Key findings and way forward

Ronald Vargas- GSP Secretary

SOILS: WHERE FOOD BEGINS

Global Symposium on Soils for Nutrition | 26-29 July 2022

GLOBAL SOIL PARTNERSHIP

GSOIL4NUTRITION – A success?

- Evaluation form for you to fill!
- A virtual symposium that demonstrated to be more inclusive and accessible.
- Less carbon-footprint, far cheaper.
- Science-policy together, but specially setting an agenda for action!

Attendance

9079 registered participants

Participation in the plenary sessions:

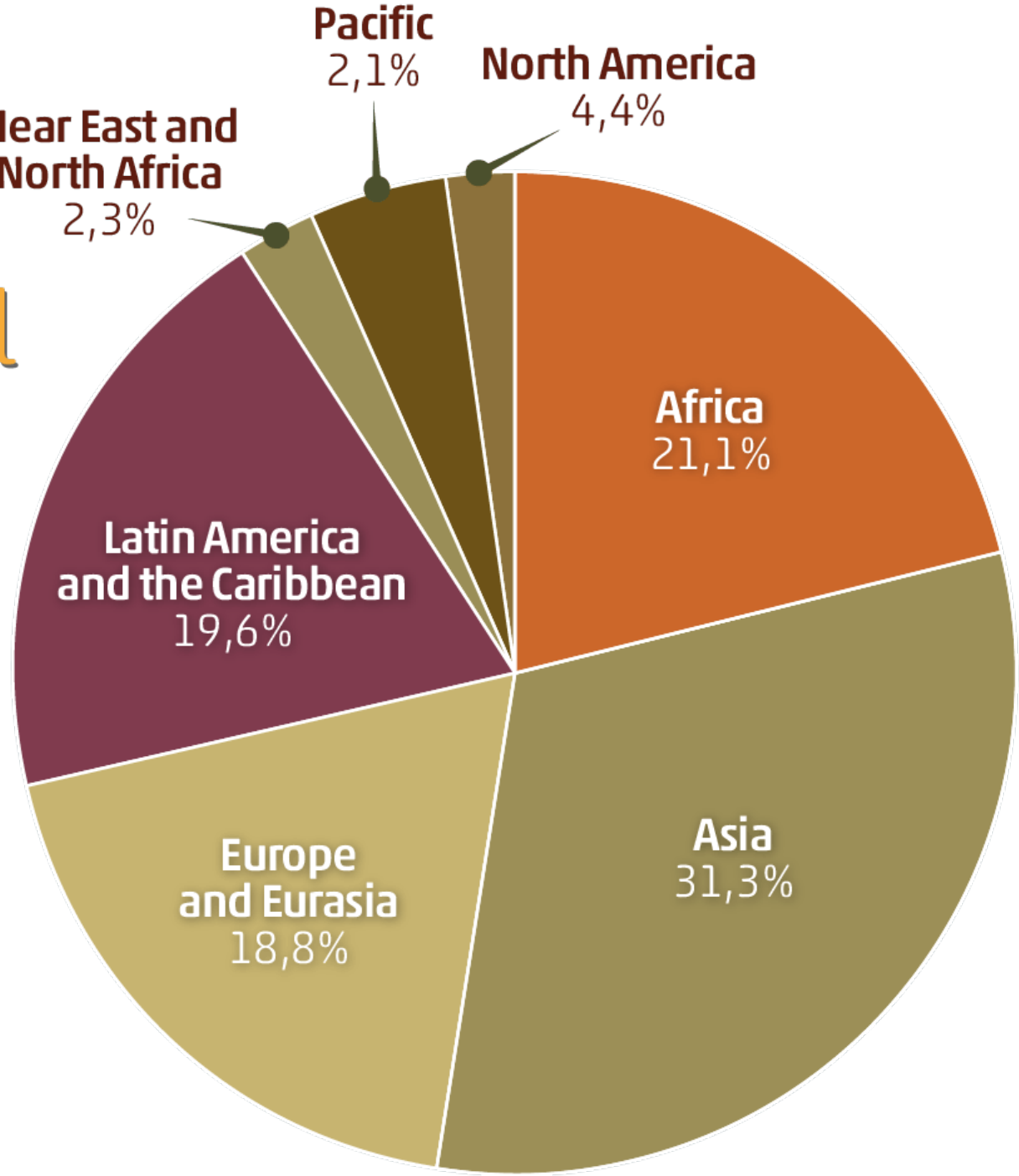
- ✓ DAY1: **+4000** participants (zoom & webcast)
- ✓ DAY2: **+3500** participants (zoom & webcast)
- ✓ DAY3: **+2500** participants (zoom & webcast)

Participation in the parallel sessions:

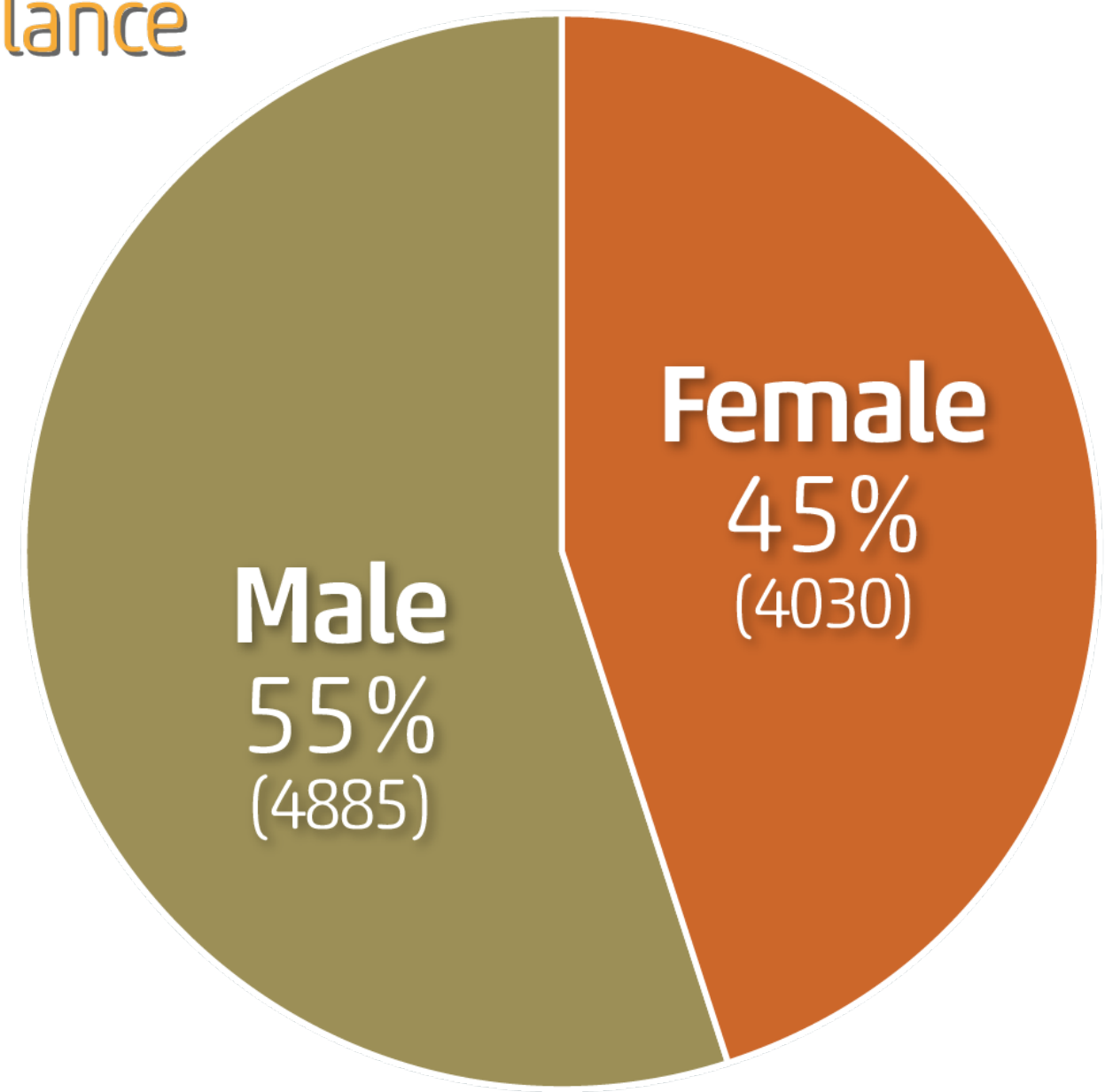
- ✓ DAY2: **2137** participants over 5 parallel sessions
- ✓ DAY3: **1738** participants over 5 parallel sessions

+ numerous viewings of recordings & downloads of presentations from all over the world (post symposium)

Regional balance

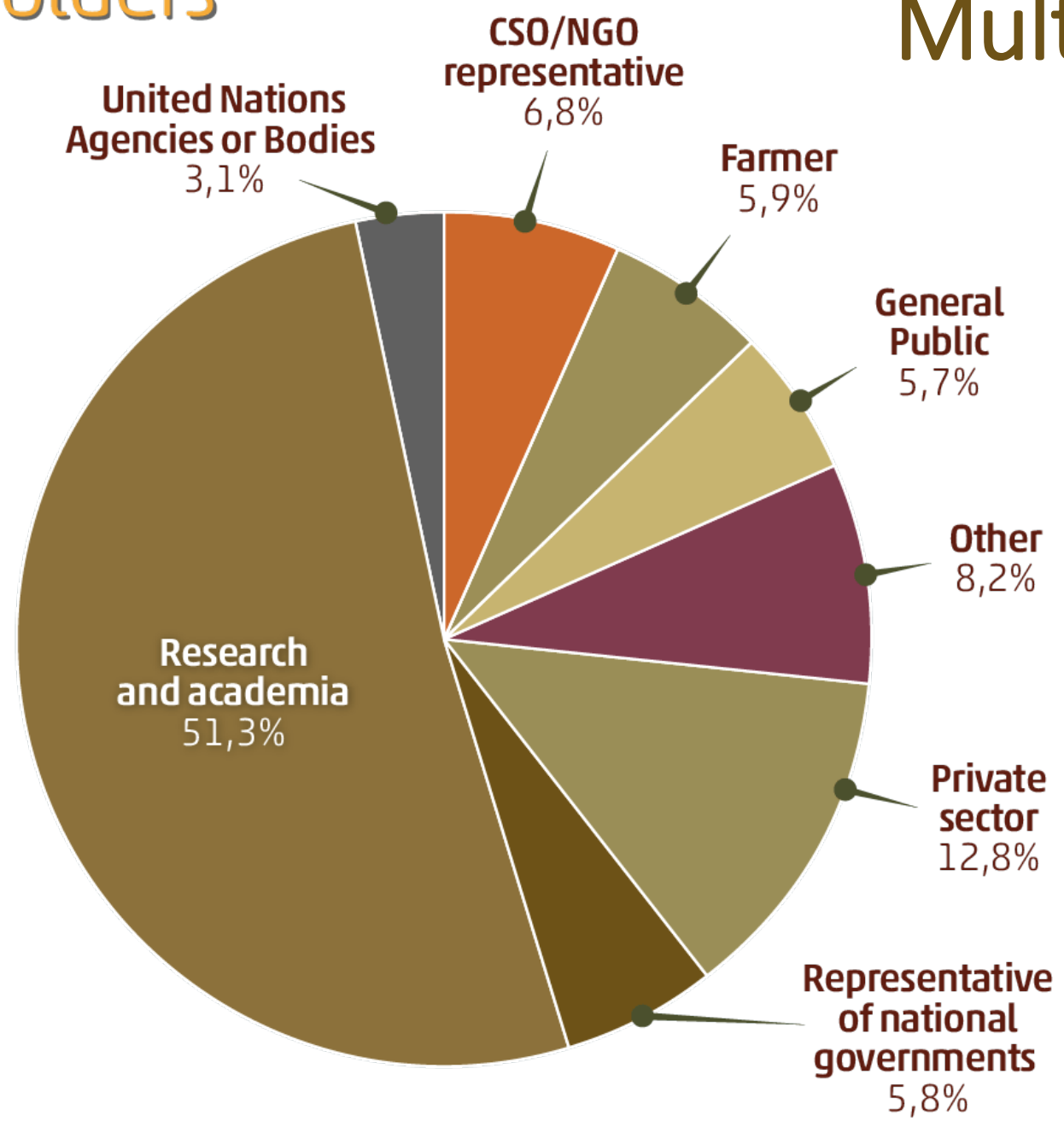


Gender balance



Multi-stakeholder Meeting

Stakeholders balance



PLENARY HIGHLIGHTS

9 distinguished guests

21 renowned keynote speakers

8 hours of plenary sessions

SCIENCE AS THE BASIS

Dynamic and interactive parallel sessions

+300 scientific abstracts submitted

80 presentations delivered

82 posters open for public voting for 3 days

20 hours of parallel sessions and open discussion

The link between Soils & Nutrition is now in the news…
…the only way to move to general public and policy makers!

+ articles in the main world newspapers

FAO, la mappatura dei nutrienti del suolo in America Centrale e nell'Africa sub-sahariana, per un uso più efficiente dei fertilizzanti

Investing in smallholder farmers

By DANIEL ESSIET — On Jul 27, 2022

ALARABIYA news

THE NATION

MIRAGE

FAO
@FAO · Follow

#DYK that 95% of our food comes from #soils?

❤️Learn more about the relationship between healthy soils and healthy food 👉 bit.ly/3POzXsQ

#Soils4Nutrition

1:00 PM · Jul 27, 2022

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FAO warns 90 per cent of Earth's topsoil at risk by 2050

Soils, where food begins

entro il 2050 potrebbe essere a rischio il 90% del suolo fertile della Terra (VIDEO)

Fao e Global Soil Partnership promuoveranno la mappatura dei nutrienti del suolo in America centrale e nell'Africa subsahariana

[28 Luglio 2022]

Il 95% del cibo globale viene prodotto nel suolo. I suoli hanno la capacità di immagazzinare, trasformare e riciclare i nutrienti dei quali gli esseri umani hanno bisogno per sopravvivere. Dei 18 nutrienti essenziali per le piante, 15 sono forniti dal suolo, se è sano. Secondo la Fao, è probabile che entro il 2050 sarà a rischio ben il 90% del prezioso terriccio terrestre. Ogni 5 secondi nel mondo viene eroso suolo fertile per l'equivalente di un campo da calcio. Il problema è che ci vogliono circa mille anni per creare solo pochi centimetri di terriccio.

Il **Global Symposium on Soils for Nutrition**, organizzato da Fao e Global Soil Partnership e che termina domani, sta discutendo proprio della fertilità dei suoli globali e dei modi per migliorare la disponibilità di nutrienti del suolo per le colture senza danneggiare l'ambiente. Il meeting è stato l'occasione per presentare il **rapporto** "Soils for nutrition: state of the art" che ricorda che «Il cibo inizia dai suoli e, poiché la data

nation relevant to soil analysis.

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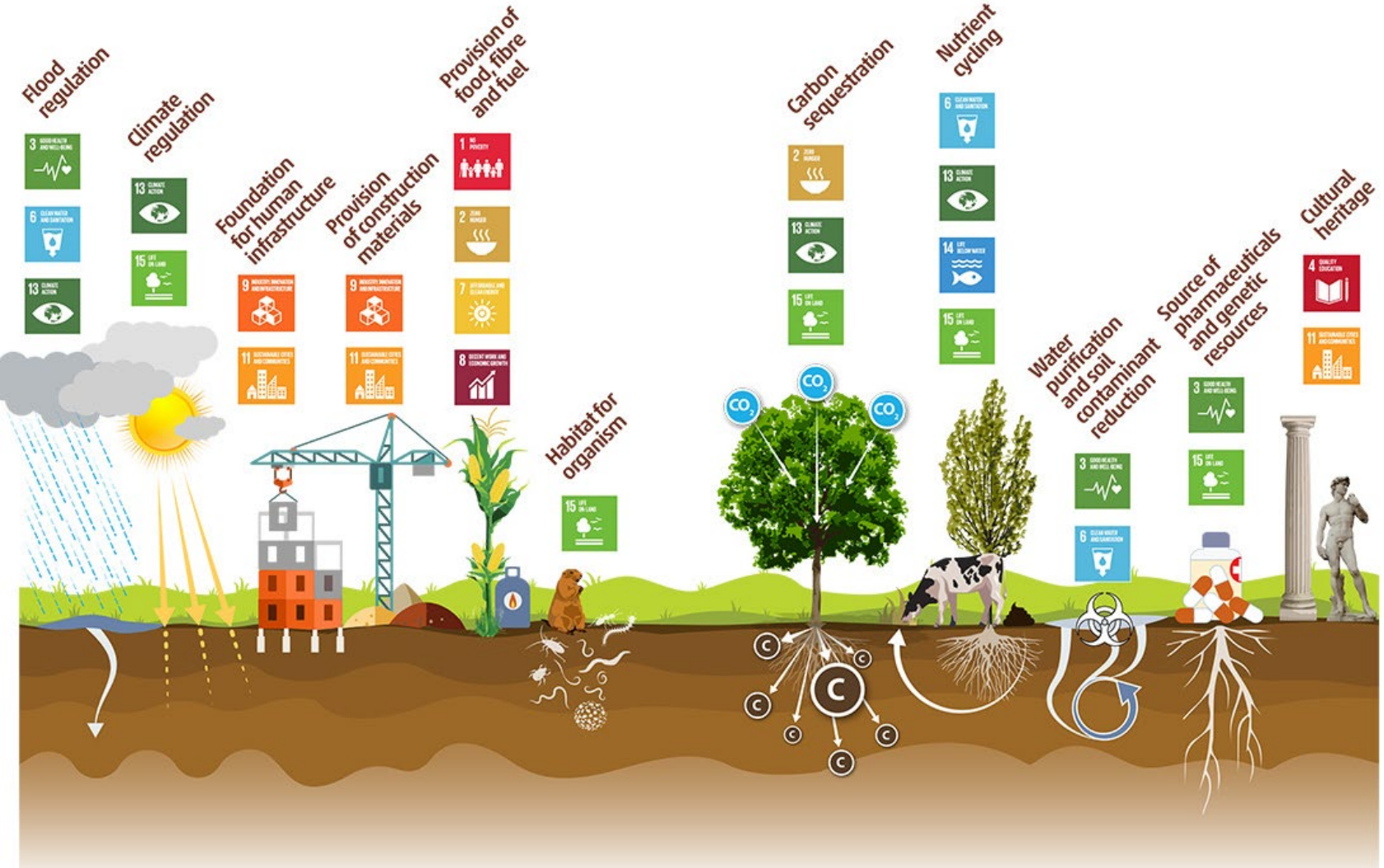
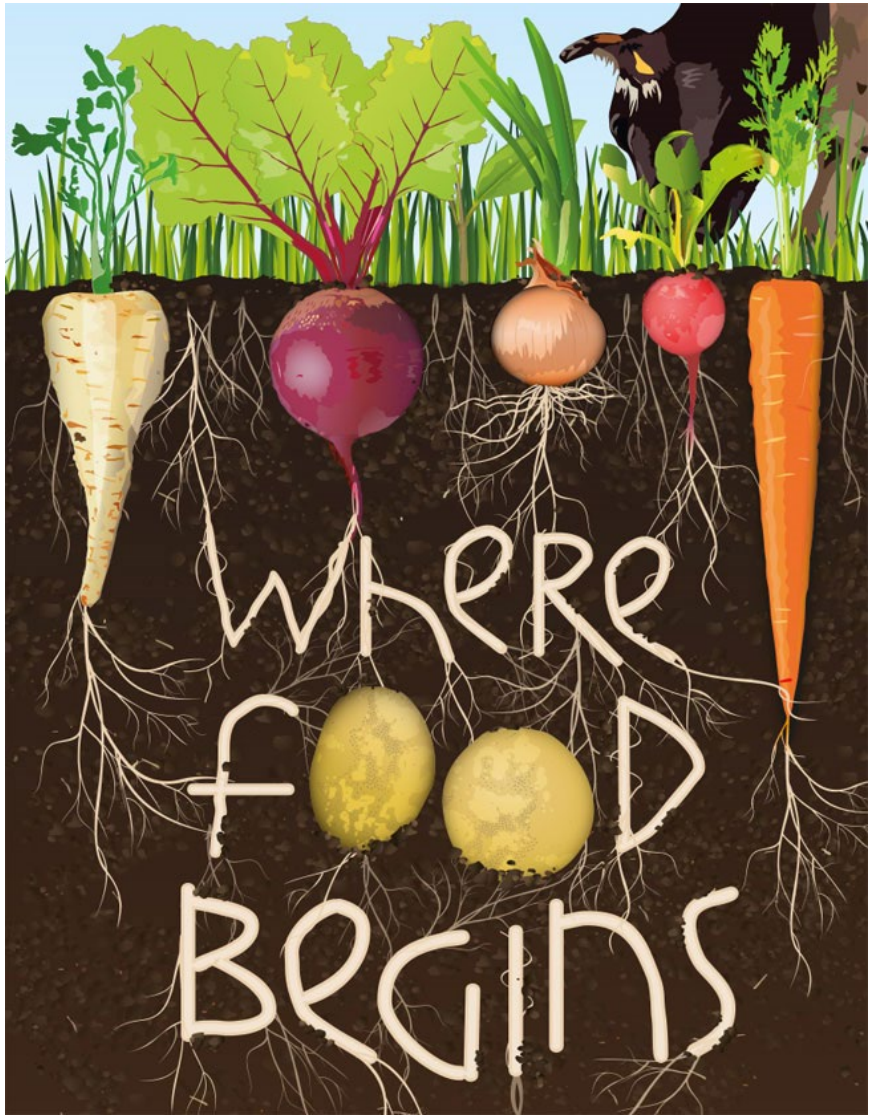
90% of Earth's topsoil at risk by 2050, FAO warns

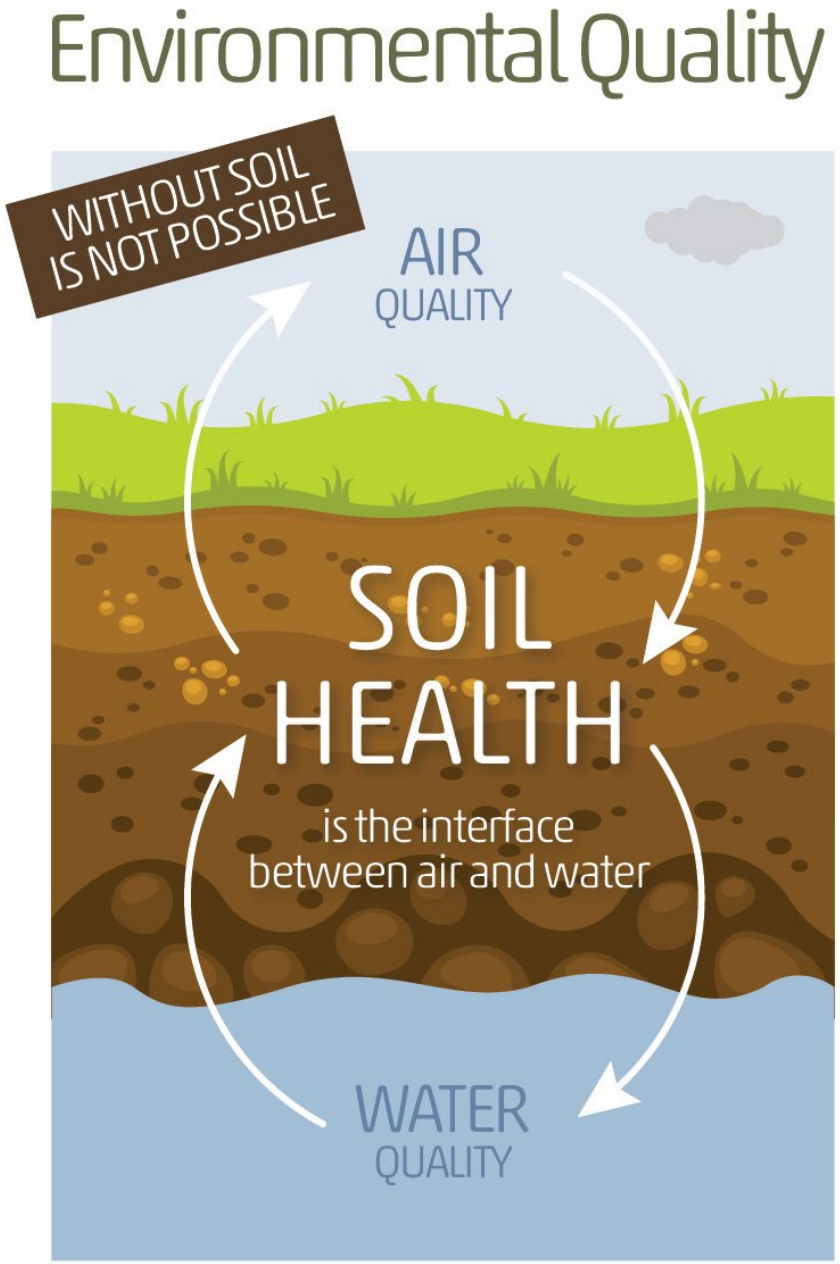
FAO to boost soil nutrient mapping

Key findings

Soil is fundamental for providing crucial ecosystem services: particularly Soil is where food begins…..

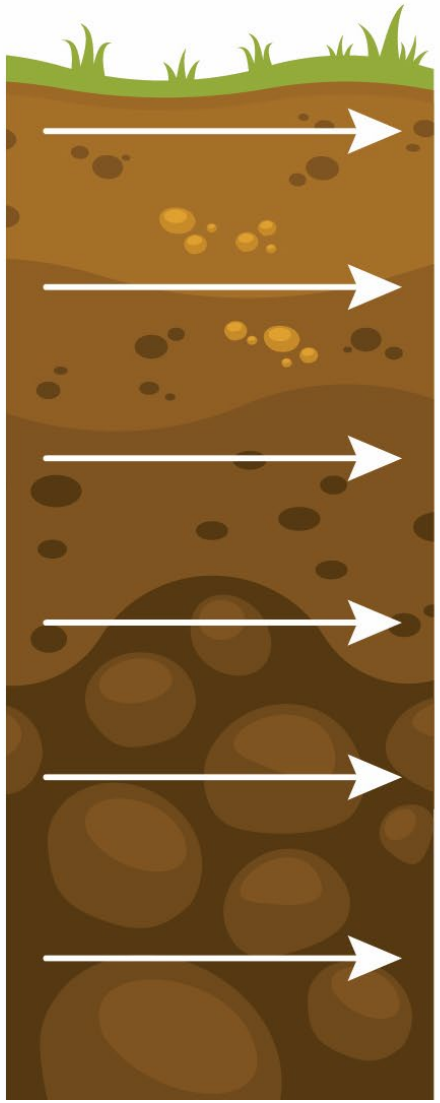




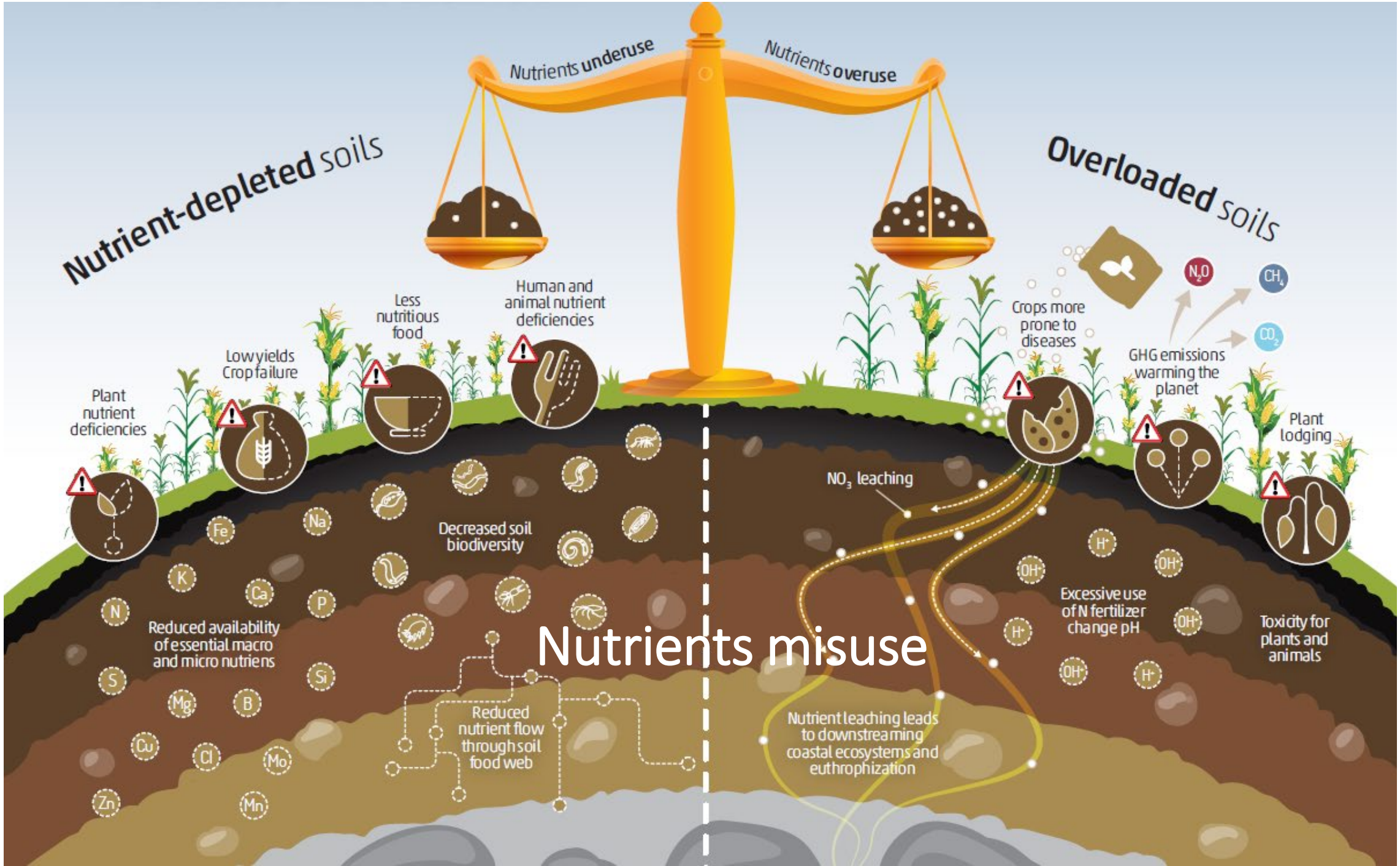


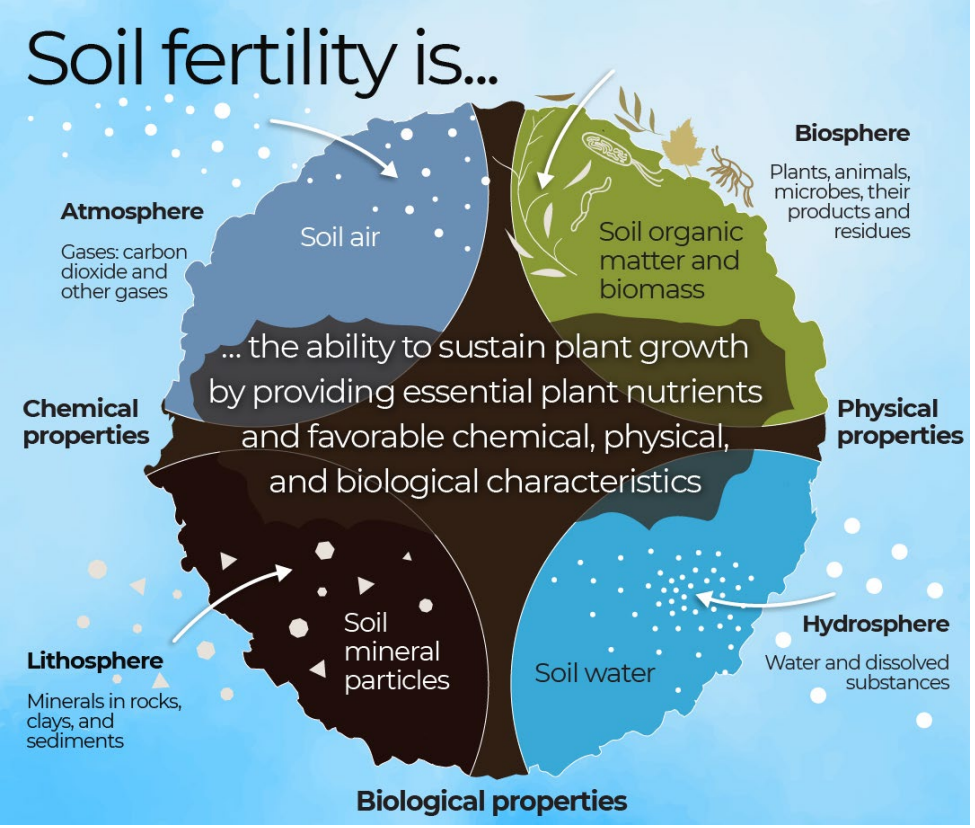
We still need to work hard in advocacy and awareness raising as soil is not given the importance and that is why, its management is not sustainable at all…….

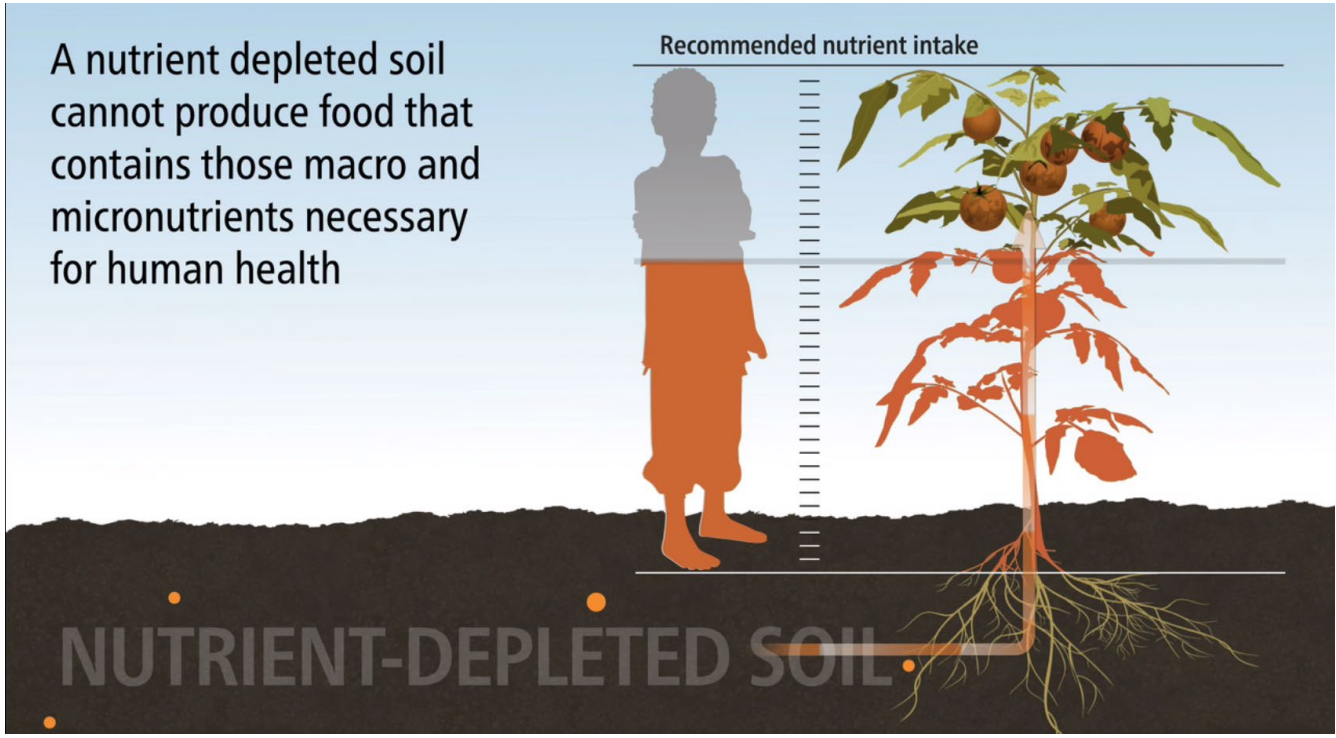
Healthy soils and Food Security/Nutrition

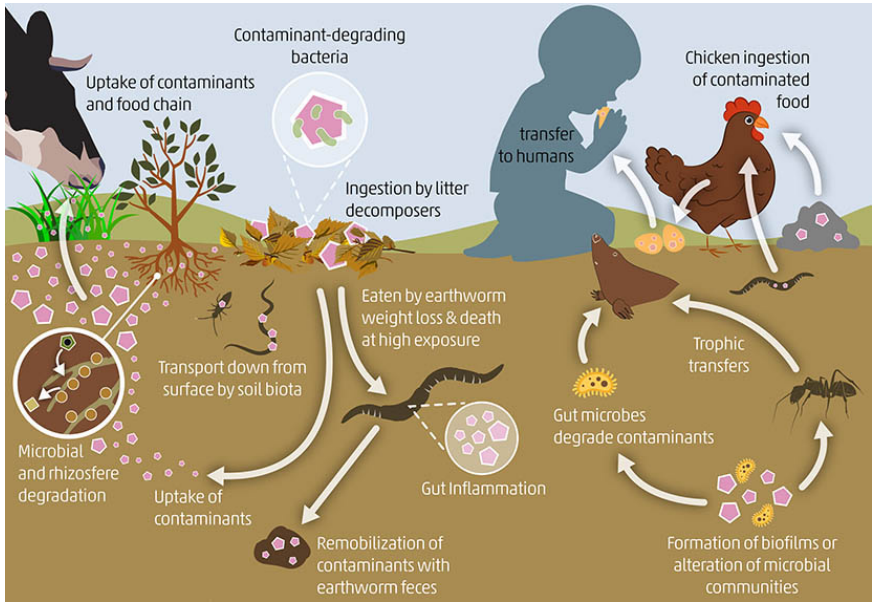


Food availability	Increase crop yield but also quality
Nutritious food	Macro and micronutrients
Food safety	Crops free of contaminants and pathogens
Low environmental impact	No degradation of soils and natural resources
Biodiversity	Soil biodiversity fundamental... crop diversity...
Mitigation and adaptation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

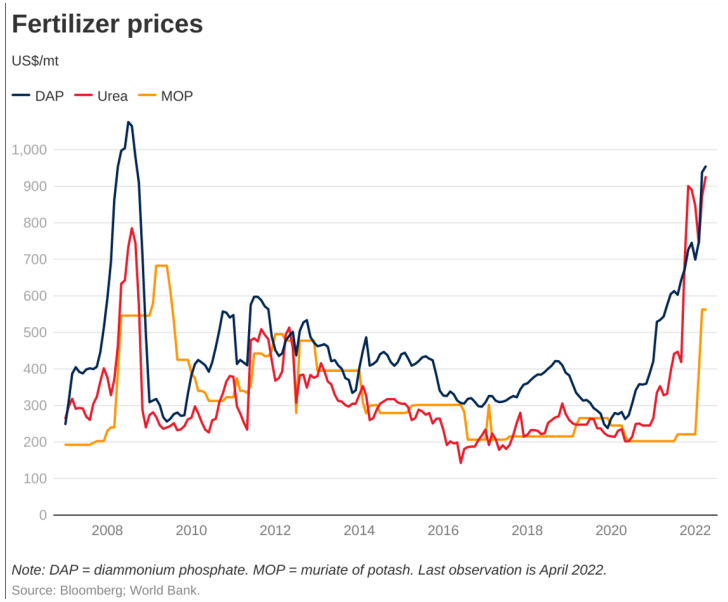

Nutrients underuse
Nutrients overuse
Nutrient-depleted soils
Overloaded soils
Plant nutrient deficiencies
Low yields Crop failure
Less nutritious food
Human and animal nutrient deficiencies
Crops more prone to diseases
GHG emissions warming the planet
Plant lodging
Decreased soil biodiversity
Reduced availability of essential macro and micro nutriens
Reduced nutrient flow through soil food web
NO_3 leaching
Excessive use of N fertilizer change pH
Toxicity for plants and animals
Nutrient leaching leads to downstreaming coastal ecosystems and euthrophization
Nutrients misuse


Soil fertility is...
Biosphere
Plants, animals, microbes, their products and residues
Atmosphere
Gases: carbon dioxide and other gases
Soil air
Soil organic matter and biomass
... the ability to sustain plant growth by providing essential plant nutrients and favorable chemical, physical, and biological characteristics
Chemical properties
Physical properties
Soil mineral particles
Soil water
Hydrosphere
Water and dissolved substances
Lithosphere
Minerals in rocks, clays, and sediments
Biological properties


A nutrient depleted soil cannot produce food that contains those macro and micronutrients necessary for human health
Recommended nutrient intake
NUTRIENT-DEPLETED SOIL


Contaminant-degrading bacteria
Uptake of contaminants and food chain
transfer to humans
Chicken ingestion of contaminated food
Ingestion by litter decomposers
Eaten by earthworm weight loss & death at high exposure
Trophic transfers
Transport down from surface by soil biota
Gut microbes degrade contaminants
Microbial and rhizosfere degradation
Gut Inflammation
Uptake of contaminants
Remobilization of contaminants with earthworm feces
Formation of biofilms or alteration of microbial communities

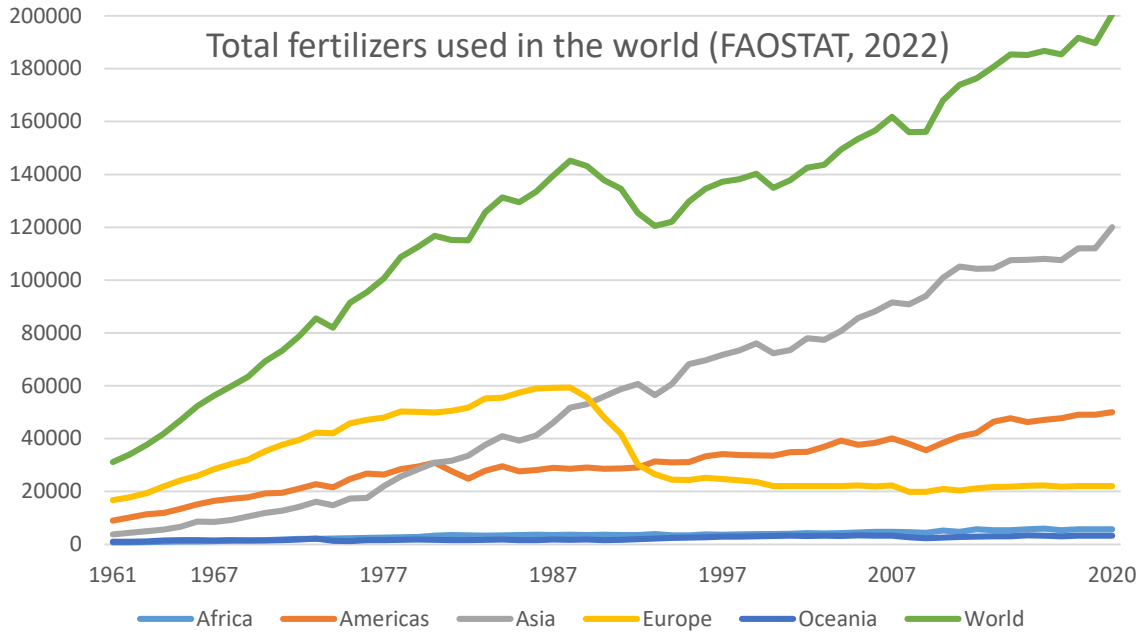
Fertilizer Market Size surpassed **USD 190 billion in 2020** and will grow at a CAGR of 2.6% from 2022 to 2030



Fertilizers are now at their least affordable levels since the 2008 global food crisis, despite higher crop prices, which may limit fertilizer use. *https://blogs.worldbank.org/*

Urea prices are expected to remain at historically high levels for as long as natural gas and coal prices remain elevated. Similarly, DAP prices are projected to remain high until ammonia and sulfur prices ease. *https://blogs.worldbank.org*

Fertilizer use reached more than 200 million of tons in 2020

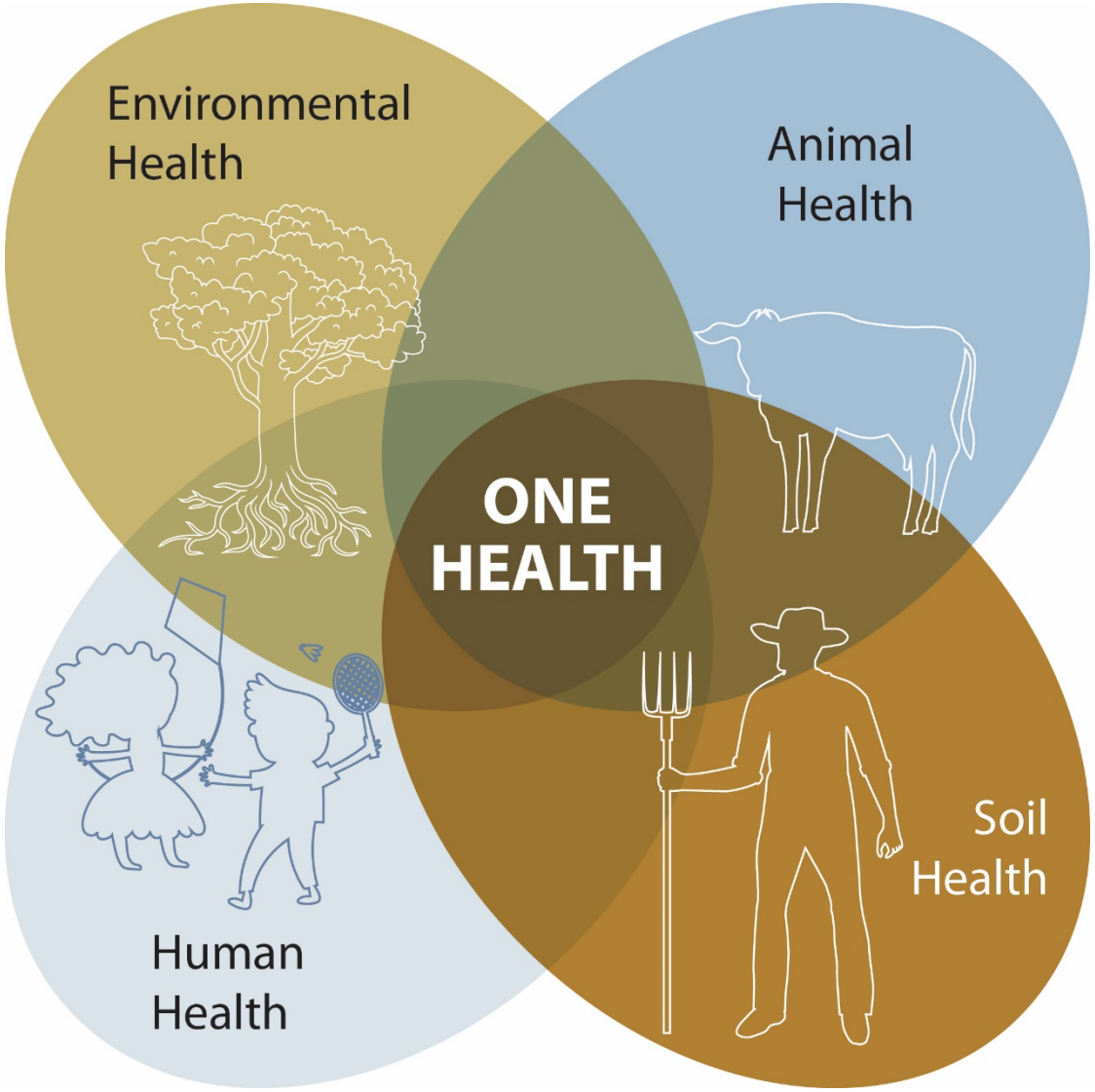


Globally, **nitrogen fertilizers represent almost 60% of the total fertilizers use**.

Regionally, Europe has followed a constant decrease of the fertilizers use, since Asia never decreased and maintain an increasing rhythm near to 20% every 10 years. FAOSTAT, 2021

In 1970, Europe consumed almost 50% of the world fertilizers and Asia 15%. This proportion is reversed in 2017, when Asia uses more than 57% of the fertilizers and Europe is around 12%. FAOSTAT, 2021

Opportunities

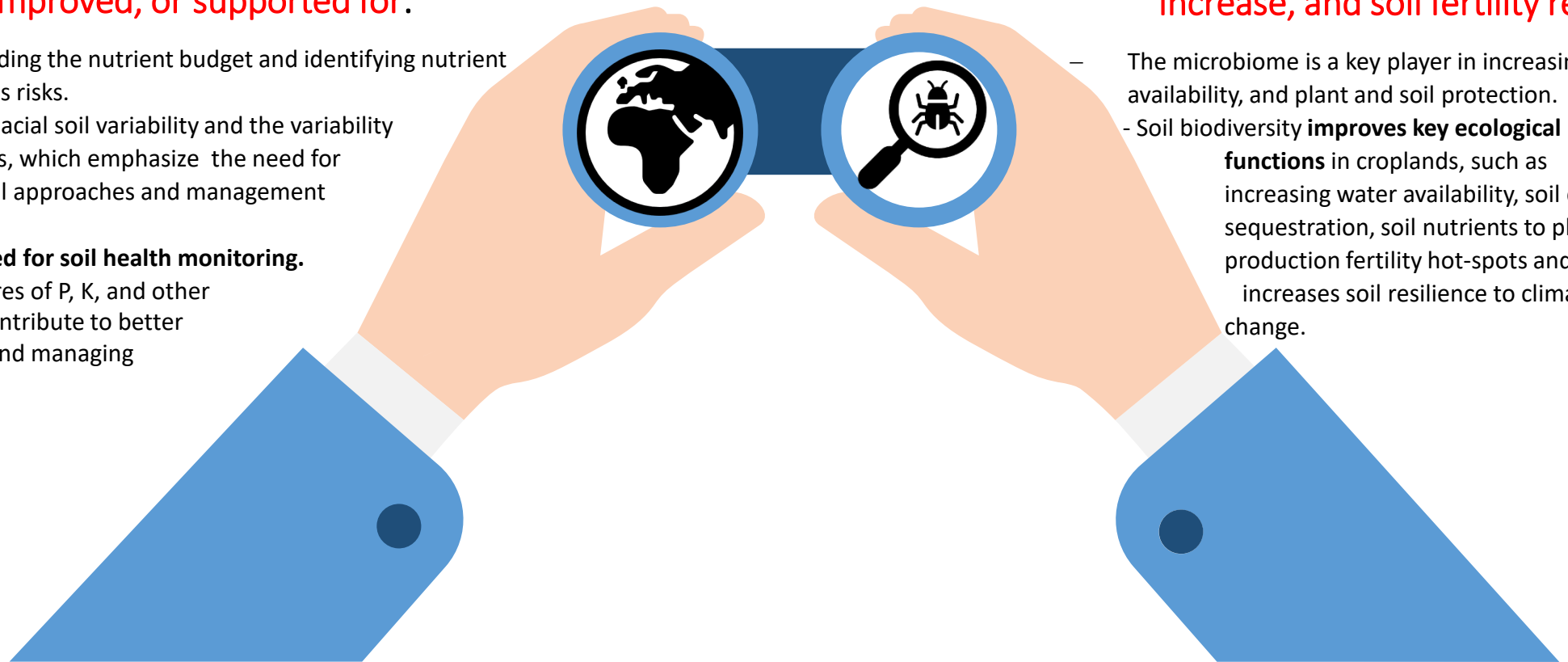


One health approach is the way to go……but soil health should be recognized.

We need to know where the nutrients are and how to increase their content without associated externalities

Soil nutrient/fertility mapping is a powerful instrument that needs to be developed, improved, or supported for:

- Understanding the nutrient budget and identifying nutrient deficiencies risks.
- Address spacial soil variability and the variability of soil properties, which emphasize the need for site-specific local approaches and management strategies.
- **Strong need for soil health monitoring.**
- Global stores of P, K, and other elements will contribute to better understanding and managing soil nutrients.



Soil biodiversity emerges as a crosscutting solution to soil fertility loss, soil fertility increase, and soil fertility recovery.

- The microbiome is a key player in increasing nutrient availability, and plant and soil protection.
- Soil biodiversity **improves key ecological functions** in croplands, such as increasing water availability, soil carbon sequestration, soil nutrients to plants, or production fertility hot-spots and increases soil resilience to climate change.

Sustainable soil management is still the more cost-effective solution to increase nutrient content in soils

The most promising strategies to increase micronutrient availability and nutritious food is the improvement of soil health and especially the use of soil microorganisms

- SSM practices **in association** with micronutrient applications conduct to micronutrient-rich food.
- Micronutrient availability is linked to **soil's physical, chemical, and biological properties**, the most important are soil pH, soil microbiome, soil organic carbon, and nutrient balance.

Exploring alternatives and synergistic effects to increase the soil micronutrient content

- The relationship between SOM additions and micronutrient availability
- Harnessing soil biodiversity, especially soil microbes
- The optimization of micronutrient availability with macronutrient fertilization
- Reuse and recycling of mineral materials
- Innovative solutions, nanoparticles are promising alternatives
- Biological solutions: micronutrient solubilizers

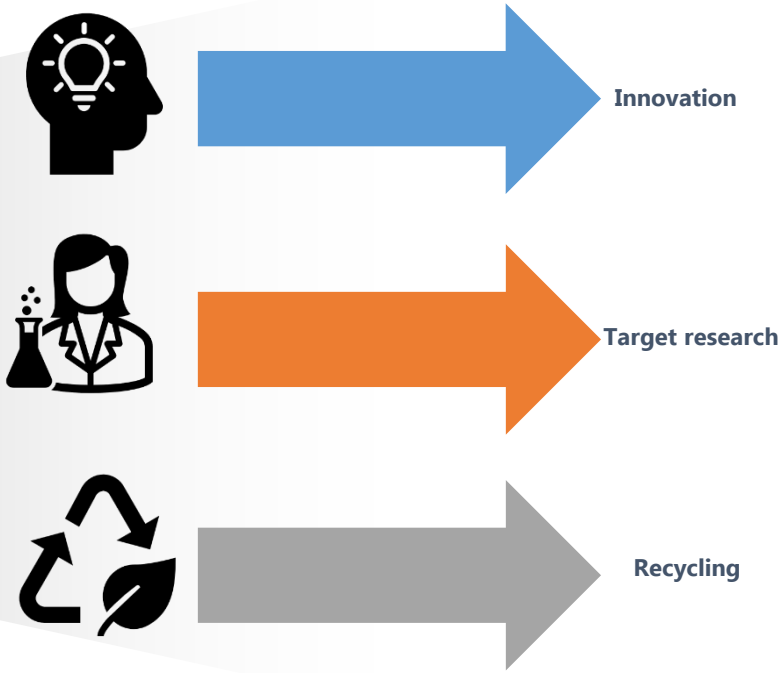
There are people who have a significant number of followers in every business.

Moving forward from the environmental impact of mineral and inorganic fertilizers to improved efficiency, alternative nutrient sources, and quality assessment

Considering that most inorganic fertilizer sources are:

- Based on mineral, **non-renewable** natural resources that will eventually be scarce and quality-reduced;
- **Fertilizers price** has significantly increased;
- Fertilizers are **not affordable and accessible** for many farmers;
- Induce **GHG emissions** and air and water pollution

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



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

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

Fertimanure, biodegradable coatings for fertilizers, nanotechnology.

Alternative sources to increase nutrient content and availability

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.

Wastes are not wastes, they can be new sources of nutrients aligned with a circular economy and a lower carbon footprint

- 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,

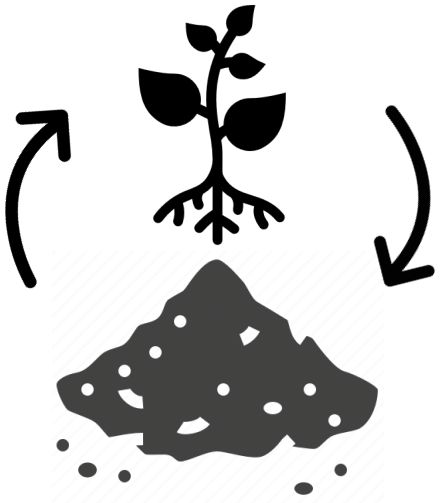
Quality assessment of all nutrient sources is a necessity that can no longer be postponed

- 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

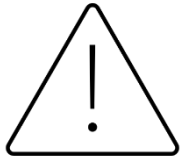
Fertilizer quality assessment

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

Because mineral fertilizers are more commonly used and will still be used it is recommended to:



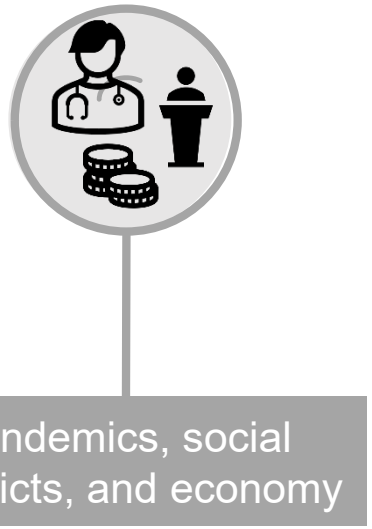
- Soil management should be a medium term activity.
- Feed the crops in addition to the soils (pair with plant-based approach like biofortification).
- Match nutrient availability with crop demand
- Keep nutrients applied to soils in available form
- Combine bioagents and inorganic fertilizers: increase yields, increase use efficiency, and reduce GHG emissions.
- Integration of organic sources (green manure, residue compost, improves productivity, nutrient availability contributes significantly to fertilizer cut down
- Use digital technologies for customization
- Follow the integrated soil fertility management principles



Soil health is not only a prerogative but also a prerequisite for other efforts and investments to work optimally.

Healthy soils are the trigger to the efficient functioning of other management strategies focused on sustainability and food security including biofortification, fertilization plans, technological innovations, and nature-based solutions.

Health and social and economic crisis.
COVID-19 and other diseases, social and military conflicts, and fertilizer price increases aggravate food insecurity and further threaten soil health and fertility



Synergies with other driving forces: water availability, climate change, poverty, fertilizers crisis position soil fertility conservation on a very complex scenario

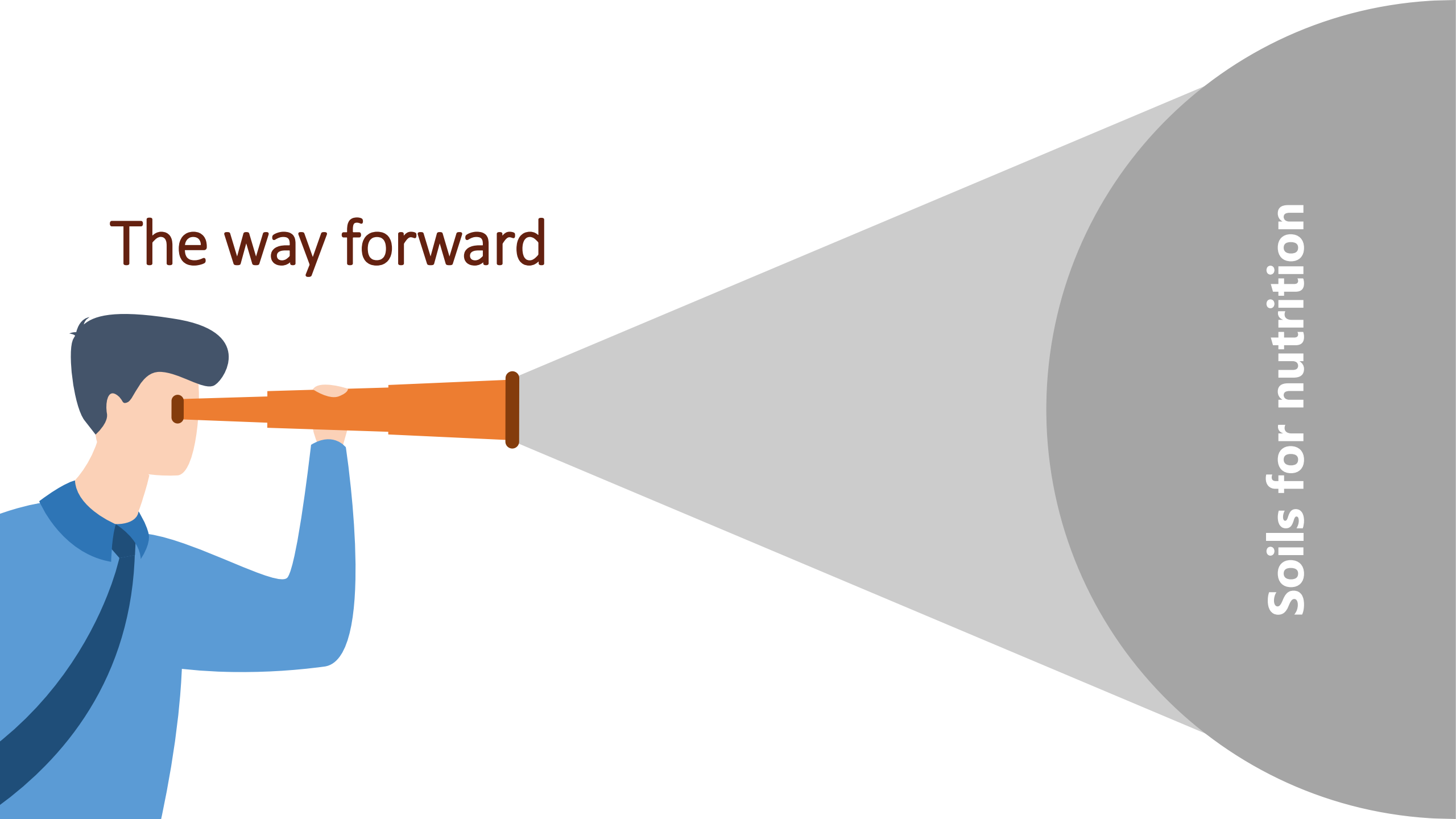
- **Water availability**: aridity generates problems that seriously affect soil fertility and make it almost impossible to implement strategies to improve soil health and fertility. On the other hand, floods also have adverse effects on soil fertility and enhance GHG emissions.
- Therefore, water management is essential and that is why next year this will be the theme of the global symposium.
- **Climate change:** it is necessary to cut the loop of croplands being affected by climate change, but also being a leading cause of greenhouse gas emissions. Increasing fertilizer use efficiency can reduce the global affectations of carbon and nitrogen cycles that are causing GHG emissions.
- **Poverty and the increase of fertilizer prices** together with social conflicts are the perfect storm for unaffordability and inaccessibility of many farmers to fertilizers widening the gap of soil degradation, and food insecurity.

Legislation to produce, apply, and assess nutrient sources is a huge opportunity area. The legislation scenario is rather scattered and there is a gap in the quality of the manure and other new nutrient sources to be applied (not clear regulations on the manure composition requirements, leading to a contamination risk), and the link to biodiversity is not reported adequately.

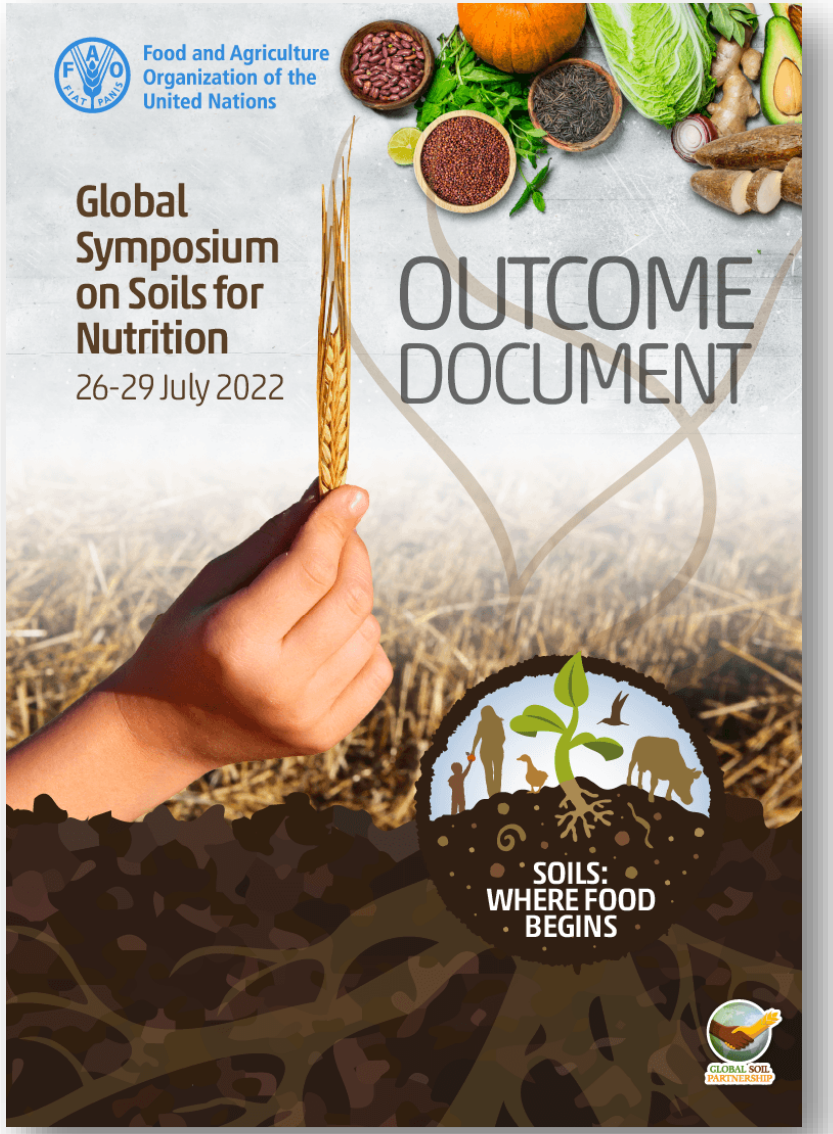
In a nutshell

- Advocacy and awareness raising: general public to know where food comes from and value it (as well as soils).
- Sustainable soil management should be adopted by all: soil management is a long-term engagement and we soil health should be analogous to human health (a healthy human cannot depend on supplements forever but in good food together with exercise, etc)….
- In the case of SSM: minimum tillage, crop rotation, addition of organic matter and use of soil biodiversity should be a must.
- Soil fertility should be integrated (no dogmas) but we should be conscious that we cannot continue with the same approach.
- Are farmers aware of the composition of bag of fertilizer? Are farmers using fertilizers based on recommendations by experts (extensions)?
- Research and development of better/cleaner fertilizers (Industry must invest on this and assume responsibility).
- Innovations in the production and use/management of fertilizers should be the way forward.
- Mapping and monitoring of soil nutrients should be: spatial, temporal, all should contribute with data (statistics on fertilizer use to be paired spatially with the soils and crops and management).

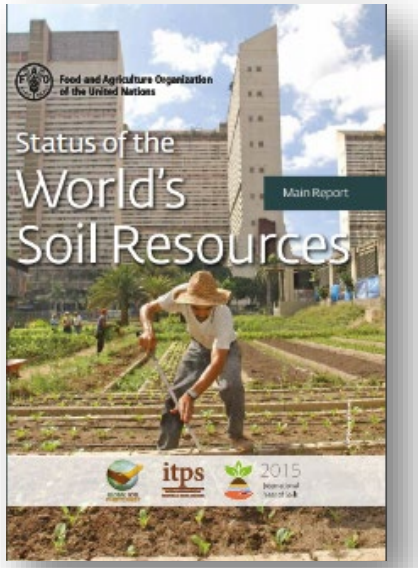
The way forward



An Agenda for action on Soils for Nutrition

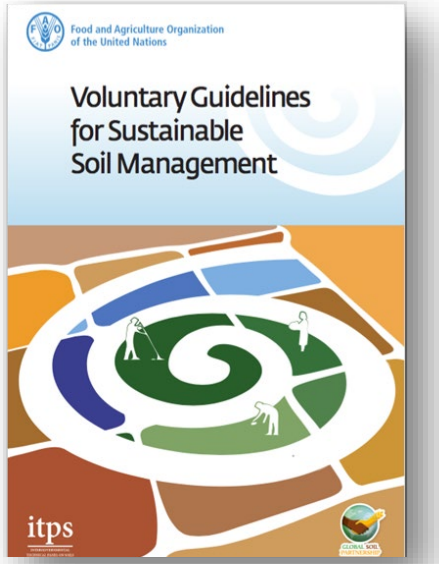


Implementation of normative tools (advancing soil governance)



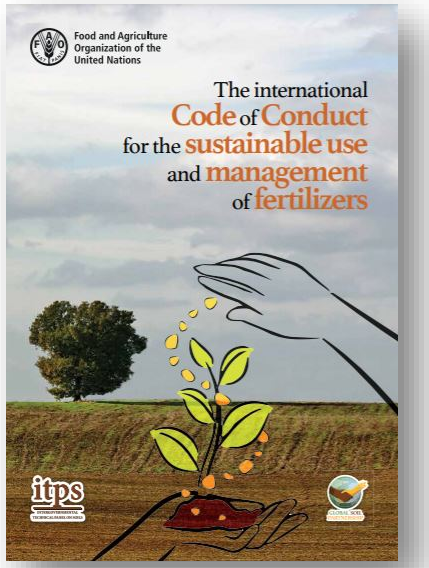
Main soil threats

2025



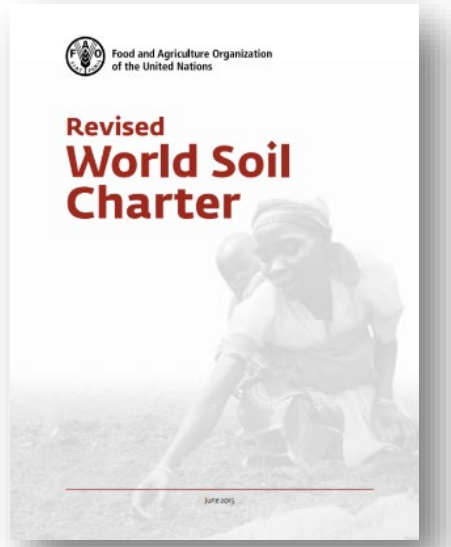
What to do?

1. Minimize soil erosion
2. Increase the organic matter content of the soil
3. **Promote soil nutrient cycling and balance**



Avoid nutrient imbalances

1. Underuse
2. Misuse
3. Overuse



Soil governance

Establishment of the International Network on Soil Fertility and Fertilizers (INSOFF)

In order to address the current challenges, it is proposed to establish the International Network on Soil Fertility and Fertilizers (INSOFF).

Advance the debate from multiple stakeholders towards making our soils healthier while ensuring the provision of clean ecosystem services.

Facilitate and Support the implementation of the International Code of Conduct for the Sustainable Use and Management of Fertilizers.

1. Mapping and Monitoring on soil nutrients and soil fertility (Working group 1)
2. Sustainably manage inorganic and organic nutrient sources through integrated soil fertility management approaches (Working group 2).
3. Increase fertilizer use efficiency through good management strategies, nature-based solutions, technological tools, and innovations to avoid environmental pollution and climate change (Working group 3).
4. Improve soil micronutrient content to enhance crop, animal, and human nutrition. Recover food nutrient quality through soil nutrient management (Working group 4).
5. Advocate and support nutrient source innovation and recycling (Working group 5).
6. Look at the quality of all nutrient sources to avoid health problems and environmental degradation. The International Network on Fertilizer Analysis (INFA) that is currently operating globally would merge with this new international network.

The GSNmap will provide soil nutrient as well as soil nutrient budget maps to optimize the sustainable management of soil nutrients

Phase I

Development of soil macronutrient and soil property maps

In Parallel

Development of the Global Soil Erosion Map (GSERmap)

Phase II

Generation of Soil Nutrient Budget maps for NPK

National Experts

Capacity development

Country driven

Multilevel Capacity development

Capacity building, aimed directly to farmers. The Global Soil Doctors program which counts with specific modules targeted at training farmers on the sustainable management of soil nutrients and on good practices in relation to fertilizer use. Innovation and recycling of nutrients could be included in this program.

Awareness raising on the importance of soil fertility management and the link of soils with human and animal nutrition and health.

Fertilizer quality assessment is the best ally to avoid health problems and environmental quality deterioration. The work of the International Network on Fertilizer Analysis is key in this regard.


Thank you !
Global Symposium on Soils for Nutrition | 26-29 July 2022
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