicator.

Soil BON



EU Soil Observatory: Key Objectives





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- Soil degradation leads to many global problems
- Biology and Biodiversity are key components of soils
- Regular soil testing should include biological measurements
- Soil carbon, health, and biodiversity are all connected
- Sustainable farming improves soil biodiversity

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