Food and Agriculture Organization of the United Nations

Towards 2030
Global Soil Partnership Action Framework

Yusuf Yigini – *on behalf of the ISAF Working Group*

GLOBAL SOIL PARTNERSHIP

11th Plenary Assembly

12-14 July 2023

2012 … 2023 … 2030

GSP Established

The Global Soil Partnership was established in December 2012 as a mechanism to develop a strong interactive partnership and enhanced collaboration and synergy of efforts between all stakeholders.

2012 ..... 2022 2023 2030

GSP 11th PA

GSP Action Framework

The Action Framework was endorsed at the **10th GSP Plenary Assembly**, to leverage the scale and scope of sustainable soil management (SSM), improving the governance of the world's soil resources.

GSP 2030

A world in which soils are healthy and resilient, ensuring the sustained provision of ecosystem functions and services for all, leaving no one behind."

Global Soil Partnership

2012-2022

Sustainable soil management in action

Global Soil Partnership 2012 2022 in figures

- TECHNICAL WEBINARS +30 000 PEOPLE
- EVENTS +4 000 WORLD SOIL DAY & INTERNATIONAL YEAR OF SOILS
- PUBLICATIONS - INFOGRAPHICS +300 IN OVER 30 LANGUAGES
- MEDIA OUTREACH 3.97 billion
- NATIONAL EXPERTS TRAINED +7 000 IN 170 COUNTRIES
- SOCIAL MEDIA REACH 1.23 billion

GLOBAL SOIL PARTNERSHIP

Saving our planet's soils

FAO Members acknowledge that soils constitute the foundation for agricultural development, essential ecosystem functions and food security and are key to fighting climate change and sustaining life on Earth.

2010 - 2012

GOVERNANCE

Plenary Assembly

As the Partnership's main decision-making body, the annual plenary reviews and prioritizes the GSP's actions to position soils on the different sustainable agendas through collective action. It unites FAO Members and GSP Partners.

2013 - 2013

Establishment of the Global Soil Partnership (GSP)

GSP is established as an interactive, responsive, and voluntary mechanism open to governments, institutions, and other stakeholders. Its' mission? To promote sustainable soil management around the world.

GOVERNANCE

Intergovernmental Technical Panel on Soils (ITPS)

ITPS members are made up of 27 top soil experts appointed by countries. They represent all regions of the world and provide the GSP with scientific and technical guidance on global soil issues.

itps

2013

Regional Soil Partnerships

Establishment of 7 regional soil partnerships to catalyze cooperation within the different regions and develop regional implementation plans.

2014

FAO Soils portal

The portal is a unique source of information on the different components of soils and the value of this vital resource.

2015

Status of the World's Soil Resources Report

The first ever Report compiling the work from over 200 soil scientists from 60 countries on the status of global soils. It provides a unique global and regional overview of the current state of soils, their role in the provision of ecosystem services and the threats to their continued contribution to these services.

2016

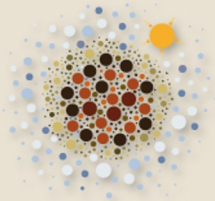
Glinka World Soil Prize

An annual award given to the GSP's partners – individuals or organizations – committed to solving national, regional, or local soil degradation problems. It comes in the form of a medal and a USD 15 000 cheque.

2016

Global Symposium on Soil Organic Carbon

The first science-policy meeting brought together over 500 participants to review the role of soils and soil organic carbon in the context of climate change and sustainable development.



2017

Global Soil Laboratory Network

The Network composed of over 800 worldwide laboratories and representing 155 countries aims to build and strengthen the capacity of laboratories in soil analysis and to respond to the need for harmonizing soil analytical data. It supports evidence-based decision-making for sustainable soil management.

2013

UN World Soil Day and International Year of Soils

The United Nations General Assembly adopted a resolution to raise awareness on the vital role of soil through an International Day on 5 December and Year in 2015. Worldwide celebrations are a unique opportunity to convey the message on the importance of soils for food security, healthy ecosystems, human wellbeing and climate change adaptation and mitigation.

2015

Revised World Soil Charter

Revision of the original World Soil Charter adopted by FAO Members at the 1981 FAO Conference. FAO Members unanimously endorsed the updated version of the World Soil Charter during the 39th Session of the FAO Conference and agreed to the principles to boost soil health and address soil degradation.

2016

International Network of Soil Information Institutions

The Network is composed of officially mandated soil data institutions for each FAO Members. It facilitates the development of national soil information systems and the exchange of technical expertise through its capacity building programme.

2016

Voluntary Guidelines for Sustainable Soil Management

This tool gives guidelines on the basic principles of managing soils sustainably. Since its endorsement, the GSP has supported FAO Members to implement effective policies and actions to improve soil health and adopt sustainable soil management practices worldwide.

2017

International Network on Black Soils

The Network provides a platform for knowledge sharing to discuss common issues related to the conservation and sustainable management of black soils. They are amongst the most productive soils, constitute the food basket of many countries and are crucial to fight climate change.

2017 – Global Soil Organic Carbon Map

The GSOCmap was the first map produced using data supplied directly by countries. The map enables countries to draw conclusions on the distribution and status of their soil organic carbonstocks at the national scale.

2018 – International Networks of Salt-Affected Soils

The Network facilitates the sustainable and productive use of salt-affected soils for food security, agricultural sustainability and climate change adaptation and mitigation.

2019 – International Code of Conduct for the sustainable use and management of fertilizers

The Fertilizer Code assists countries to address the multiple issues related to the responsible use and management of fertilizers in agriculture and provides a locally adapted framework and a voluntary set of practices for stakeholders.

2020 – State of knowledge of soil biodiversity

The Report is the result of a process involving more than 300 scientists from around the world. It presents the latest studies on soil biodiversity, the threats, and the nature-based solutions offered by soil ecosystems.

2021 – Global Assessment of Soil Pollution

The Assessment was carried out over 3 years by more than 70 experts with contributions from 75 countries. It describes the main soil contaminants, their sources, the impacts on human health, the environment and food security, and the most common soil pollution remediation and management techniques.

2018 – Global Symposium on Soil Pollution

A key symposium that gathered over 500 participants and showcased scientific knowledge on soil pollution, the risks posed to food production and safety, human and environmental health, as well as the latest techniques to safeguard polluted sites.

2018 – King Bhumibol World Soil Day Award

An annual award given every 5 December to individuals or institutions that organized successful and impactful World Soil Day celebrations. It comes in the form of a medal and a USD 15 000 cheque.

2019 – Global Symposium on Soil Erosion

This science-policy attracted over 500 participants to discuss the latest findings on the status of soil erosion, its prevention and control for increased food security and ecosystem services.

2020 – International Network on Fertilizers Analysis

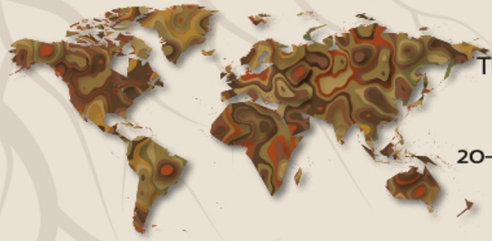
The Network builds and strengthens the capacities of laboratories in fertilizer analysis and provides a framework to harmonize fertilizer quality standards.

2020 – Global Soil Doctors Programme

The Programme is a farmer-to-farmer training initiative implemented globally on a voluntary basis. It provides Soil Doctors with training, educational materials, and soil testing kits to build farmer's capacities on sustainable soil management.

2021 – SOILEX

SoilEX is the first global database that facilitates access to information on existing legal instruments on soil protection and the prevention of soil degradation.



Global Soil Organic Carbon Sequestration Potential Map

The GSOCseq helps countries to draw conclusions on the soil's potential to sequester carbon by simulating soil organic carbon stocks over a 20–year period under sustainable soil management scenarios. The map was producedusing data supplied directly by countries.

Global Symposium on Salt-affected Soils

Leveraging on the virtual setting, 4 000 participants exchanged ideas on salinity prevention, management, and adaptation. It enhanced connections between policymakers, food producers and scientists for the sustainable management of salt-affected soils.

International Network on Soil Biodiversity

The Network promotes the sustainable use and conservation of soil biodiversity through collaboration between experts and aims at addressing major knowledge and data gaps.

2021

2021

2021

2021

2021

2022

2022
2030

Global Symposium on Soil Biodiversity

During the first virtual symposium, 5 000 participants reviewed the status and challenges of soil biodiversity conservation and use. The outcome of the symposium showed how important soil biodiversity is for food production and human wellbeing.

Recarbonizing global soils: a technical manual of recommended management practices

The manual gathers existing data on the impacts of the main soil management practices on soil organic carbon from a wide array of environments. It was developed through the participatory work of more than 400 soil management experts from around the world.

Global Map of Salt-affected Soils

The GSASmap was generated following a country-driven process. It allows countries to quantify the extent and degradation status of salt-affected soils thus improving food security.

International Network on Soil Pollution

The Network allows for an effective, coordinated and inclusive communication of all stakeholders to implement the global action agenda on soil pollution and move towards a world

GSP Action Framework

Meeting local needs, responding to global challenges

Following an assessment of progress and achievements over the period 2012-2022, a new GSP action framework is under preparation and endorsement by FAO Members. It will fully unlock the potential of healthy soils and upscale sustainable soil management approaches through the setting of action areas and the definition of quantifiable objectives, targets and indicators.

The GSP Action Framework

The Action Framework was adopted by the 10th GSP Plenary Assembly and endorsed by the 28th Session of the COAG (2022).

Quantifiable Goals, Targets and Indicators

GSP AF has a clear ambition shared by all **GSP members and partners**, with the establishment of **quantifiable goals, targets and indicators that** will allow for the evaluation of the progress that the GSP is making towards its vision of healthy soils.

The GSP Action Framework

DESIGN PRINCIPLES

Structured Approach

The GSP Action Framework organizes **past and future** work of the Global Soil Partnership (GSP) in a structured manner.

Measurable Assessment

It incorporates **quantifiable indicators** to assess the effectiveness of GSP's soil management and conservation initiatives.

Tracking with KPIs

The framework establishes Key Performance Indicators (KPIs) to monitor progress and ensure accountability for the impact of GSP's activities.

Outcome Monitoring

The framework includes a monitoring component to track outcomes and provide valuable insights for decision-making and resource allocation.

Strategic and Sustainable

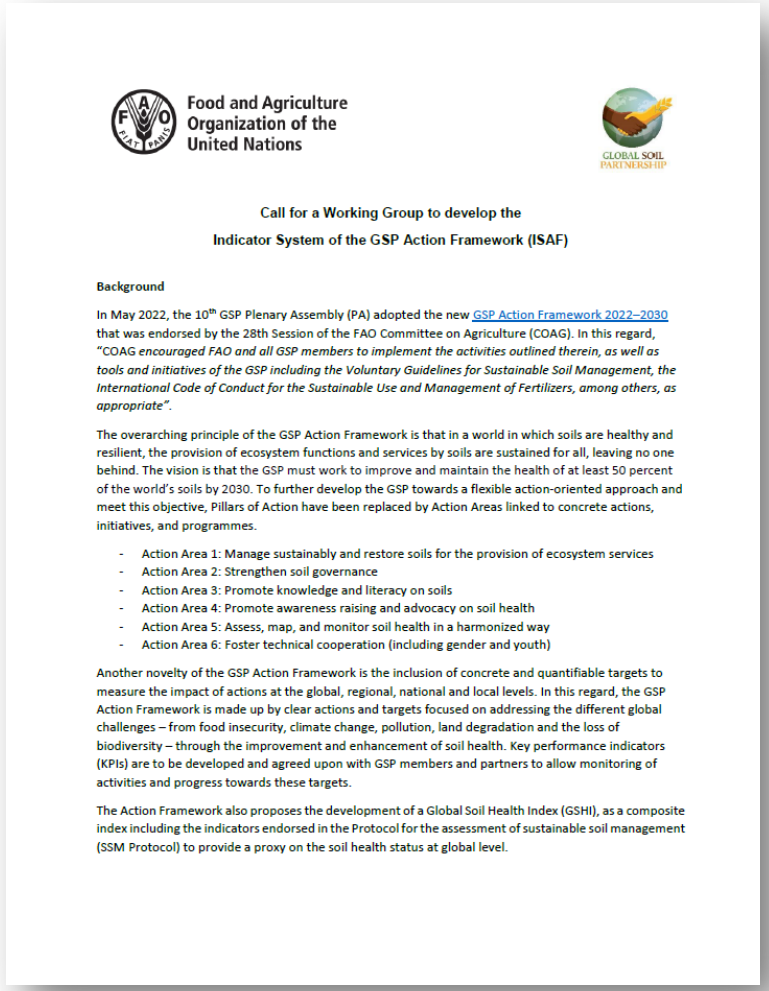
GSP's work aligns with SDGs, catalyzing meaningful change in sustainable soil management worldwide.

GSP AF Indicator Systems

GSP Action Framework States:

- The progress of the GSP Action Framework will be monitored and measured through **SoilSTAT**.
- A **Global Soil Health Index (GSHI)** is to be developed.
- This crucial task is being carried out by a dedicated working group **(ISAF WG).**

Indicator System for the GSP Action Framework (ISAF)– open call



Food and Agriculture Organization of the United Nations

GLOBAL SOIL PARTNERSHIP

Call for a Working Group to develop the

Indicator System of the GSP Action Framework (ISAF)

Background

In May 2022, the 10th GSP Plenary Assembly (PA) adopted the new GSP Action Framework 2022–2030 that was endorsed by the 28th Session of the FAO Committee on Agriculture (COAG). In this regard, "COAG *encouraged FAO and all GSP members to implement the activities outlined therein, as well as tools and initiatives of the GSP including the Voluntary Guidelines for Sustainable Soil Management, the International Code of Conduct for the Sustainable Use and Management of Fertilizers, among others, as appropriate*".

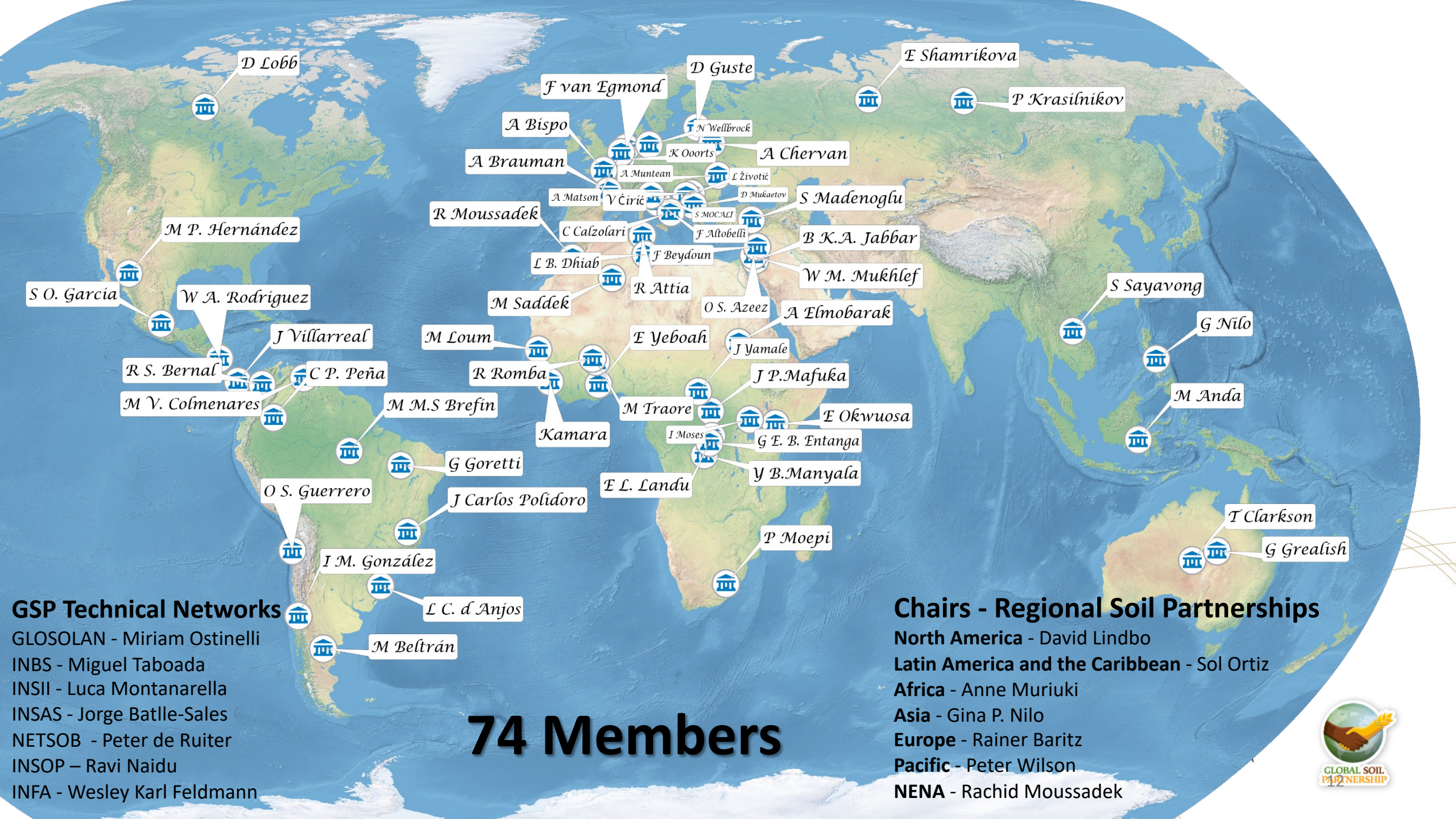
The overarching principle of the GSP Action Framework is that in a world in which soils are healthy and resilient, the provision of ecosystem functions and services by soils are sustained for all, leaving no one behind. The vision is that the GSP must work to improve and maintain the health of at least 50 percent of the world's soils by 2030. To further develop the GSP towards a flexible action-oriented approach and meet this objective, Pillars of Action have been replaced by Action Areas linked to concrete actions, initiatives, and programmes.

- Action Area 1: Manage sustainably and restore soils for the provision of ecosystem services
- Action Area 2: Strengthen soil governance
- Action Area 3: Promote knowledge and literacy on soils
- Action Area 4: Promote awareness raising and advocacy on soil health
- Action Area 5: Assess, map, and monitor soil health in a harmonized way
- Action Area 6: Foster technical cooperation (including gender and youth)

Another novelty of the GSP Action Framework is the inclusion of concrete and quantifiable targets to measure the impact of actions at the global, regional, national and local levels. In this regard, the GSP Action Framework is made up by clear actions and targets focused on addressing the different global challenges – from food insecurity, climate change, pollution, land degradation and the loss of biodiversity – through the improvement and enhancement of soil health. Key performance indicators (KPIs) are to be developed and agreed upon with GSP members and partners to allow monitoring of activities and progress towards these targets.

The Action Framework also proposes the development of a Global Soil Health Index (GSHI), as a composite index including the indicators endorsed in the Protocol for the assessment of sustainable soil management (SSM Protocol) to provide a proxy on the soil health status at global level.

- ✓ ITPS Chairperson & ITPS Members
- ✓ Chairs of the Regional Soil Partnerships
- ✓ Chairs of the GSP Technical Networks
- ✓ Experts nominated by GSP National Focal Points
- ✓ Global Soil Partnership Secretariat (facilitator)



GSP Technical Networks

GLOSOLAN - Miriam Ostinelli
INBS - Miguel Taboada
INSII - Luca Montanarella
INSAS - Jorge Batlle-Sales
NETSOB - Peter de Ruiter
INSOP – Ravi Naidu
INFA - Wesley Karl Feldmann

74 Members

Chairs - Regional Soil Partnerships

North America - David Lindbo
Latin America and the Caribbean - Sol Ortiz
Africa - Anne Muriuki
Asia - Gina P. Nilo
Europe - Rainer Baritz
Pacific - Peter Wilson
NENA - Rachid Moussadek

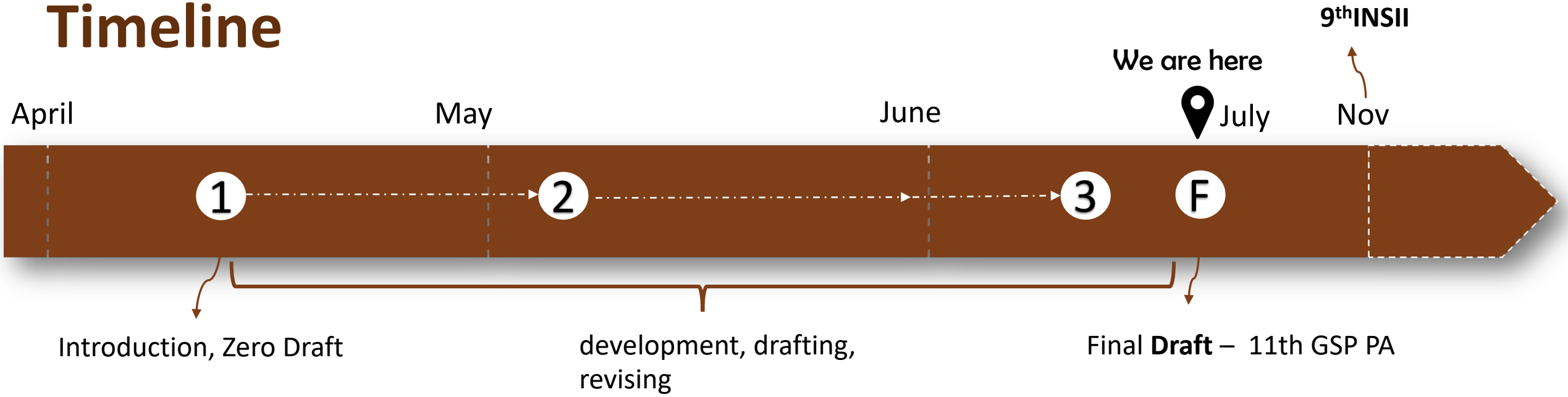
Work of ISAF WG

1. **GSP Performance Indicator System**
   monitoring Key Performance Indicators (KPIs) for soil-related activities and initiatives of the GSP

2. **SoilSTAT Soil Health Indicator System**
   a comprehensive platform for monitoring key soil health indicators

3. **Global Soil Health Index (GSHI)**
   Standardized metric to measure and track the soil health worldwide

Timeline



- **ISAF 1st Meeting** – April 2023 – Zero Draft
- **ISAF 2nd Meeting** – May 2023 – Draft
- **ISAF 3rd Meeting – July 2023 – Final Draft**
- **11th GSP PA** – July 2023 – Final Draft of the Concept
- **9th INSII** – November 2023 (7-9) – Further development, implementation

3 x Working Sessions

- **Rigorous Process:** Each element of the concept has been subjected to thorough discussion and careful review.
- **Collective Knowledge:** The revisions and iterations reflect the consensus of a diverse group of experts.


Global Soil Partnership
Action Framework 2030

SoilSTAT

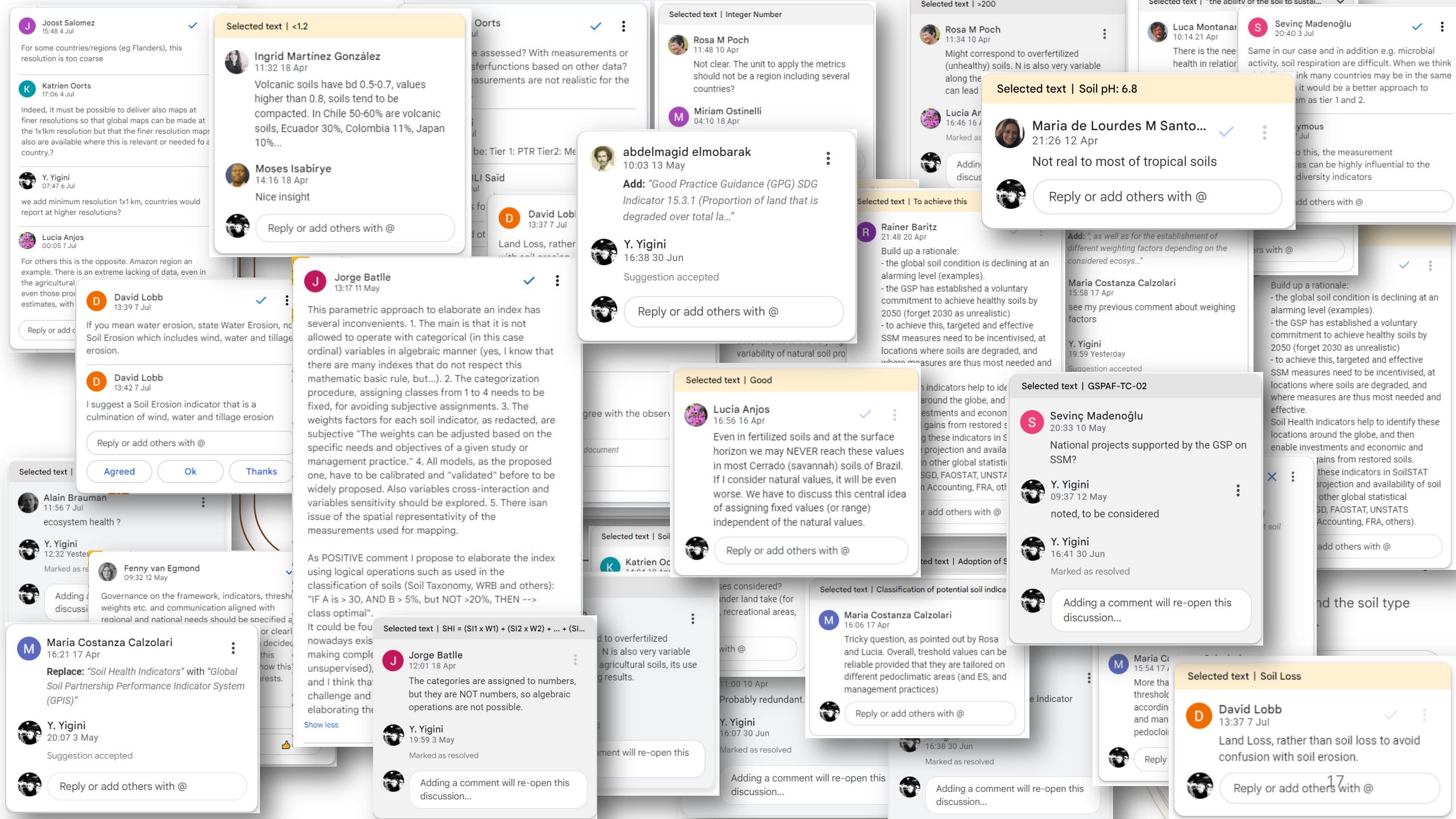
Development and Integration of Key Performance Indicators for the Global Soil Partnership, the Soil Health Indicator System, and the Global Soil Health Index (GSHI)

Technical Concept Note

ISAF Working Group

2023

Over 500 valuable inputs! The Working Group has demonstrated an **extraordinary level of engagement** and **attention to detail** in the development.


Joost Salomez
15:48 4 Jul
For some countries/regions (eg Flanders), this resolution is too coarse
Katrien Oorts
17:06 4 Jul
Indeed, it must be possible to deliver also maps at finer resolutions so that global maps can be made at the 1x1km resolution but that the finer resolution maps also are available where this is relevant or needed fo a country.?
Y. Yigini
07:47 6 Jul
we add minimum resolution 1x1 km, countries would report at higher resolutions?
Lucia Anjos
00:05 7 Jul
For others this is the opposite. Amazon region an example. There is an extreme lacking of data, even in the agricultural even those proc estimates, with
Reply or add c
Selected text | <1.2
Ingrid Martínez González
11:32 18 Apr
Volcanic soils have bd 0.5-0.7, values higher than 0.8, soils tend to be compacted. In Chile 50-60% are volcanic soils, Ecuador 30%, Colombia 11%, Japan 10%...
Moses Isabirye
14:16 18 Apr
Nice insight
Reply or add others with @
Oorts
e assessed? With measurements or sferfunctions based on other data? asurements are not realistic for the
be: Tier 1: PTR Tier2: Me
ILI Saïd
David Lobl
13:37 7 Jul
Land Loss, rather
Selected text | Integer Number
Rosa M Poch
11:48 10 Apr
Not clear. The unit to apply the metrics should not be a region including several countries?
Miriam Ostinelli
04:10 18 Apr
abdelmagid elmobarak
10:03 13 May
Add: "Good Practice Guidance (GPG) SDG Indicator 15.3.1 (Proportion of land that is degraded over total la..."
Y. Yigini
16:38 30 Jun
Suggestion accepted
Reply or add others with @
Selected text | >200
Rosa M Poch
11:34 10 Apr
Might correspond to overfertilized (unhealthy) soils. N is also very variable along the
can lead
Lucia Ar
16:46 16 A
Marked as
Adding
discus
Luca Montanar
10:14 21 Apr
There is the nee
health in relatior
Sevinç Madenoğlu
20:40 3 Jul
Same in our case and in addition e.g. microbial activity, soil respiration are difficult. When we think
ink many countries may be in the same
it would be a better approach to
em as tier 1 and 2.
ymous
Jul
o this, the measurement
es can be highly influential to the
diversity indicators
dd others with @
Selected text | Soil pH: 6.8
Maria de Lourdes M Santo...
21:26 12 Apr
Not real to most of tropical soils
Reply or add others with @
Selected text | To achieve this
Rainer Baritz
21:48 20 Apr
Build up a rationale:
- the global soil condition is declining at an alarming level (examples).
- the GSP has established a voluntary commitment to achieve healthy soils by 2050 (forget 2030 as unrealistic)
- to achieve this, targeted and effective SSM measures need to be incentivised, at locations where soils are degraded, and
variability of natural soil pro
Add: "..., as well as for the establishment of different weighting factors depending on the considered ecosys..."
Maria Costanza Calzolari
15:58 17 Apr
see my previous comment about weighing factors
Y. Yigini
19:59 Yesterday
Suggestion accepted
rs with @
Build up a rationale:
- the global soil condition is declining at an alarming level (examples).
- the GSP has established a voluntary commitment to achieve healthy soils by 2050 (forget 2030 as unrealistic)
- to achieve this, targeted and effective SSM measures need to be incentivised, at locations where soils are degraded, and where measures are thus most needed and effective.
Soil Health indicators help to identify these locations around the globe, and then enable investments and economic and
ains from restored soils.
these indicators in SoilSTAT
rojection and availability of soil
other global statistical
GD, FAOSTAT, UNSTATS
Accounting, FRA, others).
dd others with @
David Lobb
13:39 7 Jul
If you mean water erosion, state Water Erosion, nc Soil Erosion which includes wind, water and tillage erosion.
David Lobb
13:42 7 Jul
I suggest a Soil Erosion indicator that is a culmination of wind, water and tillage erosion
Reply or add others with @
Agreed
Ok
Thanks
Jorge Batlle
13:17 11 May
This parametric approach to elaborate an index has several inconvenients. 1. The main is that it is not allowed to operate with categorical (in this case ordinal) variables in algebraic manner (yes, I know that there are many indexes that do not respect this mathematic basic rule, but...). 2. The categorization procedure, assigning classes from 1 to 4 needs to be fixed, for avoiding subjective assignments. 3. The weights factors for each soil indicator, as redacted, are subjective "The weights can be adjusted based on the specific needs and objectives of a given study or management practice." 4. All models, as the proposed one, have to be calibrated and "validated" before to be widely proposed. Also variables cross-interaction and variables sensitivity should be explored. 5. There isan issue of the spatial representativity of the measurements used for mapping.
As POSITIVE comment I propose to elaborate the index using logical operations such as used in the classification of soils (Soil Taxonomy, WRB and others): "IF A is > 30, AND B > 5%, but NOT >20%, THEN --> class optimal".
It could be fou
nowadays exis
making comple
unsupervised),
and I think tha
challenge and
elaborating the
Show less
Selected text | Good
Lucia Anjos
16:56 16 Apr
Even in fertilized soils and at the surface horizon we may NEVER reach these values in most Cerrado (savannah) soils of Brazil. If I consider natural values, it will be even worse. We have to discuss this central idea of assigning fixed values (or range) independent of the natural values.
Reply or add others with @
Selected text | GSPAF-TC-02
Sevinç Madenoğlu
20:33 10 May
National projects supported by the GSP on SSM?
Y. Yigini
09:37 12 May
noted, to be considered
Y. Yigini
16:41 30 Jun
Marked as resolved
Adding a comment will re-open this discussion...
Selected text |
Alain Brauman
11:56 7 Jul
ecosystem health ?
Y. Yigini
12:32 Yester
Marked as re
Adding
discussi
Fenny van Egmond
09:32 12 May
Governance on the framework, indicators, thresh weights etc. and communication aligned with regional and national needs should be specified a
or clearl
decide
this
how this
rests.
Selected text | Soil
Katrien Oc
ses considered?
nder land take (for
recreational areas,
with @
d to overfertilized
N is also very variable
agricultural soils, its use
g results.
11:00 10 Apr
Probably redundant.
Y. Yigini
16:07 30 Jun
Marked as resolved
Adding a comment will re-open this discussion...
ment will re-open this
Selected text | Classification of potential soil indica
Maria Costanza Calzolari
16:06 17 Apr
Tricky question, as pointed out by Rosa and Lucia. Overall, treshold values can be reliable provided that they are tailored on different pedoclimatic areas (and ES, and management practices)
Reply or add others with @
ted text | Adoption of S
Indicator
16:38 30 Jun
Marked as resolved
Adding a comment will re-open this discussion...
Maria Costanza Calzolari
16:21 17 Apr
Replace: "Soil Health Indicators" with "Global Soil Partnership Performance Indicator System (GPIS)"
Y. Yigini
20:07 3 May
Suggestion accepted
Reply or add others with @
Selected text | SHI = (SI1 x W1) + (SI2 x W2) + ... + (SI...
Jorge Batlle
12:01 18 Apr
The categories are assigned to numbers, but they are NOT numbers, so algebraic operations are not possible.
Y. Yigini
19:59 3 May
Marked as resolved
Adding a comment will re-open this discussion...
Maria C
15:54 17 A
More tha
threshol
accordin
and man
pedocloi
Reply
Selected text | Soil Loss
David Lobb
13:37 7 Jul
Land Loss, rather than soil loss to avoid confusion with soil erosion.
Reply or add others with @
nd the soil type
17

The Final Draft:

Global Soil Partnership
Action Framework 2030

SoilSTAT

Development and Integration of Key Performance Indicators for the Global Soil Partnership, the Soil Health Indicator System, and the Global Soil Health Index (GSHI)

Concept Note

ISAF Working Group

2023

1. **Global Soil Partnership Performance Indicator System**
2. **SoilSTAT: Soil Health Indicator System**
3. **Soil Health Index and Global Soil Health Dashboard**

\+ Indicator Factsheets, Operational Aspects, Reporting Lines, Data Policy, QA/QC

1 GSP Performance Indicators

- **16** KPIs
- **6** Domains (SSM, Soil Governance, Knowledge and literacy, Awareness raising, Soil Information and Data, Technical Cooperation)

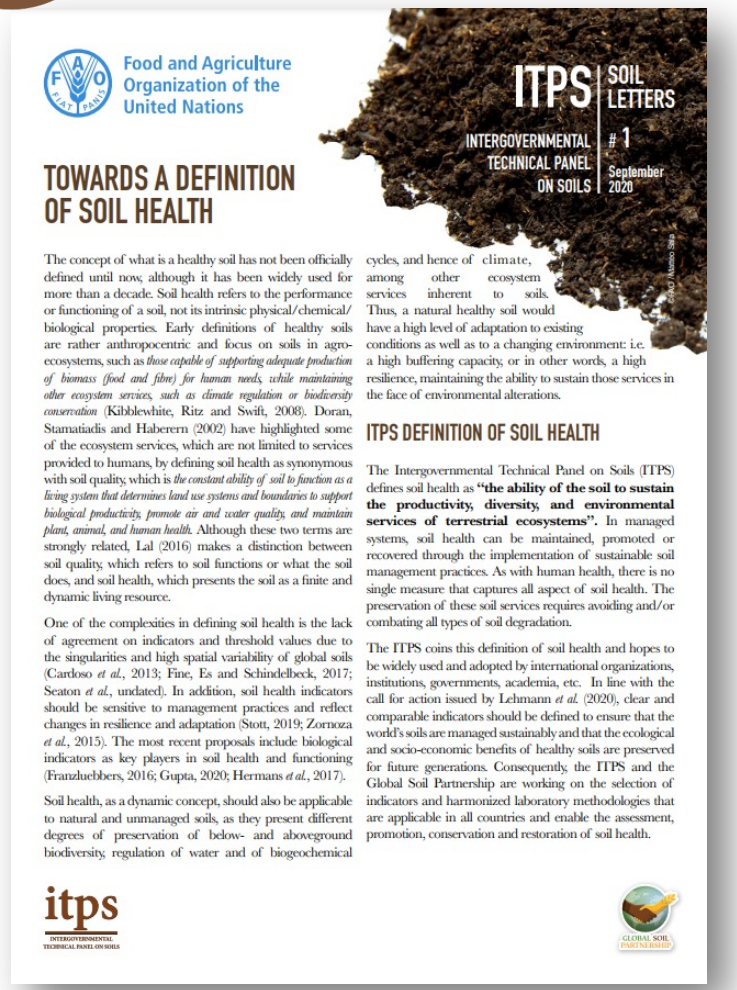
Target (GSPAF)	Domain	Indicator	Metric	(ω) (yea
1	SSM	Adoption of SSM Practices	# of farmers or beneficiaries adopting SSM Practices per unit area	2
2	SSM	Adoption of SSM in national programmes	# of countries that have included SSM in their national programmes	2
3	SSM	Proportion of degraded soils under SSM measures over total degraded soils.	Land area under SSM practices within GSP programmes, projects and initiatives.	2
4	SSM	Proportion of black soils under protection measures over total black soil area	Land Area under black soil protection measures	2
5	Soil Governance	Development of national and regional legal instruments focused on soil health	# of countries technically supported to include rev-WSC and VGSSM principles into national policies and strategies	1
6	Soil Governance	Implementation of the Fertilizer Code	# of countries technically supported to include the Fertilizer Code principles into national policies and strategies.	1
7	Soil Governance	Formalization of cooperation between the FAO/GSP and other relevant intergovernmental processes and monitoring frameworks	# of official agreements between FAO/GSP and relevant intergovernmental bodies	1
8	Knowledge and literacy	Capacity development programmes/courses on SSM	1)# of participants trained through the GSP's capacity development programmes 2) # of training sessions organised by the GSP	1
9	Knowledge and literacy	Global assessments reports on the state of world's soils and soil threats	# of global assessments and reports on soils published by the GSP..	1
10	Awareness raising and Advocacy on Soil Health	Outreach of the World Soil Day	1) Social Media Engagement Rate 2) Campaign Reach	1
			# of countries engaging	

2 Soil Health Indicators

- **21** Soil Health Indicators
- **10** Domains (e.g., Soil Physical, Chemical and Biological Health; Soil Fertility; Soil Threats; Soil Organic Carbon Dynamics, Soil Pollution)

Domain	Indicator	Metric
Soil Organic Matter	Soil Organic Carbon Stock	Predicted SOC Stocks
Soil Organic Matter	Soil Organic Carbon Concentration	Soil Organic Carbon Concentration
Soil Carbon Dynamics	Soil Organic Carbon Sequestration Potential	Predicted SOCseq Potential
Soil Salinity	Electrical Conductivity	Measured or Predicted Electrical Conductivi
Soil Loss	Wate Erosion Risk	Area under severe risk of erosion
Soil Loss	Tillage Erosion	Predicted Annual Soil Loss by Tillage
Soil Loss	Water Erosion Rate	Predicted Annual Soil Loss by Water
Soil Loss	Wind Erosion	Susceptibility to Wind Erosion
Soil Loss	Soil Sealing	Sealed area compared to the baseline
Soil Fertility	Available Nutrient Contents	Nutrient Concentrations (NPK)
Soil Fertility	Soil Nutrient Budget	Predicted/Calculated Nutrient Budgets for N
Soil Biological Health	Microbial Activity	Soil microbial biomass carbon (MBC)
Soil Biological Health	Soil Respiration	CO2 production
Soil Physical Health	Soil Compaction	Bulk Density
Soil Physical Health	Water Infiltration	Infiltration rate
Soil Physical Health	Soil Texture	Sand, Clay and Silt
Soil Physical Health	Available Water Capacity	Available Water Capacity
Soil Chemical Health	Soil Reaction	Soil pH
Soil Pollution	Contaminated Sites	Number, type of site, type of main pollutant
Soil Pollution	Heavy Metal Concentrations	Predicted/Measured Heavy Metal Concentra
Soil Salinity	Exchangeable Sodium percentage	Predicted/Measured ESP or SAR

3 Soil Health Index



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 fibre) 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 strongly related, Lal (2016) makes a distinction between soil quality, which refers to soil functions or what the soil does, and soil health, which presents the soil as a finite and dynamic living resource.

One of the complexities in defining soil health is the lack of agreement on indicators and threshold values due to the singularities and high spatial variability of global soils (Cardoso *et al.*, 2013; Fine, Es and Schindelbeck, 2017; Seaton *et al.*, undated). In addition, soil health indicators should be sensitive to management practices and reflect changes in resilience and adaptation (Stott, 2019; Zornoza *et al.*, 2015). The most recent proposals include biological indicators as key players in soil health and functioning (Franzluebbers, 2016; Gupta, 2020; Hermans *et al.*, 2017).

Soil health, as a dynamic concept, should also be applicable to natural and unmanaged soils, as they present different degrees of preservation of below- and aboveground biodiversity, regulation of water and of biogeochemical 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 systems, soil health can be maintained, promoted or recovered through the implementation of sustainable soil management practices. As with human health, there is no single measure that captures all aspect of soil health. The preservation of these soil services requires avoiding and/or combating all types of soil degradation.

The ITPS coins this definition of soil health and hopes to be widely used and adopted by international organizations, institutions, governments, academia, etc. In line with the call for action issued by Lehmann *et al.* (2020), clear and comparable indicators should be defined to ensure that the world's soils are managed sustainably and that the ecological and socio-economic benefits of healthy soils are preserved for future generations. Consequently, the ITPS and the Global Soil Partnership are working on the selection of indicators and harmonized laboratory methodologies that are applicable in all countries and enable the assessment, promotion, conservation and restoration of soil health.

itps
INTERGOVERNMENTAL TECHNICAL PANEL ON SOILS

GLOBAL SOIL PARTNERSHIP

SOIL HEALTH?

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3 Soil Health Index

- **Approach**: Soil Ecosystem Services
- **Reproducible:** National Scale
- **Regionalized :** Agroecological Zones
- **15 of 21** Indicators to be used for the Global Soil Health Index
- **Initial Focus:** Agricultural Lands

$$SHI = \sum_{i=1}^{n} \left(\frac{1}{m} \sum_{j=1}^{m} SI_j \right)_i$$

Where,

- SHI: Soil Health Index,
- SI_j: Soil indicator for the ecosystem service *i*, (SI_j ranges from 0 to 1 using a fuzzy logic membership function, and the SHI ranges from 0 to *n*.)
- *m* : number of soil indicators for each ecosystem service,
- *n* : number of ecosystem services.

Global Soil Health Dashboard

Next Steps – July 2023 Onwards

- The work of the group will proceed under the umbrella of INSII.
  - A new group, the SoilSTAT Working Group, will be established within INSII.
  - Both the ISAF Working Group and the SoilSTAT Working Group will
    - Finalize the development of Indicator Systems
    - Produce individual factsheets for each indicator.
    - Continue to develop and refine the technical components of the work done.

The Plenary Assembly may wish to

- ***welcome*** *the progress made in the preparation of the indicator system of the GSP Action Framework 2022-2030 &*
- ***recommend*** *the International Network for Soil Information Institutions (INSII) to review, finalise and endorse it during its ninth session in November 2023.*

Food and Agriculture Organization of the United Nations

GLOBAL SOIL PARTNERSHIP

11th Plenary Assembly

12-14 July 2023

Thank You ☺

ISAF Working Group