

What you need to know about... how microbes are a crucially overlooked part of environmental and biodiversity legislation

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Pediatrics

UC San Diego





SUSTAINABLE DEVELOPMENT GOALS





An Evidence-Based Framework and the Role of Scientific Societies and Institutions in Climate Action

CREATING A DYNAMIC TASK FORCE RESPONSIBLE FOR:

- 1 Establishing a global climate emergency response protocol.
- 2 Mapping critical research areas for climate action, aligning them with the UN SDGs.
- 3 Designing a platform for sharing research, resources, and technological advances.

INTERDISCIPLINARY COLLABORATION AND DEDICATED FUNDING STREAMS THAT:

- 1 Joint ventures between academic institutions, industry, and policymakers.
- 2 Establish funding specifically aimed at supporting climate-positive technologies.
- 3 Incentivize private-public partnerships.

LOCAL AMBASSADORS AND DECENTRALIZED STRATEGY

Bridge the gaps between global directives and community-based action,

- 1 Implementation of climate solutions that respect and integrate local input.
- 2 Regular assessment of local efforts.
- 3 Creation of a flexible model for climate action accommodating different socio-economic landscapes and core scientific principles.

MILESTONES AND METRICS FOR SUCCESS WILL BE MEASURED BY:

- 1 The number and diversity of climate solutions developed and tested/year.
- 2 The reduction in time from concept to deployment for climate technologies.
- 3 Quantifiable impacts on carbon reduction, ecosystem restoration, and resilience building in most affected communities.

PILOT TESTING AND SCALABILITY

Focused pilot programs will serve as test beds for new technologies and approaches, providing data for:

- 1 Evaluating the efficacy and safety of climate interventions.
- 2 Adapting and scaling successful interventions.
- 3 Creating case studies and best practice guides for widespread dissemination and replication.

REGULATORY AGILITY AND ETHICAL CONSIDERATIONS MUST ADAPT TO THE URGENCY OF THE CLIMATE CRISIS BY:

- 1 Balancing thorough risk assessments with the need for swift action, acknowledging the risk of inaction.
- 2 Streamlining approval processes for climate mitigation technologies.
- 3 Upholding high ethical and scientific standards.



Microbial Technologies to Save the Planet

Photo by InkInspire on Freepik

NO POVERTY

Microbiology can reduce poverty:

- Through jobs that use microbial technologies in local and national industries.
- Through jobs in microbial conservation and provision of microbes that support industry.
- Through benefit-sharing models in microbial development projects that target under-resourced communities



Start+Blue
Ocean Enterprise Accelerator

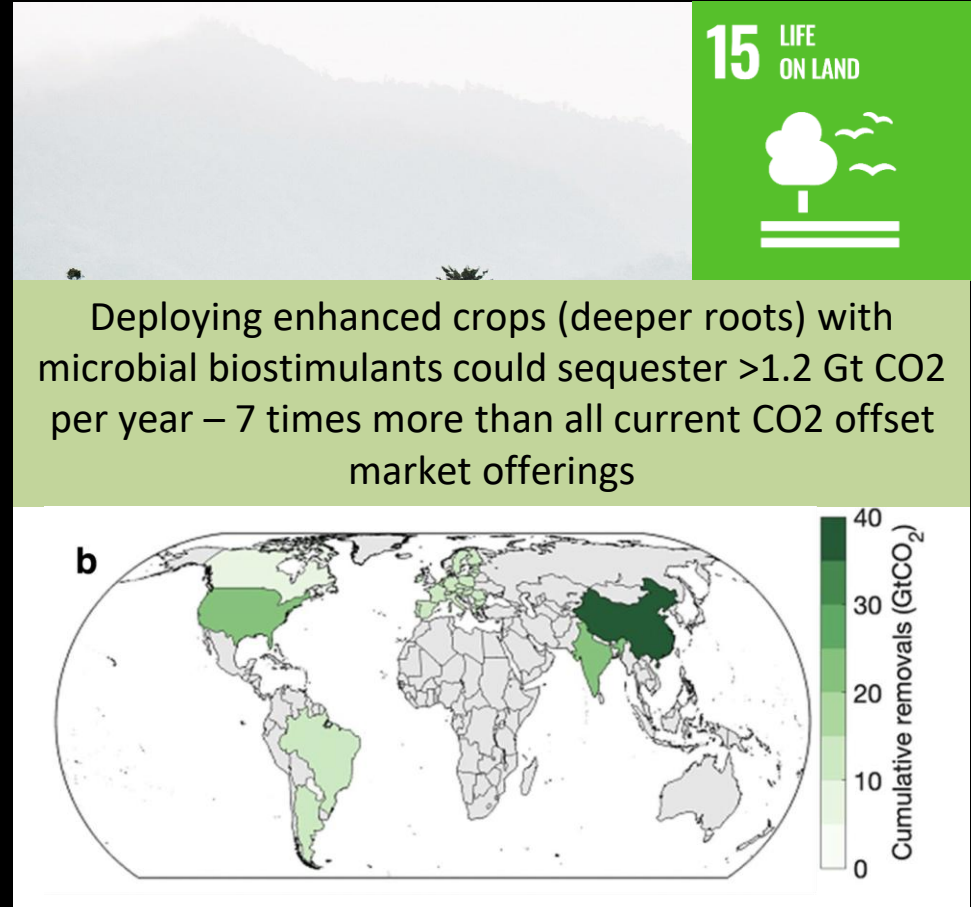


Helps Ocean Intelligence Start-Ups Launch and Scale with Mentoring and Non-dilutive Funding

HEALTHY LAND

Soils are essential:

- For construction, fuel, food security, cultural and spiritual enrichment, biodiversity, nutrient cycling, drug discovery, and water filtration.
- Agriculture is paradoxical as it depends on soil health, raises people's awareness of the value of soil, but also fosters its abuse.
- Microbial technologies can support:
 - Pollution remediation
 - Crop productivity and resilience
 - Biodiversity conservation



SOILS, FOOD SECURITY & NUTRITION



advances in agriculture technology has led to increased food production, but sometimes **with negative impacts on soils and the environment**



In many countries, **intensive crop production** has **depleted the soil**, jeopardizing our ability to maintain production in these areas in the future

It can take up to

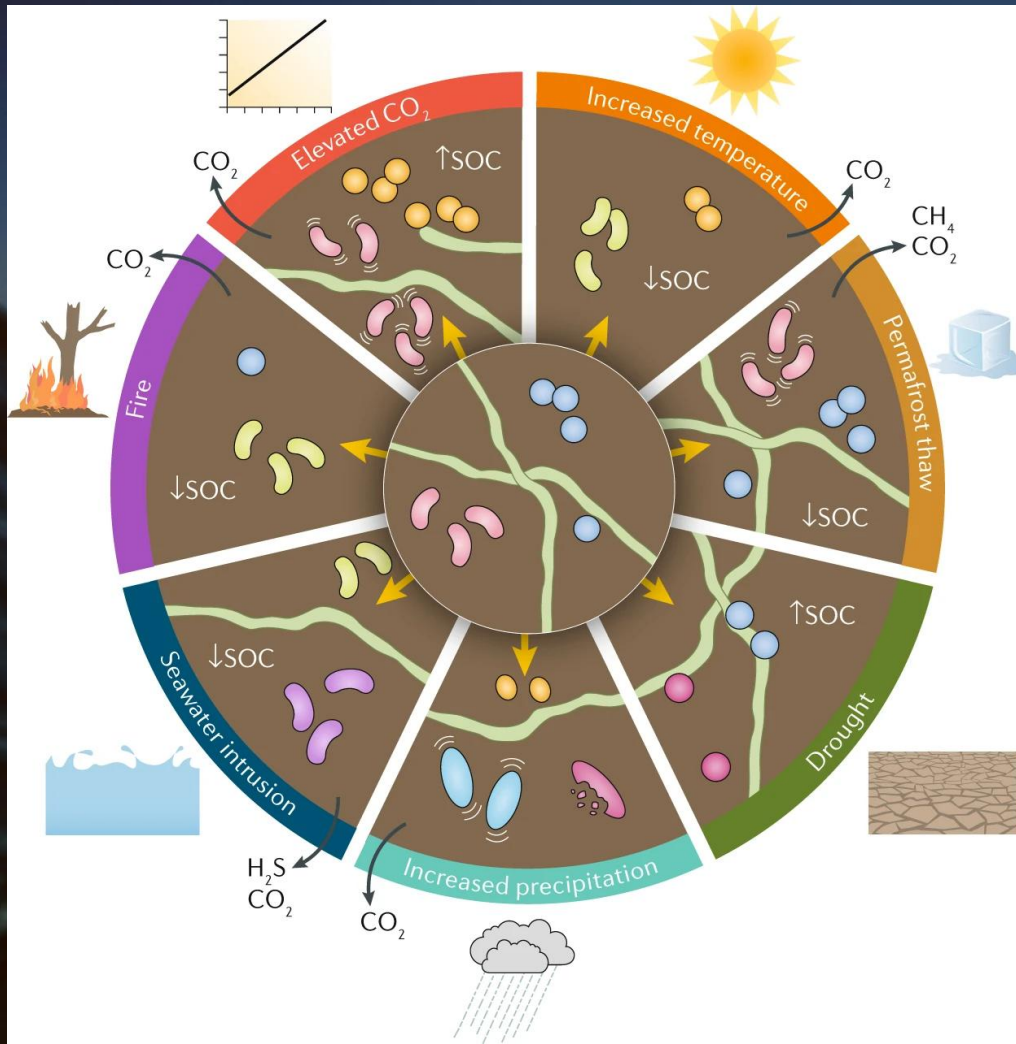


Soil health and its fertility have a direct influence on the **nutrient content of food crops**



Soils are the world's biggest water filter

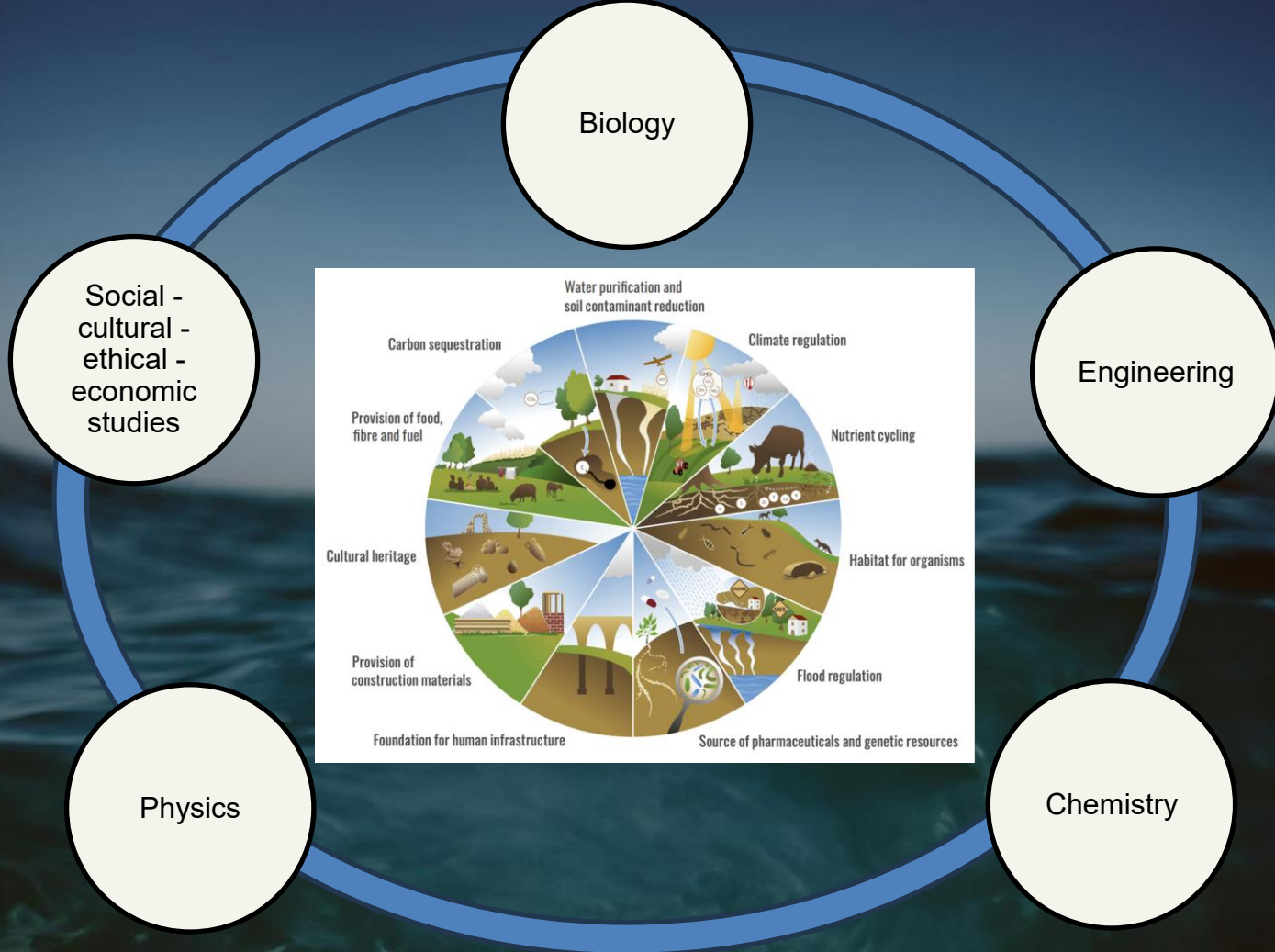




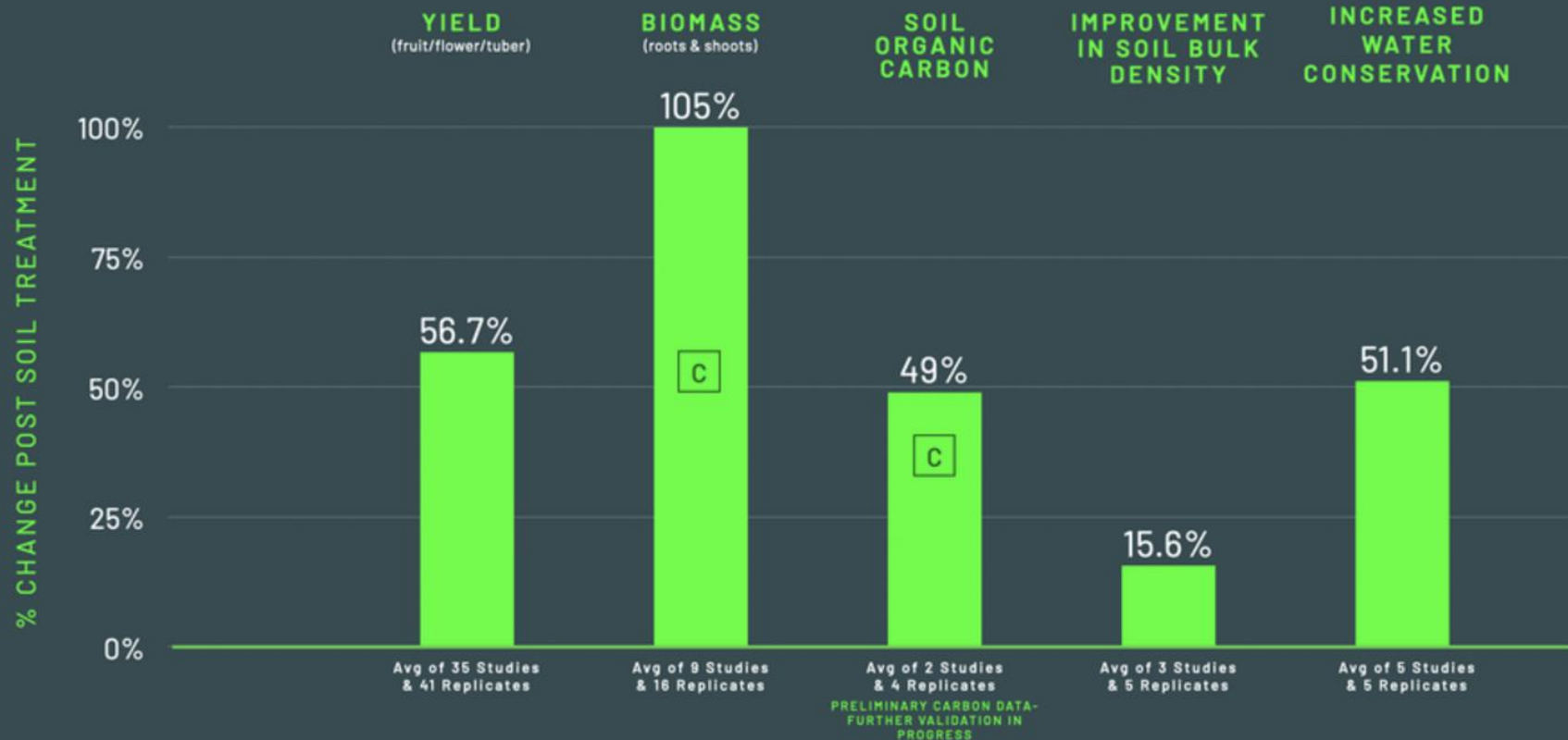
Soils are under multiple threats



Sarah Allard



Microbial Biostimulants Work



Microbial Biostimulants Work



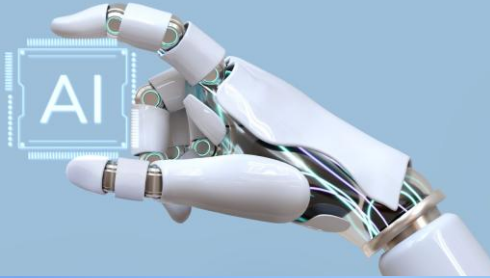
BEFORE

no plants even after re-vegetation



AFTER

PGPR oil degrading + biostimulation treatment



AI for Design



AI for Delivery



AI for Assessment

Design & Simulation

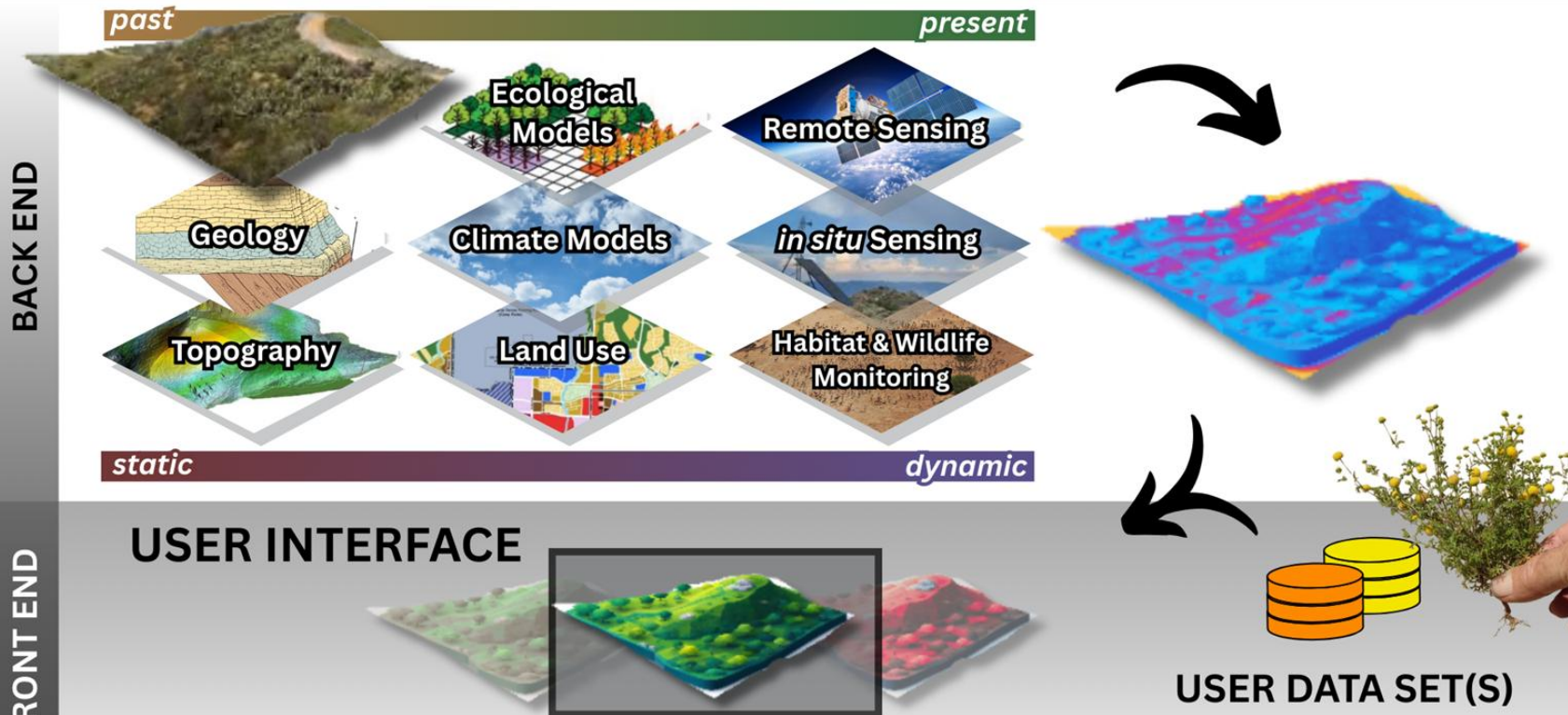
Foundation Models and LLMs integrate multi-omics, soil, and climate data to identify microbial traits, design genome and enzyme modifications, generate optimized SynComs, and simulate ecosystem compatibility before deployment.

Deployment, Monitoring & Adaptive Learning

AI optimizes where and when to apply SynComs, uses robotics and satellite data for precision delivery, quantifies outcomes (e.g., carbon sequestration signals), and continuously refines interventions through feedback integrated into Earth System Models.



FOUNDATIONAL MODEL + REAL-TIME SENSING = **DIGITAL TWIN**



User manipulates Variables for Predictive Outputs in potential future scenarios.

IUCN and Microbes

Redford, Gilbert Peixoto, ORXY 2025;
Gilbert et al., Sustainable
Microbiology 2025; Gilbert, Peixoto et
al, Nature Microbiology, 2025

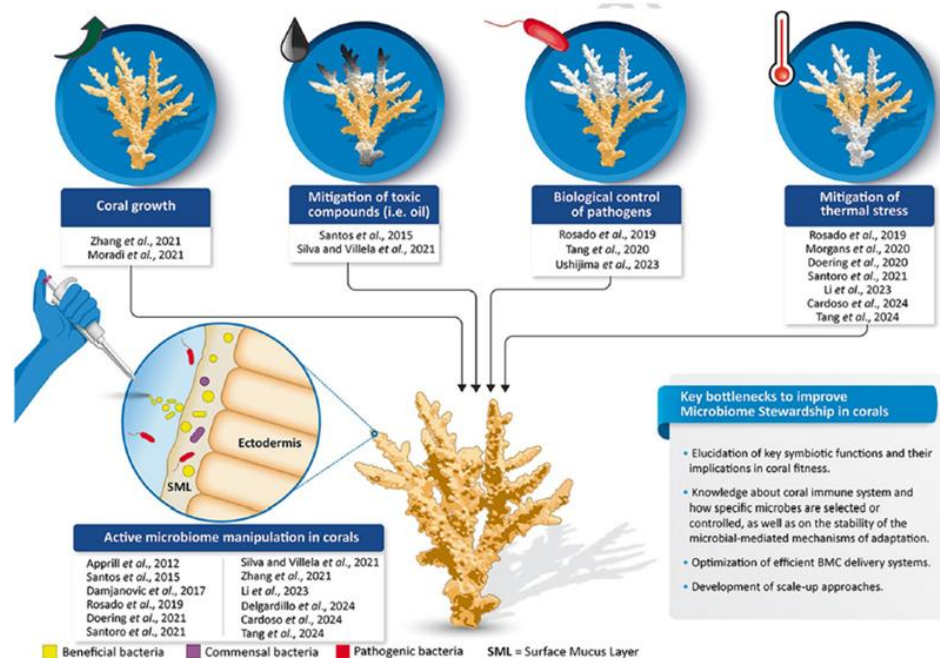
MAY 19-21, 2025
CONSERVATION IN A MICROBIAL WORLD



**Establishment of an IUCN
Species Survival Commission
– Microbial Conservation
Specialist Group (MCSG)
June 4th 2025**



Microbiome stewardship can promote coral health – and, consequently, protect coral reef biodiversity



382

Dörr and Barno *et al.*, 2025 – Coral Microbiome

El-Khaled *et al.*, in prep

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www.microbiotavault.org

A vault for humanity

The Microbiota Vault is a global non-profit initiative to conserve long-term health for humanity.

[LEARN MORE](#)[WATCH VIDEO](#)

SUPPORTING ONE HEALTH

Preserving microbial diversity

To forever secure the basis of the naturally evolved diversity of the microbiota important to humankind to support health globally.

[VIEW PROJECT](#)



<https://thesoilstars.com/>

Our strategy is to build a knowledgebase using internationally renowned scientific experts & to use this knowledge to develop microbial solutions and communication strategies that can be deployed rapidly in the face of looming environmental threats.





<https://thesoilstars.com/>



Turning a Rock Star
into a Soil Star

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Heligan Protocols

March 23-24th 2026

Missions to regenerate soil health through public-private partnerships powered by governments and the UN.



Applied
Microbiology
International



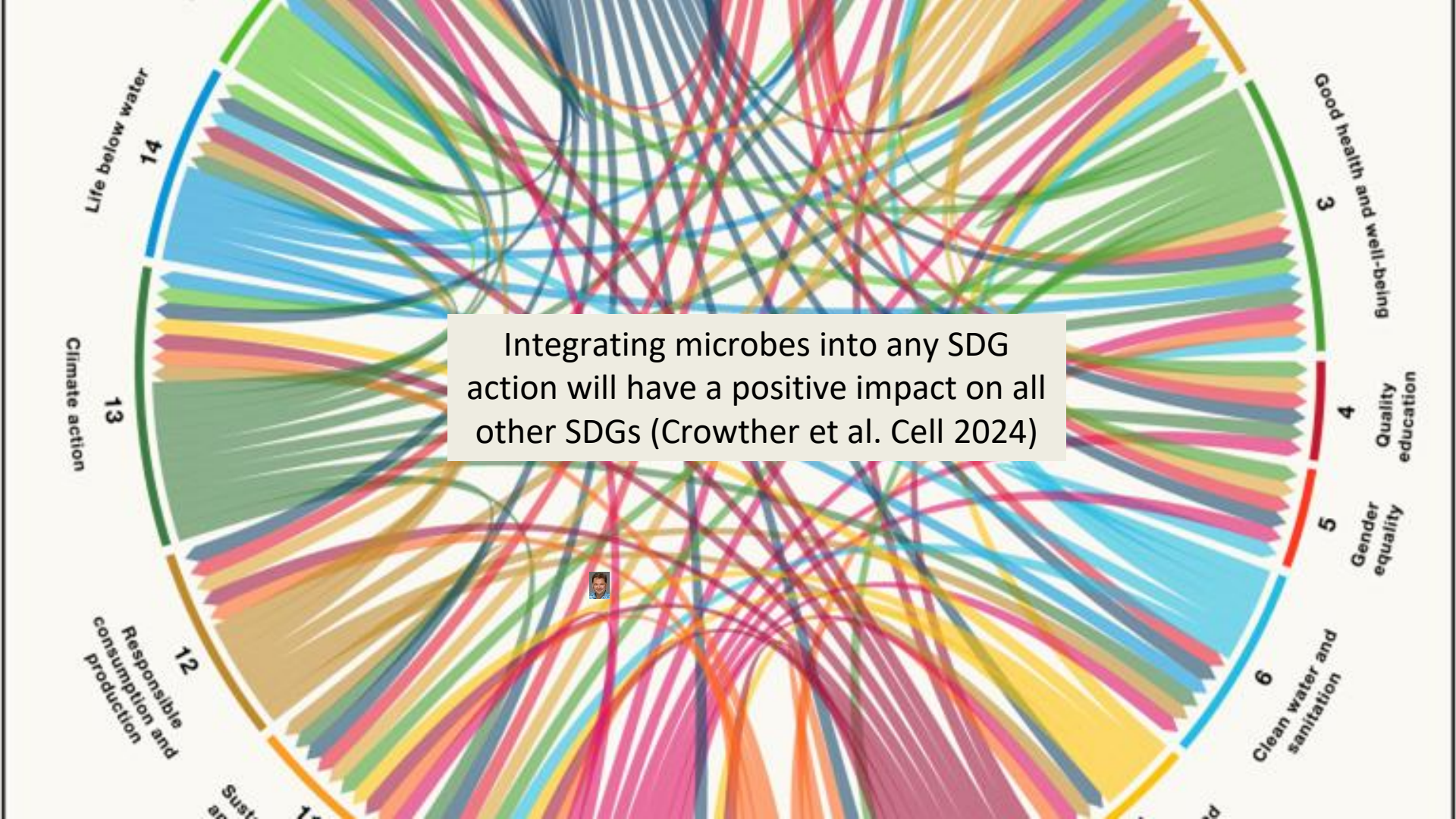
Improving Soil Health in the UK



UK soil policy lacks a unified, measurable definition of “healthy soil,” limiting the ability to set binding targets and monitor progress across the four nations.

Current monitoring frameworks focus on chemistry and structure, largely omitting the biological and microbial indicators of ecosystem services.

Embedding microbes into statutory soil standards would align food security, biodiversity recovery, and climate resilience under one evidence-based framework.



Integrating microbes into any SDG action will have a positive impact on all other SDGs (Crowther et al. Cell 2024)



Thank You