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Supplement of

Depth effects of long-term organic residue application on soil organic carbon stocks in central Kenya

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Table S1: ANOVA Comparison of Linear Mixed-Effects Models performed on all meaured depth layers

Model	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
C ~ Mineral Fertilizer + (1 | Plot)	4	802.2	815.06	-397.1	794.2			
C ~ Depth + Mineral Fertilizer + (1 | Plot)	5	605.18	621.25	-297.59	595.18	199.02	1	<2e-16 ***
C ~ Depth + silt + sand + (1 | Plot)	6	608.27	627.56	-298.13	596.27	0	1	1
C ~ Organic Residue + (1 | Plot)	6	793.07	812.36	-390.54	781.07	0	0	
C ~ Depth + Organic Residue + (1 | Plot)	7	596.05	618.56	-291.03	582.05	199.02	1	<2e-16 ***
C ~ Depth + Organic Residue + silt + sand + (1 | Plot)	10	599.69	631.84	-289.85	579.69	2.36	3	0.5013

Table S2: Summary statistics of the linear mixed effect model for soil organic carbon stocks on subsoil depth layers

	estimate	Standard error	*p* value	
(Intercept)	9.17	0.67	< 2e-16	*
Depth	-0.07	0.01	5.36e-10	*
Manure	1.86	0.61	0.007	*
Stover	1.03	0.61	0.11	
Tithonia	0.40	0.61	0.52	

Table S3: summary statistics of t-tests comparing carbon stocks between organic residue treatments and control across depth layers

Depth	Treatment	Lower conf.	Upper conf.	*p* value	
0-5 cm	Manure	-0.44	-0.13	> 0.01	*
	Thitonia	-0.22	0.06	0.2	
	Stover	-0.37	0.03	0.09	
5-10 cm	Manure	-0.41	-0.08	0.01	*
	Thitonia	-0.35	-0.06	0.01	*
	Stover	-0.35	-0.13	> 0.01	*
15-20 cm	Manure	-0.42	-0.05	0.02	*
	Thitonia	-0.43	-0.09	0.01	*
	Stover	-0.45	-0.07	0.01	*
25-30 cm	Manure	-0.42	0.03	0.08	
	Thitonia	-0.28	0.08	0.24	
	Stover	-0.5	-0.06	0.02	*
35-40 cm	Manure	-0.52	-0.11	0.01	*
	Thitonia	-0.37	0.03	0.09	
	Stover	-0.46	-0.03	0.03	*
45-50 cm	Manure	-0.59	-0.03	0.03	*
	Thitonia	-0.21	0.09	0.39	
	Stover	-0.45	0.06	0.12	
55-60 cm	Manure	-0.56	-0.06	0.02	*
	Thitonia	-0.2	0.09	0.41	
	Stover	-0.37	0.18	0.44	
65-70 cm	Manure	-0.62	0.22	0.31	
	Thitonia	-0.34	0.23	0.69	
	Stover	-0.45	0.14	0.26	

Table S4: Results of levene's test for homogeneity of variances in Log-transformed carbon stocks across depth layers and for each organic residue treatment combined with control treatment

	Treatment	F value	p value
0-5 cm	Manure	1.56	0.24
	Thitonia	3.16	0.11
	Stover	1.21	0.3
5-10 cm	Manure	2.23	0.17
	Thitonia	4.82	0.05
	Stover	3.76	0.08
15-20 cm	Manure	0.49	0.5
	Thitonia	1.55	0.24
	Stover	0.45	0.52
25-30 cm	Manure	0.07	0.79
	Thitonia	1.06	0.33
	Stover	0.15	0.7
35-40 cm	Manure	0.03	0.87
	Thitonia	0	0.96
	Stover	0.11	0.75
45-50 cm	Manure	3.84	0.08
	Thitonia	1.32	0.28
	Stover	0.65	0.44
55-60 cm	Manure	1.33	0.28
	Thitonia	0.53	0.48
	Stover	1.4	0.26
65-70 cm	Manure	1.83	0.21
	Thitonia	0.6	0.45
	Stover	0.36	0.56

Table S5: Results of levene's test for homogeneity of variances and shapiro test for normal distribution of the residuals in Log-transformed carbon stocks across depth layers

Depth layer	Shapiro test *P* value	Levene test *p* value
0-5 cm	0.094	0.645
5-10 cm	0.999	0.341
15-20 cm	0.82	0.708
25-30 cm	0.291	0.416
35-40 cm	0.645	0.982
45-50 cm	0.984	0.101
55-60 cm	0.219	0.314
65-70 cm	0.898	0.086

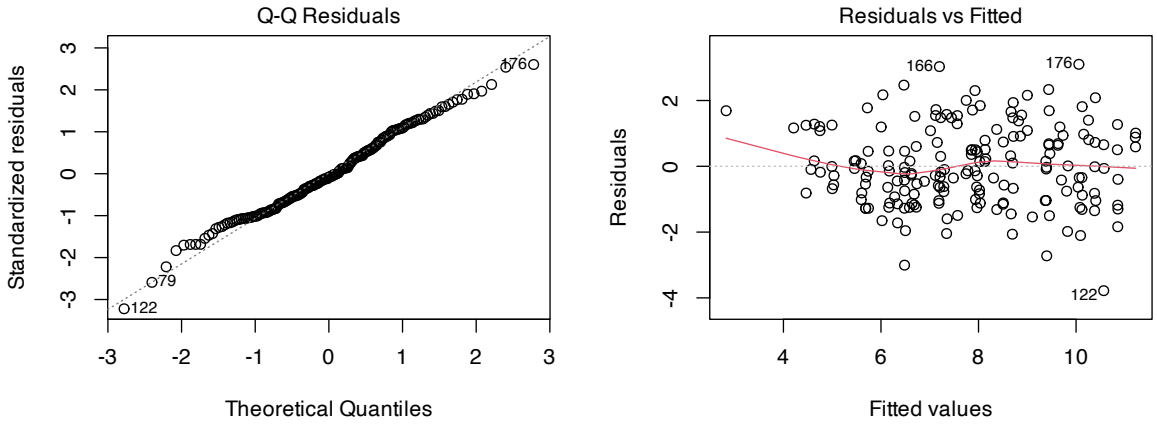


Figure S1: QQplot (a) and Residuals vs fitted values (b) of a linear model with carbon stocks as dependent variable and depth, organic residue, mineral fertilizer, clay content and silt content as independent variable. There is no sign of violation of data distribution normality nor homogeneity of variance assumption.

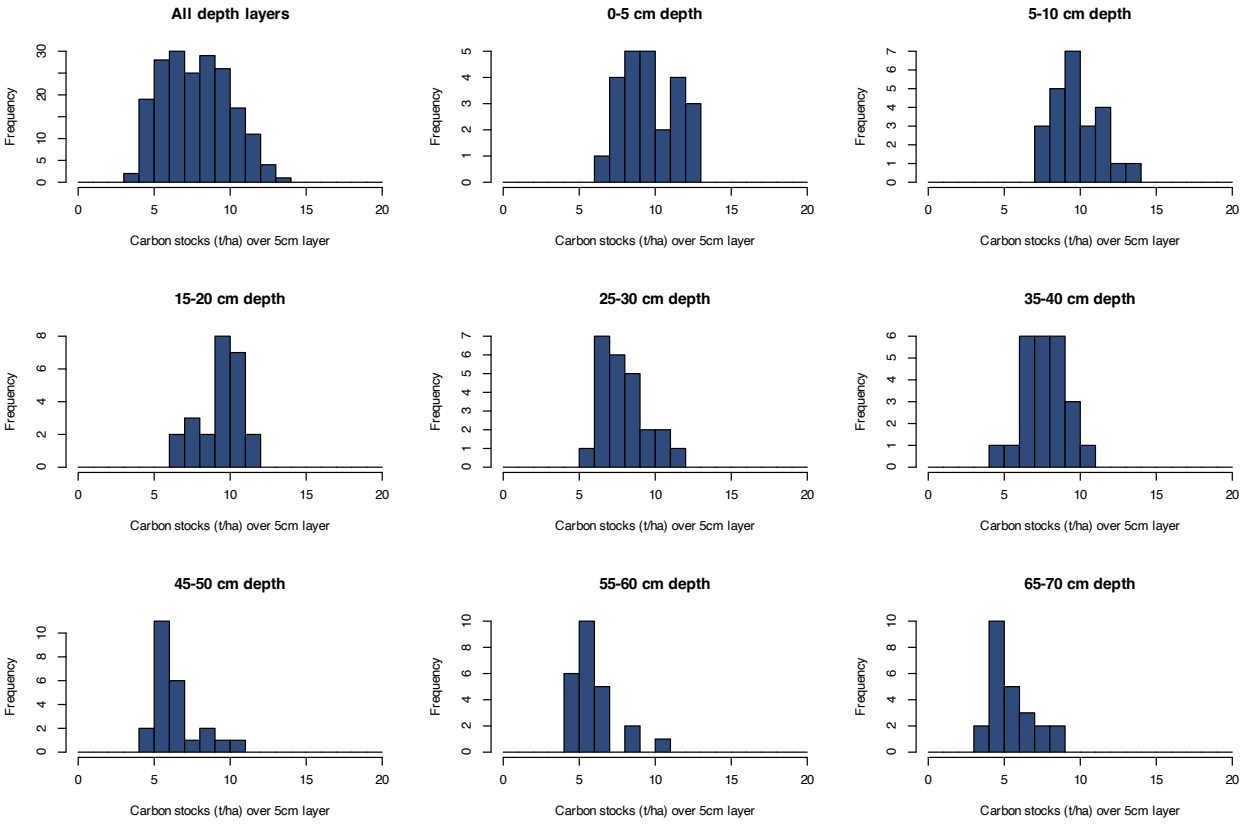


Figure S2: Distribution of the carbon stock samples over 5cm depth layers

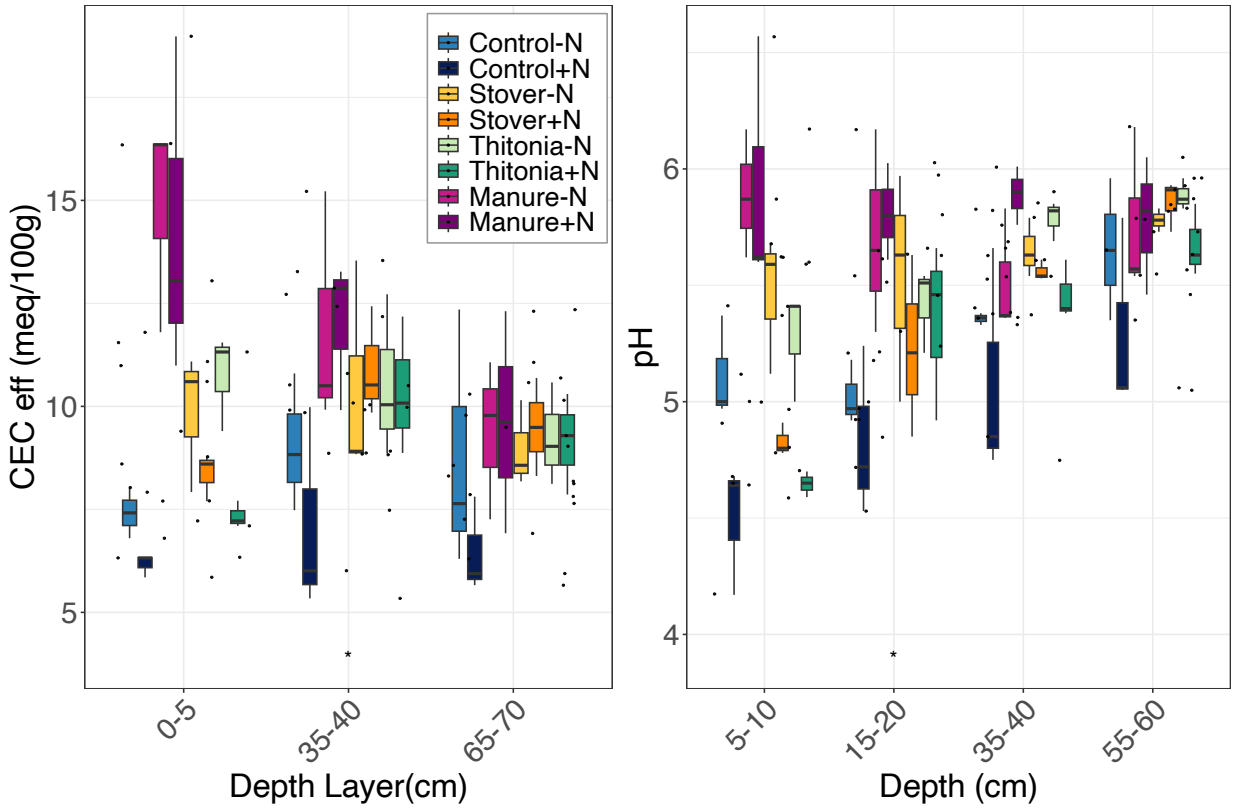


Figure S3: Effective cation exchange capacity and pH for all the different treatments

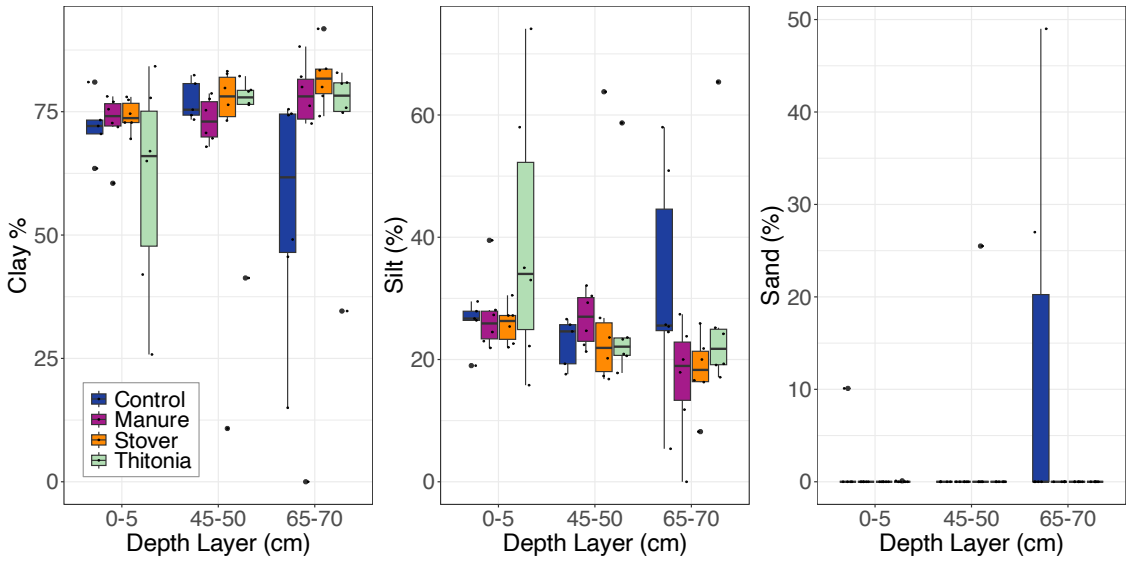


Figure S4: Texture for all the organic residue treatments and control

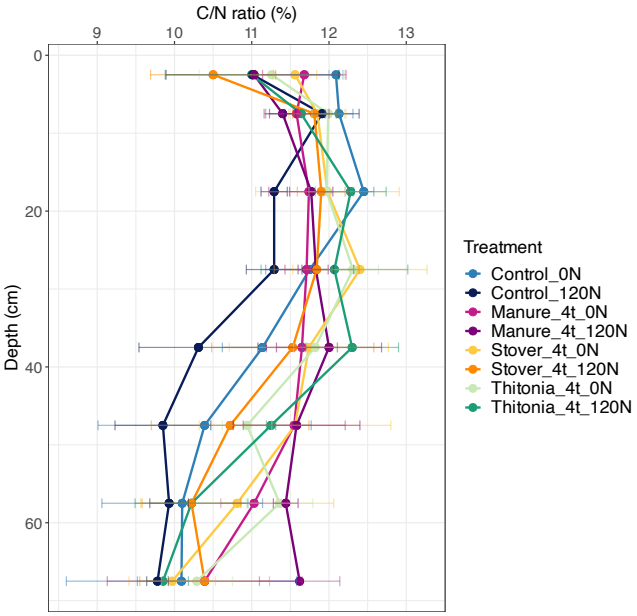


Figure S5: Depth profile of the C/N ratio of all treatments

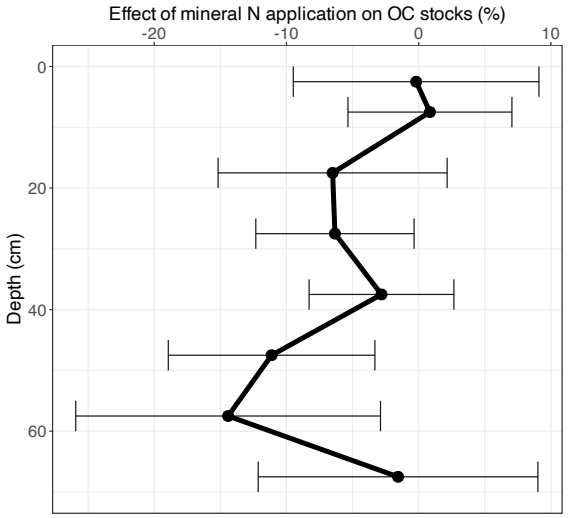


Figure S6: difference in OC stocks between +N and -N treatments (all treatment combined) at each measured 5 cm depth layer; values below 0 indicate a loss in OC when mineral nitrogen is applied

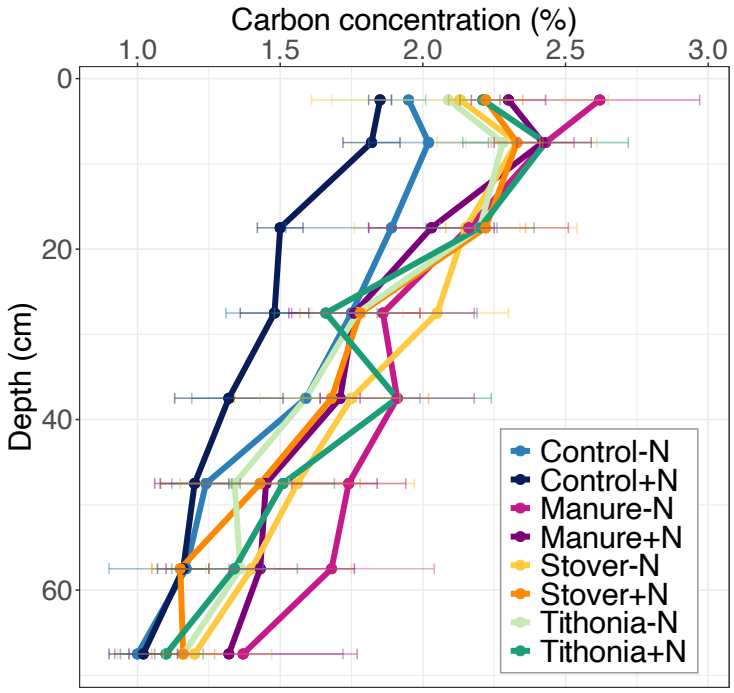


Figure S7: Soil organic carbon concentration

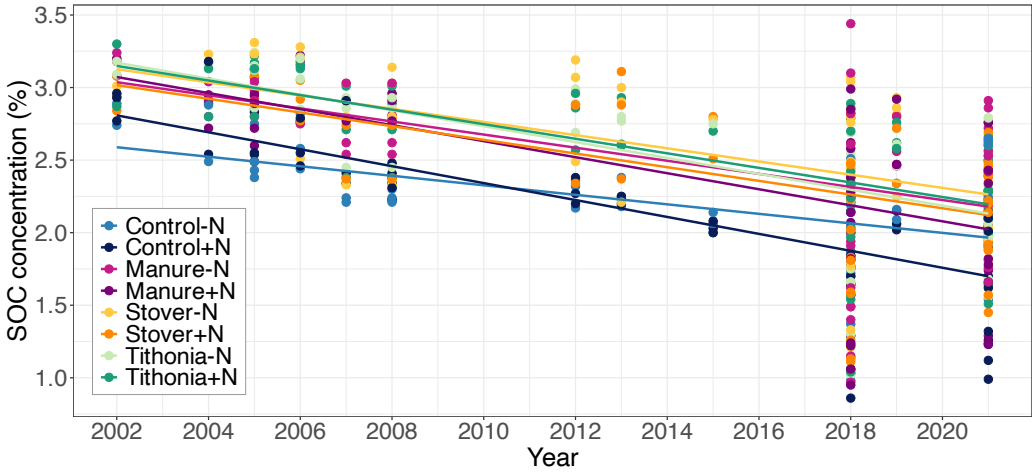
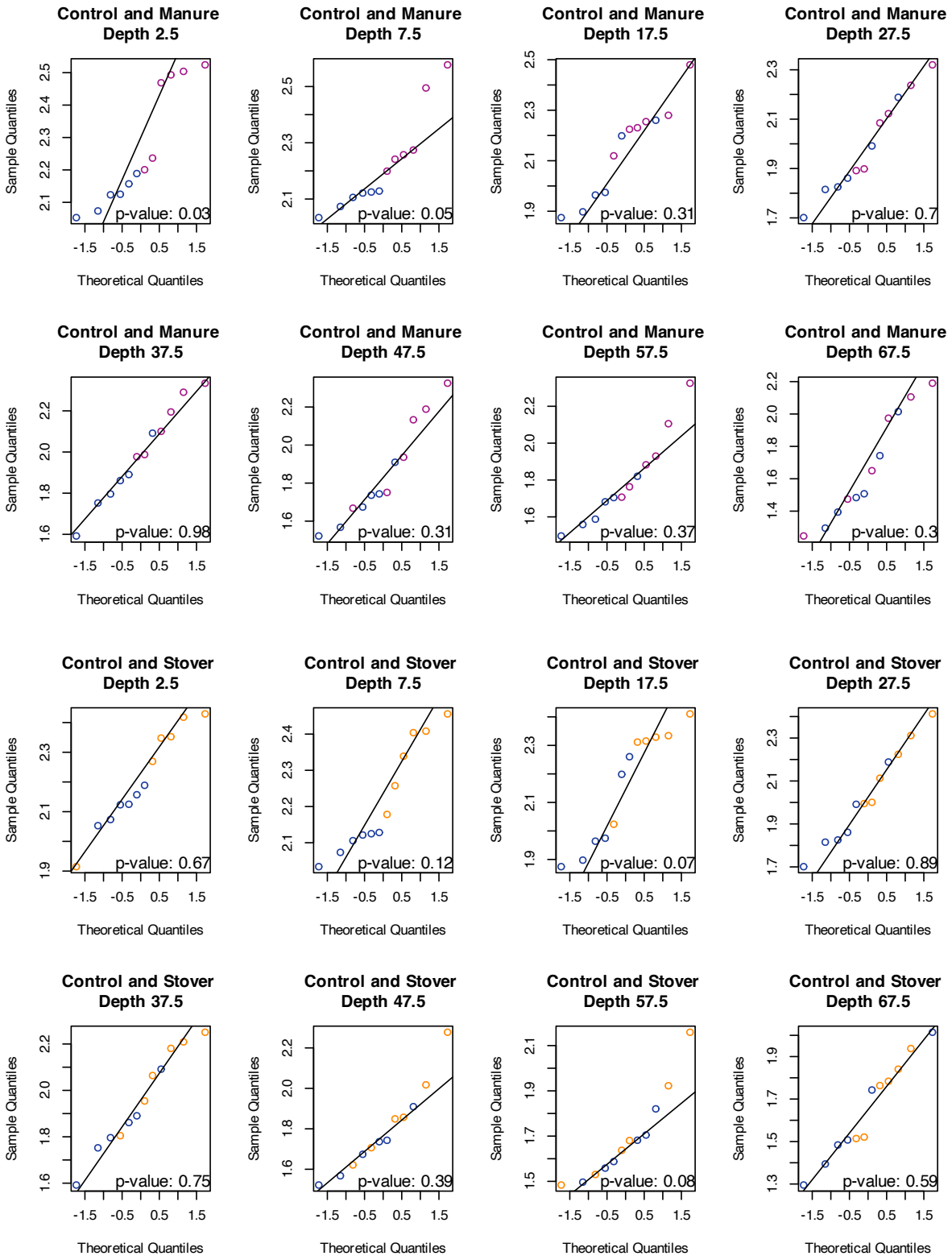


Figure S8: Annual change of SOC concentration (%) in the top 15 cm (data from Laub et al. (2023b))


Control and Manure
Depth 2.5
p-value: 0.03
Control and Manure
Depth 7.5
p-value: 0.05
Control and Manure
Depth 17.5
p-value: 0.31
Control and Manure
Depth 27.5
p-value: 0.7
Control and Manure
Depth 37.5
p-value: 0.98
Control and Manure
Depth 47.5
p-value: 0.31
Control and Manure
Depth 57.5
p-value: 0.37
Control and Manure
Depth 67.5
p-value: 0.3
Control and Stover
Depth 2.5
p-value: 0.67
Control and Stover
Depth 7.5
p-value: 0.12
Control and Stover
Depth 17.5
p-value: 0.07
Control and Stover
Depth 27.5
p-value: 0.89
Control and Stover
Depth 37.5
p-value: 0.75
Control and Stover
Depth 47.5
p-value: 0.39
Control and Stover
Depth 57.5
p-value: 0.08
Control and Stover
Depth 67.5
p-value: 0.59
Sample Quantiles
Theoretical Quantiles
-1.5 -0.5 0.5 1.5

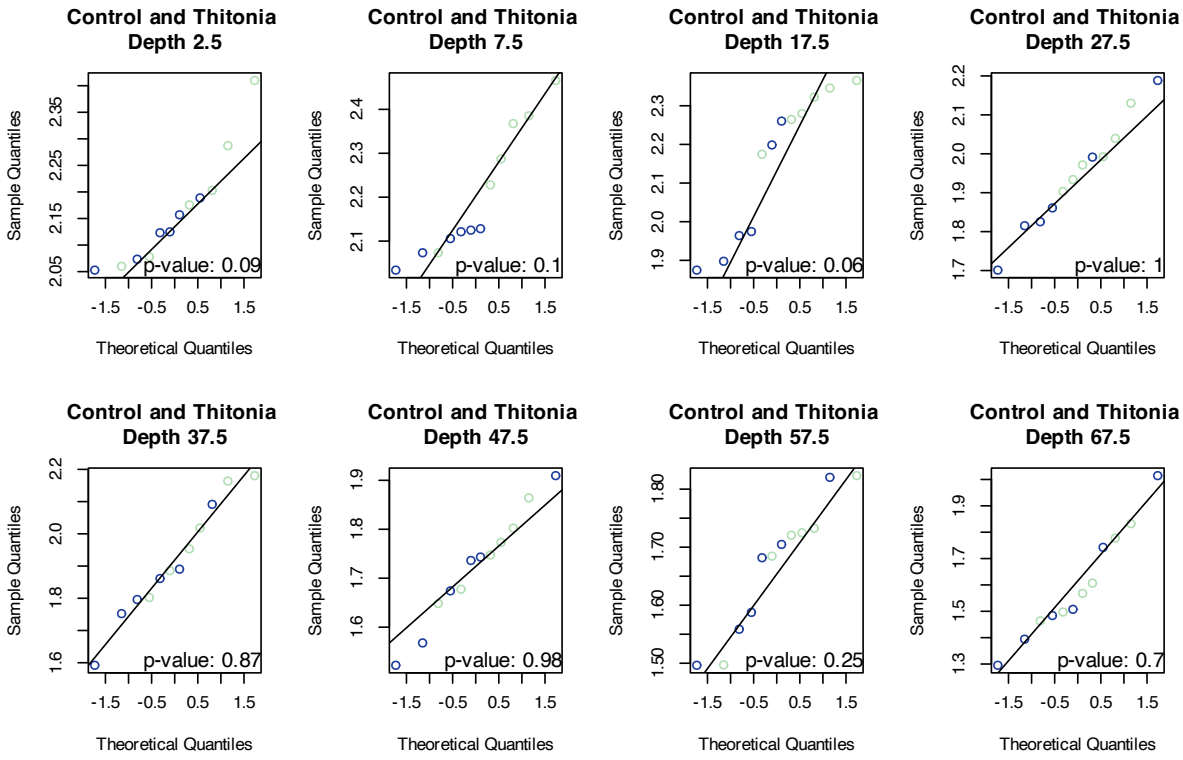


Figure S9: Q-Q plots and p-value of the Shapiro test in log-transformed carbon stocks across depth layers (depth is given in cm and represents the middle of a 5 cm depth layer)