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The Regenerative Soil Microbiome Institute

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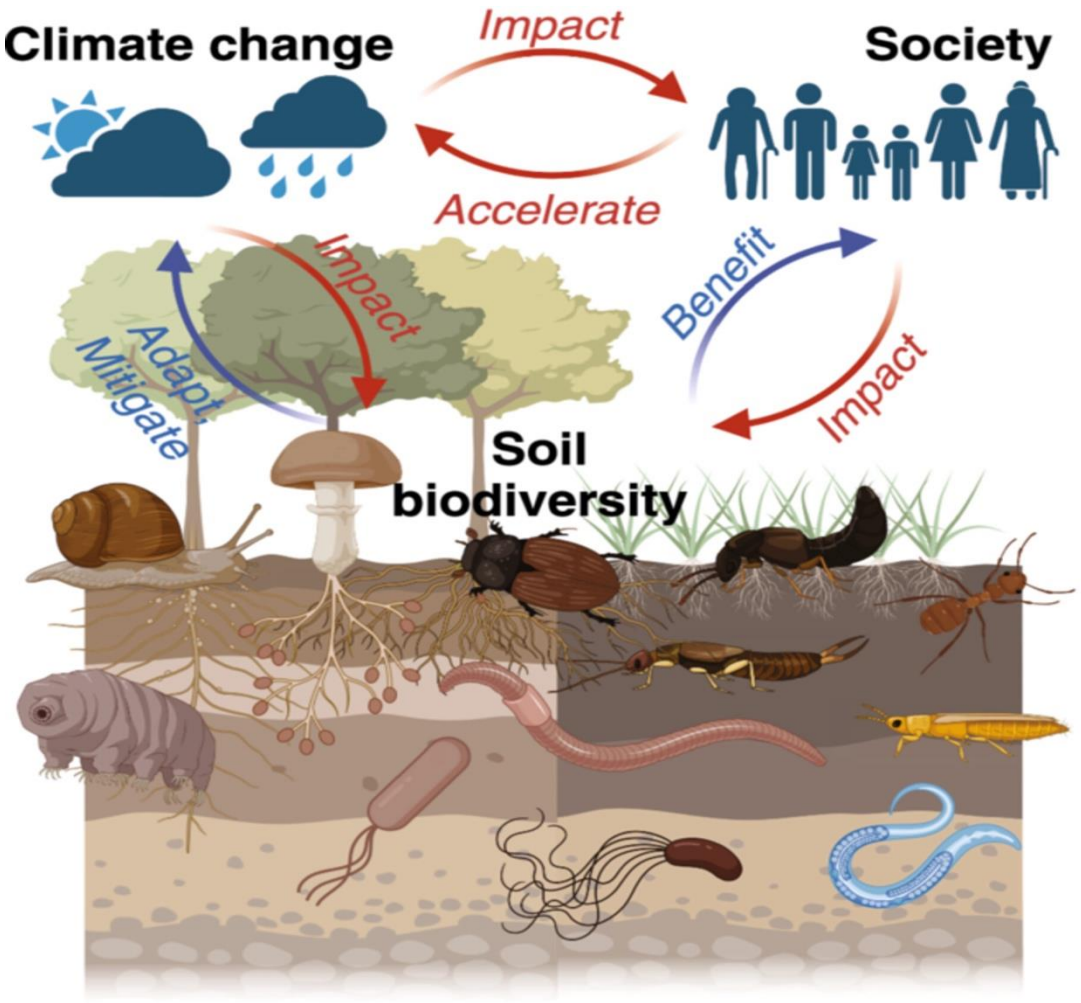

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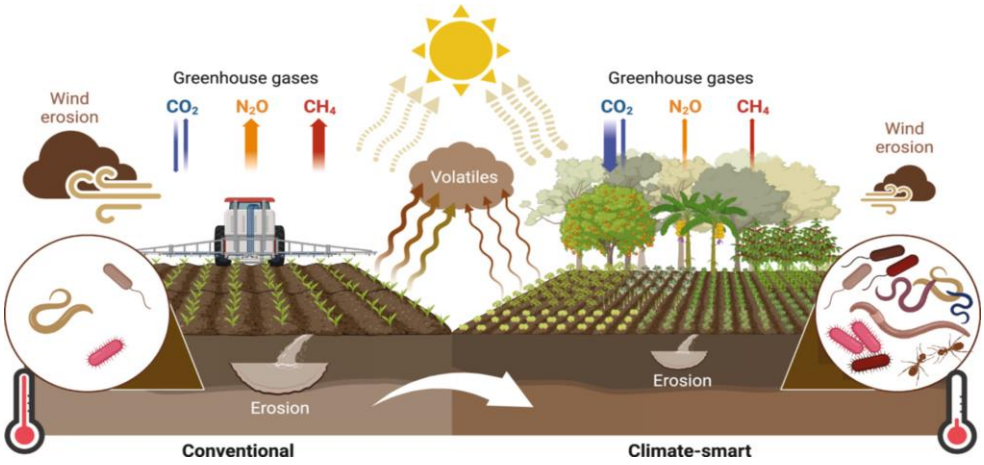
"By changing the way we grow food, we can change the world."

(Kiss the Ground. (2020). *Kiss the Ground* [Documentary]. Big Picture Ranch. https://kissthegroundmovie.com/)

Executive Summary

Soil health is an essential requirement to produce nutritious and safe food, the preservation of biodiversity, the water care and adaptation to climate change. Therefore, soil health is a primary objective of sustainable agriculture and environmental care. Since the mid-19th century, agricultural revolutions have introduced increasing challenges to maintaining the soil health in balance with the role of agriculture in the production of food and raw inputs for animal feed. Traditional and massive agricultural practices have become the main threat to wildlife, the natural landscape and the quality of water, land and air.

In a 2021 report, the world economic forum highlights that massively applied traditional agricultural practices are the direct cause of soil desertification and huge GHG emissions. However, in the same report it is highlighted that soil has the potential to sequester more carbon than plant biomass and the atmosphere combined.



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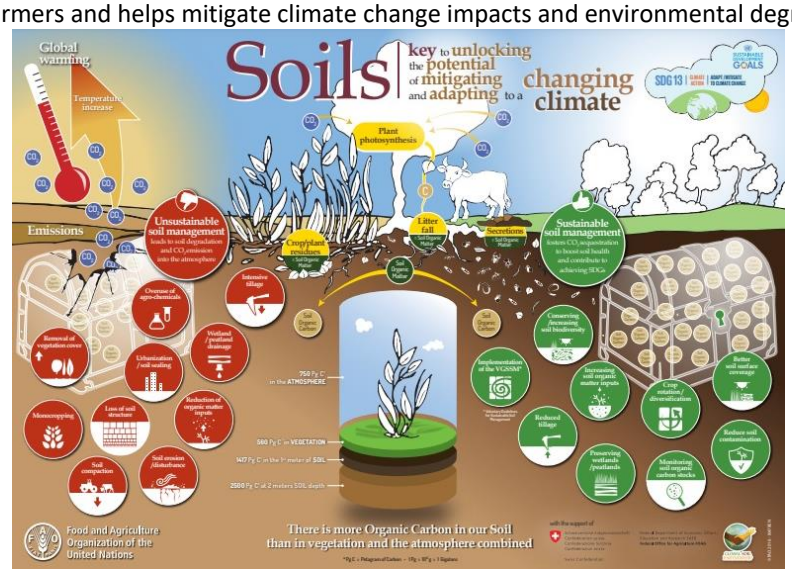
Improving soil health could significantly improve its carbon storage capacity, potentially sequestering an additional 2 billion tons of CO_2 by 2030 (https://www.weforum.org/agenda/2021/08/carbon-in-soil-key-to-halting-climate-change/).

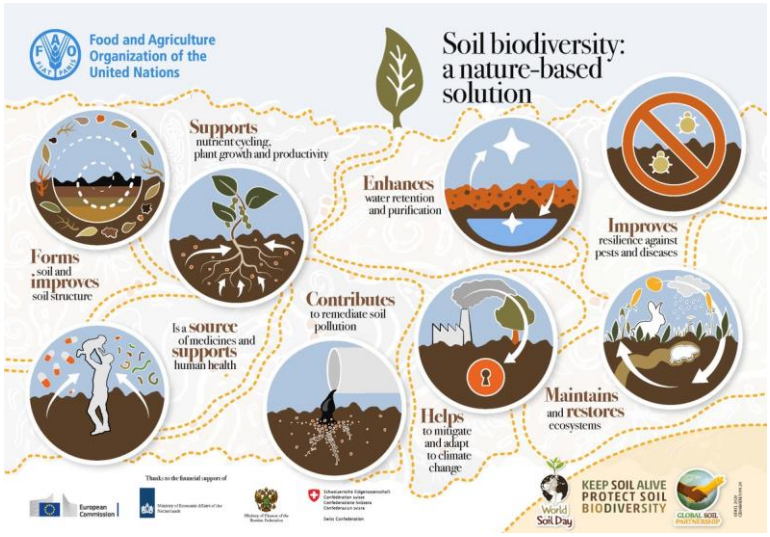
Alike, the International Union for Conservation of Nature (IUCN) confirms that increasing soil carbon stocks can lead to greater carbon sequestration, even exceeding annual global emissions from fossil fuels (https://www.weforum.org/agenda/2021/08/carbon-in-soil-key-to-halting-climate-change/).

A practical response to address environmental challenges involves the comprehensive restoration of soil health and biodiversity, essential for successful adoption of regenerative agricultural practices. By revitalizing soil health, we bolster agricultural resilience and productivity while fostering ecosystem services

crucial for biodiversity, water retention, and carbon sequestration. This approach ensures sustainable profitability for farmers and helps mitigate climate change impacts and environmental degradation.

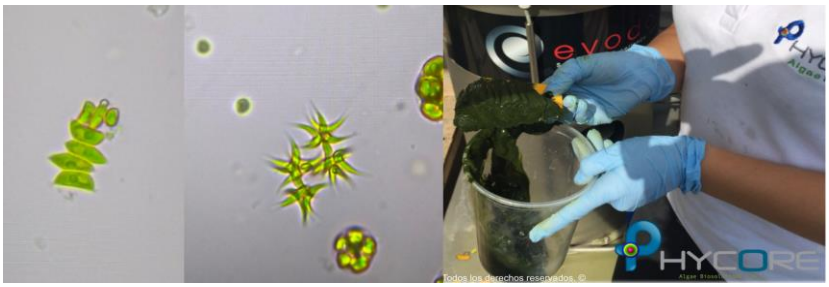


Central to implementing regenerative agriculture is enhancing soil microbiology. Soil microbes play a critical role in maintaining fertility, promoting carbon sequestration, and supporting plant health and productivity. By focusing on these intricate soil microbiome interactions, innovative strategies can be developed to improve nutrient cycling, enhance soil structure, and fortify plant resilience against pests and diseases.



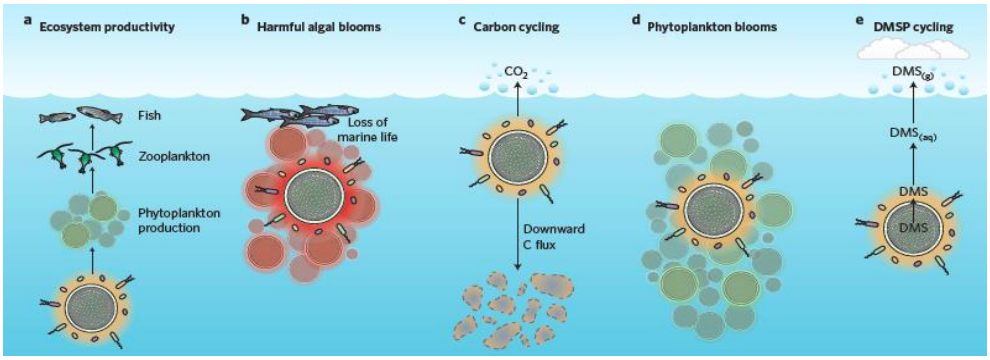
This is why numerous initiatives have emerged worldwide to contribute to this direction, most working from their experiences of decades of research with species of bacteria and fungi that have proven to be beneficial for plants and soil health.

Our team works with an innovative approach, which integrates the concept of the phycosphere of microalgae consortia into this field, offering a pioneering vision on how to integrate not only bacteria and fungi, but more diverse microbiological consortia organized around microalgae and their phycosphere.



Gutiérrez JE, Gutiérrez-Hoyos N, Gutiérrez JS, Vives MJ, Sivasubramanian V. Bioremediation of a Sewage-Contaminated Tropical Swamp Through Bioaugmentation with a Microalgae-Predominant Microbial Consortium. Indian J Microbiol. 2022 Jun;62(2):307-311.

The microalgal phycosphere has turned out to be the physiological basis of virtually all ecosystems, and despite being microscopic, the effects of the processes that occur within it are of ecosystemic magnitude.



Seymour, J. R., Amin, S. A., Raina, J. B., & Stocker, R. (2017). Zooming in on the phycosphere: The ecological interface for phytoplankton-bacteria relationships. *Nature Microbiology*, *2*(May). https://doi.org/10.1038/nmicrobiol.2017.65

It is because of that, this institute will be dedicated to pioneering research in microbiology for soil health, from the phycoesphere diversity approach, to promote and facilitate a regenerative, productive, profitable and highly resilient agriculture, capable of generating jobs and stable income, and contributing significantly to improving the GHG balance of the Earth's atmosphere.

Mission and Objectives

The mission of the Regenerative Soil Microbiome Institute is to advance the science and practical technology of soil health through cutting-edge microbiological research, education, and outreach. The primary objectives include:

1. Research and Development:
   - Conduct pioneering research on soil microbiomes and their impact on soil health and crop productivity.
   - Develop innovative technologies and practices to enhance soil microbial activity and diversity.

2. Education and Training:
   - Provide training programs for farmers, agronomists, and students on soil health and regenerative agriculture.
   - Develop educational materials and courses to raise public awareness about the importance of soil health.

3. Outreach and Collaboration:
   - Partner with agricultural organizations, research institutions, and policymakers to promote soil health initiatives.
   - Create a platform for knowledge exchange and collaboration among scientists, farmers, and industry stakeholders.

R&D

Our central epistemological interest is regenerative agriculture in combating climate change, restoring ecosystems, and ensuring food security.
Central to this approach is the understanding and enhancement of soil microbiology, which plays a vital role in soil fertility, carbon sequestration, and plant health.
The proposed institute aims to build on this foundation by advancing scientific knowledge and practical applications in soil microbiology.

Main Lines of Research

the Regenerative Soil Microbiome Institute will focus on the following lines of research:

1. Soil Carbon Capture:
   - Investigate the role of soil microbes in carbon sequestration.
   - Develop and implement practices that enhance the soil's capacity to capture and store atmospheric carbon (Join "L'Initiative internationale « 4 pour 1000 »").

2. Regenerative Agricultural Practices:
   - Study the effects of regenerative farming techniques on soil microbiology and health.
   - Increase the effectiveness of current regenerative farming techniques by improving soil diversity.

3. Soil Biodiversity and Ecosystem Health:
   - Study the relationships between soil microbial diversity and ecosystem resilience in the context of productive soils.
   - Identify new key microbial consortia that contribute to soil health and fertility.

4. Sustainable Crop Production:
   - Develop microbiome-based solutions to improve crop yields and quality.
   - Reduce dependency on chemical fertilizers and pesticides through natural soil enhancement methods.

5. Climate Change Mitigation & agricultural profitability:
   - Study the dynamics between sustainable agricultural practices versus the productivity and profitability of agriculture.
   - Model the long-term effects of improved soil management on sustainability of agriculture and global carbon cycles.

Implementation Plan

The Regenerative Soil Microbiome Institute is a collaboration between the Microbiological Research Center (CIMIC) at Universidad de Los Andes and DETECHC LLC, the parent company of Phycore®, a biotechnology startup specializing in microalgae. This partnership merges the University's expertise in environmental microbiology, scientific research capabilities, and necessary infrastructure with Phycore®'s proven track record in producing and scaling microalgal microbial consortia at an industrial level. Universidad de Los Andes contributes administrative oversight, scientific researchers, land resources, and laboratory infrastructure essential for project operations. Phycore® brings operational expertise in designing, installing, and managing production equipment for microbial consortia, specifically tailored for the conditions at "Hacienda El Noviciado" near Bogotá, Colombia.

1. Phase 1: Establishment (Year 1)
   - Secure initial funding and establish the institute's infrastructure.
   - Recruit key personnel, including researchers, educators, and administrative staff.

2. Phase 2: Research and Development (Years 2-5)
   - Launch core research projects and initiate collaborative partnerships.
   - Develop and test innovative soil health technologies and practices.

3. Phase 3: Education and Outreach (Years 2-5).
   - Roll out training programs and workshops for various stakeholders.
   - Implement public awareness campaigns and community engagement activities.

4. Phase 4: Evaluation and Expansion (Year 5 and beyond)
   -Evaluate the impact of research and outreach programs.

-Explore opportunities for expansion and additional funding sources.

Funding Requirements

To achieve these objectives, we seek to raise $12 million in donations that will be received and administered from the University. Funds will be allocated over the course of 5 years, as follows:

1. Establishment of the Institute - $2 million:
   - Infrastructure development, including laboratories, research facilities, and office spaces.
   - Procurement of advanced scientific equipment and technology.

2. Research Programs - $5 million:
   - Funding for core research projects on soil microbiology and regenerative practices.
   - Grants for collaborative research initiatives and partnerships.

3. Educational and Outreach Programs - $2 million:
   - Development of training programs, workshops, and educational materials.
   - Public awareness campaigns and community engagement activities.

4. Operational Costs - $3 million:
   - Staff salaries, administrative expenses, and operational overheads.

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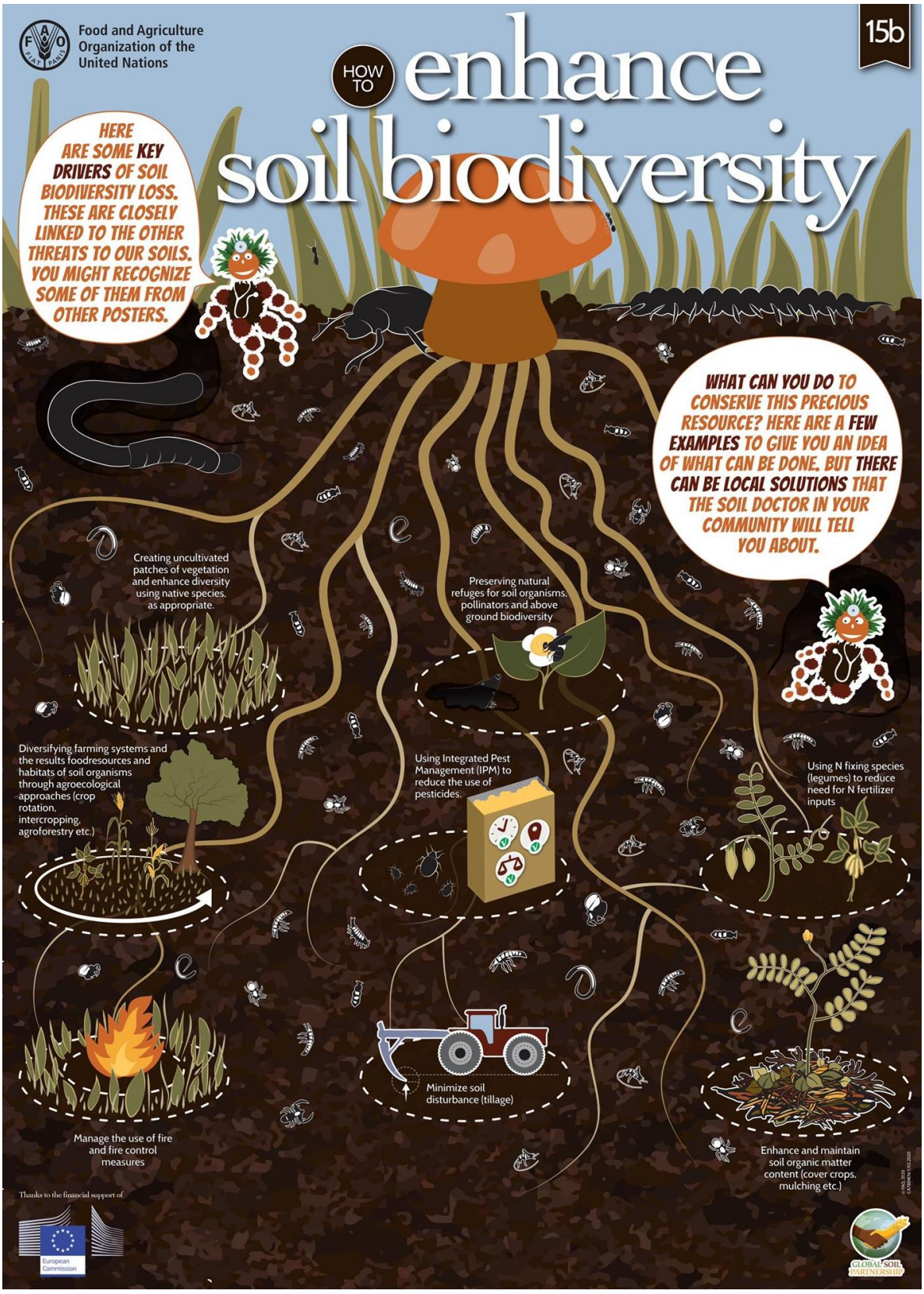
Food and Agriculture Organization of the United Nations
15b
HOW TO
enhance
soil biodiversity
HERE ARE SOME KEY DRIVERS OF SOIL BIODIVERSITY LOSS. THESE ARE CLOSELY LINKED TO THE OTHER THREATS TO OUR SOILS. YOU MIGHT RECOGNIZE SOME OF THEM FROM OTHER POSTERS.
WHAT CAN YOU DO TO CONSERVE THIS PRECIOUS RESOURCE? HERE ARE A FEW EXAMPLES TO GIVE YOU AN IDEA OF WHAT CAN BE DONE. BUT THERE CAN BE LOCAL SOLUTIONS THAT THE SOIL DOCTOR IN YOUR COMMUNITY WILL TELL YOU ABOUT.
Creating uncultivated patches of vegetation and enhance diversity using native species, as appropriate.
Preserving natural refuges for soil organisms, pollinators and above ground biodiversity
Diversifying farming systems and the results foodresources and habitats of soil organisms through agroecological approaches (crop rotation, intercropping, agroforestry etc.)
Using Integrated Pest Management (IPM) to reduce the use of pesticides.
Using N fixing species (legumes) to reduce need for N fertilizer inputs
Minimize soil disturbance (tillage)
Manage the use of fire and fire control measures
Enhance and maintain soil organic matter content (cover crops, mulching etc.)
Thanks to the financial support of
European Commission
GLOBAL SOIL PARTNERSHIP