

June 2018



Global Soil Partnership Plenary Assembly



Sixth session

Rome, 11-13 June 2018

Best Practices in Soil Analysis | Concept Note (GSPPA:VI/2018/3 Add.4)



Introduction

Soils can only be sustainably managed and prevented from further degradation, and restored, if sufficient and reliable information becomes available about its current state, its susceptibility to hazards and threats, and its resilience to environmental change. Such information cannot be generated without standards and norms, and the availability of knowledge and experience to apply them. High quality laboratories apply routine procedures with well-trained staff and the proper technical equipment. They participate in cooperation, such as ring tests, constantly compare their results, maintain analytical quality following standards for good laboratory practice, and – if needed – expand to new methods and machinery. Numerous laboratories operate at national level, sometimes overseen by reference laboratories, sometimes organized in supportive networks. However, in many cases, staff experience and training, as well as equipment are insufficient.

The harmonization of soil data and information is therefore pivotal to efficiently implement sustainable soil management, achieve the Sustainable Development Goals and promote technical and scientific cooperation among different institutions, regions and countries exchanging comparable data. According to the GSP Pillar 5 Implementation plan, harmonization is most effective at the level of data generation (sampling, soil analysis, soil profile description), but very often has to be applied at later stages of information and data development (data exchange, indicators, soil evaluation). This is why harmonization should follow the life cycle of soil data in a systematic form.

In this framework, participants to the first Global Soil Laboratory Network (GLOSOLAN) meeting agreed on the need to prepare a best practice manual to assist soil laboratories in collecting, managing, analyzing and interpret soil samples for soil nutrient content assessment.

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I. Structure of the collection of best practice manuals

Pillar 5 – Harmonization – foresees the development of a best practices guideline. Despite multiple existing guidelines and handbooks, the variability of methods, machinery and analytical quality is immense.

The review of existing reference literature and the proper reference to standards deserves sufficient time and discussion. It seems that a compendium of different manuals, one for each parameter and laboratory operation, allows for the best flexible approach; the collection of manuals could grow over time, depending on time for review, time for allowing input by regional partners, and other aspects. In specific cases, also regional specifics could be highlighted, or even summarized in annexes or different volumes. Regional specifics will also build and link to the work done by the Regional Soil Laboratory Networks (RESOLANs) in term of regional harmonization of the procedures to assess soil nutrient parameters.

Manual 1: Site characterization, sampling and sample pre-treatment.

Volume 1. How to collect a soil sample for soil nutrient assessment: site selection and sampling.

Extra notes on the content: equipment, sample transport and storage, moisture conditions

Volume 2. Generic characterization of sites and samples

Extra notes on the content: site description, texture class, soil type, etc.

Volume3: Soil pre-treatment

Manual 2: Soil chemical analysis

(note that for each method there will be information on the relevance/use, principle of measurement, apparatus, reagents, procedure, calculations, report, and references)

Volume 4. Soil carbon (as it is a major priority to maintain soil productive capacity and at the same time it is related to climate change under the effect of CO₂ release/storage, moreover, the priority of Pillar 4 was to produce a world soil map, this volume will help to associate information on the quality of carbon data and the uncertainty on the degradation/rehabilitation monitoring).

Volume 5. Soil pH (because there is a large risk of soil acidification that must be measured on a world scale and also because it is necessary to know soil pH to understand and predict many other chemical, physical and biological functioning).

Volume 6. Soil Phosphorus (Phosphorus is a mine resource and all the mines could be exhausted in 100 to 300 years meaning that we have to use it more wisely; moreover the excess use of P is a major cause of environment degradation through eutrophication, and at last but not at least, there is no standard method to analyse Phosphorous in the soil, making so that all our estimation have a high uncertainty).

Volume 7. Soil Potassium

Volume 8. Soil Nitrogen (because nitrogen is the most important limiting factor of plant production and it is at the same time a main factor of water pollution when too much nitrogen is applied to the soil, and N₂ is also be able to produce by agriculture and is a greenhouse gas)

Volume 9. Exchangeable cations and CEC (as they determine the soil fertility and also the capacity to adsorb pesticides, herbicides, heavy metals, etc..).

Volume 10. Exchangeable microelements.

Volume 11. Soil carbonate content

Volume 12. Soil gypsum and salt content

Volume 13. Soil electrical conductivity

Volume 14. Special soil analysis for peats, mineral and organic soils, agriculture and forests.

Manual 3: Soil physical analysis

Volume 15. Bulk density (as it is the only way to estimate soil compaction and potential water infiltration).

Volume 16. Coarse fragments

Volume 17. Particle size distribution (as they determine many soil properties ; and characterisation that need to be done on undisturbed samples).

Volume 18. Water retention curve (as it estimates the water storage capacity that will be a major characteristics in the context of climate change).

Manual 4: Soil biological analysis

Volume 19. Soil microbial biomass (it is still a challenge and a research concern to measure the impact of this activity on the soils, and this volume will bring a suggestion of some measures that could be standardised at world scale).

Manual 5: Data quality, management and validation

Volume 20. Data quality requirements (plausibility limits, data completeness, tolerable limits)

Volume 21. Data management and validation

Manual 6: Data processing: Soil functions, classification, statistics

II. Guidelines for the writing of the manual

The manual should meet the following criteria:

- It should be applicable at regional and at global level (extract and highlight generic components, and be open to add specific regional ones, examples);
- It should be compatible with existing reference manuals;
- It should be open to updates;
- It should be easy to read and understand (large use of graphics and pictures);
- It will include case studies reporting successful implementation examples as well as errors and risk hazard management notes;
- It will encourage the exchange of information and experiences from GSP regions;
- It will become available as internet tool and not as a book;
- it will include the most advanced techniques in soil analysis.

III. Budget

It will firstly cover the cost of writing and publishing the manuals.

Secondly, to disseminate the knowledge collected in the manuals, it is proposed that each RESOLAN select one laboratory that will be called a 'Regional Reference Center (RRC). RRCs will provide regional and international trainings. Moreover, to facilitate standardization and harmonization of the methods, exchanges will also be organised between the different RESOLANs and RRCs. Thirdly, activities related to the establishment and execution of activities of the GLOSOLAN will be included.

The total budget for this activity is **USD 500 000, including the cost of trainings organised by RRC and exchanges between RESOLANs.**

Activity	Budget (USD)
Manuals (per a 20 pages volume)	10 000
<i>English editing</i>	2 000
<i>Graphic design</i>	3 000
<i>Publishing</i>	500
<i>Printing (500 copies)</i>	3 000
<i>Author expenses</i>	1 500
Regional Reference Center (RRC)	300 000
Advertising	7 900
General Operating Expenses	2 100

IV. Logframe

Starting / Ending period: **September 2018 / September 2020**

Activity	2018	2019			2020	
	Q3	Q1	Q2	Q3	Q1	Q2
Identification of leading authors and writing of the volumes in the manual						
Selection of the Regional Reference Centers (RRC)						
Training of scientists						
Publishing of the volumes in the manual						