



Food and Agriculture  
Organization of the  
United Nations



GLOBAL SOIL  
PARTNERSHIP

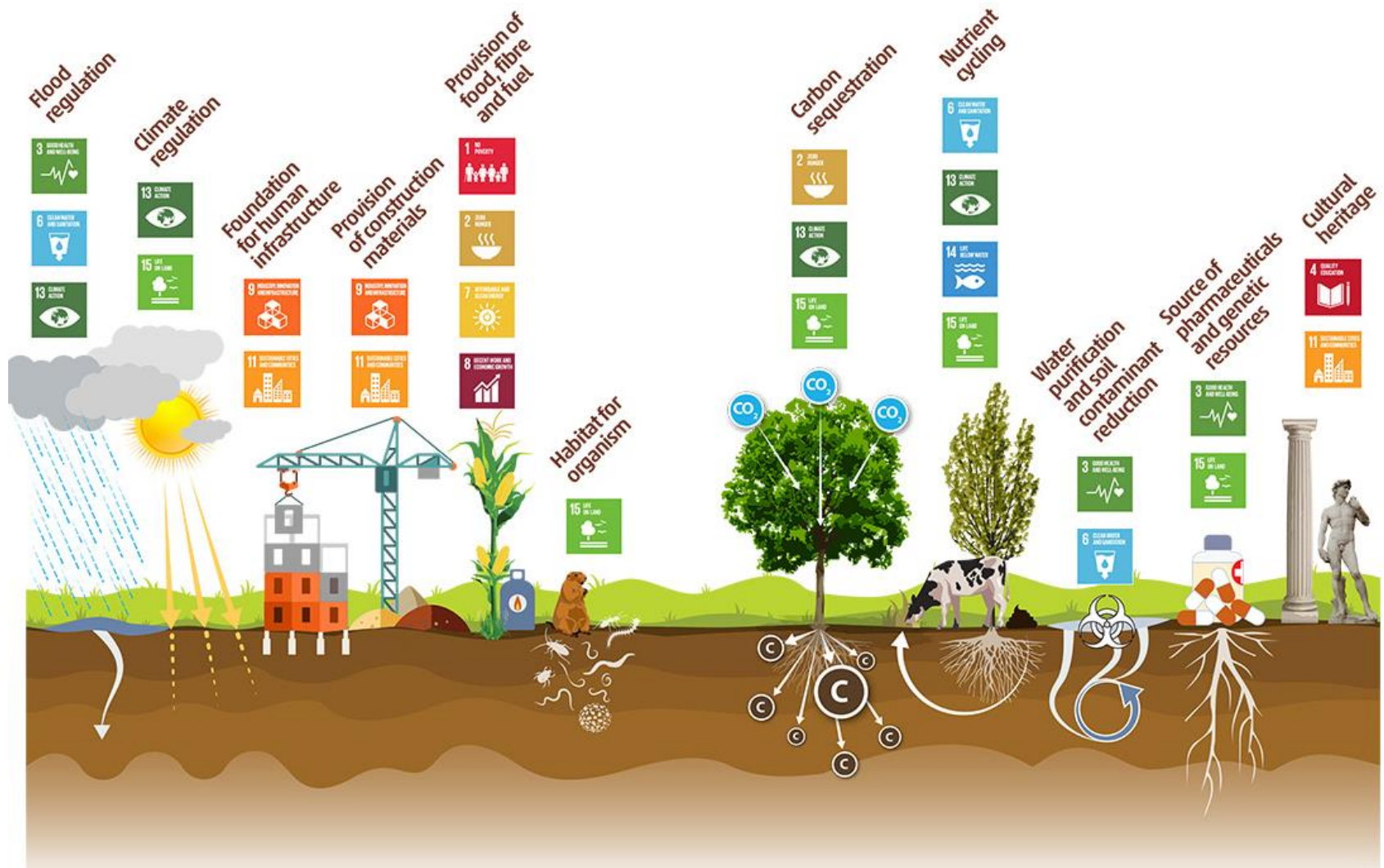
# Soil degradation and Food security

**Ronald Vargas**  
Secretary Global Soil Partnership, FAO



**Healthy soils can contribute to address these challenges**

# A healthy soil is capable of providing most terrestrial ecosystem services, therefore contributing to achieve the SDGs and human well-being



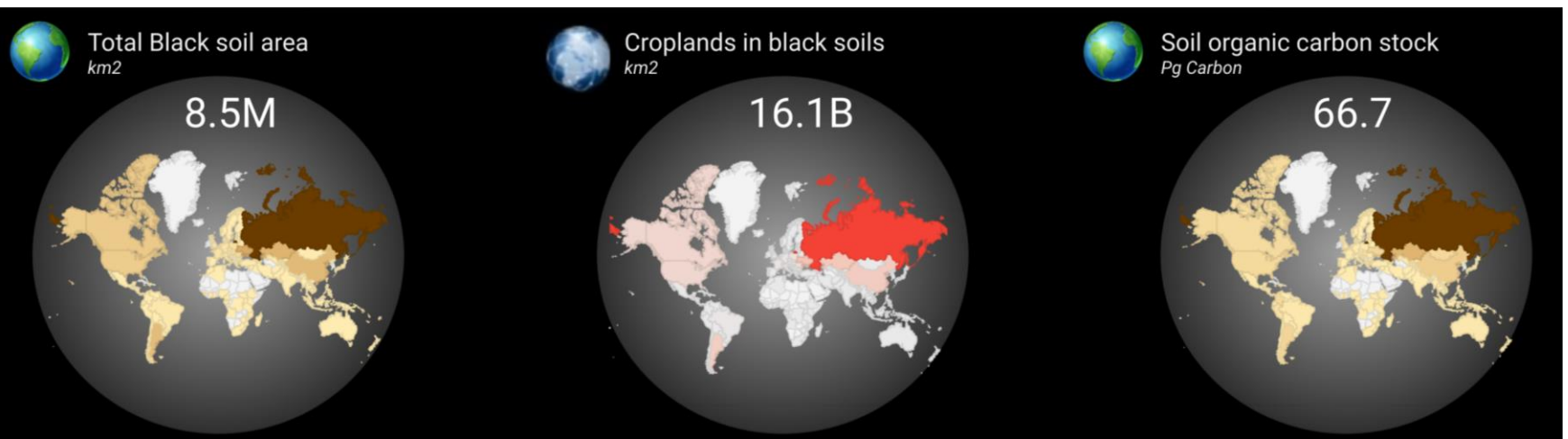
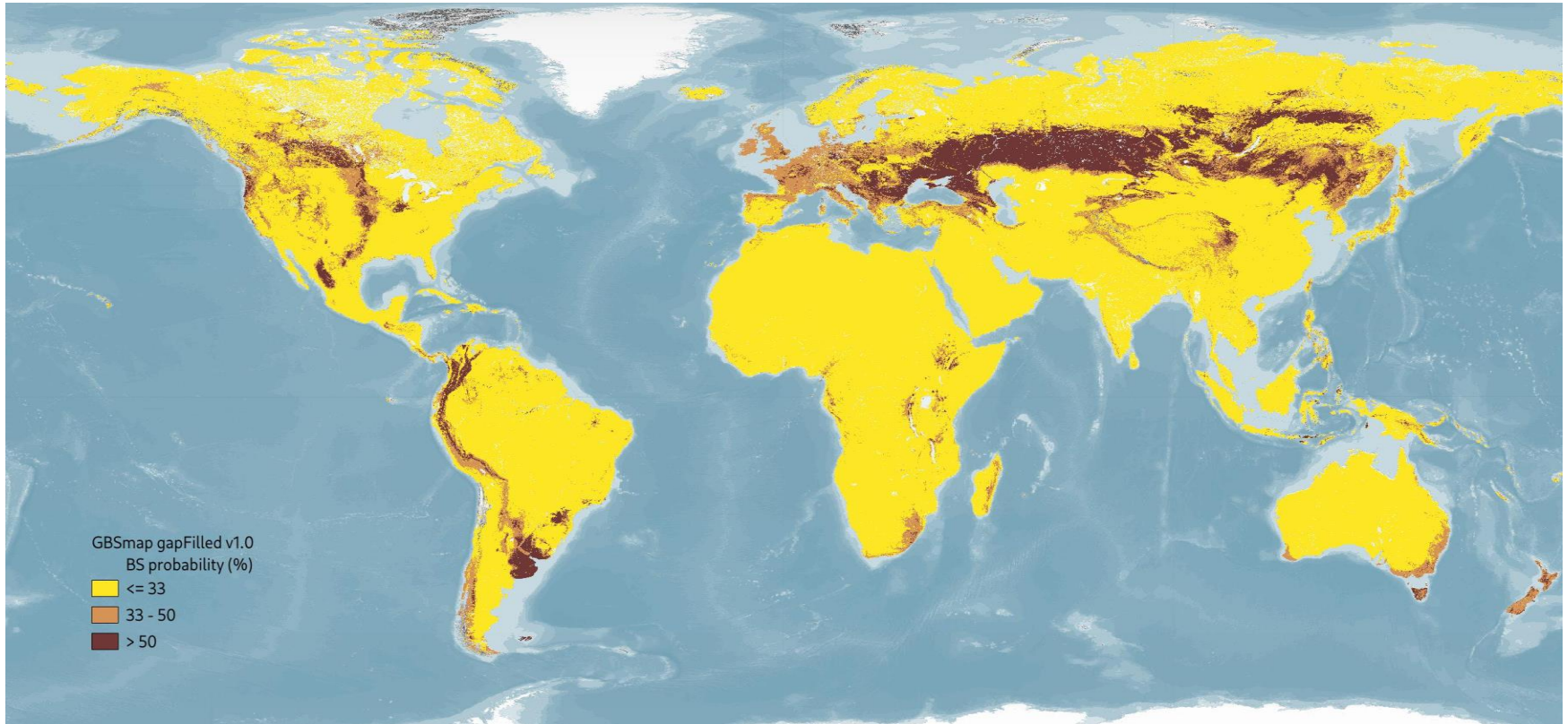


# Soil and Food Security

- **Food availability** → Crop yield
- **Nutritious food** → Macro and micronutrients
- **Food safety** → Crops free of contaminants
- **Low environmental footprint** → If sustainable managed
- **Biodiversity** → Soil biodiversity  
fundamental.....crop diversity....
- **Adaptation to climate change** → Healthy soils are resilient



# Black soils and food security (food basket)



# Yet the world's soils are at risk

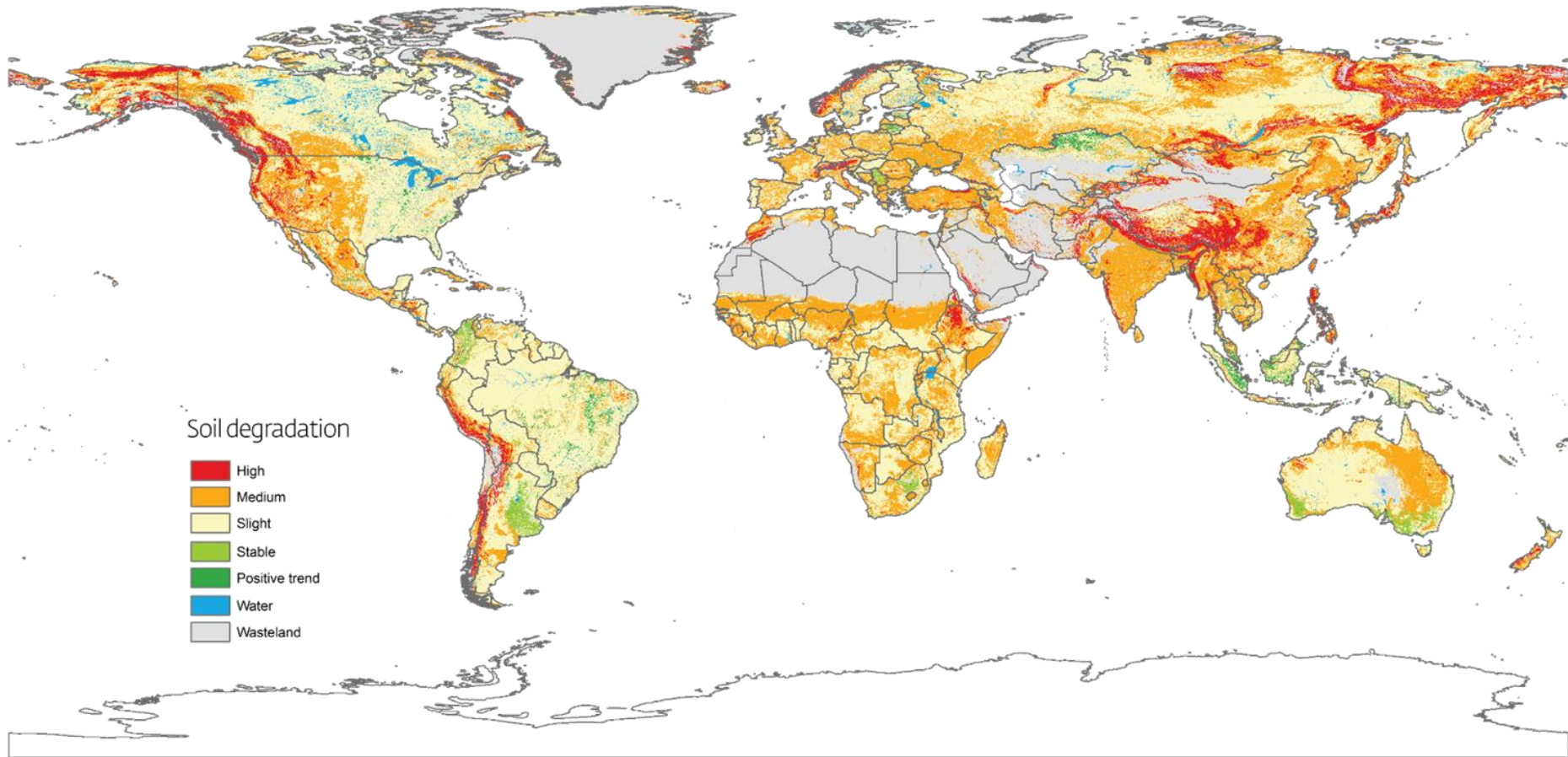
Main threats to soil function:

1. Soil erosion
2. Organic carbon change
3. Nutrient imbalance
4. Salinization and sodification
5. Soil sealing and land take
6. Loss of soil biodiversity
7. Contamination
8. Acidification
9. Compaction
10. Water Logging



The situation will **worsen** if **business as usual** continues

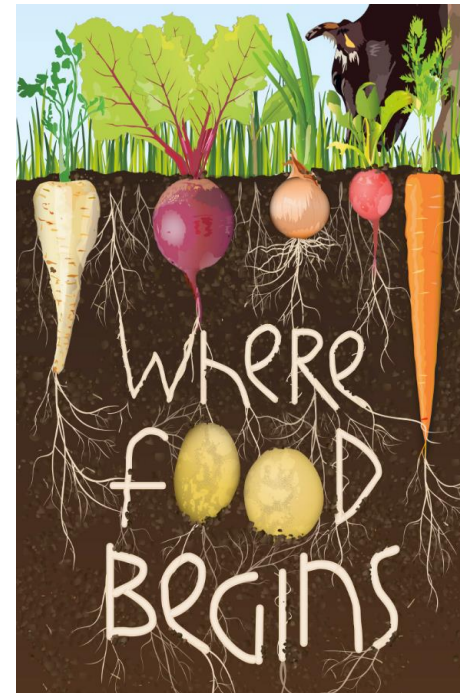
# Status of global soil degradation (33%)



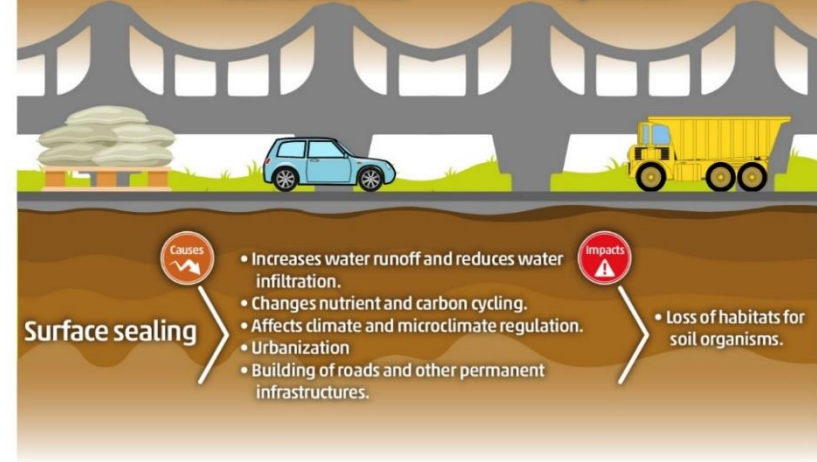
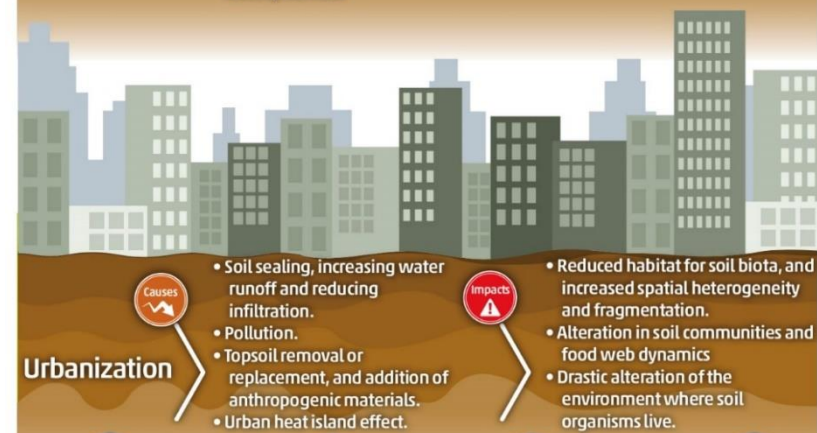
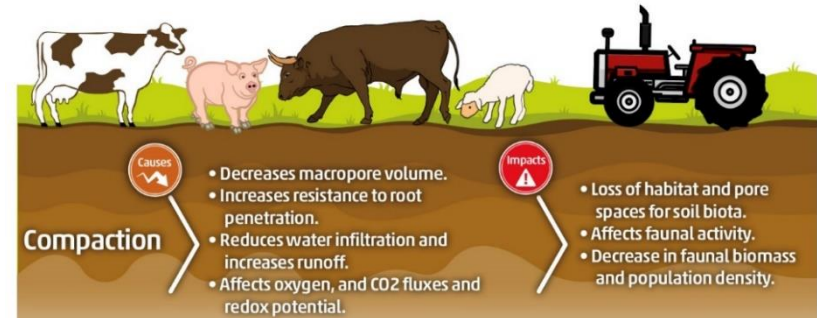
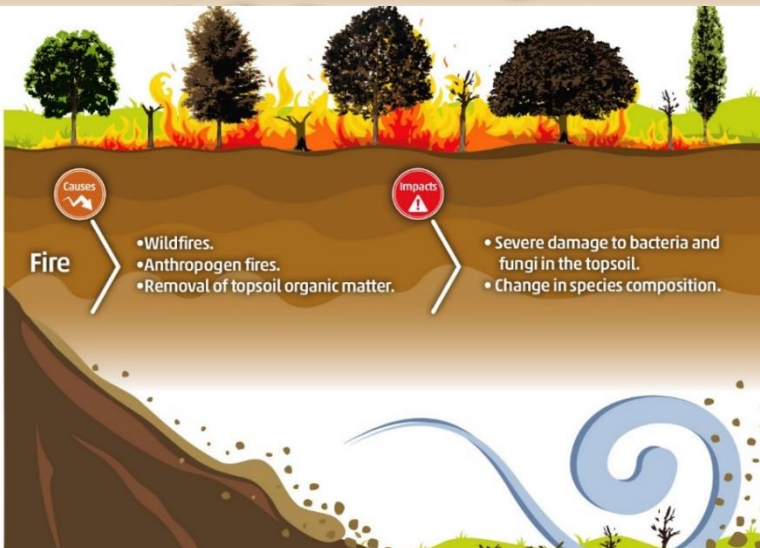
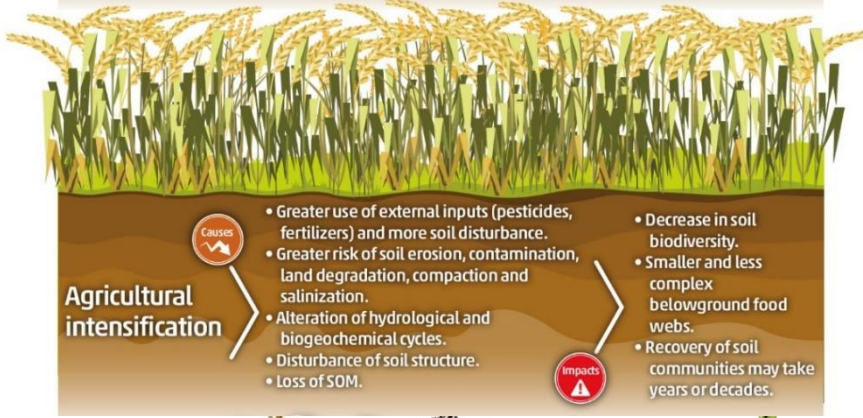


# Causes of soil degradation

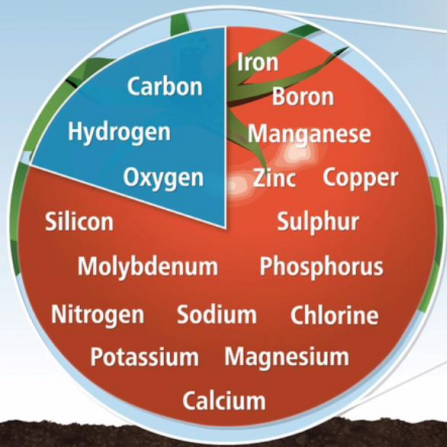
- Unawareness that soil is a living resource, but not renewable in a human time scale.
- Unawareness of all the benefits that we obtain from soils.
- Soil is a hidden resource



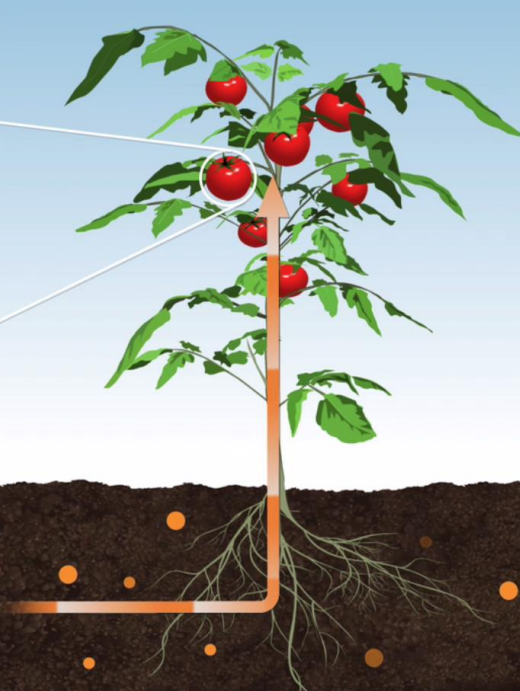
# Causes of soil degradation



# **Consequences**



The rest is obtained from the soil

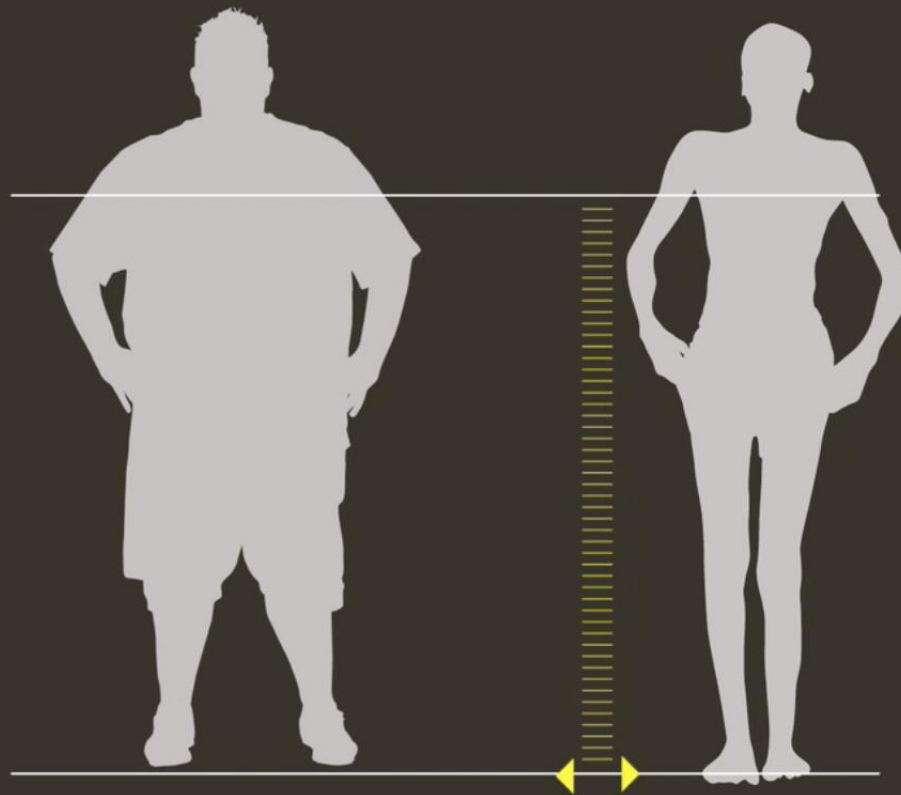


A nutrient depleted soil cannot produce food that contains those macro and micronutrients necessary for human health

Recommended nutrient intake



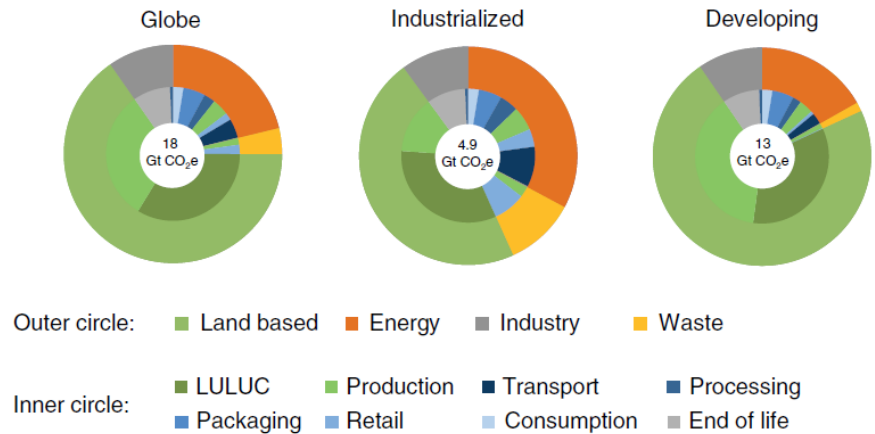
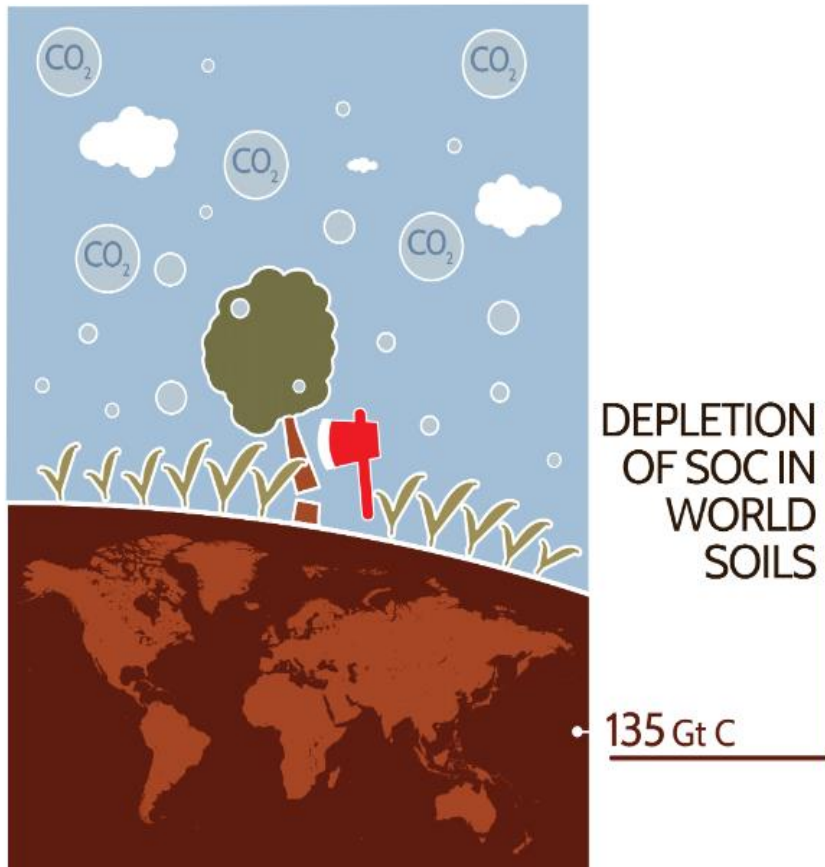
NUTRIENT-DEPLETED SOIL



Another form of malnutrition is “**hidden hunger**”:  
when a diet lacks micronutrients such as vitamin A, iodine, zinc and iron

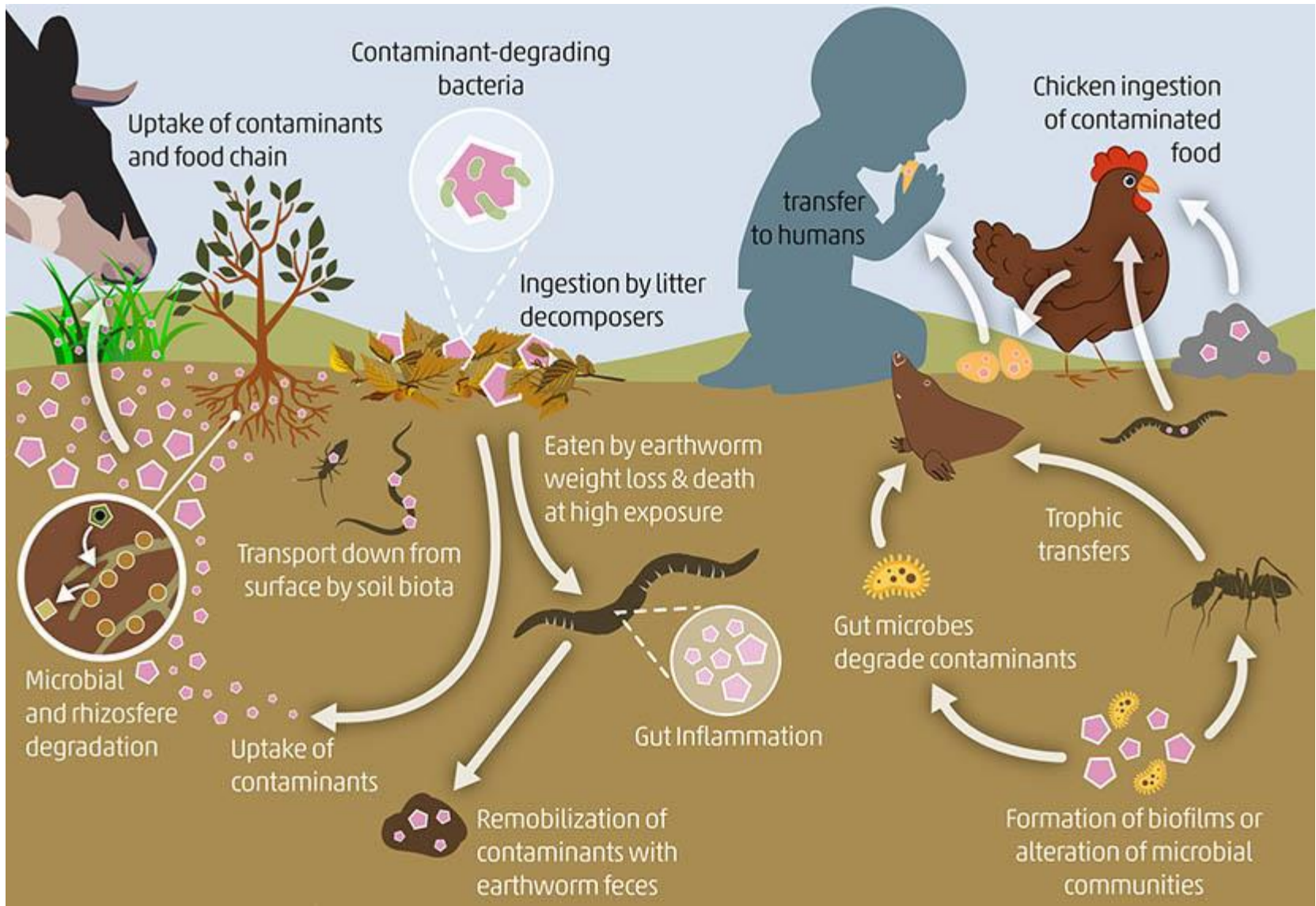
# Soil degradation has negative impact on the provision of ecosystem services but also contributes with GHG emissions (CO<sub>2</sub>, N<sub>2</sub>O y CH<sub>4</sub>)

27% of total global emissions



**Fig. 1 | GHG emissions from the food system in different sectors in 2015.** Total GHG emissions (including CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and F-gases) are expressed as CO<sub>2</sub>e calculated using the GWP100 values used in the IPCC AR5, with a value of 28 for CH<sub>4</sub> and 265 for N<sub>2</sub>O.

Gt = gigatonne = 10<sup>15</sup> g C = billion tonnes



Contaminant transfer into the terrestrial food web from the soil to pastures and crops, which are ingested by wildlife, livestock and humans, or from the soil to invertebrates, ingested by birds and poultry and ultimately transferred to humans.



## Nutrient excess in water bodies

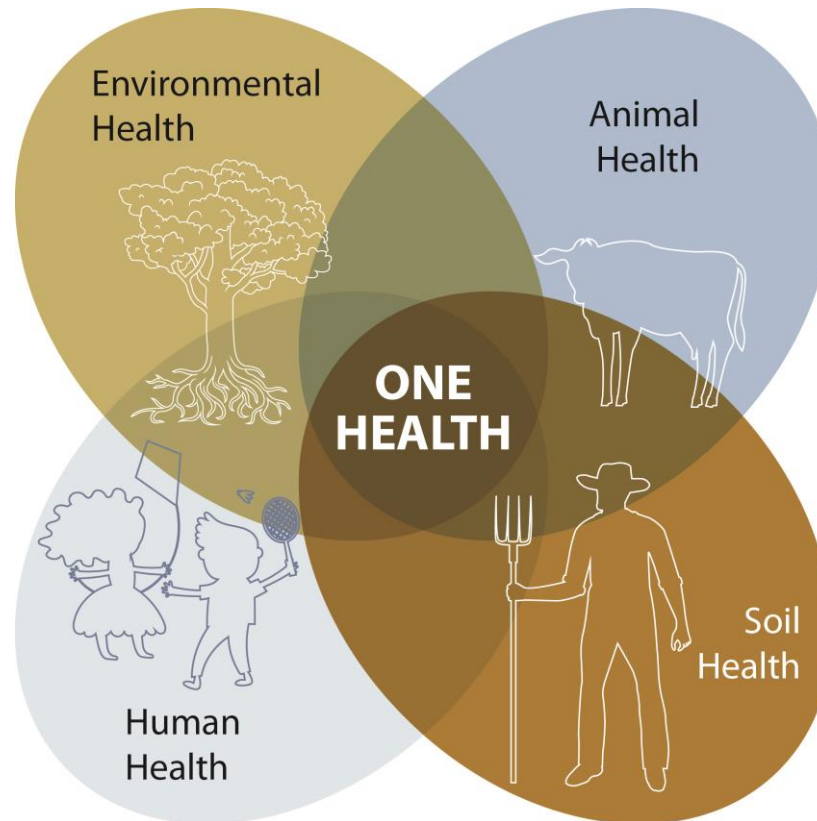
No. DE LABORATORIO	IDENTIFICACIÓN DE CAMPO	CARBONO ORGANICO %	CARBONO TOTAL %
MQ1-46960	ALONSO PB01	2.8147	3.82
MQ1-46961	CARLOS PA01	0.8080	1.10

Source: Stephane Roux



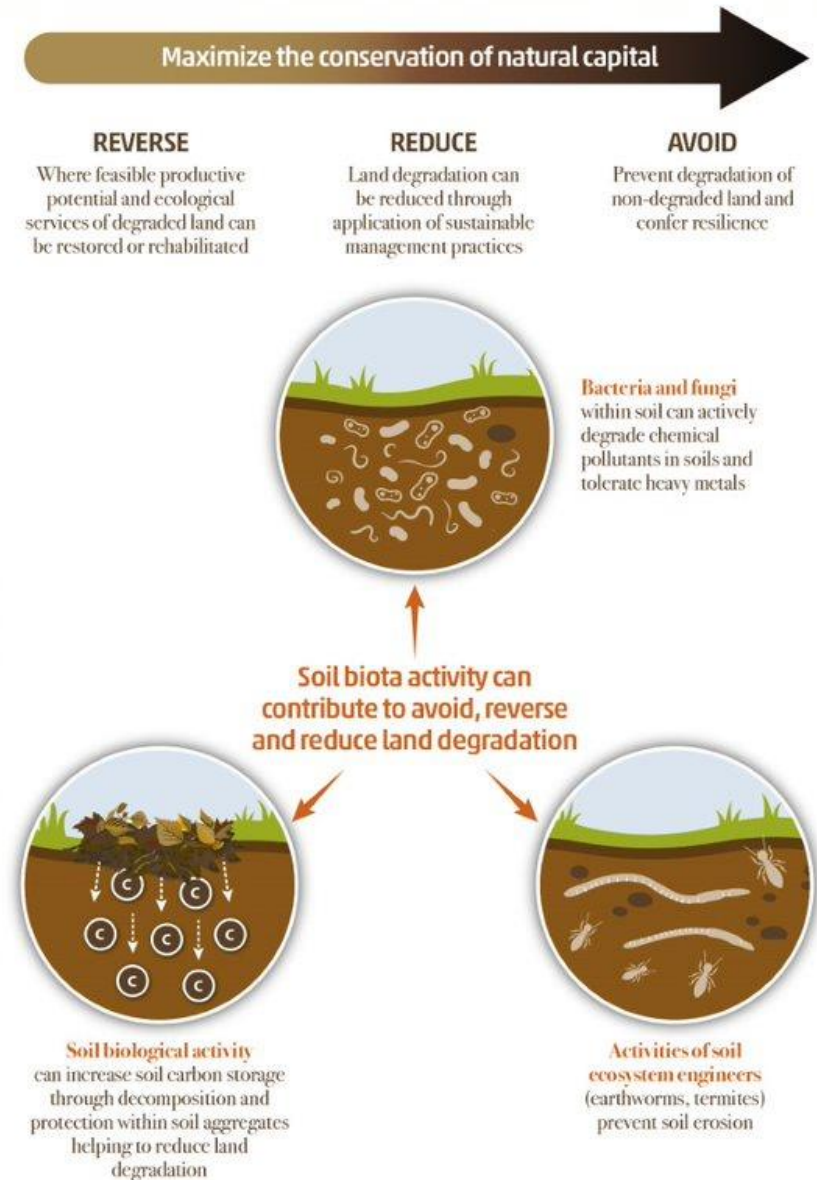


# Opportunities



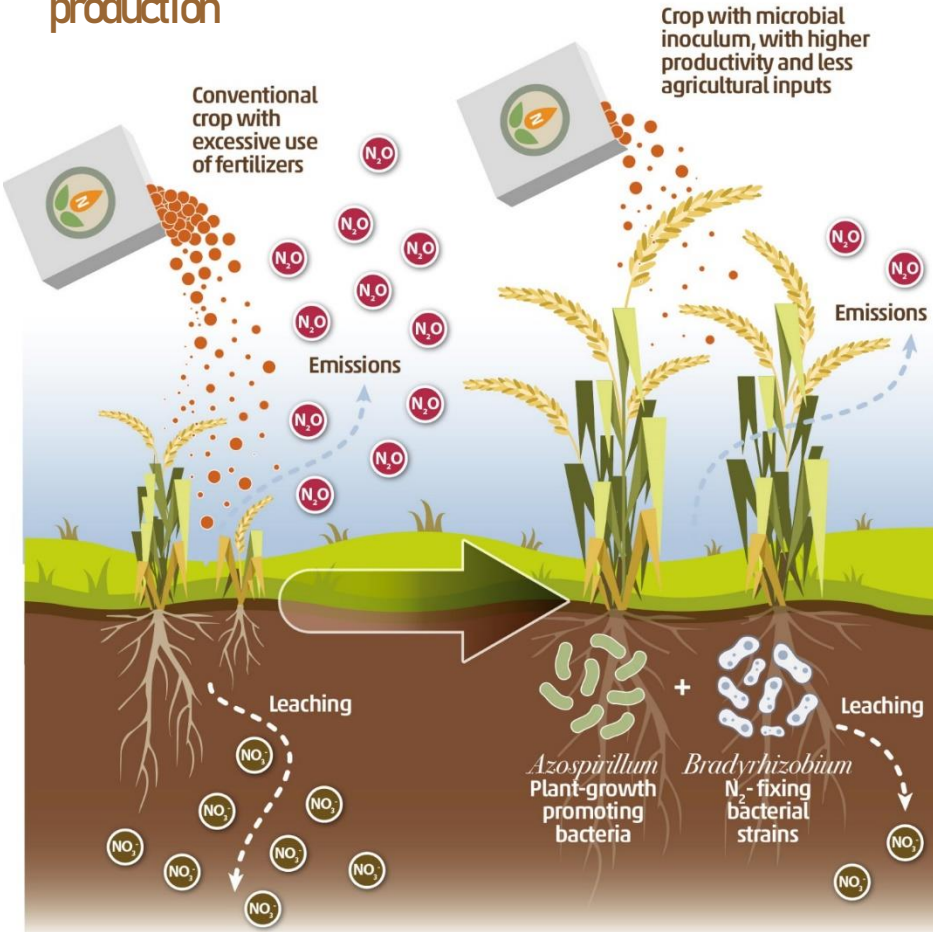
# What are the potentialities?

- **Food security and food safety:** improvement of agricultural production (biofertilizers, nitrogen fixation, pathogen control).
- **Biological control:** pests, diseases.
- **Environmental remediation (bioremediation):** bioaugmentation, phytoremediation, vermiremediation.
- **Climate change mitigation/adaptation:** carbon sequestration, GHG.
- **Nature-based solutions:** stimulate the growth and activities of soil fauna for ecosystem restoration.
- **Nutrition and human health:** vaccines, medicines, traditional medicine, microbiome.

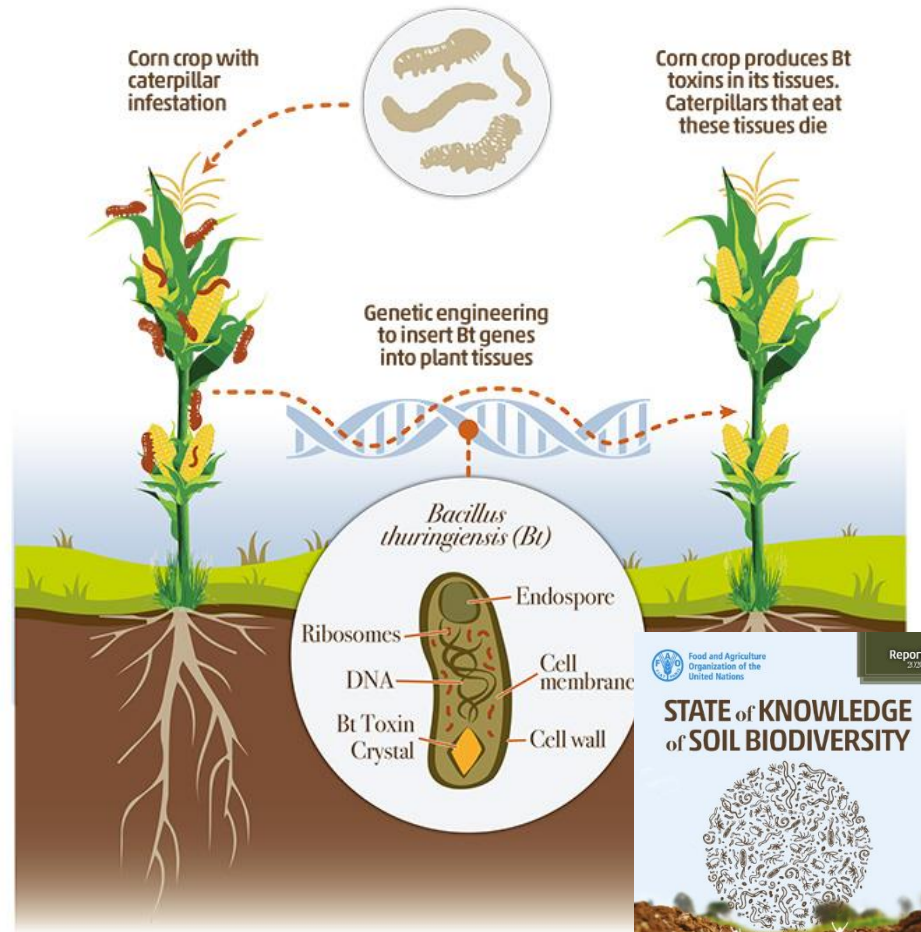


# Why is soil biodiversity important?

## Clean biotechnology in agricultural production



## Biological control



Food and Agriculture Organization of the United Nations

Report 2/23

### STATE of KNOWLEDGE of SOIL BIODIVERSITY

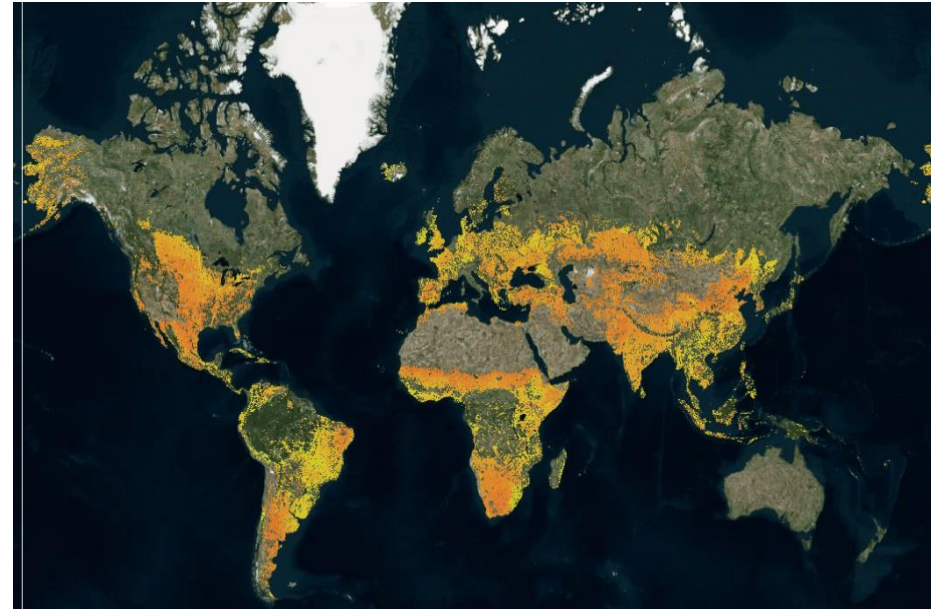
Status, challenges and potentialities

itps

International Centre for Soil Biodiversity

GLOBAL SOIL BIODIVERSITY INITIATIVE

# Carbon sequestration potential



# Sustainable Soil Management: the solution to degradation (Farmers are the key)

✓ Soil organic matter plus micronutrients

## Soil Doctors

