

6th Meeting of the **Regional Soil Laboratory Network for Africa** (AFRILAB)

23 October 2024

Standard Operating Procedures (SOPs)

Filippo Benedetti

Global Soil Partnership (GSP) Secretariat

FAO





Soil data comparability is possible only if the same procedures are adopted or via transfer functions

Using the same SOPs
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Speaking the same language

Different methods and procedures used by different laboratories can lead to **inconsistent** and **unreliable results**, which can make it difficult to compare and interpret data

Modify by	Revision	Approval date	Validated date
GLOSOLAN SOP Tech. W.G. Leader: Elena Shamrikova, Russian Federation	By the Review Panel	13 January 2021	13 January 2021
Global Soil Laboratory GLOSOLAN	/ Network	GLOSOLAI	N-SOP-16
		GLOSOLAI Version number : 01	N-SOP-16 Page 16 of 18



Harmonization of Standard Operating Procedures (SOPs)

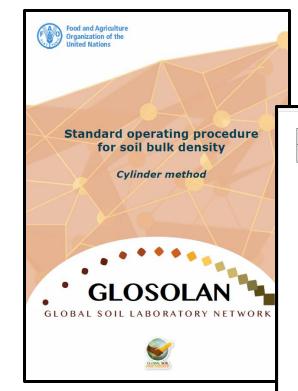


Globally harmonized protocols, with a bottomup, collaborative and inclusive approach.

- Include step-by-step instructions, sections on health and safety, quality assurance and control (QA/QC),
- Contribute to the replicability of an analysis and to the quality and reliability of the data,
- Accessible online, for free and in several languages.

In 2024, GLOSOLAN focused on:

- Translation of SOPs
- Finalization of the pending SOPs from previous years
- Review the SOPs already published



Effective date: 19 May 2033 A brief introduction to soil bulk density Il is the result of rock fractioning and weathering over periods ranging from thousands to millions of arr. Fractioning and weathering produce mineral fractions and particles of an extremely large range sizes, from several enteres to less than one micrometre. By definition, soil is made by the packing asternorm of the production of a state of the particles of the particles, well as by their shape and packing. Sand Particle 18 and particle 18 and particle 19 and particles 19 and particles 19 and particles 19 and packing. Sould	Global Soil Laboratory Net GLOSOLAN	work	GLOS	OLAN-SOP-	22
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Harmonization-bottom-up, inclusive procedure

- 1. Discussion and decision on the methods to harmonize (done within the Regional Soil Laboratory Network first, and then at a global level)
- 2. Establishment of the working groups, assignment of roles:
 - Global leader
 - Regional leaders (supporting authors)
 - Review panel
- 3. Prepare the matrix (=survey) and send it to all GLOSOLAN members who are familiar with the method to collect information on the procedures adopted worldwide
- 4. Compile the information on a regional basis \rightarrow regional matrices are harmonized
- 5. Merge the regional matrices into a global matrix
- 6. Convert the matrix into a text
- 7. Review of the procedure's text
- 8. Publication and translation



Joint products

- GLOSOLAN SOPs are living documents and are revised regularly and/or as needed
- Experts from other GSP Technical Networks support the harmonization process according to the parameter:
 - NETSOB: active members of the working groups for all SOPs dealing with soil biological parameters.

Examples: enzymes, nematodes, DNA extraction

- ➤INSAS: review the SOPs related to soil salinity and sodicity Examples: pH, electrical conductivity, Sodium Adsorption Ratio (SAR), Exchangeable Sodium Percentage (ESP), SOC in saline soils
- ➤INSOP: review the SOPs related to pollutants and toxic elements

Examples: microplastics, explosive residues, disposal of reagents



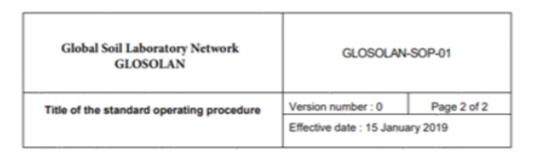






Structure of the procedure - standard template

In come cases (e.g. physical or biological parameter tests): sections on sample collection, storage and disposal



Contents

- Brief introduction to the topic
- Scope and field of application
- 3. Principle
- Apparatus
- Materials
- Health and safety
- 7. Sample preparation
- Procedure
- 9. Calculation
- 10. Quality assurance / quality control
- Reference documents (if any)
- Appendix I Results of inter-laboratory comparison
- Appendix II Acknowledgments
- 14. Appendix III List of authors
- 15. Appendix IV Contributing laboratories



Not only procedural details

- Consistency and Quality
 - QC/QA procedures



- Recommendations on health and safety
 - Personal protective equipment, chemical and biological safety, emergency procedures



- Sustainability of methods
 - reliable, accurate, and cost-effective, while minimizing the use of resources, energy, and hazardous substances.

Soil Nitrogen methods : Sustainability of methods						
Method	Risk for human health related to the use of chemicals and the overall implementation of procedure by staff	Environmental risk (waste disposal)	Level of technology required	Average duration of the analysis	Global median price of the analysis (for the customers)	
Kjeldahl	High	High	Medium	> 1 working day	7.5 USD	
Dumas	Low	Low	High	Up to half working day	11.6 USD	
Distillatio method	n Medium	Medium	Medium	Up to one working day	8.3 USD	



Facilitate the adoption of the SOPs

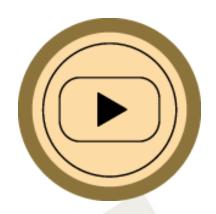
Accessibility

- SOPs are available for free on the GLOSOLAN website
- Translation in the UN Official languages and other national/local languages as needed (according to the translator availability)



Capacity building

- Webinars are regularly organized (in multiple languages) to present the methodologies
- Training videos are created







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SOLA ABORATORIO

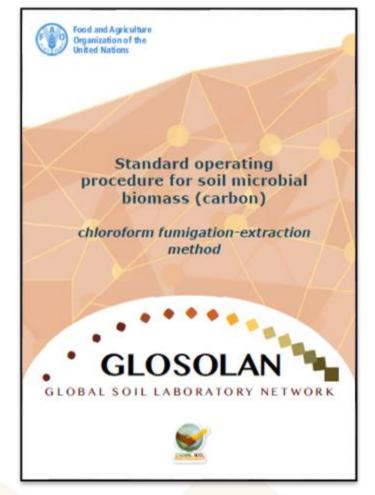


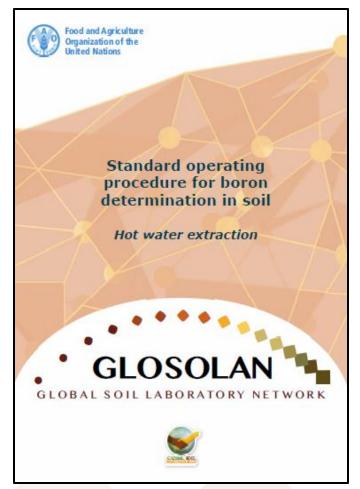
Network T



титрованием и колориметрическим методом

Recently released SOPs







Scan to access all GLOSOLAN SOPs!

Microbial biomass

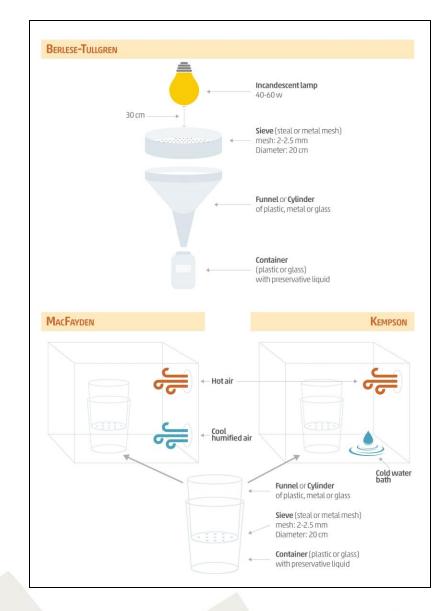
Boron by hot water extraction

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Status of the other SOPs

- Under publication (available soon):
 - Mesofauna by QBS-ar
 - Particulate organic carbon
 - Soil enzyme activity
 - β-Glucosidases
 - Arylsulfatase
 - N-acetyl-β-Glucosaminidase
 - Dehydrogenase
 - Phosphomonoesterases
- Under technical review:
 - Particle size distribution (pipette and hydrometer)
- Ongoing:
 - Water retention curve (pF)
 - Soil organic matter by loss of ignition
 - Nematodes
 - Explosive residues in soils





GLOSOLAN SOPs developed so far

Already published:

- 1 on sample pre-treatment
- 21 on soil chemical parameters (1 more ongoing)
- 2 on soil physical parameters (2 more ongoing)
- 4 on soil biological parameters

	2020	2021	2022	2023	2024
Chemical	Handling and preparation of soil samples for chemical and physical analyses, soil organic carbon (Walkley and Black), Calcium carbonate eq. (titrimetric and volumetric calcimeter methods)	Soil organic carbon (Tyurin), pH (H ₂ O, KCl, CaCl ₂), nitrogen (Dumas, Kjeldahl), electrical conductivity (in water and in saturated paste), Phosphorus (Bray I, Bray II, Olsen, Mehlich I), TC Dumas,	Available micronutrients (extraction using DTPA), Exchangeable bases and CEC (ammonium acetate)	Quasi-total elements- including heavy metals (digestion using aqua regia and EPA)	Boron by hot water extraction, particulate organic carbon (physical fractionation), Organic matter (loss of ignition)
Physical				bulk density (cylinder method), moisture content (gravimetric method)	Water retention (pF) curve, Particle density (pycnometer), particle size- distribution (hydrometer, pipette)
Biological				Soil respiration rate	Microbial biomass C and N by chloroform fumigation-extraction, soil enzyme activities (beta-glucosidase, arylsulfatase, beta-glucosaminidase, phosphatases and dehydrogenase), QBSar (mesofauna)

Translations: where we are

French – already done, just final review missing

- Guidelines on sample preparation
- Guidelines on how to prepare samples for internal reference material
- Guidelines on how to prepare samples for PT
- SOP for calcium carbonate
- SOP for carbon by Dumas
- SOP for soil organic carbon by Walkley and Black
- SOP on soil pH

Portuguese – already done, just final review missing

- Guidelines on sample preparation
- Guidelines on how to prepare samples for internal reference material
- Guidelines on how to prepare samples for PT
- SOP for soil organic carbon by Walkley and Black
- SOP carbon by Dumas
- SOP on soil pH
- SOP on soil bulk density
- SOP for respiration rate
- SOP for electrical conductivity
- SOP for phosphorous by Bray I and II
- SOP for phosphorous by Olsen
- SOP for phosphorous by Mehlich I
- SOP for CEC and exchangeable bases
- SOP for available micronutrient and heavy metals by DTPA
- OP for heavy metals by acidic digestion
- SOP for moisture content



Already in the pipeline

CHEMICAL

- Organic matter by loss of ignition
- Available phosphorus by KCl
- Exchangeable acidity by KCl + Exchangeable Al by KCl
- Soil buffer capacity using KOH
- Exchangeable acidity by BaCl2
- Fe and Al oxides by ammonium oxalate and by sodium citrate plus sodium dithionite

PHYSICAL

- Water retention (pF) curve
- Particle density by pycnometer
- Aggregate stability by Le Bissonais

BIOLOGICAL

- N Mineralization by incubation method
- Nematodes trophic groups by wet extraction
- Greenhouse gases (GHS) emissions in soil
- DNA extractions



Any additional SOP?



