Food and Agriculture Organization of the United Nations

FAO SCIENCE AND INNOVATION FORUM

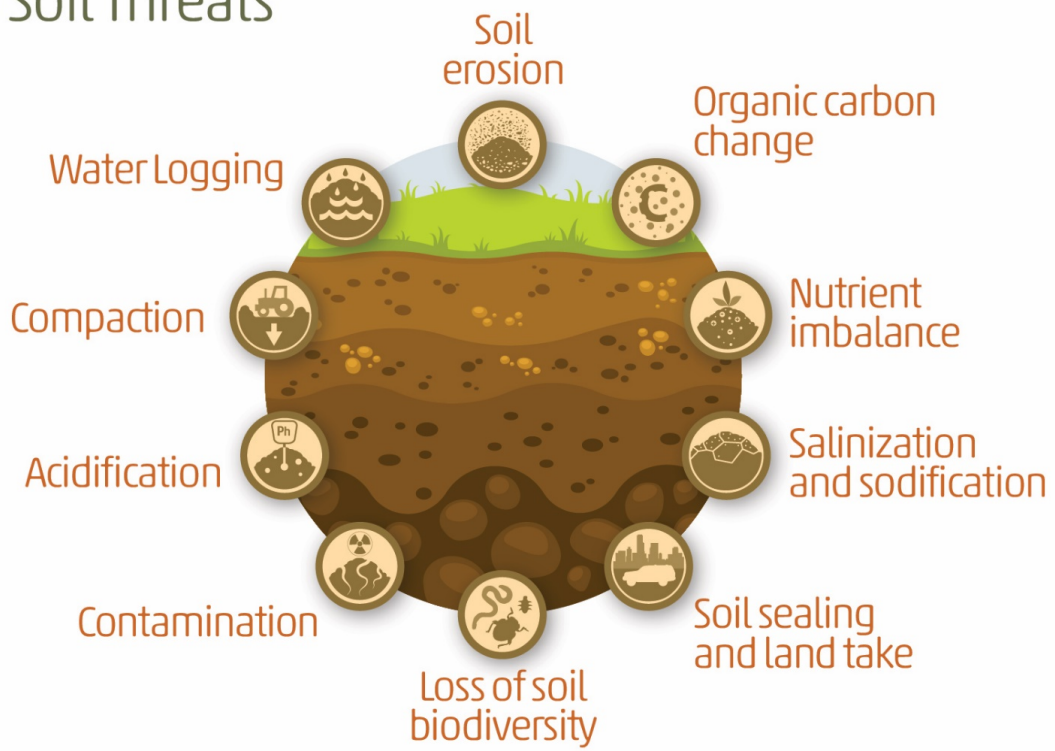
Innovations in Soil and Plant Nutrient Management

Outcomes of the Global Symposium on Soils for Nutrition: a joint plan of action on soil fertility beyond 2030

Ronald Vargas

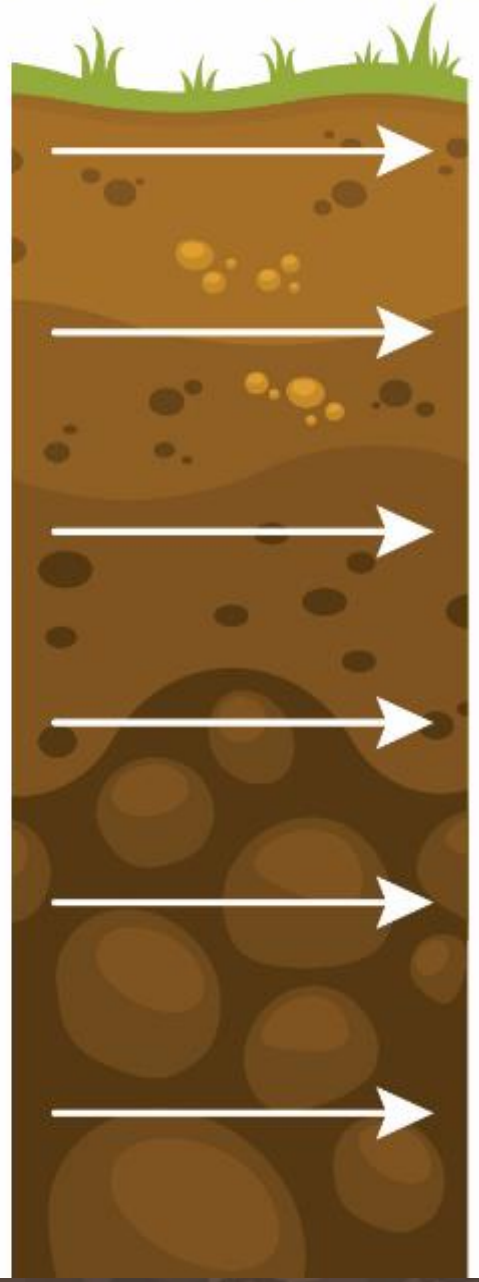
GLOBAL SOIL PARTNERSHIP


Climate change
Biodiversity loss
Pollution
Food insecurity and malnutrition
Poverty
Pandemic and Conflicts
Land and environmental degradation
Global Challenges
Population growth
Water scarcity

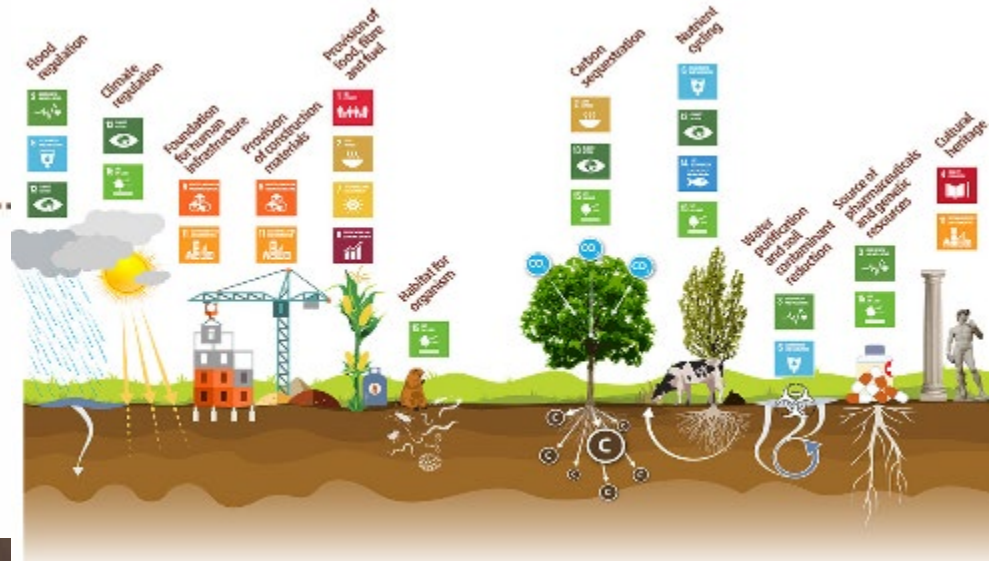

10 Soil Threats
Soil erosion
Organic carbon change
Water Logging
Compaction
Nutrient imbalance
Acidification
Salinization and sodification
Contamination
Soil sealing and land take
Loss of soil biodiversity

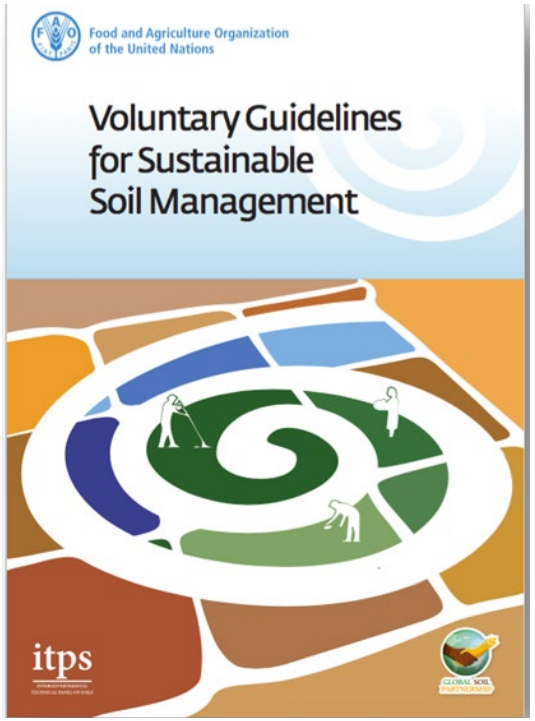

33%
OF OUR GLOBAL SOILS ARE DEGRADED

Healthy soils and Food Security/Nutrition



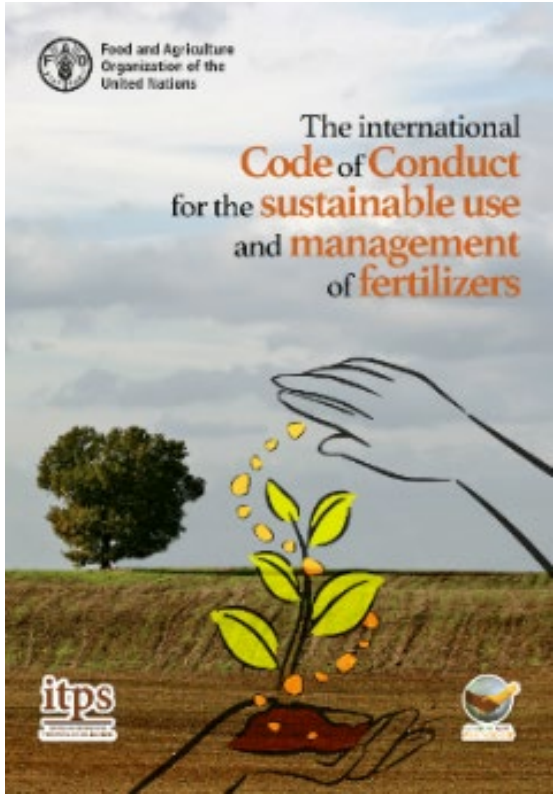
Food availability	Increase crop yield but also quality
Nutritious food	Macro and micronutrients
Food safety	Crops free of contaminants and pathogens
Low environmental impact	No degradation of soils and natural resources
Biodiversity	Soil biodiversity fundamental... crop diversity...
Mitigation and adaptation to climate change	Reduce emissions, restore SOC and make soils resilient





Soil management is not a short term activity! It requires a long term perspective to build its resilience!

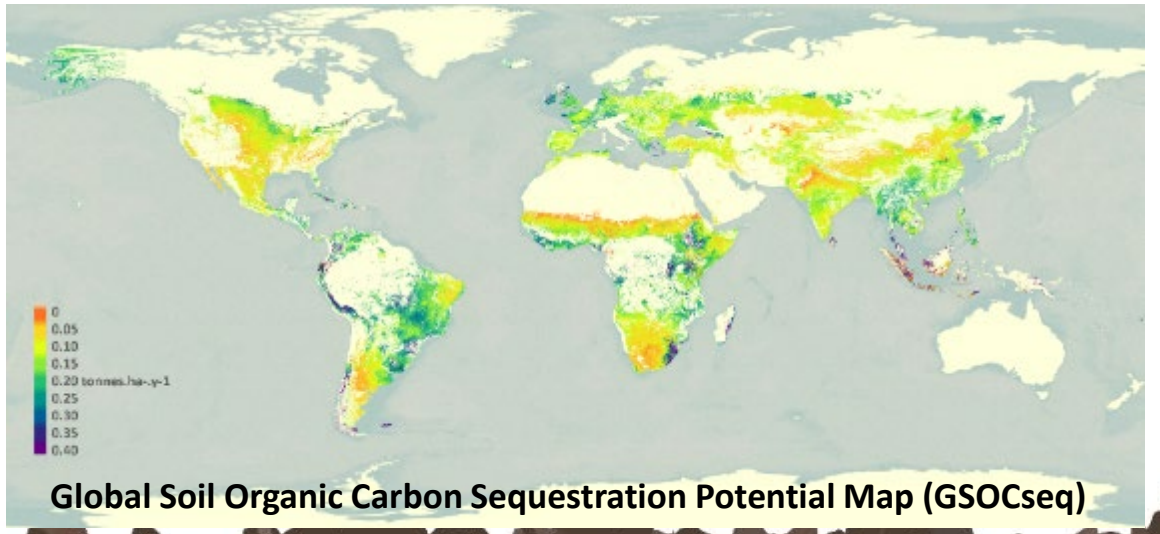
Sustainable Soil Management



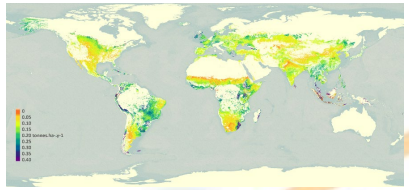

SOILS: WHERE FOOD BEGINS
Global Symposium on Soils for Nutrition
1
2
3
4
-Soil fertility data and information
-Updated information at different scales
-Strategies to increase soil fertility and crop production
THE STATUS AND TRENDS OF GLOBAL SOIL NUTRIENT BUDGET
-Nutrition sensitive agriculture
-Micronutrient balance
-Innovations to increase nutrient content in food
-Plant and soil integrated approaches
SUSTAINABLE SOIL MANAGEMENT FOR FOOD SECURITY AND BETTER NUTRITION.
-Impacts and solutions to externalities derived from unsustainable agricultural practices:
-Climate change
-Environmental pollution
-Crop, animal, and human health
IMPACTS OF SOIL NUTRIENT MANAGEMENT ON THE ENVIRONMENT AND CLIMATE CHANGE.
-Policies and regulatory frameworks to ensure and increase soil fertility and better nutrition
GOVERNANCE OF SOIL FERTILITY/SOIL NUTRIENTS.

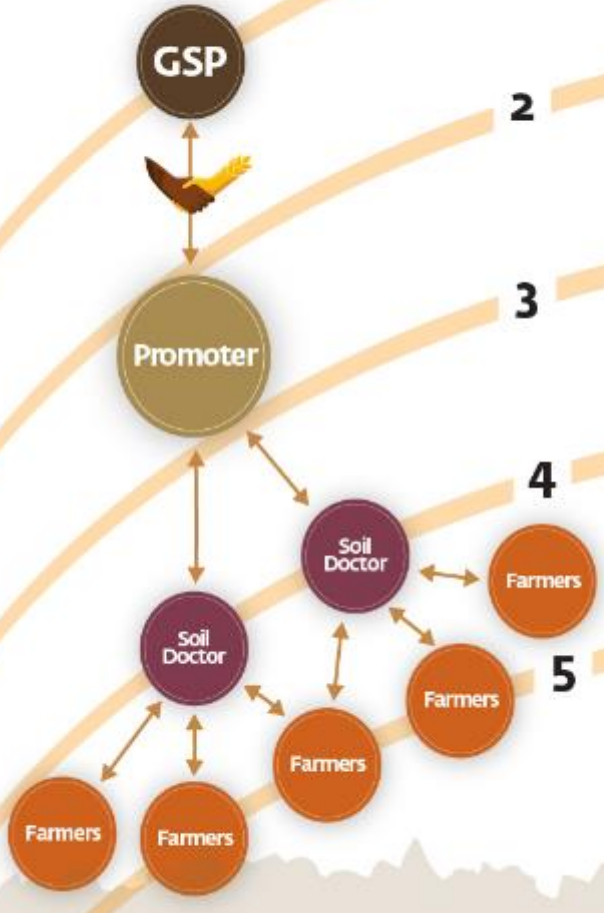
How can we manage something we do not know?

- **Assessing and mapping soils and building National Soil Information (monitoring) Systems is the start.**
- **Uncertainty/quality is fundamental, and that starts with the Soil Laboratories (standard operating procedures and quality control).**



Global Soil Organic Carbon Sequestration Potential Map (GSOCseq)





1 The Global Soil Partnership and the Promoter agree on the **implementation plan**

2 The Global Soil Partnership **trains** the **Promoter**

3 The Promoter **identifies farmer groups** and selects **potential Soil Doctors**

Training of the Soil Doctor by the Promoter

4 **Training of the Farmers** by the Soil Doctor

5

Global **Soil Doctors** Programme

GLOBAL SOIL PARTNERSHIP

Región Lagunera, noviembre 2021

Innovation is key to move forward from the environmental impact of mineral and inorganic fertilizers to improved efficiency, alternative nutrient sources, and quality assessment

It is necessary to find new nutrient sources and support the existing ones

Considering that most inorganic fertilizer lead to externalities

Innovation

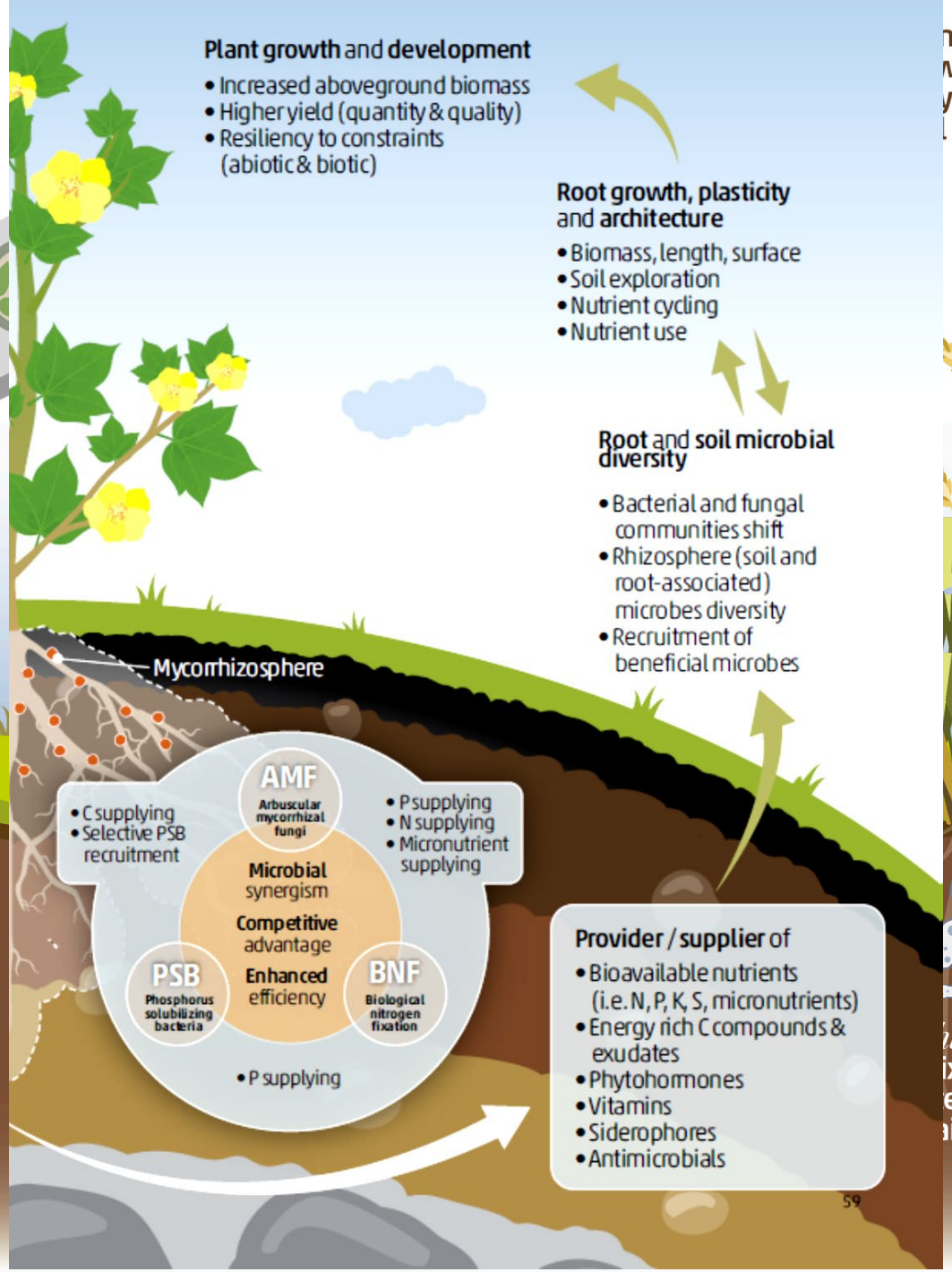
New sources should be more affordable, environmentally friendly, and aligned with climate change mitigation

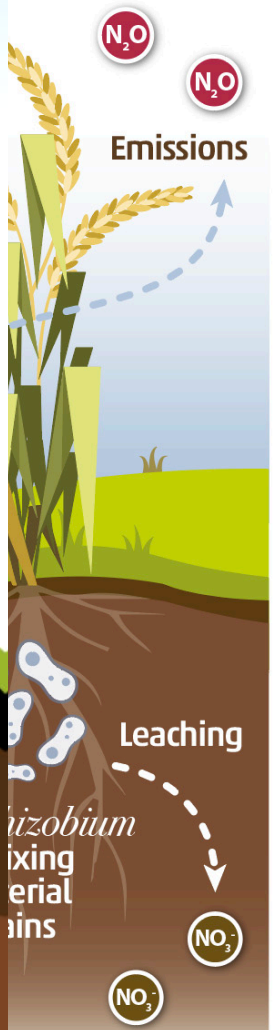
Target research

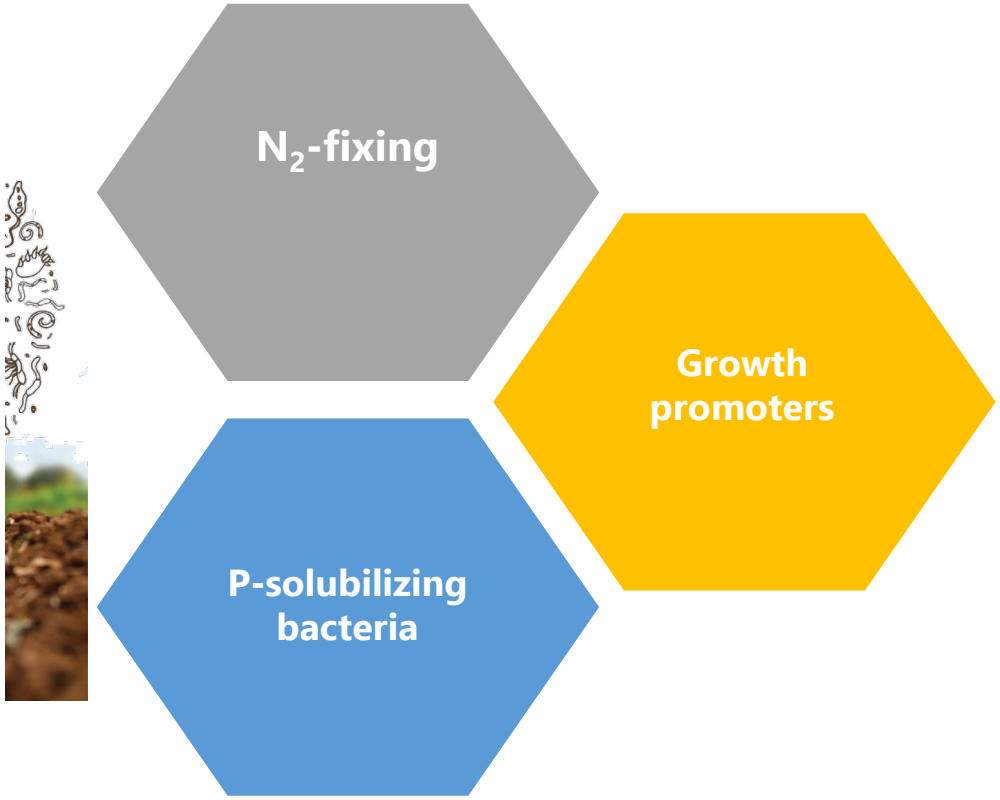
Additional research is needed on innovative and sustainable solutions.
Optimize nutrients while maintaining soil fertility.

Recycling

Fertimanure, biodegradable coatings for fertilizers, nanotechnology.







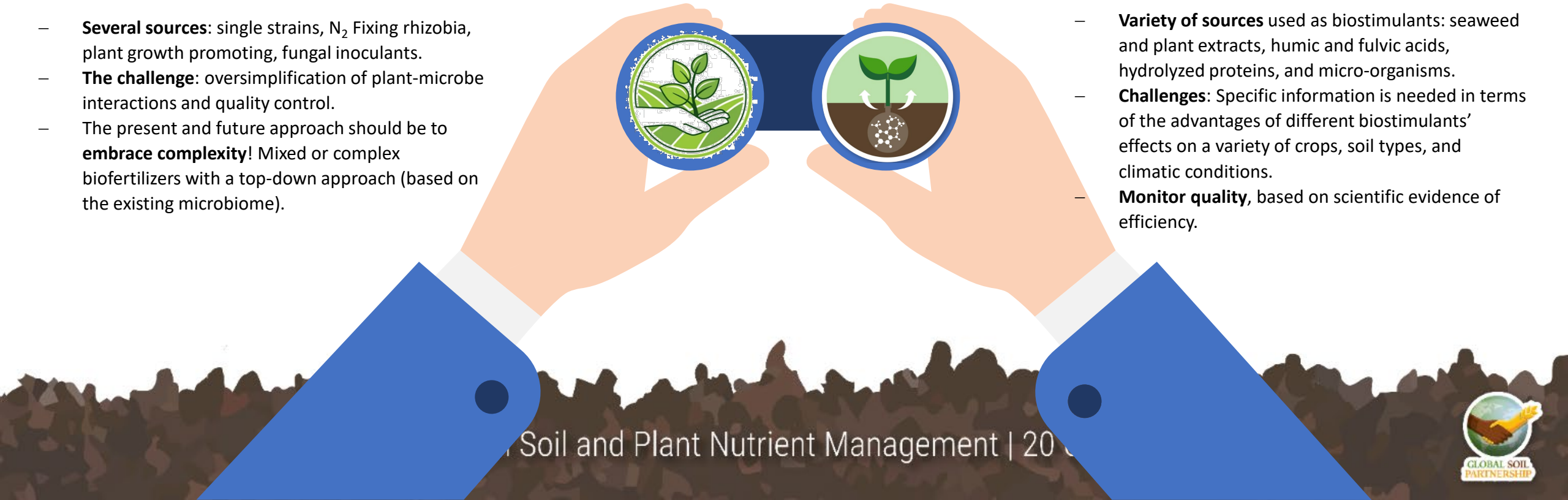
availability, and plant and soil protection.

croplands, such as increasing water availability, soil carbon
ertility hot-spots, and increases soil resilience to climate

Opportunities

Biofertilizers: harnessing soil biodiversity

- **Several sources**: single strains, N_2 Fixing rhizobia, plant growth promoting, fungal inoculants.
- **The challenge**: oversimplification of plant-microbe interactions and quality control.
- The present and future approach should be to **embrace complexity**! Mixed or complex biofertilizers with a top-down approach (based on the existing microbiome).



Biostimulants: Acting to enhance the natural processes

- **Variety of sources** used as biostimulants: seaweed and plant extracts, humic and fulvic acids, hydrolyzed proteins, and micro-organisms.
- **Challenges**: Specific information is needed in terms of the advantages of different biostimulants' effects on a variety of crops, soil types, and climatic conditions.
- **Monitor quality**, based on scientific evidence of efficiency.

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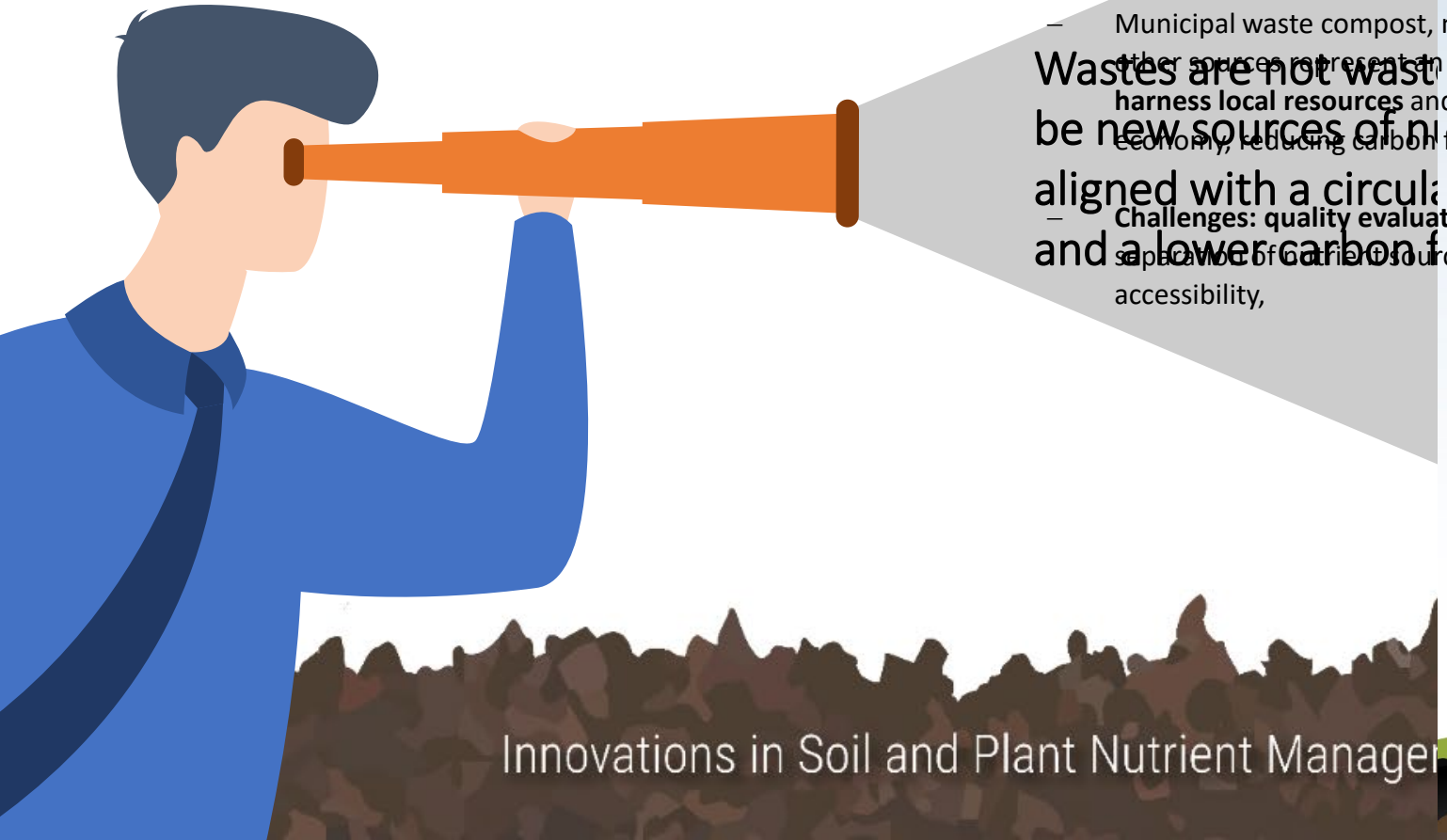
Recycled nutrient source

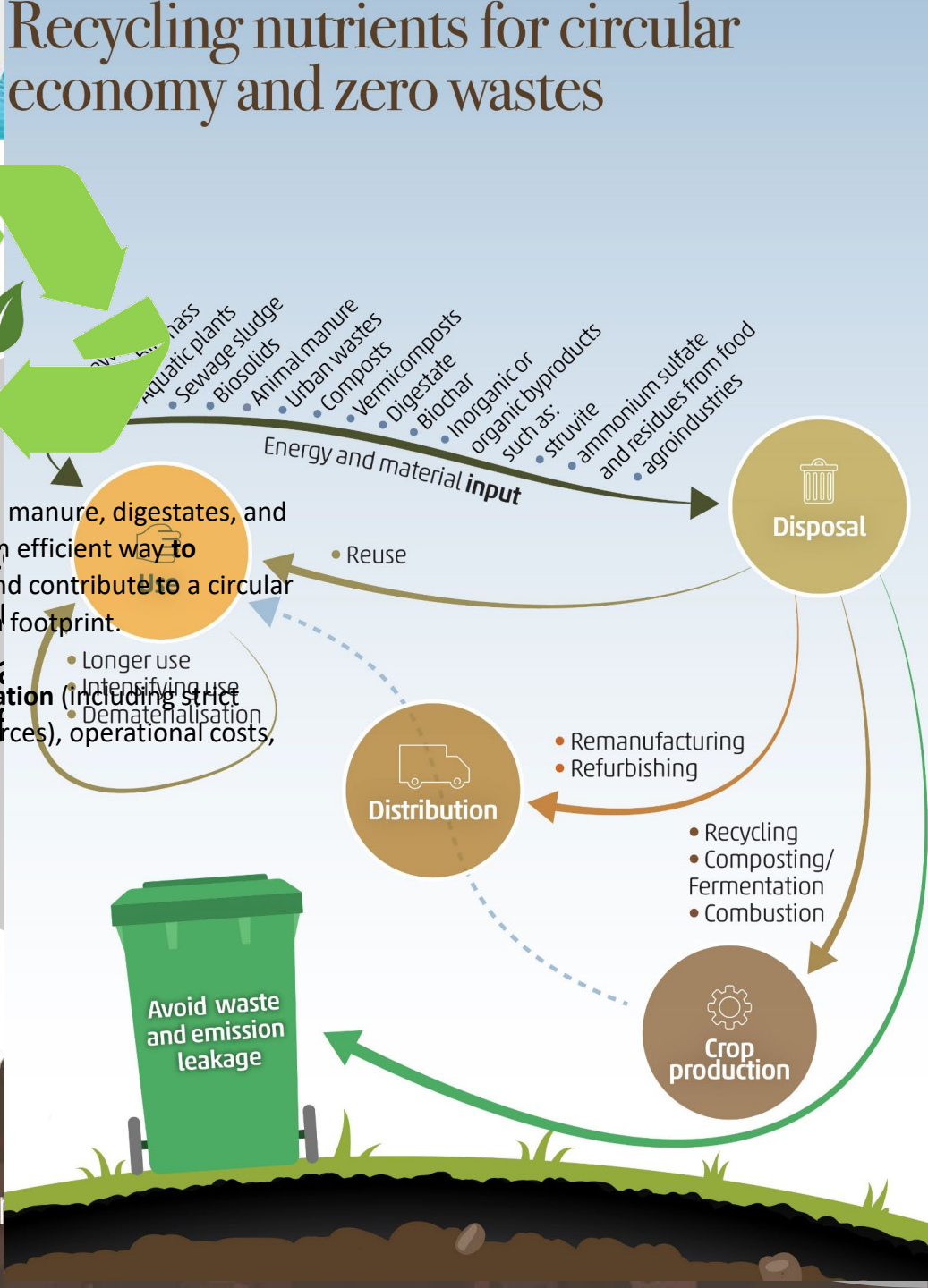


Wastes are not wast
be new sources of n
aligned with a circul
and a lower carbon f

- Municipal waste compost, manure, digestates, and other sources represent an efficient way **to harness local resources** and contribute to a circular economy, reducing carbon footprint.
- **Challenges: quality evaluation** (including strict separation of nutrient sources), operational costs, accessibility,

Innovations in Soil and Plant Nutrient Manage

Recycling nutrients for circular economy and zero wastes



Innovation? Yes, but hand in hand with quality assessment/monitoring of all nutrient sources!

- It is necessary to assess and **monitor the quality and efficiency of traditional and new sources** of nutrients.
- It is especially relevant in the case of **new or recycled** sources to support their implementation in bigger scales.
- Fertilizer quality assessment is the **best ally against undesirable effects** of nutrient sources on environmental quality, and human and animal health.
- Assessments of **biodegradability** of different materials used in agriculture, including plastics, and fertilizer coatings.
- **Well-equipped laboratories** for tasting efficiency, quality, and safety are necessary

Fertilizer quality assessment

The quality of fertilizers and their bioavailability ensure that fertilizers and recycled nutrients are compliant with **quality and safety standards**.

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FAO SCIENCE AND INNOVATION FORUM

Supporting farmers for ensuring crop yields today and building soil health forever!

1

Soil assessment and monitoring

Innovation in soil fertility based on accurate representation of the **actual soil conditions at an appropriate scale**.

2

Soil and fertilizers harmonized analysis and methodologies

If you cannot measure it you cannot manage it. Monitoring soil fertility innovative methods through standardized analytical methods is critical to providing reliable and comparable soil information.

3

INFA International Network on Fertilizers Analysis

Fertilizer quality assessment

The efficiency of biofertilizers, biostimulants, and recycled sources to ensure compliance with **quality and safety standards**.

4

Scale up of good practices including diverse sources of nutrients

5

Empowering and supporting farmers

Strengthening of national capacities on sustainable soil nutrient management and **rising awareness to support the implementation of innovative sources**

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Thank you!