PRO AGRO LECTORIUM

Importance of Soil Knowledge for achieving the Sustainable Development Goals

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INTRODUCTION

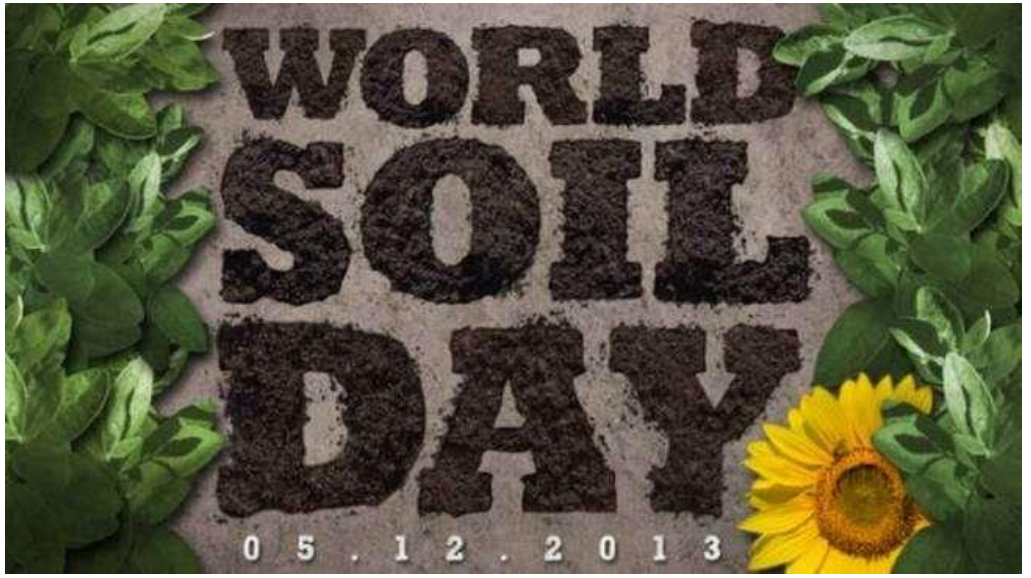
- 2030 Agenda for Sustainable Development
- 17 SDGs:
- A/RES/70/1
- Year 2015

https://www.un.org/sustainabledevelopment/news/communications-material/

WORLD SOIL DAY - WSD

- World Soil Day 2013 & 2012

- *"Recognizing the importance of soils, under the framework of the Global Soil Partnership and with the unanimous support of FAO members,* ***the 37th FAO Conference endorsed 5th December as WSD and requested the UN General Assembly to provide its final endorsement****. Since then, the soils community has an important opportunity as soils are placed high in global discussions".*



https://www.fao.org/world-soil-day/about-wsd/wsd-2013/en/

WORLD SOIL DAY - WSD

- 2015
- *"The 68th UN General Assembly declared 2015 the International Year of Soils (IYS) (A/RES/68/232)."*

2015
International
Year of Soils

https://www.fao.org/soils-2015/about/en/

"The IYS 2015 aims to increase awareness and understanding of the importance of soil for food security and essential ecosystem functions."

"The specific objectives of the IYS 2015 are to:

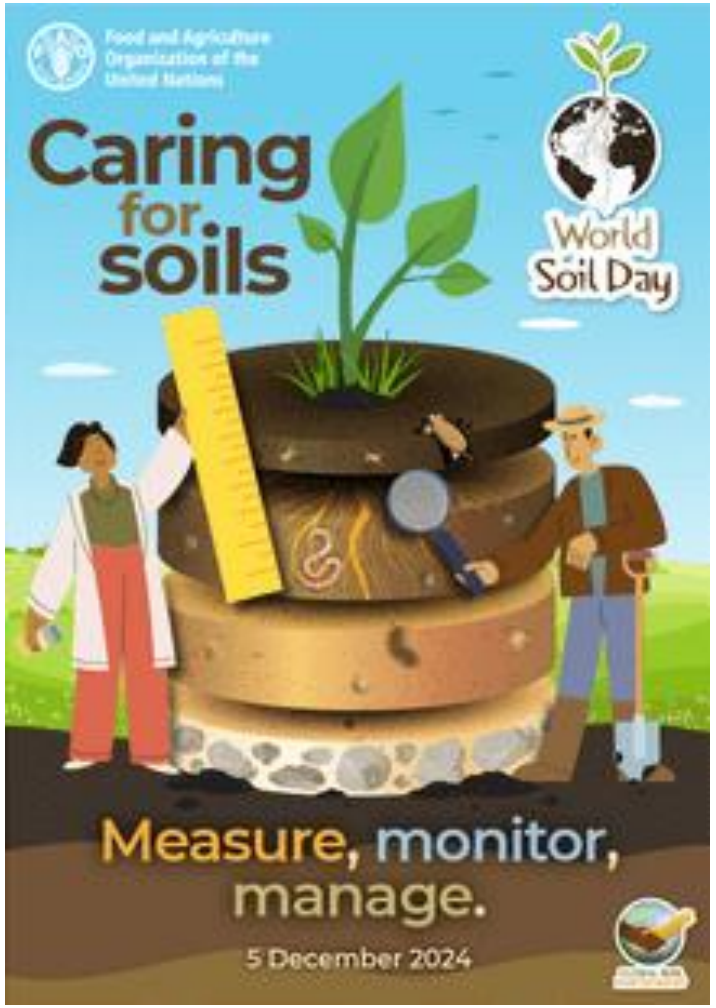
- *Raise full awareness among civil society and decision makers about the profound **importance of soil for human life**;*
- ***Educate the public about the crucial role soil plays in food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development**;*
- ***Support effective policies and actions** for the sustainable management and protection of soil resources;*
- *Promote investment in **sustainable soil management** activities to develop and maintain healthy soils for different land users and population groups;*
- *Strengthen initiatives in connection with the SDG process (Sustainable Development Goals) and Post-2015 agenda;*
- *Advocate for rapid capacity enhancement for soil information collection and monitoring at all levels (global, regional and national)."*

WORLD SOIL DAY - WSD

- **2024**

- *"**Did you know?***

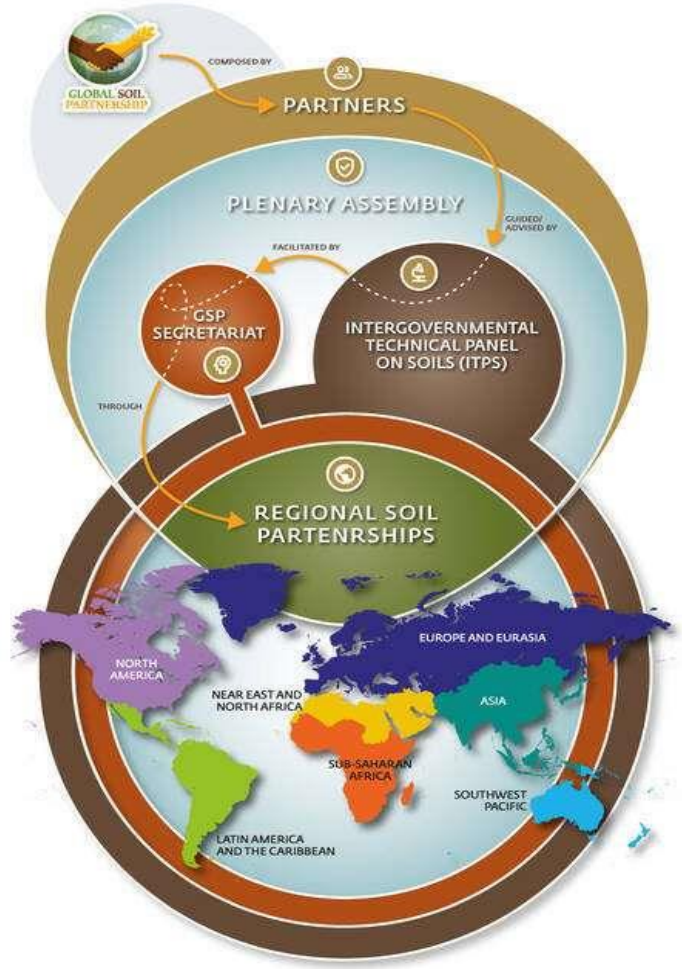
  - *95% of our food comes from soils.*
  - *33% of soils are degraded.*
  - *There are more living organisms in a tablespoon of soil than people on Earth.*
  - *Over the last 70 years, the level of vitamins and nutrients in food has drastically decreased.*
  - *2 billion people worldwide suffer from lack of micronutrients, known as hidden hunger.*
  - *Agricultural production will have to increase by 60% to meet the global food demand in 2050.*
  - *Up to 58% more food could be produced through sustainable soil management.*
  - *Up to half of our household waste could be composted to nurture our soil."*



https://www.fao.org/world-soil-day/about-wsd/en/

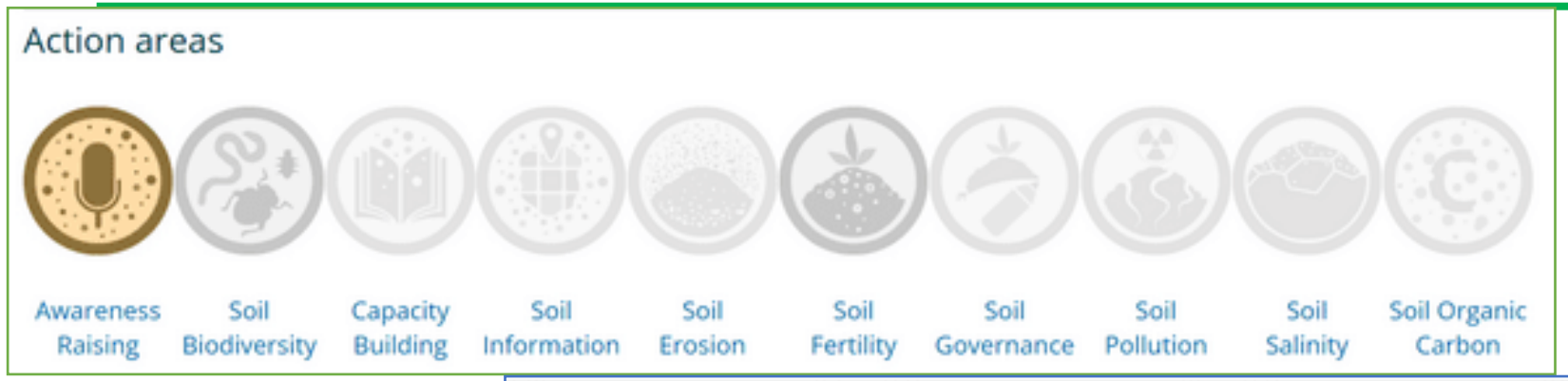
SOIL KNOWLEDGE – GSP & ITPS

- "The **Global Soil Partnership (GSP)** is a globally recognized mechanism established in **2012** with the mission to **position soils in the Global Agenda and to promote sustainable soil management."**
- The **Intergovernmental Technical Panel on Soils (ITPS)** was established at the first Plenary Assembly of the Global Soil Partnership held at FAO Headquarters in **2013**.



https://www.fao.org/global-soil-partnership/itps/en/

SOIL KNOWLEDGE – GSP & ITPS

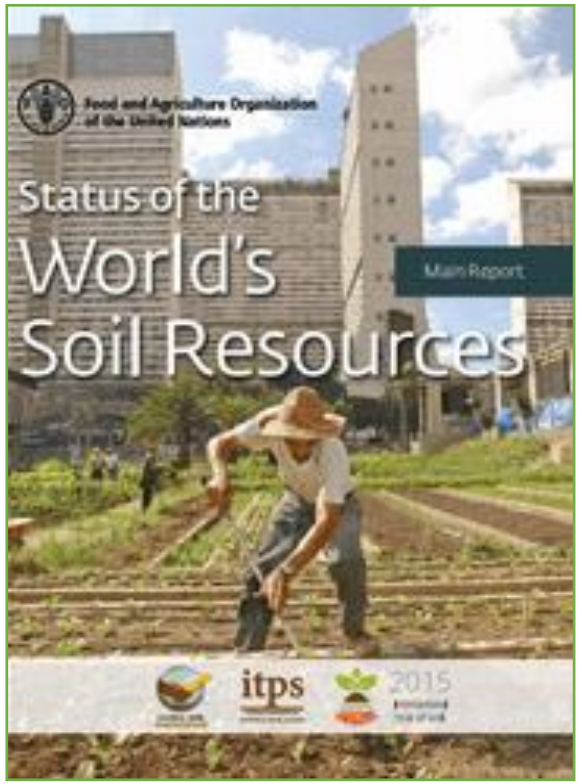


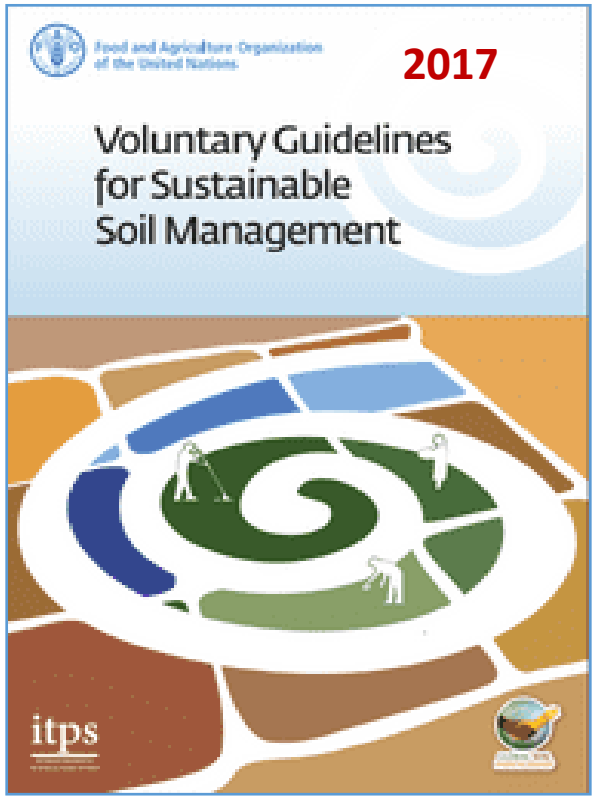
GLOBAL SOIL PARTNERSHIP

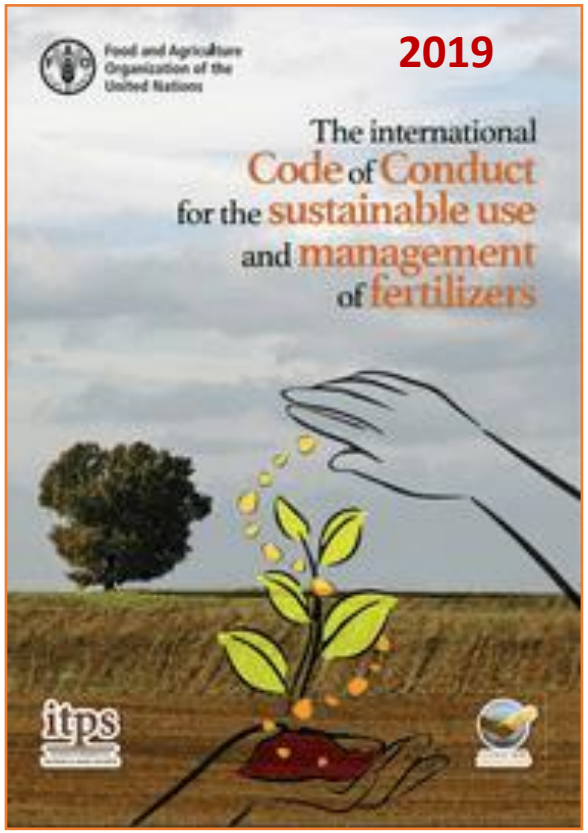
itps
INTERGOVERNMENTAL TECHNICAL PANEL ON SOILS

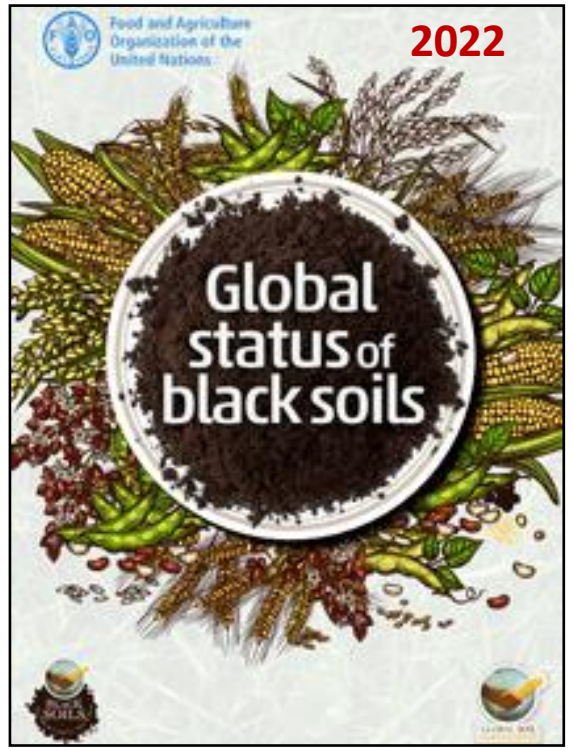
https://www.fao.org/global-soil-partnership/en/

SOIL KNOWLEDGE – ITPS Contributions









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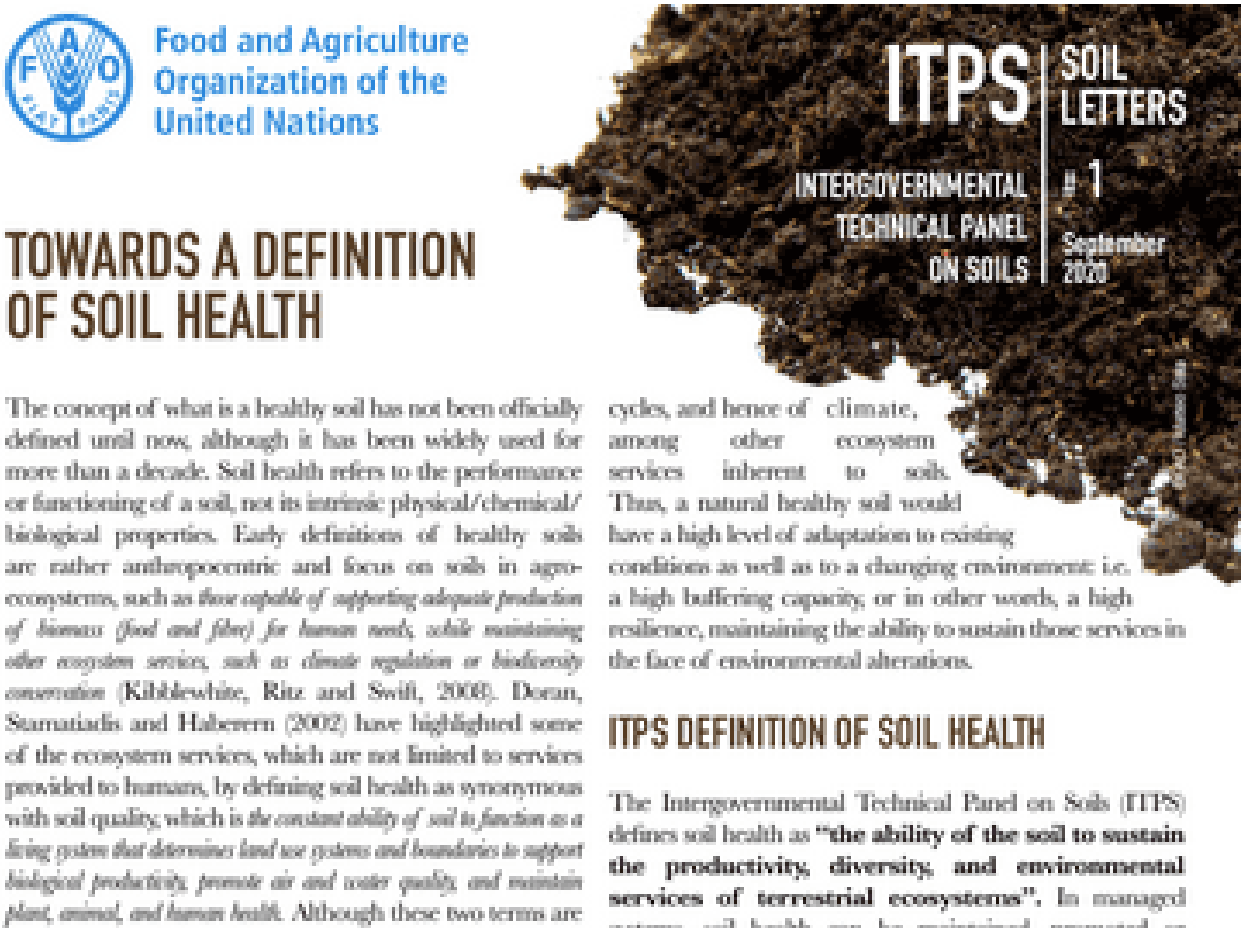
SOIL KNOWLEDGE – ITPS Contributions



Food and Agriculture Organization of the United Nations

ITPS | SOIL LETTERS

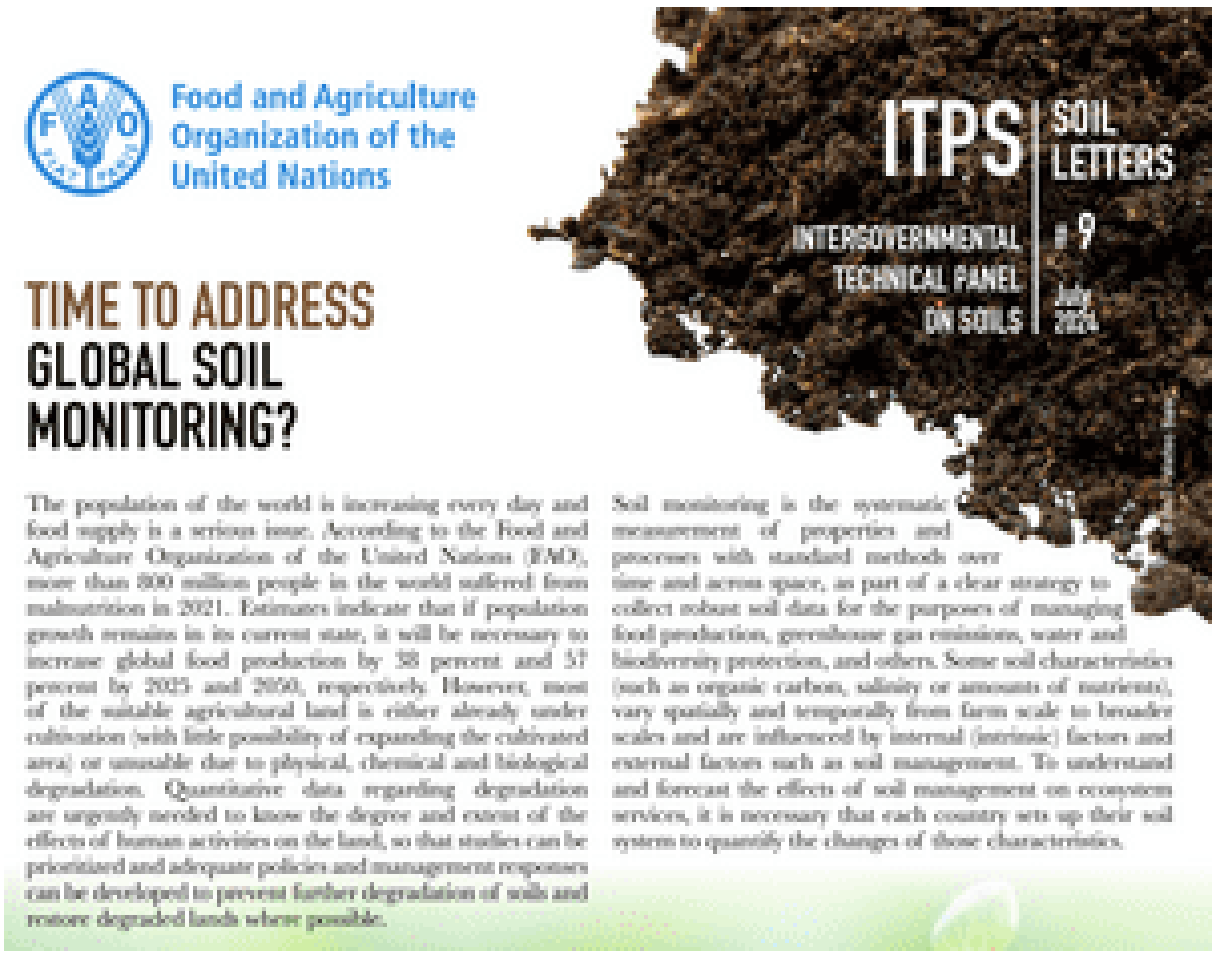
INTERGOVERNMENTAL TECHNICAL PANEL ON SOILS | # 1 | September 2020

TOWARDS A DEFINITION OF SOIL HEALTH

The concept of what is a healthy soil has not been officially defined until now, although it has been widely used for more than a decade. Soil health refers to the performance or functioning of a soil, not its intrinsic physical/chemical/biological properties. Early definitions of healthy soils are rather anthropocentric and focus on soils in agro-ecosystems, such as *those capable of supporting adequate production of biomass (food and fiber) for human needs, while maintaining other ecosystem services, such as climate regulation or biodiversity conservation* (Kibblewhite, Ritz and Swift, 2008). Doran, Stamatiadis and Haberern (2002) have highlighted some of the ecosystem services, which are not limited to services provided to humans, by defining soil health as synonymous with soil quality, which is *the constant ability of soil to function as a living system that determines land use systems and boundaries to support biological productivity, promote air and water quality, and maintain plant, animal, and human health.* Although these two terms are cycles, and hence of climate, among other ecosystem services inherent to soils. Thus, a natural healthy soil would have a high level of adaptation to existing conditions as well as to a changing environment: i.e. a high buffering capacity, or in other words, a high resilience, maintaining the ability to sustain those services in the face of environmental alterations.

ITPS DEFINITION OF SOIL HEALTH

The Intergovernmental Technical Panel on Soils (ITPS) defines soil health as **"the ability of the soil to sustain the productivity, diversity, and environmental services of terrestrial ecosystems"**. In managed



Food and Agriculture Organization of the United Nations

ITPS | SOIL LETTERS

INTERGOVERNMENTAL TECHNICAL PANEL ON SOILS | # 9 | July 2024

TIME TO ADDRESS GLOBAL SOIL MONITORING?

The population of the world is increasing every day and food supply is a serious issue. According to the Food and Agriculture Organization of the United Nations (FAO), more than 800 million people in the world suffered from malnutrition in 2021. Estimates indicate that if population growth remains in its current state, it will be necessary to increase global food production by 38 percent and 57 percent by 2025 and 2050, respectively. However, most of the suitable agricultural land is either already under cultivation (with little possibility of expanding the cultivated area) or unusable due to physical, chemical and biological degradation. Quantitative data regarding degradation are urgently needed to know the degree and extent of the effects of human activities on the land, so that studies can be prioritized and adequate policies and management responses can be developed to prevent further degradation of soils and restore degraded lands where possible.

Soil monitoring is the systematic measurement of properties and processes with standard methods over time and across space, as part of a clear strategy to collect robust soil data for the purposes of managing food production, greenhouse gas emissions, water and biodiversity protection, and others. Some soil characteristics (such as organic carbon, salinity or amounts of nutrients), vary spatially and temporally from farm scale to broader scales and are influenced by internal (intrinsic) factors and external factors such as soil management. To understand and forecast the effects of soil management on ecosystem services, it is necessary that each country sets up their soil system to quantify the changes of those characteristics.

https://www.fao.org/documents/card/en/c/cb1110en

SOIL KNOWLEDGE & SDGs

Increase soil productivity and achieve better food quality

Reducing soil and water contamination

Reducing soil and water contamination

Promote policies that encourage and guide agricultural activities, in a sustainable way :
4, 8, 12, 17

Protection of natural resources, **reduction of environmental impacts, mutual relationships cities and rural**
8, 9, 11,12, 13

Governance and management of soil and natural resources; averting pollutants to affect soil, water and air
13, 14, 15, 17

Fonte: ONU, adaptado Núcleo ISZA / UFMG

SOIL KNOWLEDGE & SDGs

To guarantee access to basic services and to natural resources: **1, 8, 10**

Strengthen research and support the production of science and technology: **4, 7, 8, 9, 17**

Access and improvements to sanitation and water quality. Efficient use of water, tackling scarcity and preserving ecosystems: **6, 12, 13**

Promote equity and give women equal rights to natural resources and land ownership: **5, 8, 10**

Sustainably management, restoration and protection of marine and coastal ecosystems. Ensure the conservation, recovery and sustainable use of terrestrial and freshwater ecosystems: **11, 13, 14, 15, 15, 17**

Fonte: ONU, adaptado Núcleo ISZA / UFMG

Examples of Soil Knowledge vs SDGs in tropical soils

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CLIMATE-SMART AGRICULTURE (CSA)

- **"CSA** practices for Brazilian Cerrado (**no-tillage, cover cropping, crop-livestock systems, crop-livestock-forestry systems, and soil fertilization with organic amendments**), showed **average positive rates of C stock change.**
- **Diversification and intensification of agricultural areas** in the Cerrado by the adoption of CSA is a promising pathway to increase soil C stocks, contributing to **climate change mitigation and adaptation** (Figure 6).
- **Soil C sequestration enhances soil health**, as well as the provision of other soil-related ecosystem services with **effects on crop yield, increasing or stabilizing the production of food, feed, fiber and energy."**

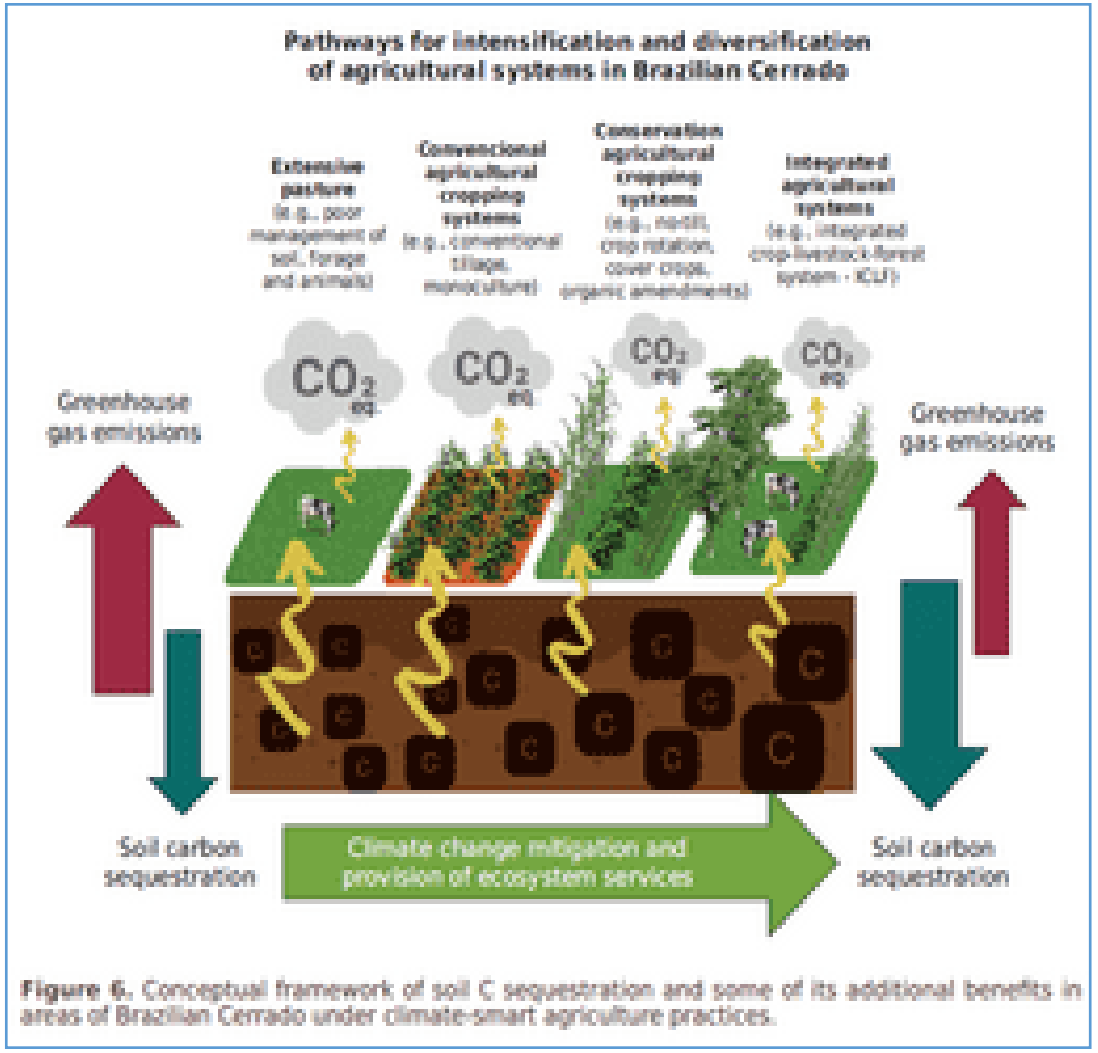

Figure 6. Conceptual framework of soil C sequestration and some of its additional benefits in areas of Brazilian Cerrado under climate-smart agriculture practices.

Oliveira DMS et al. Climate-smart agriculture and soil C sequestration in Brazilian Cerrado: a systematic review. RBCS. 2023; 47nspe:e0220055. https://doi.org/10.36783/18069657rbcs20220055

BIOLOGICAL NITROGEN FIXATION (BNF)

- "The **economic value resulting from replacement of N fertilizer (urea) by BNF in the 2019–2020** crop season was estimated at **15.2 billion USD** profit generated by inoculation and coinoculation 914 million USD.
- **2019–2020 crop season**, **coinoculating soybean with *Bradyrhizobium* spp. and *Azospirillum brasilense*** reached **25% of the whole soybean area in Brazil.**
- The **replacement of N fertilizer by BNF** corresponded to the **mitigation of 183 million Mg CO2-e in the 2019–2020 season**, equivalent to over **5 billion Euros in carbon credits."**

https://doi.org/10.1016/j.eti.2023.103158

Conservation Agriculture (CA): zero tillage (ZT/CA) and integrated crop–livestock–forest (iCLF-CA) systems

- "The future increase of the CA area in **2030** was forecast at **34.4 Mha for ZT/CA** and between **22.99 and 28.74 Mha for iCLF-CA.**
- For **2020**, the positive economic impact for Brazilian farmers in preventing soil erosion by water was estimated as **1.5 billion US$ for ZT/CA and 0.5 billion US$ for iCLF-CA.**

✓ With the determination of **farmers, agronomists, researchers,** in promoting soil erosion control practices, and government plans and policies toward the **adoption of CA (ZT/CA and iCLF-CA systems),** Brazil may reach up to **60 Mha of agricultural lands with sustainable management by the year 2025."**


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Potential impact of plans and policies based on the principles of conservation agriculture on the control of soil erosion in Brazil

José Carlos Polidoro, Pedro Luiz de Freitas, Luís Carlos Hernani, Lúcia Helena Cunha dos Anjos, Renato de Aragão Ribeiro Rodrigues, Fernando Vieira Cesário ... See all authors

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Thank you!

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