
**Soil quality — Framework for detailed
recording and monitoring of changes
in dynamic soil properties**

*Qualité du sol — Cadre pour l'enregistrement détaillé et la
surveillance des modifications des propriétés dynamiques du sol*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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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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

Since it is not an absolute concept, even within a single purpose that soil can serve (e.g. natural habitat, recreational land, agriculture, ecosystem services), soil quality is difficult to define and quantify. Surface soil (also referred to as the surface A horizon or topsoil) with good quality is characterized by improved soil structure, greater water retention, nutrient cycling and aeration, and enhanced biological diversity^[1]. Surface soil provides the major portion of nutrients, water and air for supporting plant and microbial growth, and is dynamic both spatially and temporally with respect to soil processes and properties. In the face of increasing global degradation of soil resources there is a growing need to describe dynamic soil properties related to soil function, along with dynamic and static conditions that influence function, in order to, for example, track effects of land management (e.g. remediation, agricultural practices) on soil quality (e.g. crop yield, drought resilience) or develop dynamic soil properties databases to enhance existing soil survey databases for estimation of carbon stocks in soils, sustainable agriculture, etc. ISO 25177 standardizes soil description for use in pedological, environmental or other studies in the field at site and plot scales. When combined with the precise system of recording needed to monitor and track changes in surface soils described in this document, data collected is optimally used, for example to identify trends due to changes in land use or land management.

This document is a framework to integratively record and monitor changes in physical, chemical and biological soil properties in surface soils as well as to systematically document landscape conditions and land use management practices. The framework records and facilitates the monitoring of soil surface horizon characteristics that represent dynamic soil properties (e.g. soil structure, organic carbon) inherent soil properties (e.g. soil texture), and landscape features (e.g. slope), land use (e.g. crop type) and land management activities (e.g. tillage practices). Collecting “contextual” data in addition to data on dynamic and static soil properties allows for comparative interpretations of soil quality change and the ability to identify trends due to changes in management practices or remediation efforts among different soils, or the same soils under different conditions or at different times.

The criteria chosen and used in the framework for soil descriptions were field-tested with the goal of maximizing information necessary for making soil quality interpretations and for designing decision models for assessing the state of soil quality. The soil quality description framework has been field-tested at sites in eastern Canada (Ontario)^[2] and western Canada (British Columbia)^[3] as well as in northern (Osnabrück) and eastern (Müncheberg) Germany. The framework has also been used in field studies to determine its ability to characterize surface soil in agricultural soils in Russia (Siberia).^[4] In this study, differences in soil fingerprint codes were statistically compared using hierarchical cluster analyses.

Soil quality — Framework for detailed recording and monitoring of changes in dynamic soil properties

1 Scope

This document provides a framework for the detailed assessment and monitoring of dynamic soil properties related to soil function with concomitant recording of in-situ static soil properties, landscape, land use and soil management practices that influence function at the time the data were collected. It is applicable to the assessment of soil quality in agricultural landscapes, contaminated sites and natural soil ecosystems at plot, field and landscape spatial scales. It can also be applied in the development of dynamic properties databases to enhance existing soil survey databases for estimation of carbon stocks in soils, sustainable agriculture, landscape management etc.

Although the soil quality description framework has been developed to describe surface soils, the same principles can be applied to adapt the framework to describe subsurface soil horizons.

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 11074, *Soil quality — Vocabulary*

ISO 25177, *Soil quality — Field soil description*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11074 and the following 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/>

3.1

soil fingerprint code

single line of soil and environmental information compiled using a system of formatting and syntax that is unique to an individual soil sample

Note 1 to entry: A soil fingerprint code developed in accordance with this document is considered metadata.

4 Principle

The soil quality description framework uses a system of formatting and syntax to record various soil and environmental information about a soil sample in a single line that is unique to a soil sample at the time the data were collected. This single line, or code, is analogous to the generation of a genetic code or "soil fingerprint" for a soil sample. The framework is designed with specific formatting and syntax so that each level of description is easily identifiable in the recorded soil fingerprint code. The symbols used to generate the soil fingerprint codes were developed using elements from several national and global soil description systems (including the Food Agriculture Organization of the United Nations