

Standard Operating Procedures

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6th Meeting of the
**Global Soil
Laboratory
Network**
(GLOSOLAN)



GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

SOP = Standard Operating Procedure

- Globally harmonized
- Ensures the replicability of a measurement and the credibility and traceability of data
- Available online, for free
- Step-by-step instructions
- Includes sections on health and safety, quality assurance and quality control (QA/QC) – and in some cases sampling guidelines



SOPs harmonized so far

Green: published

Orange: publication ongoing

Red: Late

Blue: published, but to be revised

Pink: published and reviewed already. Revised version available online soon

| | 2019 | 2020 | 2021 | 2022 |
|------------|---|---|---|--|
| Chemical | OC Walkley and Black, TC Dumas, Calcium carbonate eq. (titrimetric and volumetric calcimeter methods) | Phosphorus (Bray I, Bray II, Olsen, Mehlich I), pH, electrical conductivity (in water and in saturated paste), nitrogen (Dumas, Kjeldah), carbon (Tyurin) | Particulate organic carbon (physical fractionation), Quasi-total elements (digestion using aqua regia and EPA), Exchangeable bases and CEC (ammonium acetate), available micronutrients (extraction using DTPA), Boron (hot water extraction), Mehlich III for macro and micronutrients (including S and B) | Organic matter (loss of ignition), Available phosphorus (KCl), Exchangeable acidity + Exchangeable Al (KCl), Soil buffer capacity (KOH), Fe and Al oxides (ammonium oxalate) |
| Physical | | | Particle size-distribution (hydrometer, pipette), bulk density, moisture content (gravimetric method) | Water retention (pF) curve, Particle density (pycnometer) |
| Biological | | | Microbial biomass C and N by chloroform fumigation-extraction, soil respiration | Microbial Enzyme Activities (B-Glucosidase, Arylsulfatase, Dehydrogenase), N Mineralization (incubation method), Nematodes trophic groups (wet extraction), QBSar, ISO-TSBF |

Global harmonization process

1. Decide which SOP to harmonize (parameter + method)
2. Establishment of the working group (experts from all regions)
3. Developing of the matrix
4. Share the matrix with soil labs worldwide
5. Harmonization of the information collected on regional basis ☐ regional matrices
6. Harmonization of the regional matrix into a global matrix
7. Transform the matrix into a text
8. Review
9. Publication of the SOP
10. Translation of the SOP in multiple languages
11. Publication of the information on the sustainability of methods

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| | RESOLANs |
|---|--------------------------------------|
| Soil chemical analysis | |
| • Resin extractable P | AFRILAB |
| • Mineral nitrogen – ammonium and nitrate nitrogen (plant available N) by KCl. Plus to be combined with available N by calcium chloride extraction; | AFRILAB, EUROSOLAN |
| • CEC and exch. Cations by hexamine cobalt trichloride extraction | EUROSOLAN |
| • Available anions and cations by calcium chloride extraction | EUROSOLAN |
| • P-AL/ammonium lactate – acetic acid buffer | EUROSOLAN |
| • soluble anions (sulphate, chloride, carbonate, bi-carbonate) by titration method | NENALAB |
| • soluble cations (calcium, magnesium) by titration method + sodium and potassium using flamephotometer include standards on the interpretation of results in these SOPs | NENALAB |
| Soil physical analysis | |
| • Aggregate stability by Le Bissonais | AFRILAB, NENALAB |
| • Textural determination by laser diffraction (PARIO??) | EUROSOLAN, SEALNET |
| • K sat | AFRILAB |
| • Field capacity by cylinder method | NENALAB |
| Soil biological analysis | |
| • DNA extraction | AFRILAB, EUROSOLAN, NENALAB, SEALNET |
| • Earthworms sampling and identification | AFRILAB, NENALAB |
| • Ryzobia classification | AFRILAB |
| Various | |
| • SOP on UNDISTURBED soil collection, transportation and storage | NENALAB |

| Soil chemical analysis | Coming from |
|--|--------------------|
| Exchangeable acidity by BaCl ₂ | From 2021 requests |
| Fe and Al oxides by sodium citrate plus sodium dithionite | From 2021 requests |
| potentially toxic elements (PTEs) | INSOP |
| Available and total Potassium (<i>maybe included in Mehlich III?</i>) | INSII |
| Calcium (Ca), Sulphur (S), Magnesium (Mg), Iron (Fe), Boron (B), Chlorine (Cl), Manganese (Mn), Zinc (Zn), Copper (Cu), Molybdenum (Mo), Nickel (Ni), Silisium (Si) (<i>Some of these are covered by Mehlich III and DTPA extraction</i>) | INSII |
| Exchangeable Sodium Percentage, several analytical methods | INSAS |
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| Sodium Absorption Ratio, several methods | INSAS |
| Alkalinity in soil saturated paste extract | INSAS |
| Analysis of Boron, several analytical methods | INSAS |

| Soil biological analysis | Coming from |
|---|----------------------|
| Greenhouse gases (GHGs) emissions in soil | NETSOB |
| Incubation for protozoa | NETSOB |
| Nematodes - NGS sequencing | NETSOB |
| automated calculation system for nematode-based biological monitoring (NINJA) | NETSOB |
| DNA metabarcoding analysys | NETSOB |
| Protozoa by non flooded petri dish method | NETSOB |
| Microbial Biomass by PLFA | NETSOB |
| DNA extraction | NETSOB |
| Microbial population identification | NETSOB |
| Nitrifyng bacteria | NETSOB |
| Soil Health Lipidic Index | Argentina (Dr. Wall) |



Proposal from GLOSOLAN Technical Committee

- Harmonize the following SOPs at global level:
 - **Chemical**
Exchangeable acidity by BaCl₂
A general multi-element suite of potentially toxic elements (PTEs) - elements to include to be discussed with INSOP. Shall we review the SOP on **Quasi-total elements (digestion using aqua regia and EPA)** to include As in it? Need to organize a meeting with INSOP to assess the work on this SOP and discuss the eventual harmonization of a SOP on pesticides.
 - **Physical**
Aggregate stability by Le Bissonais
Textural determination by laser diffraction
 - **Biological**
Greenhouse gases (GHGs) emissions in soil
DNA extraction
Soil Health Lipidic Index
- RESOLANs to decide which SOPs to harmonize at regional level, starting from the proposals they made
- Establish a joint working group with other GSP Technical Networks to work on guidelines/SOP on samples collection, transportation and storage
- Focus more on transfer functions and activities on QA/QC



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Thanks for your attention

