Organic matter cycling along geochemical, geomorphic and disturbance gradients in vegetation and soils of African tropical forests and cropland - Project TropSOC DATABASE_v1.0

3.2.1. Cropland – Mineral Soil Layers – Soil carbon and nitrogen including organic matter fractions

When using these data, please cite the original publications of the source data:

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Introduction

The dataset comprises a unique sample identifier and 36 variables that provide information on soil organic carbon (C) and organic nitrogen (N) content in bulk soil and different soil fractions for TropSOC's cropland plots. Note that for about 20 % of these data per parameter, triplicates were measured to assess the analytical laboratory error. In these cases, the respective means from these three measurements are reported. For all other data the entered datapoint represents a single measurement. This is indicated in the data table by information on the number of measurements used to calculate the mean. Standard deviation (SD) is only stated when triplicates were measured. In all other cases the SD is set to –9999, indicating missing values. Additional information regarding physico-chemical bulk soil and soil fraction properties can be found in 322_*soil_phy_chem.csv/pdf*. Radioisotope signatures of soil C can be found in 342_*c14.csv/pdf*. Details regarding plots and plot design are documented in 3_*cropland.pdf*.

Data structure

No.	Variable	Explanation	Unit
1	sampleID	unique identifier of any soil or vegetation sample taken in the field	-
2	mean_N_bulk	mean nitrogen content of the bulk soil	wt %
3	no_N_bulk	number of measurements available to calculate the mean nitrogen content of the bulk soil	-
4	sd_N_bulk	standard deviation of the mean nitrogen content of the bulk soil	wt %
5	mean_N_cPOM	mean nitrogen content of the coarse particulate organic matter fraction	wt %
6	no_N_cPOM	number of measurements available to calculate the mean nitrogen content of the coarse particulate organic matter fraction	-
7	sdd_N_cPOM	standard deviation of the mean nitrogen content of the coarse particulate organic matter fraction	wt %
8	mean_N_m	mean nitrogen content of the water-stable microaggregate fraction	wt %

9	no_N_m	number of measurements available to calculate the mean nitrogen content of the water-stable microaggregate fraction	-
10	sd_N_m	standard deviation of the mean nitrogen content of the water-stable microaggregate fraction	wt %
11	mean_N_s+c	mean nitrogen content of the free silt and clay fraction	wt %
12	no_N_s+c	number of measurements available to calculate the mean nitrogen content of the free silt and clay fraction	-
13	sd_N_s+c	standard deviation of the mean nitrogen content of the free silt and clay fraction	wt %
14	mean_C_bulk	mean organic carbon content of the bulk soil	wt %
15	no_C_bulk	number of measurements available to calculate the mean organic carbon content of the bulk soil	-
16	sd_C_bulk	standard deviation of the mean organic carbon content of the bulk soil	wt %
17	mean_C_cPOM	mean organic carbon content of the coarse particulate organic matter fraction	wt %
18	no_C_cPOM	number of measurements available to calculate the mean organic carbon content of the coarse particulate organic matter fraction	-
19	sd_C_cPOM	standard deviation of the mean organic carbon content of the coarse particulate organic matter fraction	wt %
20	mean_C_m	mean organic carbon content of the water-stable microaggregate fraction	wt %
21	no_C_m	number of measurements available to calculate the mean organic carbon content of the water-stable microaggregate fraction	-
22	sd_C_m	standard deviation of the mean organic carbon content of the water-stable microaggregate fraction	wt %
23	mean_C_s+c	mean organic carbon content of the free silt and clay fraction	wt %
24	no_C_s+c	number of measurements available to calculate the mean organic carbon content of the free silt and clay fraction	-
25	sd_C_s+c	standard deviation of the mean organic carbon content of the free silt and clay fraction	wt %
26	mean_weight_bulk	mean mass of the bulk soil sample before fractionation	g
27	no_weight_bulk	number of measurements available to calculate the mean mass of the bulk soil sample	g
28	sd_weight_bulk	standard deviation of the mean mass of the bulk soil sample	g
29	mean_weight_cPOM	mean soil mass of the coarse particulate organic matter fraction as part of the bulk soil before fractionation (note from variables 26, 29, 32 & 35 the proportion of the fractions in bulk soil can be calculated)	g
30	no_weight_cPOM	number of measurements available to calculate the mean mass of the coarse particulate organic matter fraction	g
31	sd_weight_cPOM	standard deviation of the mean mass of the coarse particulate organic matter fraction	g
32	mean_weight_m	mean soil mass of the water-stable microaggregate fraction as part of the bulk soil before fractionation (note from variables 26, 29, 32 & 35 the proportion of the fractions in bulk soil can be calculated)	g
33	no_weight_m	number of measurements available to calculate the mean mass of the water-stable microaggregate fraction	g

34	sd_weight_m	standard deviation of the mean mass of the water-stable microaggregate fraction	g
35	mean_weight_s+c	mean soil mass of the free silt and clay fraction as part of the bulk soil before fractionation (note from variables 26, 29, 32 & 35 the proportion of the fractions in bulk soil can be calculated)	g
36	no_weight_s+c	number of measurements available to calculate the mean mass of the free silt and clay fraction	g
37	sd_weight_s+c	standard deviation of the mean mass of the free silt and clay fraction	g

Methods

Organic carbon and nitrogen analyses: Bulk C and N contents in soil and soil fractions were measured using 1 g of ground samples with a dry combustion analyser (Variomax CN, Elementar GmbH, Hanau, Germany) and measuring range of 0.2 - 400 mg g^{-1} soil (absolute C or N mass in sample) and a reproducibility of < 0.5% (relative deviation). Recovery rates exceeding 97 % and 91 % were obtained across all samples for the soil mass as well as C and N concentrations, respectively. None of the soil samples showed any reaction when treated with 10 % HCl and are therefore considered free of carbonates. Consequently, total soil CN content is interpreted as soil organic carbon (SOC) and soil organic nitrogen (SON) content. This interpretation is also applied to samples showing fossil organic C residues from sediment sources (Reichenbach et al. 2021).

Soil fractionation: A subsample of 80 g was fractionated for each soil and depth layer to derive functional C fractions. This procedure was based on a conceptual C fraction model method proposed by Steward et al. (2008) and modified following Doetterl et al. (2015). The scheme consists of a series of physical fractionation techniques applied in order to isolate C fractions, differentiated based on stabilization mechanisms (chemical, biochemical, and physical). The isolated fractions can also be associated with different turnover times and varying C stability. Using a microaggregate isolator, C was fractionated into coarse particulate organic matter C (CPOM, > 250 µm), water-stable microaggregate associated C (mAgg 250 – 53 µm), and non-aggregated, free silt and clay associated C (s+c, < 53 µm). Reproducibility and the analytical laboratory error was determined by executing about 20 % of all measurements and fractionations in triplicate. For a scientific interpretation of the results of this fractionation scheme see Reichenbach et al. (2021).

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References

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