

Table S1 Average mass of 1 liter of mixture of green waste compost (GWC) and excavated deep horizon for the different proportion of GWC, and average water mass (g) used for moistening every mixture at 80% of the water storage capacity according to its compost content (n = 16).

GWC %	0%	10%	20%	30%	40%	50%
Average soil mass	1291	1263	1178	1114	1040	972
Average water mass	279	294	305	328	345	351

Table S2 mean and standard error for all the treatments (C control, E earthworm, P plant, EP earth and plant), GWC: percentage of green waste compost in the mixtures (V/V),  $e_0$ : void ratio at non-swelling micropores (oven-dry) state,  $v_L$ : moisture ratio at macropore saturation,  $v_M$ : moisture ratio at micropore saturation,  $v_N$ : the moisture ratio at the shrinkage limit,  $K_{bs}$ : slope of the basic phase,  $K_{re}$ : slope of the residual phase,  $K_N$ : parameter related to shrinkage curve shape between the residual and basic phases,  $K_L$ : parameter related to shrinkage curve shape between the structural and interpedal phases, and the void ratio at the end of the shrinkage period ( $e_0$ ). The hydro-structural parameter representing the slope of the interpedal  $K_{ip}$  phase, the  $k_M$  parameter related to the shape of the soil shrinkage curves and  $K_{re}$  the slope of the residual phase were constant for all mixtures ( $K_{ip} = 1$ ), ( $k_M = -53$ ) and ( $K_{re} = 0$ ).

Treatments	GWC	$e_0$	$v_L$	$v_M$	$v_N$	$K_{bs}$	$K_{st}$	$K_N$	$K_L$
C	0%	0.91±0.02	0.83±0.00	0.66±0.00	0.48±0.00	0.46±0.01	0.08±0.01	0.24±0.03	3.57±0.17
C	10%	0.91±0.05	0.94±0.04	0.71±0.03	0.51±0.02	0.46±0.01	0.02±0.01	0.31±0.03	1.26±0.19
C	20%	1.08±0.02	1.01±0.01	0.73±0.01	0.52±0.01	0.34±0.03	0.06±0.02	0.70±0.06	2.86±0.32
C	30%	1.14±0.05	1.06±0.02	0.77±0.02	0.52±0.01	0.61±0.01	0.15±0.06	0.21±0.01	0.43±0.02
C	40%	1.29±0.02	1.36±0.02	0.99±0.01	0.34±0.02	0.24±0.01	0.10±0.02	0.28±0.00	3.25±0.13
C	50%	1.29±0.05	1.32±0.03	1.04±0.02	0.28±0.01	0.25±0.02	0.02±0.01	0.25±0.03	2.00±0.00
E	0%	0.98±0.02	0.95±0.02	0.73±0.01	0.46±0.01	0.41±0.00	0.02±0.00	0.22±0.01	1.31±0.00
E	10%	1.10±0.02	0.97±0.01	0.74±0.01	0.48±0.01	0.40±0.00	0.07±0.01	0.24±0.01	2.75±0.13
E	20%	1.14±0.05	1.05±0.01	0.72±0.00	0.47±0.01	0.37±0.02	0.13±0.02	0.38±0.04	0.88±0.36
E	30%	1.29±0.02	1.14±0.02	0.79±0.01	0.47±0.01	0.35±0.00	0.17±0.00	0.20±0.00	1.42±0.05
E	40%	1.28±0.04	1.26±0.04	1.06±0.03	0.42±0.02	0.27±0.00	0.13±0.05	0.13±0.01	1.25±0.13
E	50%	1.30±0.03	1.35±0.03	1.16±0.02	0.38±0.01	0.26±0.01	0.08±0.04	0.20±0.01	1.62±0.24
P	0%	0.94±0.02	0.93±0.01	0.75±0.01	0.51±0.01	0.41±0.02	0.05±0.02	0.26±0.02	1.15±0.14
P	10%	1.00±0.05	1.00±0.03	0.76±0.01	0.51±0.01	0.42±0.03	0.11±0.02	0.22±0.00	1.25±0.13
P	20%	1.15±0.02	1.05±0.02	0.73±0.00	0.45±0.01	0.31±0.04	0.18±0.01	0.48±0.06	0.55±0.14
P	30%	1.24±0.05	1.23±0.01	0.84±0.01	0.46±0.01	0.32±0.01	0.16±0.01	0.20±0.00	1.11±0.16
P	40%	1.29±0.01	1.38±0.01	0.96±0.01	0.48±0.01	0.38±0.02	0.13±0.00	0.12±0.01	1.00±0.00
P	50%	1.60±0.06	1.48±0.02	1.02±0.01	0.31±0.01	0.26±0.01	0.14±0.01	0.20±0.00	2.00±0.20
EP	0%	1.16±0.03	0.96±0.00	0.69±0.00	0.42±0.02	0.41±0.02	0.13±0.03	0.26±0.01	1.05±0.11
EP	10%	1.41±0.11	0.97±0.01	0.76±0.01	0.40±0.02	0.39±0.04	0.00±0.00	0.56±0.14	1.18±0.32
EP	20%	1.13±0.03	1.07±0.02	0.81±0.00	0.47±0.01	0.33±0.01	0.12±0.01	0.71±0.06	1.00±0.00
EP	30%	1.14±0.04	1.16±0.01	0.84±0.01	0.44±0.01	0.25±0.01	0.10±0.02	0.70±0.00	1.30±0.21
EP	40%	1.59±0.08	1.38±0.03	0.93±0.01	0.44±0.03	0.43±0.03	0.11±0.01	0.24±0.03	0.88±0.02
EP	50%	1.91±0.04	1.70±0.05	0.98±0.03	0.30±0.01	0.36±0.04	0.15±0.02	0.31±0.05	1.10±0.05

Table S3 mean and standard error (sd) for total plant biomass (g) and available volumetric water content ( $\text{cm}^3_{\text{water}} \cdot \text{cm}^{-3}_{\text{soil}}$ ), the results and sd of both equations summarizing the relation between total dried plant biomass (X, g) and plant available water content ( $\theta_{\text{Total}}$ ,  $\text{cm}^3_{\text{water}} \cdot \text{cm}^{-3}_{\text{soil}}$ ) were:  $X = 8.97 \cdot \theta_{\text{Total}} + 4.07$  and  $X = 8.97 \cdot \theta_{\text{Total}} + 2.69$  with and without earthworms.

GWC	$\theta_{\text{Total}}$ without earthworm ( $\text{cm}^{-3} \cdot \text{cm}^{-3}$ )	Total plant biomass without earthworm (g)	Prediction total plant biomass without earthworm (g)	sd prediction equation	$\theta_{\text{Total}}$ with earthworm ( $\text{cm}^{-3} \cdot \text{cm}^{-3}$ )	Total plant biomass with earthworm (g)	Prediction total plant biomass with earthworm (g)	sd prediction equation
0	0.19±0.01	4.62 ±0.19	4.25	0.39	0.22±0.02	6.37±0.43	5.62	0.39
10	0.21±0.02	4.48 ±0.26	4.63	0.39	0.23±0.01	6.14±0.47	6.00	0.39
20	0.25±0.02	4.32±0.20	5.01	0.38	0.27±0.03	5.86±0.19	6.38	0.38
30	0.29±0.01	4.93±0.12	5.39	0.38	0.30±0.01	6.03±0.24	6.76	0.38
40	0.33±0.01	6.35±0.19	5.77	0.39	0.34±0.05	6.94±0.42	7.14	0.39
50	0.39±0.01	6.48±0.31	6.15	0.39	0.41±0.01	8.07±0.38	7.52	0.39