D3.2 A

Inventory of soil data for Africa represented in the ISRIC-WDC holdings

Project No. 869200

29 May 2021

Deliverable: Soils4Africa_D3.2a_SoilDataInventory_v01

Version 1.0

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Project details

Project number	862900
Project acronym	Soils4Africa
Project name	Soil Information System for Africa
Starting date	01/06/2020
Duration In months	48
Call (part) identifier	H2020-SFS-2019-2
Topic	SFS-35-2019-2020 Sustainable Intensification in Africa

Document details

Work Package	WP3
Deliverable number	D3.2A
Version	1
Filename	*Soils4Africa_D3.2a_SoilDataInventory_v01.doc*
Type of deliverable	Report
Dissemination level	Public
Lead partners	ISRIC
Contributing partners	SZIU, ICRAF, FARA, IRA, BUNASOLS, IFA, KALRO, SU
Author	Niels H. Batjes and Eloi Ribeiro
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Due date	31 May 2021
Submission date	29 May 2021

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List of Partner Abbreviations

Short name	Name	Country
ISRIC	Stichting International Soil Reference and Information Centre	Netherlands
FARA	Forum for Agricultural Research in Africa, Ghana	Ghana
SZIU *(WP3 lead)*	Szent Istvan University	Hungary
SU	Stellenbosch University	South Africa
ICRAF	International Centre for Research in Agroforestry	Kenya
IFA-YANGAMBI	Institut Facultaire Des Sciences agronomiques (IFA) De Yangambi	Congo (Democratic Republic of)
BUNASOLS	Bureau National des Sols	Burkina Faso
IRA	Institut des Regions Arides	Tunisia
KALRO	Kenya Agricultural and Livestock Research Organisation	Kenya

1. Introduction

The Soils4Africa[1] project (2020-2024) will develop a soil information system for Africa for which new soil point data will be collected using standard procedures for field sampling, data registration, soil analyses and data processing building on the LUCAS approach (Fernández-Ugalde *et al.* 2016; Orgiazzi *et al.* 2018). An insight into available, geo-referenced point soil data resources for Africa is considered useful as it can be used to inform the sampling design. Further, such legacy data, once standardised, are useful to underpin agricultural decision making by complementing the new data that will be collected during the Soils4Africa project itself.

The inventory required in the Grant Agreement involves: a) an analysis of digital point datasets for Africa registered in the ISRIC holdings and b) an inventory of point data from ongoing and completed soil surveys at continental, national and regional scales in Africa. The latter irrespective of whether these resources have already been considered in the holdings mentioned in sub a.

[1] https://www.soils4africa-h2020.eu/the-project

This report focuses on 'inventory a'. It describes the distribution and characteristics of soil (point data) for Africa as provided through the World Soil Information Service (WoSIS; version 'latest'[2] of 10 September 2020). Inherently, the inventory is limited to those datasets that may be shared with the international community based on the licence provided with each dataset; that is, the geo-locations of these profiles may be shown. Thereby, this overview may serve to inform the sampling design for the Soils4Africa project, keeping in mind though that often the available soil properties will have been sampled and analysed according to methods that differ from the standards defined for the LUCAS sampling programme itself (Fernández-Ugalde *et al.* 2017; Fernández-Ugalde *et al.* 2016; Tóth *et al.* 2013).

Results of the inventory are presented largely as tables and figures (Section 2), while more lengthy tables giving, for example, the 'long' names of the various source datasets are presented in Appendices. In the case of data compilations, full references to the underpinning datasets may generally be found in the metadata or reports that describe the given compilations. A particularly well-documented data compilation for Africa in this respect is the Africa Soil Profiles Database (Leenaars *et al.* 2014a; Leenaars *et al.* 2014b).

Section 3 serves to describe some recent data sampling programmes for Africa. These are mainly based on spectrally determined soil parameters with a focus on the topsoil only. Often the resulting data are not freely available online, hence their contents cannot be discussed in detail here. Similarly, we list a few datasets for Africa that have also been standardised according to the WoSIS workflow, but for which the geo-locations may not be shown due to current licence restrictions; these profiles are of limited use for the Soils4Africa project itself.

Concluding remarks on the way forward are made in Section 4.

This report contributes to Deliverable 3.2 of Soils4Africa to be delivered in month eight of the project. When completed, this deliverable will consist of three documents: the present report (D3.2a), a report that summarizes findings of a questionnaire on 'data holdings in Africa' (D3.2b), and a report that will describe the sampling design (D3.2c) for the project.

[2] https://www.isric.org/explore/wosis/accessing-wosis-derived-datasets

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2. Data inventory

2.1 Source of data

Data sets shared by a wide range of contributors have been quality-assessed and standardised in the World Soil Information Service (WoSIS) in accordance with the licences (permissions) provided with each dataset (Batjes *et al.* 2020; Ribeiro *et al.* 2018). Out of these datasets, 45 have at least some profiles for the African continent. However, not all these profiles are geo-referenced (besides giving e.g. the country name) thereby already reducing the number of 'useable' profiles for this inventory.

A wide range of soil properties have been considered in the source databases, largely depending on the purpose of the initial surveys. Routine soil survey programmes generally collected samples for each soil horizon to a given depth, while specific surveys tend to focus on one or two fixed depth layers (e.g. 0-20 cm and 20-50cm) (Landon 1991; Soil Science Division Staff 2017; Tóth *et al.* 2013).

For this inventory, meant to inform the sampling design for Soils4Africa, we only consider the range of soil properties that have been standardized (so far) in WoSIS (Appendix 1). These include the properties considered in the 2009 and 2015 LUCAS soil inventory programme: percentage of coarse fragments, particle size distribution (% clay, silt and sand content), pH (in $CaCl_2$ and H_2O), organic carbon content, carbonate content, phosphorous content, total nitrogen content, and cation exchange capacity, as well as bulk density (Fernández-Ugalde *et al.* 2016).

At the time of writing this report, WoSIS contained 25,101 unique profiles for Africa. These profiles originate from 23 datasets as described in Appendix 2. The largest source of information considered here is the Africa Soil Profile Data Base (AfSP, Leenaars *et al.* 2014a) compiled in the framework of the Africa Soil Information (AfSIS) project, phase I. It should be noted that AfSP includes all Africa-located profiles compiled for e.g. WISE and SOTER; as such the same profile have been considered in AfSP yet sometimes using different criteria for e.g. clustering horizons. Note that duplicate profiles have been removed in the standardised data sets served from WoSIS (Batjes *et al.* 2020). In the following sections, however, information is presented per dataset unless otherwise indicated.

2.2 Geographic distribution of profiles

Figure 1 shows the distribution of profiles in Africa with the corresponding datasets presented in Figure 2; full names of the datasets are given in Appendix 2. The number of profiles and observations by country varies greatly (Appendix 3). The greatest number of profiles with observations is reported for Malawi (3049), Burkina Faso (2023) and Tanzania (1910), and the lowest for Algeria (10), Togo (9) and Chad (7).

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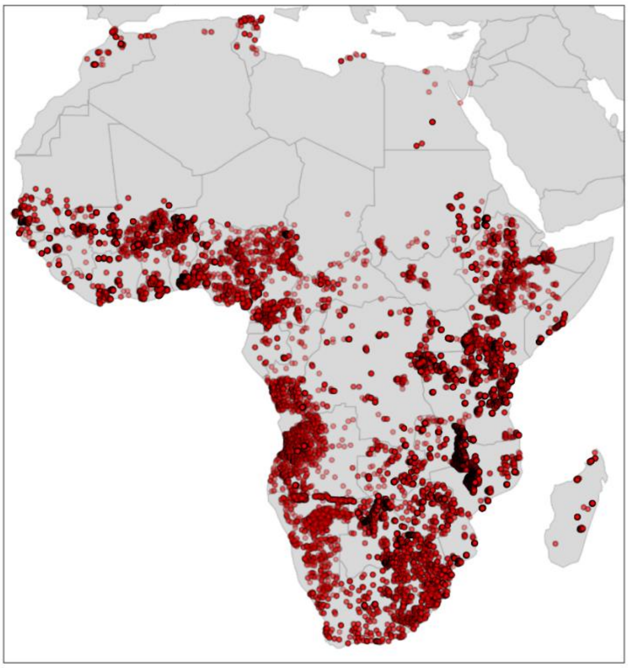

Figure 1. Location of soil point data in Africa represented in this inventory

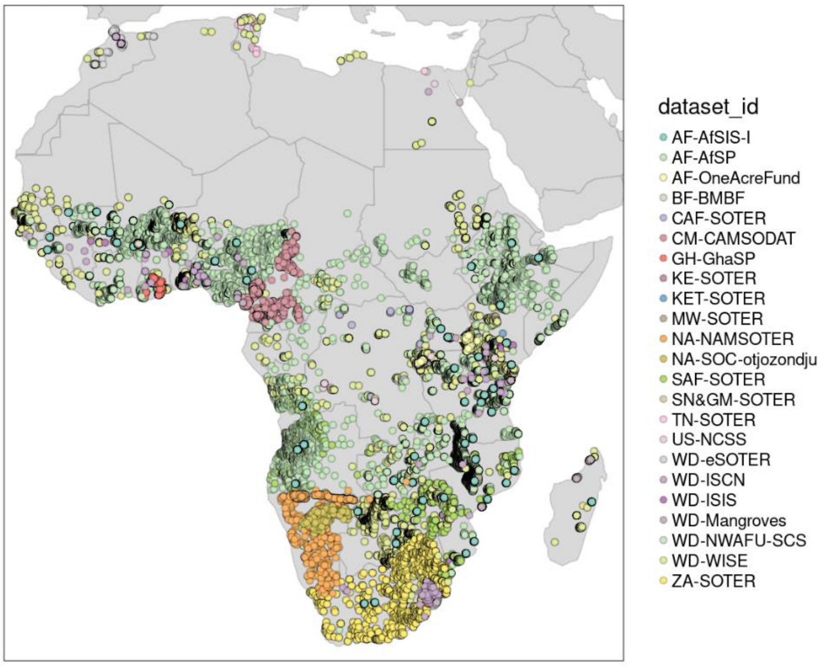

Figure 2. Datasets considered in the inventory

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The number of profiles per dataset and broad UN-region is presented in Figure 3; as stated earlier, AfSP is a compilation that includes several of the datasets shown (see Appendix 2). Overall, the number of represented profiles is greatest for Eastern Africa, followed by Western Africa, Middle Africa and Southern Africa, with few profiles only for Northern Africa.

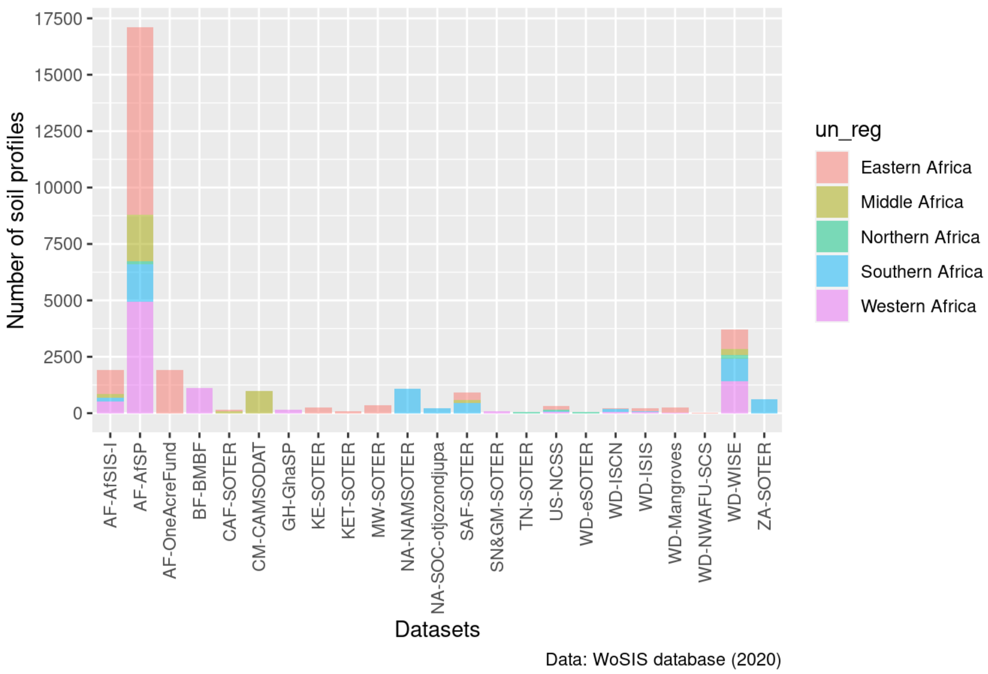

Figure 3. Number of profiles per dataset, clustered by UN region.

Figure 4 shows the number of observations per country in Africa indicating great regional differences. These partly reflect the intensity of soil survey programmes in the various countries (as represented in WoSIS), for datasets with appropriate licences.

A full listing of the number and type of observations represented per data set is given in Appendix 4. Presenting such information per country here would lead to excessively long tables, hence this information has not been included in this report.

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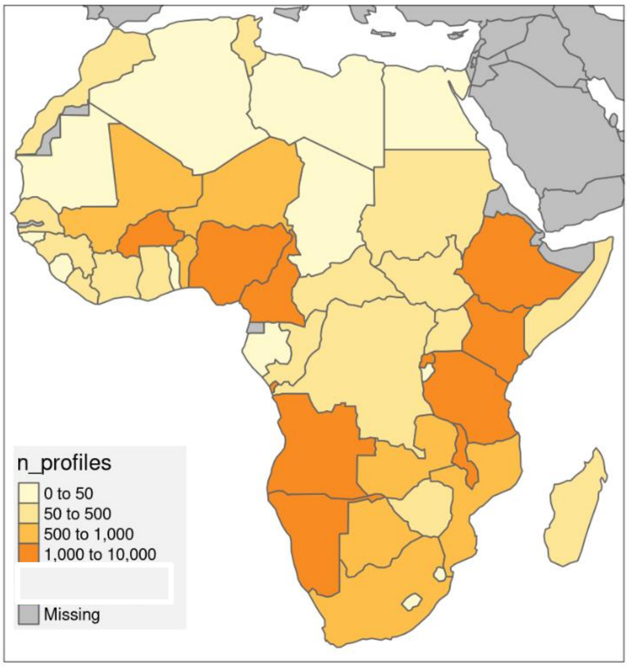

Figure 4. Number of profiles per country in Africa

The number of observations varies greatly with the property under consideration. Overall, there are more observations for chemical than for physical soil properties (Appendix 4); soil biological properties, critical for assessment of soil functioning and health are not yet represented in the datasets that underpin WoSIS.

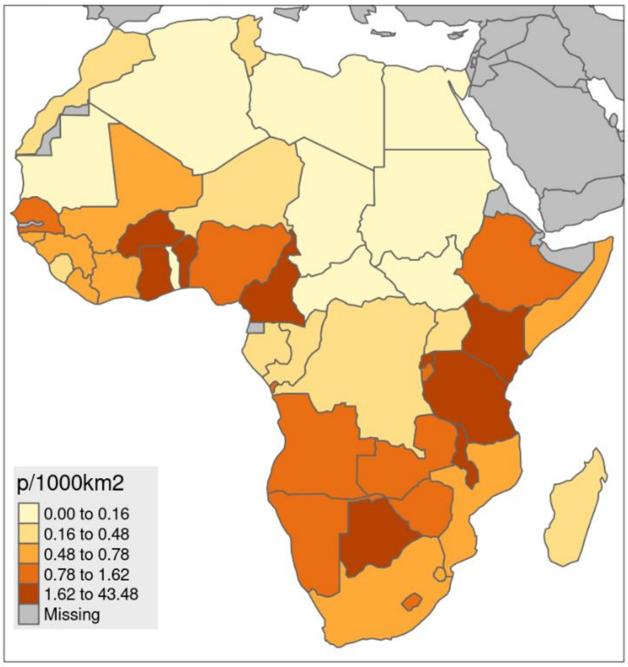

Figure 5. Number of profiles per country (per 1000 km^2) in Africa

In some cases, the number of profiles is the same as the number of observations reported for clay content, for example. This reflects the fact that the corresponding dataset, or study, considered the topsoil only.

Figure 5 shows the number of profiles per country, showing large regional differences, per 1000 km^2.

2.3 Observations per country

Alternatively, Figure 6 shows the total number of observations (undifferentiated) per country, while Figure 7 shows the corresponding data per 1000 km^2; specifics per dataset, in terms of properties represented, are given in Appendix 4.

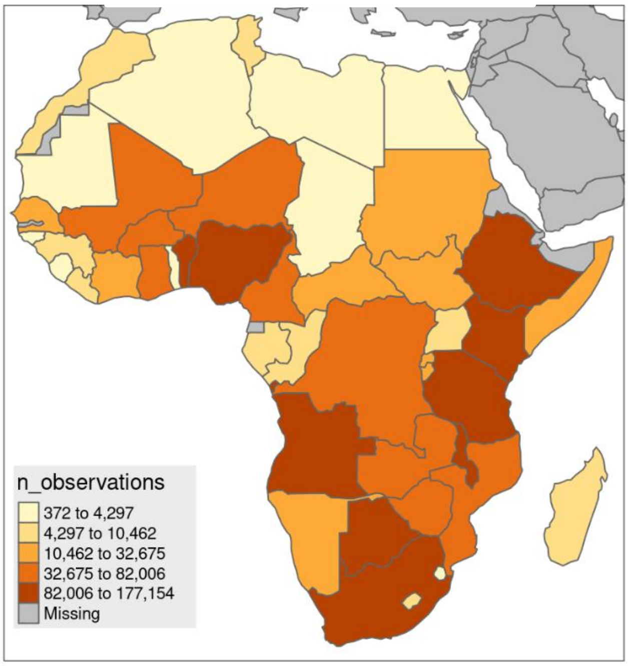

Figure 6. Number of observations (undifferentiated) per country

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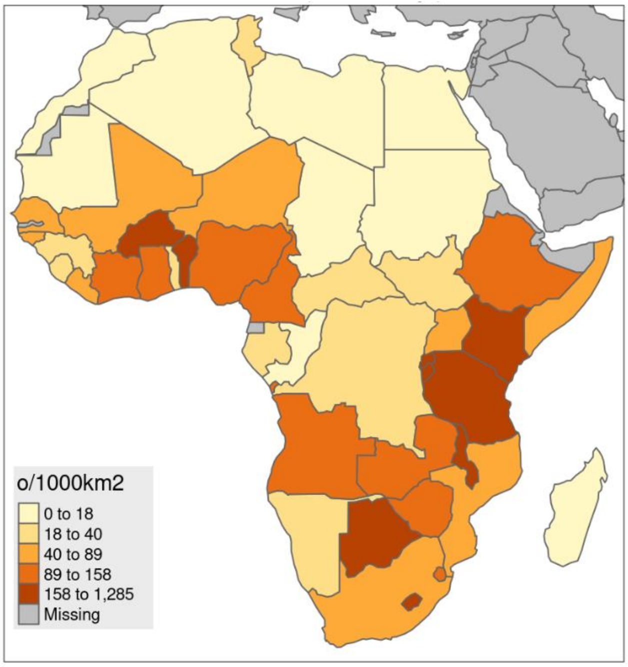

Figure 7. Number of observations (undifferentiated) per country per 1000 km²

As indicated, the type and number of observations per country varies greatly. Figure 8 presents a summary of the number of profiles for which some measurements for bulk density (BDFIOD), cation exchange capacity (measured at pH7, CECPH7), total nitrogen (NITKJD), organic carbon (ORGC), pH_{water} (PHAQ) and pH $CaCL_2$ (PHCA) data are available.

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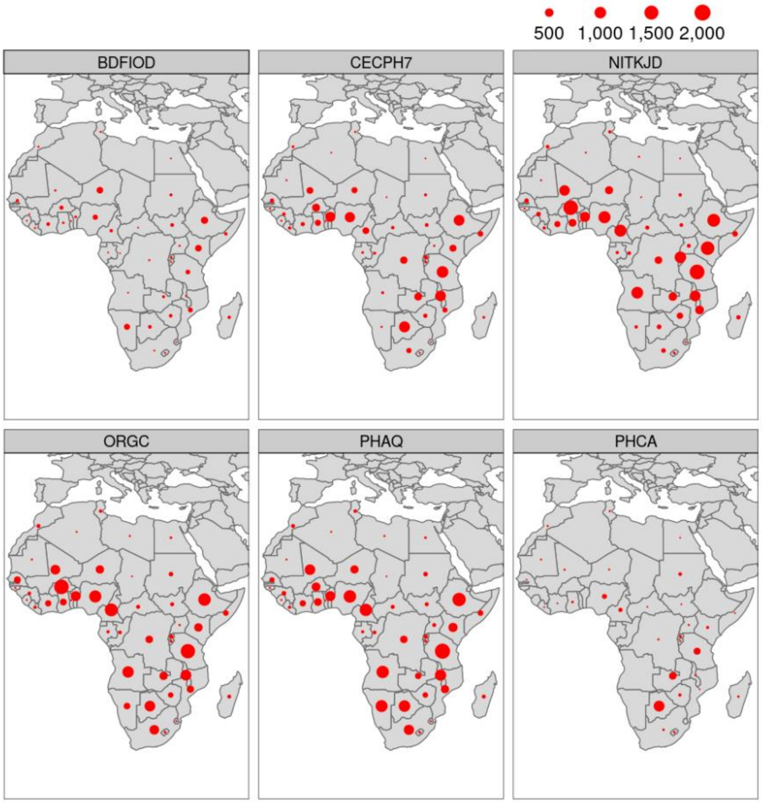

Figure 8. Number of profiles with observations for bulk density, cation exchange capacity, total nitrogen, organic carbon, pH_{water} and pH_{CaCL2}.

2.4 Depth of soil sampled

Generally, there fewer observations for the subsoil than for the topsoil. This aspect is illustrated in Figure 9 for the properties considered earlier in Figure 8. Specific purpose surveys, such as soil fertility inventories, often consider the top 20 cm of soil only.

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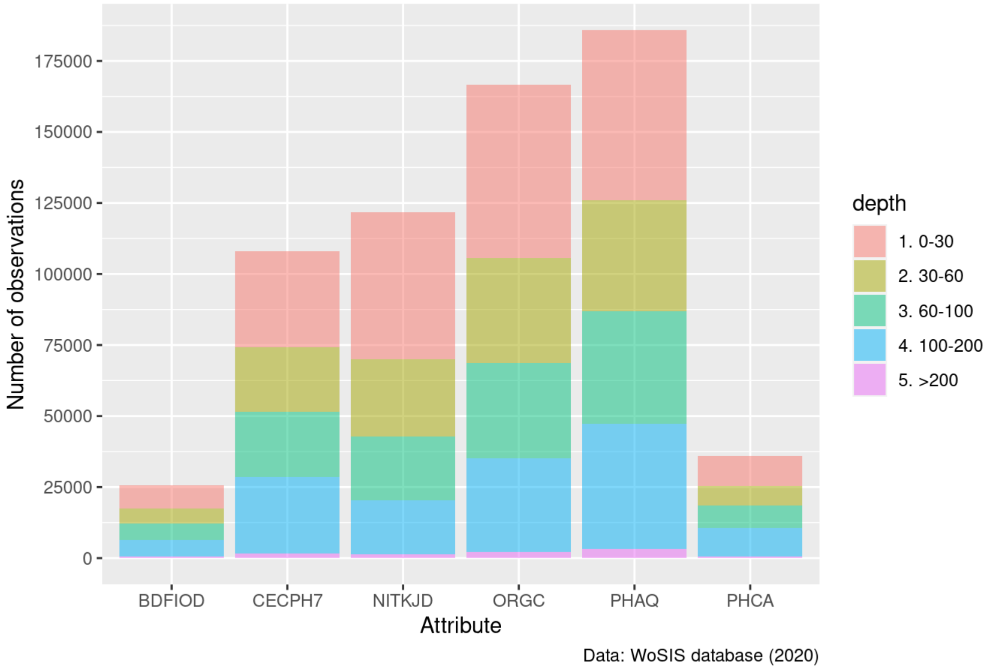

Figure 9. Number of observations per soil property and depth (cm)

2.5 Date of sampling

Soil data in Africa have been collated for various purposes and over a long period of time starting around 1935. For this inventory, the sampling dates of dates of the various profiles were examined (Figure 10). Most of the profiles represented in WoSIS, were collected between 1965 and 1995.

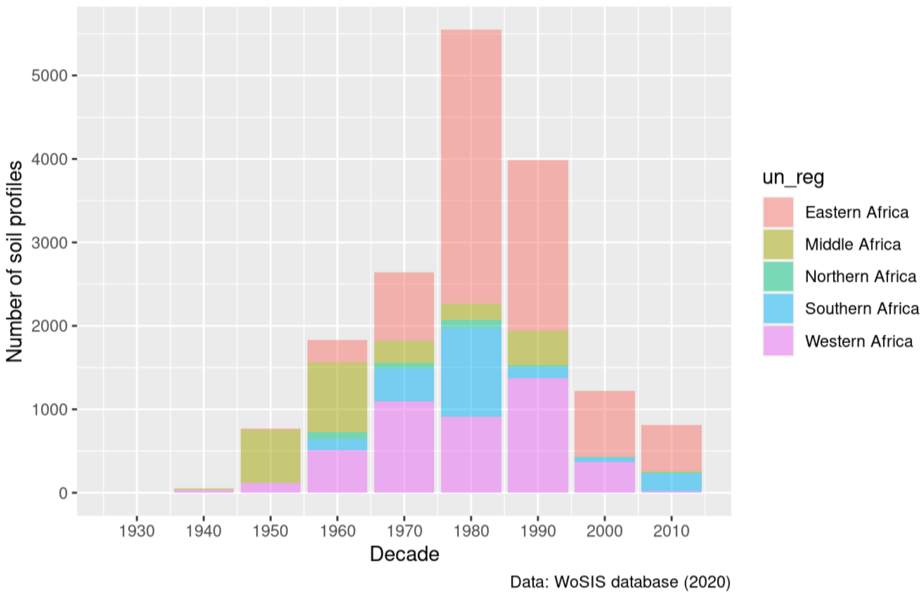

Figure 10. Number of observations per decade and UN region (Period 1938-2016)

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3. Other data holdings

There are more point data sets for Africa in the ISRIC repository than currently provided through `WoSIS Latest'. Several datasets were shared with licences that (so far) preclude divulging of the profile's coordinates, as earlier stated. These datasets, corresponding with 4,112 profiles and 35,692 observations, are listed in Table 1 below.

Table 1. Datasets for Africa in WOSIS with restrictive licences

Dataset	No. of profiles	No. of observations
AF-VitalSigns – VitalSigns topsoil data	71	1676
BI-IFDC – Topsoil data of the PAN-PNSEB project (Burundi)	1029	2058
RW-IFDC – Topsoil data for Rwanda	993	1986
TZ-NAFORMA – NAFORMA Soil Data	1408	29332
UG-IFDC – Topsoil data for Uganda	598	598
WD-CIFOR – Center for International Forestry Research (CIFOR)	13	42

Further, several initiatives have generated a range of new soil data for Africa during the last decade. World Agroforestry (ICRAF) in collaboration with partners, for example, collected over 18,500 soil samples from two depth intervals (0-20 cm and 20-50 cm) at 9,600-point locations in 19 African countries in the framework of the 1st phase (2009-2016) of the Africa Soil Information System (AfSIS) project. The samples were collected at 60 randomised LDSF (Land Degradation Surveillance Framework) sites based on Köppen–Geiger climate zones across sub-Saharan Africa, using consistent procedures for field sampling. The samples were analysed using soil spectroscopy (MIR, with some 10% of the samples selected as reference samples being analysed using traditional methods for the determination of SOC (dry combustion), pH water (1:1), base cations Mehlich-3 extraction, and texture). These have resulted in the largest 'georeferenced library of soil infrared spectra for Africa' to date (Vågen *et al.* 2016). Recently (2021), both spectral and reference data for AfSIS phase-I have become available through the AfSIS-DB site; 'the two types of data can be paired to form a training dataset for machine learning, such that certain soil properties can be well-predicted through less expensive spectral techniques'.

Data collected during the 2nd phase of the AfSIS project (2014-2018) are mainly limited to spectral data while the reference data 'reported as measured according to a defined traditional wet chemistry method,'[3] which are critical for deriving the actual (inferred) soil properties from the 'raw' spectral data (Terhoeven-Urselmans *et al.* 2010; Viscarra Rossel *et al.* 2016), seem not freely accessible. Apparently, there are several restrictions from the national data holders (e.g. Ethiopia, Ghana, Tanzania, Nigeria, see isda-africa.com) in distributing the data, resulting in incomplete data availability. At the time of writing this report, AfSIS-DB did not yet provide access to the 'reference data' of phase II, i.e. the some 10% of the samples that were analysed using wet chemistry to calibrate the spectral data. The derived soil properties themselves were also not accessible. Nor were the geographic coordinates that would be needed for making interpretations.

In addition to the above, through several other projects and initiatives beyond Sub-Saharan Africa and systematic soil sampling campaigns, ICRAF has expanded its soil spectral library to its current holding of more than 150,000

[3] http://africasoils.net/services/data/soil-databases/

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samples[4]. In principle, all data collected through the Sentinel Landscapes portal is available, but no URL for accessing this large collection seems to be available yet.

Several private companies have been collecting soil data for Africa using novel techniques based on spectrometry. AgroCares[5], for example, is developing a large spectral library aimed at supporting agricultural production, presently covering twenty two countries of which seven are in Africa. However, the data themselves are not freely accessible to third parties as they form an important part of the company's business model.

Numerous soil profile data still only exist in paper format, while other analogue data are being compiled into digital databases. See, for example, the CountrySIS effort undertaken within the wider framework of the development of GLOSIS (Global Soil Information System, GSP-SDF 2018). Numerous known digital holdings for parts of Africa are not freely available for various reasons (Arrouays *et al.* 2017; Omuto *et al.* 2012). These include substantial data holdings for West Africa, as compiled into STIPA (Système de transfert de l' information pédologique et agronomique, Falipou and Legros 2002) as well as national datasets that are not online yet and can only identified/created through active collaborations with partner countries. Similarly, many scientific studies and technical reports with soil holdings have been scanned and registered in the CGIAR's platform 'Big Data in Agriculture'[6], but these resources have not yet been standardised in a consistent, user friendly format.

On a fairly regular basis, for different parts of Africa and at different scale levels, new and old soil data are being collated using various approaches and for different purposes (e.g. Cambule *et al.* 2015; Leenaars *et al.* 2020; Owusu *et al.* 2020; van Zijl and Botha 2016; Yemefack *et al.* 2005). The OCP Group (Office Chérifien de Phosphates), for example, has been collecting soil data for Nigeria and other countries in Africa within a fertiliser support programme. A review of all these resources/studies, however, is beyond the scope of this inventory (D3.2a) and resorts under a separate questionnaire-based inventory (Deliverable D3.2b) .

Importantly, data derived from LUCAS and AfSIS (2020), for example, do not consider the same methods of analysis. For the future, the comparability of the respective methods would have to be established using a set of reference materials within the framework of 'round-robin' rounds as organized by WEPAL (2015, 2019). Also important in this respect is the Global Soil Laboratory Network (GLOSOLAN)[7], established in 2017 to build and strengthen the capacity of laboratories in soil analysis and to respond to the need for harmonizing soil analytical data. Harmonization of methods, units, data and information is critical to (1) provide reliable and comparable information between countries and projects; (2) allow the generation of new harmonized soil data sets; and (3) support evidence-based decision making for sustainable soil management. This forms an important component of the work of the Global Soil Partnership (Baritz *et al.* 2017).

Hence the merit of the Soils4Africa project that will make soil data freely available for some 20 000 locations in Africa, building on the consistent LUCAS soil approach (Fernández-Ugalde *et al.* 2017; Fernández-Ugalde *et al.* 2016).

[4] http://www.worldagroforestry.org/blog/2020/08/13/data-streaming-spectrometer-new-dawn-soil-assessments
[5] https://www.agrocares.com/en
[6] https://bigdata.cgiar.org/shared-services/
[7] http://www.fao.org/global-soil-partnership/glosolan/en/

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4. Concluding remarks

This report presents a summary of quality-assessed and standardised soil profile data for Africa as provided by WoSIS, ISRIC's institutional soil database, per September 2020. Inherently, these do not and cannot represent the full range and diversity of soil data that have been collated for the continent by a wide range of organisations at various scale levels over the last hundred years.

Part of the data are still hidden in paper archives and at risk of deterioration or permanent loss unless transformed into digital holdings such as done in the framework of AfSP/AfSIS (Leenaars *et al.* 2014a) and envisaged in the context of the country-driven Global Soil Partnership's development of national soil databases (CountrySIS). As indicated, however, several data holdings may never become freely available due to licence restrictions.

Overall, when considering the information presented in this report as a possible basis for informing the sampling design for Soils4Africa (Deliverable D3.2c) it is important to realise that the added value of this H2020 project lies in adopting a standard method (building on LUCAS) for sampling, shipping, and subsequently analysing the samples in a single reference laboratory in Africa for subsequent processing in a central information system. This setting will provide a consistent basis for subsequent analyses in support of sustainable agricultural intensification in Africa and provide the basis for a longer-term soil monitoring programme for the continent.

Acknowledgements

This desk study was carried out within the framework of the European Union 2020 Research and Innovation programme under Grant Agreement number 862900.

The authors thank Mary Steverink-Mosugu, Bas Kempen and Johan Leenaars for comments on an earlier version of this document.

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This project has received funding from the European Union Horizon 2020 Research and Innovation Programme under Grant Agreement 862900

Appendices

Appendix 1. Codes, properties, units of measurement and description as used in 'wosis_latest'

Code [a]	Property	Units	Description
BDFI33	Bulk density fine earth - 33 kPa	kg/dm^3	Bulk density of the fine earth fraction[b], equilibrated at 33 kPa
BDFIAD	Bulk density fine earth - air dry	kg/dm^3	Bulk density of the fine earth fraction, air dried
BDFIFM	Bulk density fine earth - field moist	kg/dm^3	Bulk density of the fine earth fraction, field moist
BDFIOD	Bulk density fine earth - oven dry	kg/dm^3	Bulk density of the fine earth fraction, oven dry
BDWS33	Bulk density whole soil - 33 kPa	kg/dm^3	Bulk density of the whole soil including coarse fragments, equilibrated at 33 kPa
BDWSAD	Bulk density whole soil - air dry	kg/dm^3	Bulk density of the whole soil including coarse fragments, air dried
BDWSFM	Bulk density whole soil - field moist	kg/dm^3	Bulk density of the whole soil including coarse fragments, field moist
BDWSOD	Bulk density whole soil - oven dry	kg/dm^3	Bulk density of the whole soil including coarse fragments, oven dry
TCEQ	Calcium carbonate equivalent total	g/kg	The content of carbonate in a liming material or calcareous soil calculated as if all the carbonate is in the form of $CaCO_3$ (in the fine earth fraction[b]); also known as inorganic carbon
ORGC	Organic carbon	g/kg	Gravimetric content of organic carbon in the fine earth fraction[b]

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Code [a]	Property	Units	Description
TOTC	Total carbon	g/kg	Gravimetric content of organic carbon and inorganic carbon in the fine earth fraction[b]
NITKJD	Total nitrogen (N)	g/kg	The sum of total Kjeldahl nitrogen (ammonia, organic and reduced nitrogen) and nitrate-nitrite
CECPH7	Cation exchange capacity - buffered at pH7	cmol(c)/kg	Capacity of the fine earth fraction to hold exchangeable cations, estimated by buffering the soil at 'pH7'
CECPH8	Cation exchange capacity - buffered at pH8	cmol(c)/kg	Capacity of the fine earth fraction to hold exchangeable cations, estimated by buffering the soil at 'pH8'
ECEC	Effective cation exchange capacity	cmol(c)/kg	Capacity of the fine earth fraction to hold exchangeable cations at the pH of the soil (ECEC). Conventionally approximated by summation of exchangeable bases (Ca^{2+}, Mg^{2+}, K^{+}, and Na^{+}) plus 1 N KCl exchangeable acidity (Al^{3+} and H^{+}) in acidic soils
ELCO20	Electrical conductivity - ratio 1:2	dS/m	Ability of a 1:2 soil water extract to conduct electrical current
ELCO25	Electrical conductivity - ratio 1:2.5	dS/m	Ability of a 1:2.5 soil water extract to conduct electrical current
ELCO50	Electrical conductivity - ratio 1:5	dS/m	Ability of a 1:5 soil water extract to conduct electrical current
ELCOSP	Electrical conductivity - saturated paste	dS/m	Ability of a water saturated soil paste to conduct electrical current (ECe)

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Code [a]	Property	Units	Description
CFGR	Coarse fragments gravimetric total	g/100g	Gravimetric content of coarse fragments in the whole soil
CFVO	Coarse fragments volumetric total	$cm^3/100cm^3$	Volumetric content of coarse fragments in the whole soil
CLAY	Clay total	g/100g	Gravimetric content of < X mm soil material in the fine earth fraction[b] (e.g. X = 0.002 mm as specified in the analytical method description)
SILT	Silt total	g/100g	X to Y mm fraction of the fine earth fraction; Y as specified in the analytical method description (e.g. Y = 0.05 mm)
SAND	Sand total	g/100g	Larger than Y mm fraction of the fine earth fraction; Y as specified in the analytical method description (e.g. Y = 0.05 mm to 2 mm[b])
PHCA	pH CaCl2		A measure of the acidity or alkalinity in soils, defined as the negative logarithm (base 10) of the activity of hydronium ions (H_+) in a $CaCl_2$ solution, as specified in the analytical method descriptions
PHAQ	pH H2O		A measure of the acidity or alkalinity in soils, defined as the negative logarithm (base 10) of the activity of hydronium ions (H^+) in water
PHKC	pH KCl		A measure of the acidity or alkalinity in soils, defined as the negative logarithm (base 10) of the activity of hydronium ions (H^+) in a KCl solution, as specified in the analytical method descriptions
PHNF	pH NaF		A measure of the acidity or alkalinity in soils, defined as the negative logarithm (base 10) of the activity of hydronium ions (H^+) in a NaF solution, as specified in the analytical method descriptions

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Code [a]	Property	Units	Description
PHPBYI	Phosphorus (P) - Bray I	mg/kg	Measured according to the Bray-I method, a combination of HCl and NH4 F to remove easily acid soluble P forms, largely Al- and Fe-phosphates (for acid soils)
PHPMH3	Phosphorus (P) - Mehlich 3	mg/kg	Measured according to the Mehlich-3 extractant, a combination of acids (acetic [HOAc] and nitric [HNO3]), salts (ammonium fluoride [NH4F] and ammonium nitrate [NH4 NO3]), and the chelating agent ethylenediaminetetraacetic acid (EDTA); considered suitable for removing P and other elements in acid and neutral soils
PHPOLS	Phosphorus (P) - Olsen	mg/kg	Measured according to the P-Olsen method: 0.5 M sodium bicarbonate (NaHCO3) solution at a pH of 8.5 to extract P from calcareous, alkaline, and neutral soils
PHPRTN	Phosphorus (P) - retention	mg/kg	Retention measured according to the New Zealand method
PHPTOT	Phosphorus (P) - total	mg/kg	Determined with a very strong acid (aqua regia and sulfuric acid/nitric acid)
PHPWSL	Phosphorus (P) - water soluble	mg/kg	Measured in 1:x soil:water solution (mainly determines P in dissolved forms)
WG1500	Water retention gravimetric - 1500 kPa	g/100g	Soil moisture content by weight, at tension 1500 kPa
WG0500	Water retention gravimetric - 500 kPa	g/100g	Soil moisture content by weight, at tension 500 kPa

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Code [a]	Property	Units	Description
WG0200	Water retention gravimetric - 200 kPa	g/100g	Soil moisture content by weight, at tension 200 kPa
WG0100	Water retention gravimetric - 100 kPa	g/100g	Soil moisture content by weight, at tension 100 kPa
WG0033	Water retention gravimetric - 33 kPa	g/100g	Soil moisture content by weight, at tension 33 kPa
WG0010	Water retention gravimetric - 10 kPa	g/100g	Soil moisture content by weight, at tension 10 kPa
WG0006	Water retention gravimetric - 6 kPa	g/100g	Soil moisture content by weight, at tension 6 kPa
WV1500	Water retention volumetric - 1500 kPa	$cm^3/100cm^3$	Soil moisture content by volume, at tension 1500 kPa
WV0500	Water retention volumetric - 500 kPa	$cm^3/100cm^3$	Soil moisture content by volume, at tension 500 kPa
WV0200	Water retention volumetric - 200 kPa	$cm^3/100cm^3$	Soil moisture content by volume, at tension 200 kPa
WV0100	Water retention volumetric - 100 kPa	$cm^3/100cm^3$	Soil moisture content by volume, at tension 100 kPa
WV0033	Water retention volumetric - 33 kPa	$cm^3/100cm^3$	Soil moisture content by volume, at tension 33 kPa
WV010	Water retention volumetric - 10 kPa	$cm^3/100cm^3$	Soil moisture content by volume, at tension 10 kPa
WV0006	Water retention volumetric - 6 kPa	$cm^3/100cm^3$	Soil moisture content by volume, at tension 6 kPa

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Code [a]	Property	Units	Description
CFAO	Soil classification FAO		Classification of the soil profile according to specified edition (year) of the FAO-Unesco Legend (up to soil unit level)
CWRB	Soil classification WRB		Classification of the soil profile according to specified edition (year) of the World Reference Base for Soil Resources (WRB, up to qualifier level)
CSTX	Soil classification Soil Taxonomy		Classification of the soil profile according to specified edition (year) of the USDA Soil Taxonomy (up to subgroup level)
DSDS	Depth of soil - sampled	cm	Total depth of soil sampled
HODS	Horizon designation		Horizon designation as provided in the source database[c]

[a] Provides a link to the corresponding dataset at the ISRIC Soil Data Hub

[b] The fine earth fraction is generally defined as being < 2 mm. However, an upper limit of 1 mm was used in the former Soviet Union and its satellite states (Katchynsky scheme). This has been indicated in the database.

[c] Where available, the 'cleaned' (original) layer/horizon designation is provided for general information; these codes have not been standardised. When horizon designations are not provided in the source data bases, we have flagged all layers with an upper depth given as being negative (e.g. -10 to 0 cm that is using pre-1993 conventions; see WoSIS Procedures Manual 2018, p. 24, footnote 9) in the source databases as being 'litter' layers (i.*e. organic layers at the surface of a mineral soil).*

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SOILS4AFRICA

Appendix 2. Datasets covering Africa that contain at least one property standardized in WoSIS

Dataset	No. of profiles	No. of observations
AF-AfSIS-I –AfSIS phase 1 soil data by ICRAF	1902	15010
AF-AfSP – Africa Soil Profiles Database	17108	2561007
AF-OneAcreFund – OneAcreFund top soil data	1914	3828
BF-BMBF – Topsoil data from the research of Forkuor et al. (2017) in Burkina Faso	1104	4101
CAF-SOTER* – Soil and Terrain Database for Central Africa (SOTERCAF)	162	14076
CM-CAMSODAT – Cameroon soil profile data	973	28837
GH-GhaSP – Ghana Soil Profiles database	155	6548
KE-SOTER* – Soil and Terrain Database for Kenya (KENSOTER), version 2.0	267	16511
KET-SOTER* – Soil and Terrain Database (SOTER) for Upper Tana River Catchment, version 1.1	100	5253
MW-SOTER* – Soil and Terrain Database (SOTER) for Malawi	341	9874
NA-NAMSOTER – Soil and Terrain database of Namibia	1092	17108
NA-SOC-otjozondjupa – Soil dataset for the Otjozondjupa Region, Namibia	222	438
SAF-SOTER* – Soil and Terrain Database for Southern Africa (SOTERSAF)	932	48173
SN&GM-SOTER* – Soil and Terrain Database (SOTER) for Senegal and the Gambia	89	4007
TN-SOTER – Soil and Terrain Database (SOTER) for Tunisia	45	3062
US-NCSS* – National Coop. Soil Survey, National Coop. Soil Characterization Database	325	188984
WD-eSOTER – eSOTER soil profiles	63	1931
WD-ISCN – International Soil Carbon Network (ISCN)	219	3678
WD-ISIS* – ISRIC Soil Information System ISIS	210	30760
WD-Mangroves – Global mangrove soil carbon: dataset and spatial maps	175	2118
WD-NWAFU-SCS – Global patterns of the effects of land-use changes on soil carbon stocks	5	12
WD-WISE* – WISE - Global Soil Profile Data, version 3.1	3705	211335
ZA-SOTER* – Soil and Terrain Database (SOTER) for South Africa	609	31381

Note: The data contributing organisations or experts are acknowledged on the ISRIC website[8]. As indicated, AF-AfSP builds upon on other data compilations (*); only unique profiles are served from WoSIS itself.

[8] https://www.isric.org/explore/wosis/wosis-contributing-institutions-and-experts

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Appendix 3. Number of profiles with total number of observations by country

ISO code	Country name	No. of profiles*	No. of observations
AO	Angola	1168	177108
BF	Burkina Faso	2023	79687
BI	Burundi	36	10578
BJ	Benin	730	103084
BW	Botswana	994	117916
CD	Democratic Republic of the Congo	378	67190
CF	Central African Republic	88	12119
CG	Congo	70	5604
CI	Côte d'Ivoire	255	32398
CM	Cameroon	1305	70928
DZ	Algeria	10	372
EG	Egypt	26	1530
ET	Ethiopia	1712	131307
GA	Gabon	47	6197
GH	Ghana	431	33079
GN	Guinea	128	6737
GW	Guinea-Bissau	15	1950
KE	Kenya	1599	93792
LR	Liberia	50	8628
LS	Lesotho	33	10288
LY	Libya	14	415
MA	Morocco	108	4578
MG	Madagascar	130	10141
ML	Mali	885	74252
MR	Mauritania	13	3153
MW	Malawi	3049	121615
MZ	Mozambique	564	42616
NA	Namibia	1301	23279
NE	Niger	520	75326
NG	Nigeria	1395	142604
RW	Rwanda	1016	30004
SD	Sudan	130	28839
SL	Sierra Leone	12	2605
SN	Senegal	311	16310
SO	Somalia	245	25407
SS	South Sudan	82	11301
SZ	Swaziland	14	2544
TD	Chad	7	936
TG	Togo	9	1276
TN	Tunisia	60	6054
TZ	United Republic of Tanzania	1910	173806
UG	Uganda	84	9869
ZA	South Africa	879	91337
ZM	Zambia	599	68963

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ISO code	Country name	No. of profiles*	No. of observations
ZW	Zimbabwe	411	46582

* WoSIS, status per 10 September 2020

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Appendix 4. Descriptive statistics for soil properties per dataset in WoSIS

Dataset	Property	Units	n_profiles	n_observations	min	max	avg
AF-AfSIS-I	CLAY	g/100g	1896	1896	1.6	19.95	80.7
AF-AfSIS-I	NITKJD	g/kg	1900	1900	0.04	0.8	6.59
AF-AfSIS-I	PHAQ	unitless	1902	1902	3.6	6.24	9.9
AF-AfSIS-I	SAND	g/100g	1896	1896	0	50.42	96.8
AF-AfSIS-I	SILT	g/100g	1896	1896	1.3	29.64	61.8
AF-AfSIS-I	TOTC	g/kg	1900	1900	0.8	12.19	112.9
AF-AfSIS-I	WV0033	$cm^3/100cm^3$	1834	1834	1.24	22.27	71.72
AF-AfSIS-I	WV1500	$cm^3/100cm^3$	1786	1786	1.01	14.43	64.89
AF-AfSP	BDFI33	kg/dm^3	2	36	1.57	1.88	2.12
AF-AfSP	BDFIAD	kg/dm^3	198	1710	0.73	1.27	1.94
AF-AfSP	BDFIOD	kg/dm^3	1954	21552	0.16	1.41	2.6
AF-AfSP	CECPH7	cmol(c)/kg	7605	86412	0.1	14.39	139.9
AF-AfSP	CECPH8	cmol(c)/kg	986	10974	0.2	16.88	108.3
AF-AfSP	CFVO	$cm^3/100cm^3$	9948	237480	0	9.23	100
AF-AfSP	CLAY	g/100g	13893	158685	0	30.19	97
AF-AfSP	ECEC	cmol(c)/kg	7322	82938	0.1	16.11	99.8
AF-AfSP	ELCO20	dS/m	23	315	0	1.71	40.6
AF-AfSP	ELCO25	dS/m	2240	22611	0	0.36	16
AF-AfSP	ELCO50	dS/m	571	7419	0	0.27	33.4
AF-AfSP	ELCOSP	dS/m	764	9651	0	1.37	48.8
AF-AfSP	NITKJD	g/kg	10596	98532	0	0.81	29.4
AF-AfSP	ORGC	g/kg	13462	134829	0	9	570
AF-AfSP	PHAQ	unitless	12767	147702	2.4	6.23	11
AF-AfSP	PHCA	unitless	2075	26487	2.7	5.57	10.3
AF-AfSP	PHKC	unitless	6291	75849	2	5.04	10.7
AF-AfSP	PHPRTN	mg/kg	82	1500	0	41.32	100
AF-AfSP	PHPTOT	mg/kg	3064	33030	0	265.73	11521
AF-AfSP	SAND	g/100g	13895	158718	0	53.82	100
AF-AfSP	SILT	g/100g	13893	158676	0	15.9	100
AF-AfSP	TCEQ	g/kg	4393	85200	0	12.41	990
AF-AfSP	TOTC	g/kg	120	2127	0.1	7.73	85.7
AF-AfSP	WV0006	$cm^3/100cm^3$	7	45	16	34.87	49
AF-AfSP	WV0010	$cm^3/100cm^3$	347	3525	3.69	30.3	79
AF-AfSP	WV0033	$cm^3/100cm^3$	2472	27585	1	20.95	79.29
AF-AfSP	WV0100	$cm^3/100cm^3$	331	3138	1	16.56	77.91
AF-AfSP	WV0200	$cm^3/100cm^3$	3	27	3.3	9.83	18
AF-AfSP	WV0500	$cm^3/100cm^3$	641	5004	1	12.57	71
AF-AfSP	WV1500	$cm^3/100cm^3$	2416	24948	1	14.55	70.8
AF-OneAcreFund	NITKJD	g/kg	1914	1914	0.2	1.52	5.5
AF-OneAcreFund	TOTC	g/kg	1914	1914	2.2	19.07	76.1
BF-BMBF	CLAY	g/100g	631	631	0.6	20.07	52.8
BF-BMBF	NITKJD	g/kg	1104	1104	0.05	1.09	3.1
BF-BMBF	ORGC	g/kg	1104	1104	0.6	14.91	44.6

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Dataset	Property	Units	n_profiles	n_observations	min	max	avg
BF-BMBF	SAND	g/100g	631	631	3.5	37.35	58.8
BF-BMBF	SILT	g/100g	631	631	22.4	43.89	65.2
CAF-SOTER	CECPH7	cmol(c)/kg	86	446	0.3	15.39	124.8
CAF-SOTER	CLAY	g/100g	160	841	0	39.24	91
CAF-SOTER	ECEC	cmol(c)/kg	84	360	0.1	5.27	70.7
CAF-SOTER	ELCOSP	dS/m	8	41	0	5.41	36.8
CAF-SOTER	NITKJD	g/kg	106	404	0.05	1.29	14.4
CAF-SOTER	ORGC	g/kg	160	752	0.1	17.92	359.1
CAF-SOTER	PHAQ	unitless	162	855	3.4	5.48	10.9
CAF-SOTER	PHKC	unitless	97	483	2.3	4.31	7.2
CAF-SOTER	PHPRTN	mg/kg	1	5	96	97.8	99
CAF-SOTER	SAND	g/100g	160	841	0	41.86	98
CAF-SOTER	SILT	g/100g	160	841	1	18.88	76
CAF-SOTER	TCEQ	g/kg	4	22	0.4	15.36	45.6
CAF-SOTER	WV0033	$cm^3/100cm^3$	1	5	37	45	52
CAF-SOTER	WV1500	$cm^3/100cm^3$	2	11	13	24.09	38
CM-CAMSODAT	CECPH7	cmol(c)/kg	6	25	3.6	7.88	18.8
CM-CAMSODAT	CFGR	g/100g	37	71	0	9.19	68.6
CM-CAMSODAT	CLAY	g/100g	953	3556	0	36.37	97
CM-CAMSODAT	NITKJD	g/kg	914	3132	0.02	1.64	37.2
CM-CAMSODAT	ORGC	g/kg	966	3360	0.1	14.39	410
CM-CAMSODAT	PHAQ	unitless	971	3769	2.6	5.75	10.3
CM-CAMSODAT	PHCA	unitless	32	146	3.8	5.59	9.3
CM-CAMSODAT	PHKC	unitless	588	2389	2.5	4.56	10.4
CM-CAMSODAT	PHPTOT	mg/kg	461	1443	0	76.76	2303
CM-CAMSODAT	SAND	g/100g	953	3556	0	43.81	98
CM-CAMSODAT	SILT	g/100g	953	3556	0	19.83	91
CM-CAMSODAT	TCEQ	g/kg	89	258	0	69.84	930
GH-GhaSP	BDFIAD	kg/dm^3	155	931	0.35	1.17	1.58
GH-GhaSP	CECPH7	cmol(c)/kg	155	934	20.2	41.89	73.4
GH-GhaSP	NITKJD	g/kg	155	936	0.7	12.78	74.9
GH-GhaSP	ORGC	g/kg	155	936	9.8	126.3	986.7
GH-GhaSP	PHAQ	unitless	155	937	3.8	6.06	8.8
GH-GhaSP	PHKC	unitless	155	937	3	5.21	7.9
KE-SOTER	CLAY	g/100g	262	1038	0	38.85	96
KE-SOTER	ECEC	cmol(c)/kg	3	13	1.6	7.2	19
KE-SOTER	ELCOSP	dS/m	228	881	0	0.69	55
KE-SOTER	NITKJD	g/kg	140	233	0.09	1.84	16
KE-SOTER	ORGC	g/kg	259	918	0.2	11.86	363
KE-SOTER	PHAQ	unitless	263	1046	3.6	6.56	11
KE-SOTER	PHKC	unitless	248	991	3.4	5.53	10.5
KE-SOTER	PHPRTN	mg/kg	4	14	0	61.29	98
KE-SOTER	SAND	g/100g	262	1038	1	41.59	98
KE-SOTER	SILT	g/100g	262	1038	0	19.57	84
KE-SOTER	TCEQ	g/kg	112	369	0	11.72	410
KE-SOTER	WV0010	$cm^3/100cm^3$	36	112	10	36.29	52

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Dataset	Property	Units	n_profiles	n_observations	min	max	avg
KE-SOTER	WV0033	$cm^3/100cm^3$	49	152	4	29.48	48
KE-SOTER	WV1500	$cm^3/100cm^3$	50	154	1	17.36	37
KET-SOTER	CLAY	g/100g	100	394	2	51.22	96
KET-SOTER	ECEC	cmol(c)/kg	1	1	6.5	6.5	6.5
KET-SOTER	NITKJD	g/kg	42	66	0.05	2.09	16
KET-SOTER	ORGC	g/kg	92	311	0.6	13.66	363
KET-SOTER	PHAQ	unitless	100	397	4.2	5.96	8.8
KET-SOTER	PHKC	unitless	96	381	3.3	5.04	7.6
KET-SOTER	SAND	g/100g	100	395	2	29.69	90
KET-SOTER	TCEQ	g/kg	28	100	0	11.03	270
KET-SOTER	WV0033	$cm^3/100cm^3$	13	37	8	28.97	46
KET-SOTER	WV1500	$cm^3/100cm^3$	16	45	2	16.82	35
MW-SOTER	CECPH7	cmol(c)/kg	314	873	0.8	9.13	65.3
MW-SOTER	CLAY	g/100g	312	884	3	28.42	75
MW-SOTER	ECEC	cmol(c)/kg	28	71	1.7	6.68	27.1
MW-SOTER	ELCO25	dS/m	34	78	0	0.98	38
MW-SOTER	NITKJD	g/kg	289	643	0.1	0.84	4.3
MW-SOTER	ORGC	g/kg	325	808	0.6	8.76	45.4
MW-SOTER	PHAQ	unitless	341	986	3.9	5.98	9
MW-SOTER	PHCA	unitless	3	19	4.6	5.42	6.3
MW-SOTER	PHKC	unitless	3	19	4.4	5.12	6.1
MW-SOTER	PHPRTN	mg/kg	3	19	19	34.26	58
MW-SOTER	SAND	g/100g	312	884	19	63.69	96
MW-SOTER	SILT	g/100g	312	884	1	7.9	36
MW-SOTER	TCEQ	g/kg	23	46	5	17.07	50
MW-SOTER	TOTC	g/kg	3	19	1	7.12	26.8
MW-SOTER	WV0010	$cm^3/100cm^3$	2	10	17	21.5	29
MW-SOTER	WV1500	$cm^3/100cm^3$	3	19	3	11.11	17
NA-NAMSOTER	CLAY	g/100g	844	2159	0	12.24	66.8
NA-NAMSOTER	ELCOSP	dS/m	468	1103	0.2	10.07	59.3
NA-NAMSOTER	NITKJD	g/kg	45	93	0.01	0.27	0.97
NA-NAMSOTER	PHAQ	unitless	1067	2939	3.6	7.95	11.2
NA-NAMSOTER	PHETOL	mg/kg	405	1047	0	3.43	68.28
NA-NAMSOTER	SAND	g/100g	844	2160	2.1	77.4	98.9
NA-NAMSOTER	SILT	g/100g	844	2160	0	10.36	74.3
NA-NAMSOTER	TCEQ	g/kg	249	528	0	54.73	761.8
NA-NAMSOTER	TOTC	g/kg	814	2075	0.1	2.8	35.9
NA-SOC-otjozondjupa	BDFIOD	kg/dm^3	218	218	0.74	1.45	1.84
NA-SOC-otjozondjupa	ORGC	g/kg	220	220	0.7	3.7	14
SAF-SOTER	BDFIAD	kg/dm^3	9	24	1.25	1.55	1.76
SAF-SOTER	CECPH7	cmol(c)/kg	60	265	0.2	16.27	63.4
SAF-SOTER	CLAY	g/100g	923	3185	0	26.82	90
SAF-SOTER	ECEC	cmol(c)/kg	192	458	0.2	3.68	24.4
SAF-SOTER	ELCOSP	dS/m	261	670	0	3.24	59.4
SAF-SOTER	NITKJD	g/kg	361	1263	0	0.61	9
SAF-SOTER	ORGC	g/kg	780	2487	0	6.59	125

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Dataset	Property	Units	n_profiles	n_observations	min	max	avg
SAF-SOTER	PHAQ	unitless	781	2670	3.9	6.53	11.5
SAF-SOTER	PHKC	unitless	522	2023	3.4	5.28	9.2
SAF-SOTER	PHPRTN	mg/kg	313	790	0	3.19	10
SAF-SOTER	SAND	g/100g	922	3178	0	61.32	100
SAF-SOTER	SILT	g/100g	921	3166	0	11.65	63
SAF-SOTER	TCEQ	g/kg	116	382	0	53.15	634
SAF-SOTER	WV0010	$cm^3/100cm^3$	17	61	6	28.9	64
SAF-SOTER	WV0033	$cm^3/100cm^3$	502	1606	1	17.43	75
SAF-SOTER	WV1500	$cm^3/100cm^3$	453	1312	1	10.92	61
SN&GM-SOTER	CLAY	g/100g	84	283	0	17.43	59
SN&GM-SOTER	ECEC	cmol(c)/kg	1	1	6	6	6
SN&GM-SOTER	ELCOSP	dS/m	29	111	0	3.63	50
SN&GM-SOTER	NITKJD	g/kg	81	245	0	0.54	6.5
SN&GM-SOTER	ORGC	g/kg	81	246	0.1	5.68	62.4
SN&GM-SOTER	PHAQ	unitless	86	324	2.4	5.92	9.2
SN&GM-SOTER	PHKC	unitless	34	113	2.9	4.78	7.6
SN&GM-SOTER	SAND	g/100g	84	285	1	69.69	99
SN&GM-SOTER	SILT	g/100g	83	282	0	12.94	67
SN&GM-SOTER	TCEQ	g/kg	4	11	28	232.64	517
SN&GM-SOTER	WV0033	$cm^3/100cm^3$	1	1	18	18	18
SN&GM-SOTER	WV1500	$cm^3/100cm^3$	1	1	8	8	8
TN-SOTER	BDFI33	kg/dm^3	14	65	1.08	1.4	1.73
TN-SOTER	CLAY	g/100g	45	204	2	33.05	86
TN-SOTER	ECEC	cmol(c)/kg	1	4	15.6	18.45	21.4
TN-SOTER	ELCOSP	dS/m	33	140	0.2	3.49	34
TN-SOTER	NITKJD	g/kg	32	80	0	1.06	5.1
TN-SOTER	ORGC	g/kg	43	168	0.1	9.28	104.1
TN-SOTER	PHAQ	unitless	44	192	4.6	7.74	9.7
TN-SOTER	PHKC	unitless	21	106	3.4	6.83	9.1
TN-SOTER	SAND	g/100g	45	204	1	42.86	96
TN-SOTER	SILT	g/100g	45	204	1	23.96	60
TN-SOTER	TCEQ	g/kg	37	163	0	236.09	790
TN-SOTER	WV0033	$cm^3/100cm^3$	22	103	2	24.48	51
TN-SOTER	WV1500	$cm^3/100cm^3$	27	138	1	12.88	30
US-NCSS	BDFI33	kg/dm^3	244	7344	0.05	1.52	2.64
US-NCSS	BDFIFM	kg/dm^3	17	48	1.23	1.75	2.44
US-NCSS	BDFIOD	kg/dm^3	244	2674	0.16	1.56	2.6
US-NCSS	BDWS33	kg/dm^3	304	3550	0.5	1.48	2.56
US-NCSS	BDWSOD	kg/dm^3	228	2368	0.7	1.62	2.6
US-NCSS	CECPH7	cmol(c)/kg	325	3888	0.2	16	124.8
US-NCSS	CFGR	g/100g	308	5532	0	9.59	97
US-NCSS	CFVO	$cm^3/100cm^3$	304	3550	0	4.55	92
US-NCSS	CLAY	g/100g	324	3886	0	34.73	87.6
US-NCSS	ECEC	cmol(c)/kg	195	3030	0.3	4.29	38
US-NCSS	ELCO20	dS/m	84	964	0	1.3	29
US-NCSS	ELCOSP	dS/m	70	628	0.1	4.04	51.7

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Dataset	Property	Units	n_profiles	n_observations	min	max	avg
US-NCSS	NITKJD	g/kg	278	2038	0	1	29.38
US-NCSS	ORGC	g/kg	310	3720	0	8.41	345.3
US-NCSS	PHAQ	unitless	325	4532	3.6	6.34	10
US-NCSS	PHCA	unitless	325	3900	3	5.59	9.9
US-NCSS	PHETB1	mg/kg	95	1098	0	7.65	102
US-NCSS	PHETM3	mg/kg	6	86	0.8	2.77	16.3
US-NCSS	PHKC	unitless	231	2748	2.8	4.85	9.7
US-NCSS	PHNF	unitless	87	1112	6.2	9.04	11.4
US-NCSS	PHPRTN	mg/kg	82	1002	0	36.93	99
US-NCSS	SAND	g/100g	324	3886	0.1	48.12	98.3
US-NCSS	SILT	g/100g	324	3886	0.8	17.16	79.9
US-NCSS	TCEQ	g/kg	107	992	0	96.92	930
US-NCSS	TOTC	g/kg	114	1394	0.1	8.22	85.7
US-NCSS	WG0010	g/100g	66	640	3.7	20.57	79
US-NCSS	WG0033	g/100g	243	2596	2	22.27	79
US-NCSS	WG0100	g/100g	7	54	5.1	21.57	34.4
US-NCSS	WG0200	g/100g	64	796	1.2	12.2	39.3
US-NCSS	WG1500	g/100g	325	3942	1	13.84	70.8
WD-eSOTER	BDFIOD	kg/dm³	7	33	1.26	1.68	1.93
WD-eSOTER	CLAY	g/100g	61	223	3	33.08	80.7
WD-eSOTER	NITKJD	g/kg	49	164	0.01	0.54	5.05
WD-eSOTER	ORGC	g/kg	63	231	0.1	8.46	105.9
WD-eSOTER	PHAQ	unitless	63	236	4.8	7.89	9.1
WD-eSOTER	PHCA	unitless	7	39	6	7.54	8.1
WD-eSOTER	PHKC	unitless	32	125	3.5	6.78	8.8
WD-eSOTER	PHPTOT	mg/kg	21	69	0.11	1.34	6.84
WD-eSOTER	SAND	g/100g	61	223	1.5	37.54	84.5
WD-eSOTER	SILT	g/100g	61	223	2.5	29.47	67.6
WD-eSOTER	TCEQ	g/kg	27	124	0	112.77	696
WD-ISCN	BDFIOD	kg/dm³	5	36	1.4	1.48	1.5
WD-ISCN	CECPH7	cmol(c)/kg	209	823	0.8	12.92	69.6
WD-ISCN	CFGR	g/100g	175	684	0	12.54	100
WD-ISCN	SAND	g/100g	183	674	0	51.31	96
WD-ISCN	SILT	g/100g	177	638	1	15.32	47
WD-ISCN	TCEQ	g/kg	1	5	264	293.4	310
WD-ISCN	TOTC	g/kg	217	818	0.3	14.46	839
WD-ISIS	BDFIOD	kg/dm³	88	286	0.49	1.35	1.88
WD-ISIS	CECPH7	cmol(c)/kg	204	1225	0.2	13.74	88.1
WD-ISIS	CFVO	cm³/100cm³	91	495	0	10.26	95
WD-ISIS	CLAY	g/100g	204	1211	0	34.03	90.8
WD-ISIS	ECEC	cmol(c)/kg	111	658	0.1	3.84	58.9
WD-ISIS	ELCO25	dS/m	196	1161	0	0.27	30
WD-ISIS	NITKJD	g/kg	187	936	0	0.88	12.7
WD-ISIS	ORGC	g/kg	204	1218	0	8.9	218.9
WD-ISIS	ORGM	g/kg	76	459	0.3	7.48	28
WD-ISIS	PHAQ	unitless	204	1234	3.3	6.09	10.6

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Dataset	Property	Units	n_profiles	n_observations	min	max	avg
WD-ISIS	PHCA	unitless	6	38	3.9	5.17	7.9
WD-ISIS	PHETB1	mg/kg	3	14	0	1.51	7.5
WD-ISIS	PHETOL	mg/kg	9	27	0	9.04	47.9
WD-ISIS	PHKC	unitless	204	1220	3.1	5.05	10.3
WD-ISIS	PHNF	unitless	20	111	7.6	9.11	11.3
WD-ISIS	SAND	g/100g	204	1211	0.5	47.83	99.6
WD-ISIS	SILT	g/100g	204	1215	0.2	18.32	84.3
WD-ISIS	TCEQ	g/kg	79	365	0	37.65	746
WD-ISIS	WV0010	$cm^3/100cm^3$	80	249	6.7	30.18	66
WD-ISIS	WV1500	$cm^3/100cm^3$	85	273	1.6	17.89	55.7
WD-Mangroves	BDFIOD	kg/dm^3	175	862	0.38	0.9	1.62
WD-Mangroves	NITKJD	g/kg	113	579	0.1	1.57	31.9
WD-Mangroves	ORGC	g/kg	133	677	1.4	21.14	128.5
WD-NWAFU-SCS	BDFIOD	kg/dm^3	5	6	0.91	1.14	1.51
WD-NWAFU-SCS	ORGC	g/kg	5	6	1.8	22.12	42.3
WD-WISE	CECPH7	cmol(c)/kg	3199	13148	0.1	13.21	136
WD-WISE	CECPH8	cmol(c)/kg	337	1177	1	15.11	74
WD-WISE	CFVO	$cm^3/100cm^3$	554	2076	0	13.01	95
WD-WISE	CLAY	g/100g	3656	14912	1	28.41	96
WD-WISE	ECEC	cmol(c)/kg	284	1074	0.1	4.1	70.7
WD-WISE	ELCO20	dS/m	768	2213	0	0.5	42.7
WD-WISE	ELCO25	dS/m	16	75	0.1	4.23	56.7
WD-WISE	ELCO50	dS/m	84	355	0	1.23	33.4
WD-WISE	ELCOSP	dS/m	699	3404	0	0.78	51.7
WD-WISE	NITKJD	g/kg	2300	7504	0.01	0.88	37
WD-WISE	ORGC	g/kg	3578	12985	0.1	8.8	570
WD-WISE	PHAQ	unitless	3540	14479	2.4	6.32	11
WD-WISE	PHCA	unitless	1296	5220	2.7	5.93	10.5
WD-WISE	PHKC	unitless	1424	6559	2.3	5.11	10.7
WD-WISE	SAND	g/100g	3656	14913	1	56.42	98
WD-WISE	SILT	g/100g	3656	14913	1	15.17	94
WD-WISE	TCEQ	g/kg	2859	10864	0	10.08	794
WD-WISE	WV0010	$cm^3/100cm^3$	126	412	5	28.03	80
WD-WISE	WV0033	$cm^3/100cm^3$	316	1223	2	28.42	79
WD-WISE	WV1500	$cm^3/100cm^3$	343	1346	2	18.45	60
ZA-SOTER	CLAY	g/100g	602	1531	0	26.87	90
ZA-SOTER	ECEC	cmol(c)/kg	344	763	0.1	3.89	56.8
ZA-SOTER	ELCOSP	dS/m	115	195	0.1	4.73	59.4
ZA-SOTER	NITKJD	g/kg	3	15	0	0.43	0.9
ZA-SOTER	ORGC	g/kg	603	1563	0	7.49	326
ZA-SOTER	PHAQ	unitless	608	1579	4.1	6.56	10.1
ZA-SOTER	PHKC	unitless	181	469	3.6	5.41	8.1
ZA-SOTER	PHPRTN	mg/kg	590	1513	0	3.34	10
ZA-SOTER	SAND	g/100g	602	1529	2	57.24	99
ZA-SOTER	SILT	g/100g	602	1531	0	14.61	62
ZA-SOTER	WV0033	$cm^3/100cm^3$	596	1535	1	17.41	72

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Dataset	Property	Units	n_profiles	n_observations	min	max	avg
ZA-SOTER	WV1500	$cm^3/100cm^3$	593	1516	1	10.97	60

[a] See Appendix 1 for a short description of the properties.

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