Supplementary material

No	Type	Description
1	Forest	A continuous stand of trees, their crowns interlocking.
2	Woodland	An open stand of trees with a canopy cover of 40 % or more. The field layer is usually dominated by grasses.
3a	Bushland	A mix of trees and shrubs with a canopy cover of 40% or more
3b	Thicket	A closed stand of bushes and climbers usually between 2 and 7 m tall
4	Shrubland	An open or closed stand of shrubs up to 3 m tall
5	Grassland	Land covered with grasses and other herbs, either without woody vegetation or the woody cover is less than 10 %
6	Wooded grassland	Land covered with grasses and other herbs, with woody vegetation covering between 10 and 40 % of the ground
7	Cropland	Cultivated land (or being prepared for cultivation (if sampling in the dry season)) with annual or perrenial crops
8	Mangrove	Open or closed stands of trees or bushes occurring on shores between high and low water mark.
9	Freshwater aquatic	Herbaceous freshwater swamp and aquatic vegetation/ Wetland
10	Halophytic	Saline and brackish swamp vegetation
11	Distinct / restricted	Formation of distinct physiognomy (vegetative formations) but restricted distribution, e.g. bamboo, inselbergs etc.
12	Other	Describe...

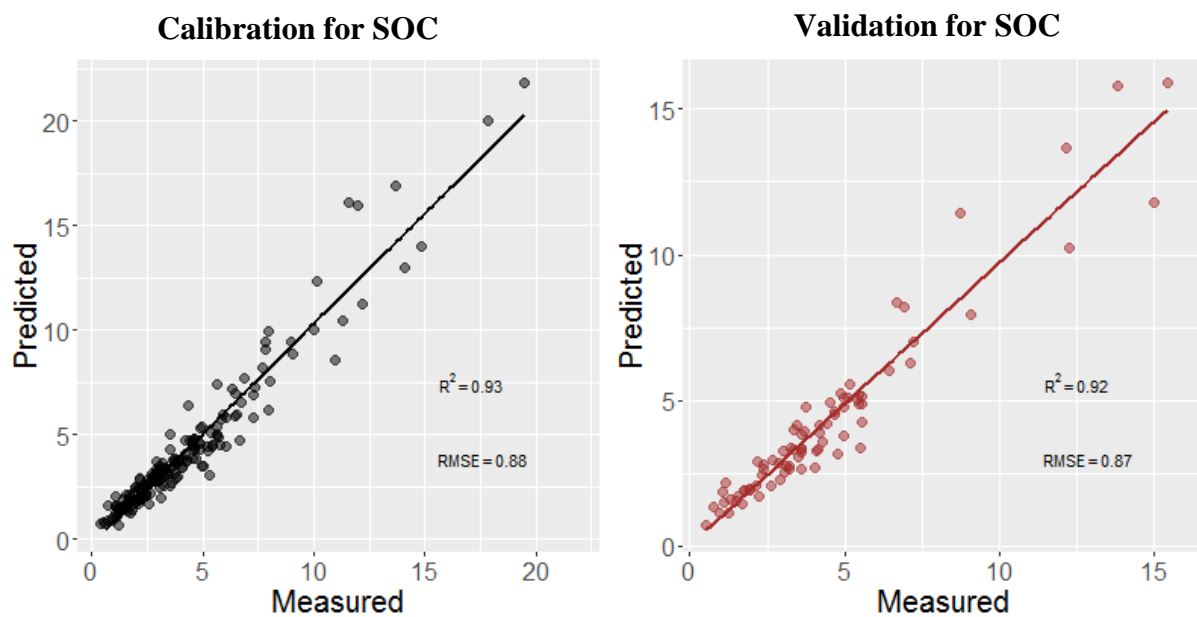Figure S1: Land use classification in LDSF filed guide (Vågen et al., 2013)

Figure S2: Calibration and validation of partial least squares model developed to predict the total C concentration of soil (g C kg^{-1} soil; n_calibration=182 samples; n_validation=78 samples)
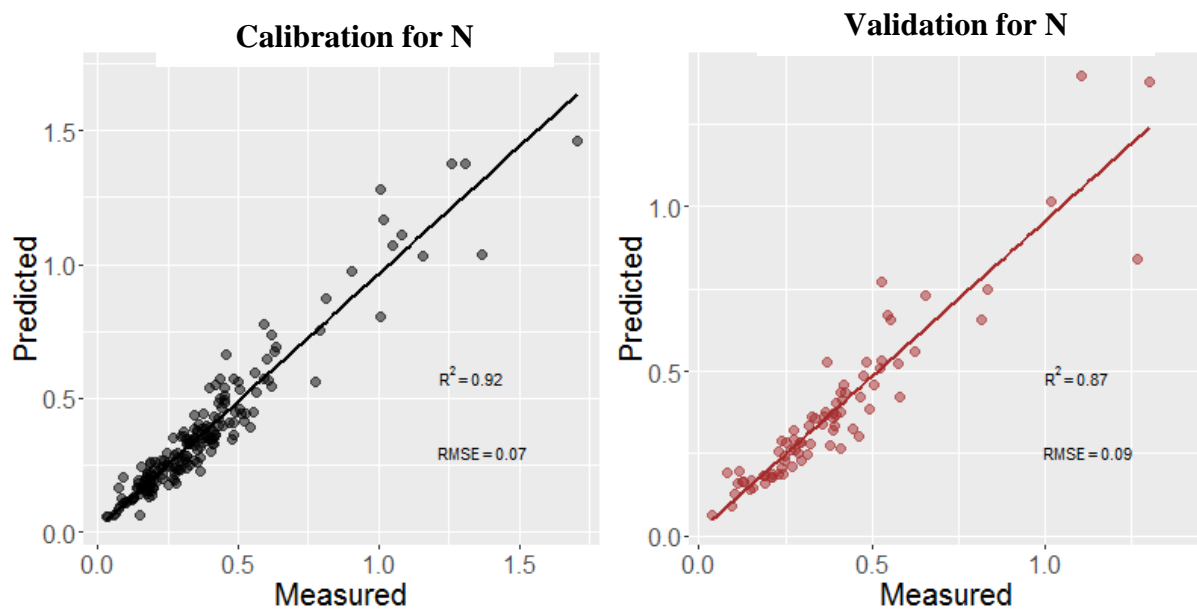
Figure S3: Calibration and validation of partial least squares model developed to predict the total N concentration of soil (g N kg^{-1} soil; n_calibration=182 samples; n_validation=78 samples)
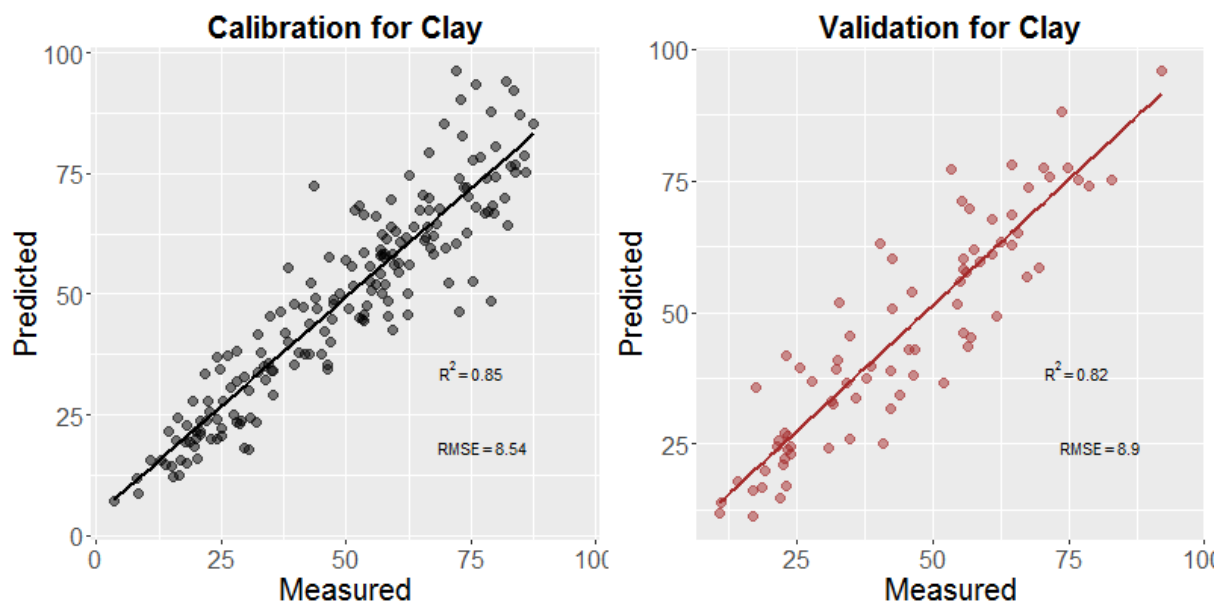
Figure S4: Calibration and validation of partial least squares model developed to predict clay content of soil (g clay kg^{-1} soil; n_calibration=182 samples; n_validation=78 samples)
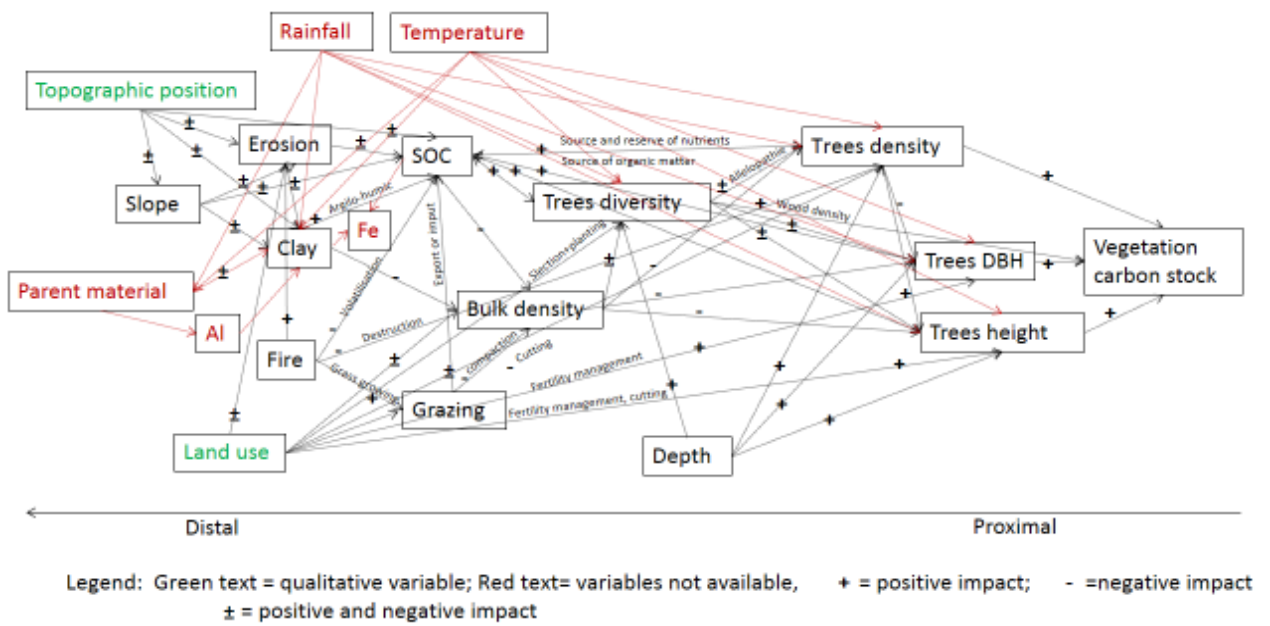
Figure S5: Conceptual model of causal effects of drivers of carbon stocked by trees for path analysis

Table S1: Soil bulk density (g.cm^{-3}) per soil depth (cm) and land use in forest - savanna transition zone, West Africa, calculated according to LDSF protocol (Vågen *et al*, 2010; Aneyukulu *et al*, 2011)

Depth	Forest	Bushland	Wooded grassland	Grassland	Perennial cropland	Annual cropland
0-20	0.6 ± 0.3[a]	0.8 ± 0.2[a]	0.9 ± 0.3[a]	0.9 ± 0.2[a]	0.9 ± 0.2[a]	0.9 ± 0.2[a]
20-50	1.6 ± 0.6[a]	2.4 ± 0.7[b]	2.3 ± 0.7[b]	2.0 ± 0.3[b]	2.0 ± 0.4[b]	2.1 ± 0.6[b]
50-80	1.8 ± 0.2[a]	2.3 ± 0.6[b]	2.3 ± 0.5[b]	2.2 ± 0.2[b]	2.1 ± 0.4[b]	2.1 ± 0.5[b]
80-110	2.3 [a]	2.2 ± 0.9[b]	2.1 ± 0.5[ab]	1.9 ± 0.2[ab]	2.0 ± 0.5[b]	2.0 ± 0.4[b]

Mean ± standard deviation, means with the same letters are not significantly different between lands uses, means were compared with the test of Tukey.

Table S2: Soil coarse content (soil fraction > 2 mm, %) per soil depth (cm) and land use in a forest - savanna transition zone, West Africa.

Depth	Forest	Bushland	Wooded grassland	Grassland	Perennial cropland	Annual cropland
0-20	3.5 ± 2.3^a	7.3 ± 11.1^a	7.8 ± 10.5^a	1.2 ± 1.8^a	6.8 ± 9.7^a	7.6 ± 9.3^a
20-50	28.9 ± 1.1^{ab}	20.7 ± 16.5^{ab}	17.9 ± 19.2^{ab}	4.9 ± 6.8^a	24.8 ± 14.9^b	20.9 ± 16.7^{ab}
50-80	22.0 ± 12.6^{abc}	21.9 ± 13.1^{abc}	14.4 ± 13.9^{ab}	4.4 ± 4.0^a	21.9 ± 12.5^{bc}	24.4 ± 18.3^c
80-110	2.2^a	15.3 ± 12.3^a	12.8 ± 13.9^a	6.1 ± 6.2^a	13.3 ± 6.9^a	15.7 ± 13.8^a

Mean ± standard deviation, means with the same letters are not significantly different between lands uses, means were compared with the test of Tukey.

Table S3: Plots characteristics according to land use in a forest – savanna zone, West Africa, observations in June 2015

	Forest	**Bushland**	**Wooded grassland**	**Grassland**	**Perennial cropland**	**Annual cropland**
Slope	5.2 ± 2.5^{ab}	5.0 ± 2.7^{a}	7.7 ± 3.0^{b}	5.8 ± 3.0^{ab}	5.1 ± 2.6^{a}	5.3 ± 2.6^{a}
Fire (%)	0	32	80	80	20	69
Erosion (%)	0	43	80	90	22	83
Grazing (%)	0	11	34	40	11	20
Tree cutting (%)	0	11	34	40	22	66

Mean ± standard deviation, means with the same letters are not significantly different between lands uses, means were compared with the test of Tukey.

Table S4: Carbon/Nitrogen ratio per land use and soil depth (cm) is a forest – savanna transition soil in West Africa
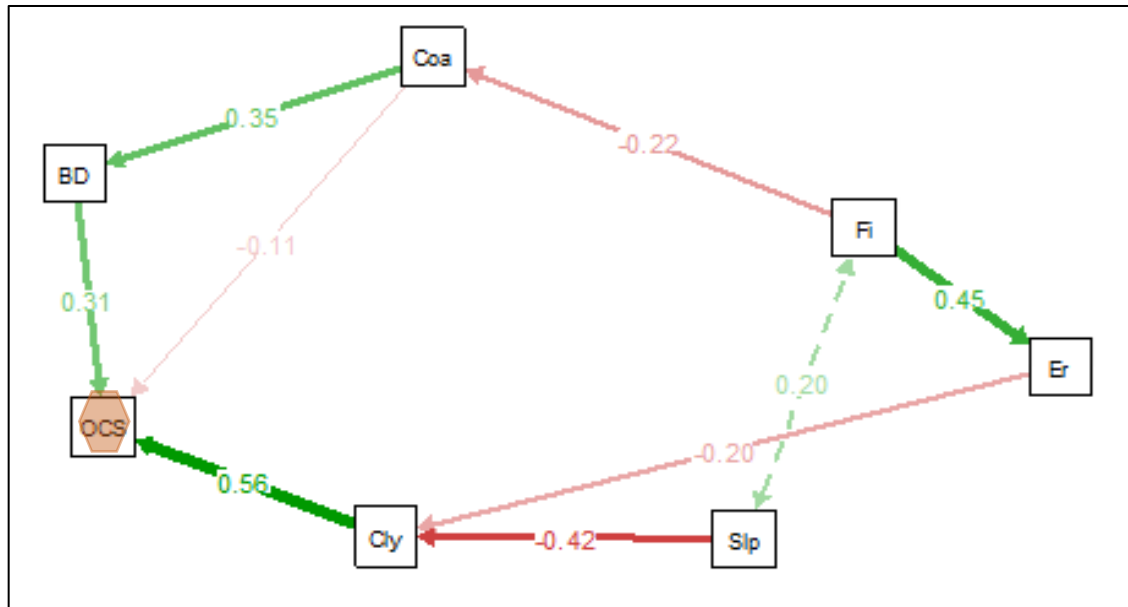
Depth	Forest	Bushland	Wooded grassland	Grassland	Perennial cropland	Annual cropland
0-20	13.5 ± 1.9^{ab}	13.4 ± 1.7^{a}	13.9 ± 1.3^{ab}	14.7 ± 1.5^{ab}	14.6 ± 1.8^{b}	14.8 ± 1.9^{ab}
20-50	12.9 ± 1.9^{ab}	13.0 ± 1.8^{ab}	12.9 ± 1.6^{a}	13.3 ± 1.6^{ab}	14.4 ± 1.6^{b}	13.9 ± 2.1^{ab}
50-80	12.1 ± 1.6^{a}	12.2 ± 1.0^{a}	12.2 ± 1.4^{a}	12.0 ± 0.7^{a}	13.0 ± 1.5^{a}	12.6 ± 1.8^{a}
80-110	9.7^{a}	11.7 ± 1.2^{a}	12.0 ± 1.4^{a}	11.2 ± 1.0^{a}	11.6 ± 1.5^{a}	11.8 ± 1.7^{a}

Mean ± standard deviation, means with the same letters are not significantly different between lands uses, means were compared with the test of Tukey.

Table S5: Soil sand content (%) per soil depth (cm) and land use in a forest - savanna transition zone, West Africa.

Depth	Forest	Bushland	Wooded grassland	Grassland	Perennial cropland	Annual cropland
0-20	41.4 ± 0.3^{abc}	49.1 ± 9.3^{bc}	54.8 ± 10.3^{a}	55.8 ± 11.6^{ab}	45.0 ± 10.0^{c}	45.7 ± 12.0^{bc}
20-50	37.3 ± 13.1^{abc}	47.6 ± 11.3^{bc}	56.5 ± 14.9^{a}	55.7 ± 17.5^{ab}	42.4 ± 11.4^{c}	44.5 ± 14.4^{bc}
50-80	29.7 ± 22.9^{abc}	40.3 ± 24.7^{bc}	55.6 ± 21.1^{a}	59.5 ± 23.1^{ab}	28.5 ± 14.2^{c}	35.2 ± 19.5^{c}
80-110	16.2^{abc}	35.4 ± 18.2^{bc}	56.9 ± 24.3^{a}	57.4 ± 25.5^{ab}	25.0 ± 15.5^{c}	35.2 ± 19.5^{bc}

Mean ± standard deviation, means with the same letters are not significantly different between lands uses, means were compared with the test of Tukey.
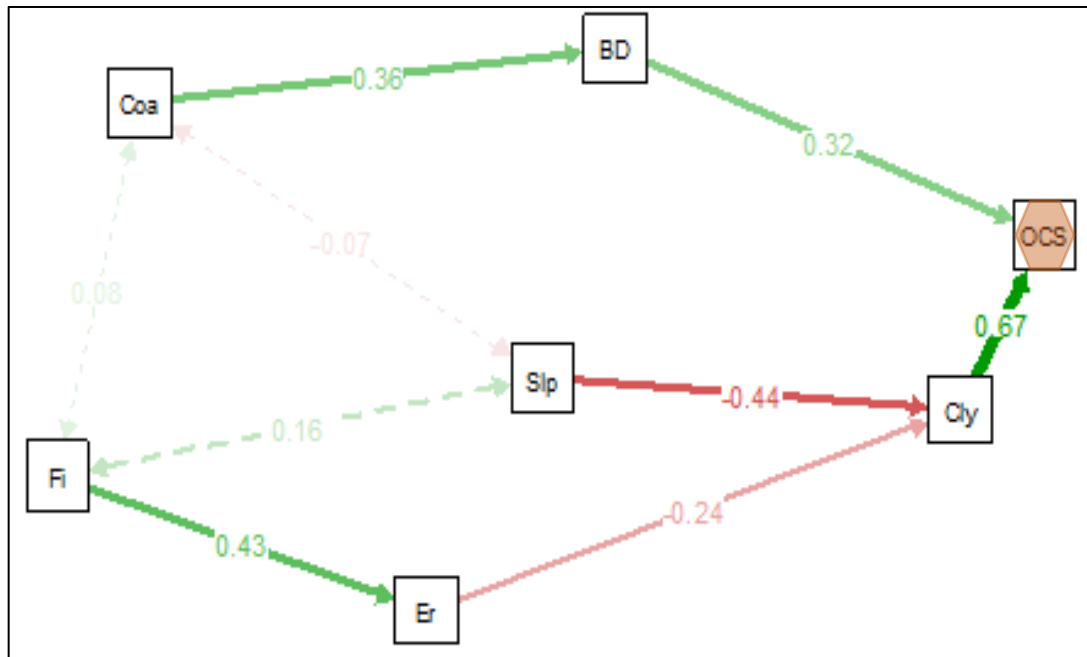
OCS= soil organic carbon stock, Cly= soil clay content, BD= soil bulk density, Er= erosion impact, Fi= fire impact, Slp= slope, Coa= coarse fraction, single-headed arrows indicate direct causal relationships and double-headed arrows indicate unanalyzed correlations. Numbers are path coefficients and numbers within single-headed arrows indicate proportion of total variance explained for each variable. The numbers within double-headed arrows represent the proportion of unexplained variance and, thus, indicate the relative contribution of all unmeasured or unknown factors to each dependent variable. Green color represents positive effect and red color represents negative effect.

Figure S6: SOCS factors determined at 20-50cm by path analysis in a forest – savanna transition, West Africa.
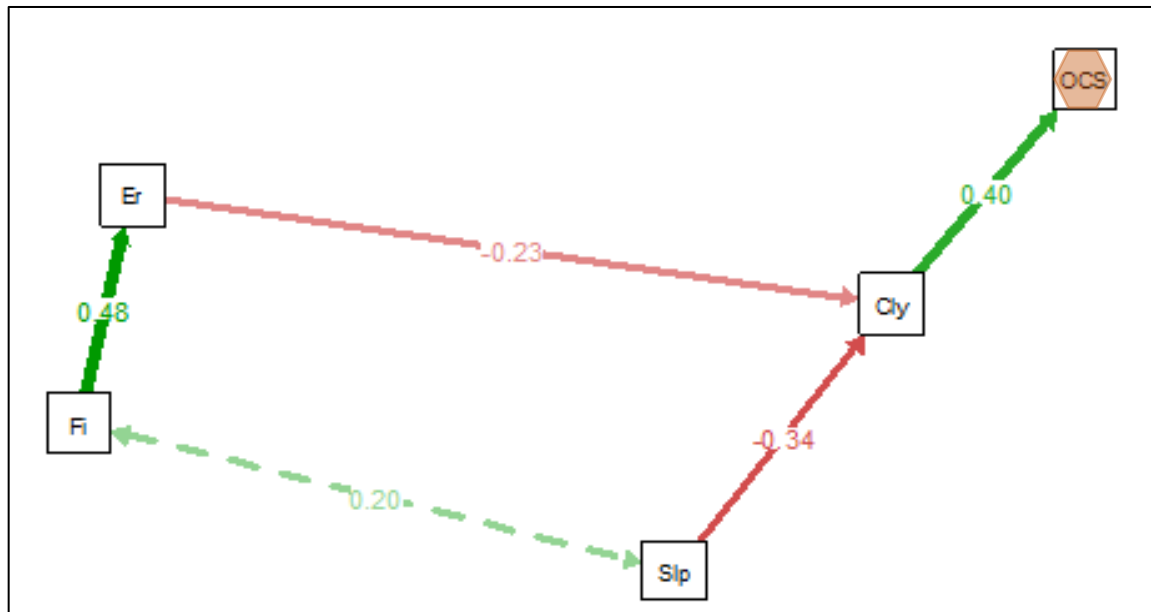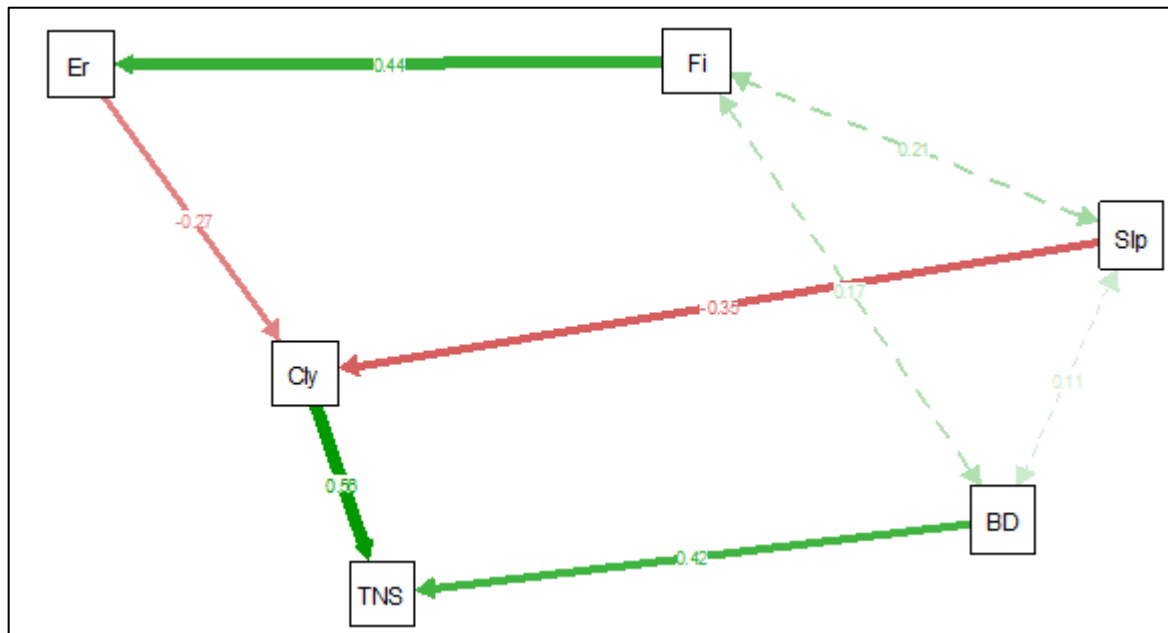
OCS= soil organic carbon stock, Cly= soil clay content, Er= erosion impact, Fi= fire impact, Slp= slope, fraction, single-headed arrows indicate direct causal relationships and double-headed arrows indicate unanalyzed correlations. Numbers are path coefficients and numbers within single-headed arrows indicate proportion of total variance explained for each variable. The numbers within double-headed arrows represent the proportion of unexplained variance and, thus, indicate the relative contribution of all unmeasured or unknown factors to each dependent variable. Green color represents positive effect and red color represents negative effect.

Figure S7: SOCS factors determined at 50 - 80 cm by path analysis in a forest – savanna transition, West Africa.

OCS= soil organic carbon stock, Cly= soil clay content, BD= soil bulk density, Er= erosion impact, Fi= fire impact, Slp= slope, Coa= coarse fraction, single-headed arrows indicate direct causal relationships and double-headed arrows indicate unanalyzed correlations. Numbers are path coefficients and numbers within single-headed arrows indicate proportion of total variance explained for each variable. The numbers within double-headed arrows represent the proportion of unexplained variance and, thus, indicate the relative contribution of all unmeasured or unknown factors to each dependent variable. Green color represents positive effect and red color represents negative effect.

Figure S8: SOCS factors determined at 80 − 110 cm by path analysis in a forest − savanna transition, West Africa.

OCS= soil organic carbon stock, Cly= soil clay content, BD= soil bulk density, Er= erosion impact, Fi= fire impact, Slp= slope, Coa= coarse fraction, single-headed arrows indicate direct causal relationships and double-headed arrows indicate unanalyzed correlations. Numbers are path coefficients and numbers within single-headed arrows indicate proportion of total variance explained for each variable. The numbers within double-headed arrows represent the proportion of unexplained variance and, thus, indicate the relative contribution of all unmeasured or unknown factors to each dependent variable. Green color represents positive effect and red color represents negative effect.

Figure S9: TNS factors determined at $0 - 20$ cm by path analysis in a forest $-$ savanna transition, West Africa.