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Guidelines for the determination of organic carbon and nitrogen stocks and their variations in mineral soils at field scale

Lignes directrices pour la détermination des stocks de carbone organique et d'azote et de leurs variations dans les sols minéraux à l'échelle d'une parcelle

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Soils comprise an important pool in the biogeochemical cycles of carbon (C) and nitrogen (N), and thus are critical for climate regulation either by emitting greenhouse gases (GHGs) or by sequestering C.[1]. Soils are the largest terrestrial reservoir of organic carbon, accounting for more carbon than contained in the atmosphere or biota. Consequently, relatively small changes in soil carbon stocks can equate to considerable exchanges with other actively cycling carbon pools, such as the atmosphere. Estimation of soil organic carbon stock changes is one of the main methods applied to determine long-term carbon fluxes and to design carbon sequestration strategies. Soil organic carbon (soil OC) is the balance between inputs (e.g. plant residues, manure, etc.) and biologically mediated losses. Information on soil total N stocks is valuable, because adequate N is critical for plant production while excessive N can be an environmental hazard. Leakage of nitrous oxide (N_2O) from terrestrial systems to the atmosphere (where it enhances radiative forcing and may catalyse stratospheric ozone (O_3) destruction) is one hazard associated with excessive soil N inputs. The ratio of organic C to total N stock can also provide insight into soil OC stability and potential for element retention in the soil. Climate policies promote actions regarding the protection and increase of soil OC stocks. Such measures require standardized methods to assess the current soil OC stocks at the relevant scale (e.g. plot, farm, region) and to verify the efficiency of soil carbon sequestration actions. This document provides guidance on the measurement of carbon and nitrogen stocks in soils and to the detection of their temporal variations.

Guidelines for the determination of organic carbon and nitrogen stocks and their variations in mineral soils at field scale

1 Scope

This document presents a method to quantify the soil organic carbon and nitrogen stocks in mineral soils at plot scale. It also provides guidance on how to detect and quantify simultaneously the variations of carbon and nitrogen stocks over time in mineral soils at field scale. It is based on several documents already published[2],[3],[4],[5],[6],[7],[8].

This document does not apply to organic soils, soils with permafrost, wetland soils, or to soil layers prone to submergence below the groundwater table.

NOTE 1 The possibility of increasing soil C storage is viewed as a means to sequester atmospheric carbon dioxide (CO_2) and mitigate greenhouse gas (GHG) emissions. Information on soil nitrogen (N) stocks is crucial because it interacts with carbon cycling through plant nutrition and organic matter decomposition, and leakage of N is of environmental concern (e.g. N_2O emissions, NO_3- leaching). Therefore, it is becoming increasingly important to measure accurately the impact of changes of land uses and practices on organic carbon and nitrogen stocks.

NOTE 2 While understanding changes in soil inorganic carbon it is important also to understand the land-atmosphere exchange of CO_2, measuring stocks of soil inorganic carbon is outside the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16133, *Soil quality — Guidance on the establishment and maintenance of monitoring programmes*

ISO 18400-101, *Soil quality — Sampling — Part 101: Framework for the preparation and application of a sampling plan*

ISO 18400-105, *Soil quality — Sampling — Part 105: Packaging, transport, storage and preservation of samples*

ISO 18400-206, *Soil quality — Sampling — Part 206: Collection, handling and storage of soil under aerobic conditions for the assessment of microbiological processes, biomass and diversity in the laboratory*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/