S1. Supporting information for blocking structure

Based on the strong and consistent gradient we observed in %C content of the soils (Figure S1a) and a similar gradient for the %N content of the soils (Figure S1b), we applied a retrospective blocking structure to enable a more accurate assessment of non-additive effects. The plots with the highest %C content for each treatment were grouped into one block, the plots with the second highest %C content for each treatment were grouped into another block, etc. (Figure S1c).

(a)

2.18	2.42	2.59	2.73	3.29	3.51	3.54	3.42
2.21	2.28	2.45	2.65	2.89	3.22	3.29	3.36
2.10	2.24	2.29	2.73	2.90	2.86	3.13	3.16

(b)

0.21	0.23	0.24	0.26	0.30	0.31	0.31	0.31
0.22	0.22	0.23	0.25	0.27	0.29	0.29	0.30
0.22	0.22	0.22	0.25	0.27	0.26	0.28	0.28

(c)

3	3	4	3	1	4	4	4
3	2	2	2	2	1	4	4
3	3	1	2	1	1	2	1

Figure S1: The gradient in (a) %C and (b) %N observed in the plots, and (c) the retrospective blocking structure we applied, where each box represents a plot, numbers = blocks; and colours = treatments (grey = control, yellow = straw, beige = woodchip, purple = compost, light brown = straw-compost, chestnut brown = woodchip-compost).

S2. Additional per-treatment results

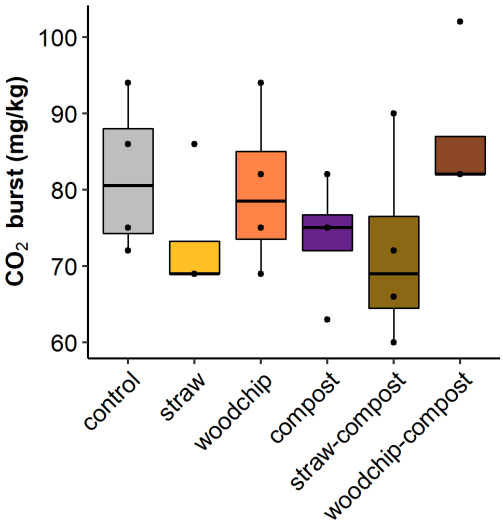

Figure S2: Soil respiration measured by the Solvita CO_2-burst method. Lower and upper hinges correspond to the 25th and 75th percentiles; black dots represent individual data points, occasionally overlapping (n = 4).

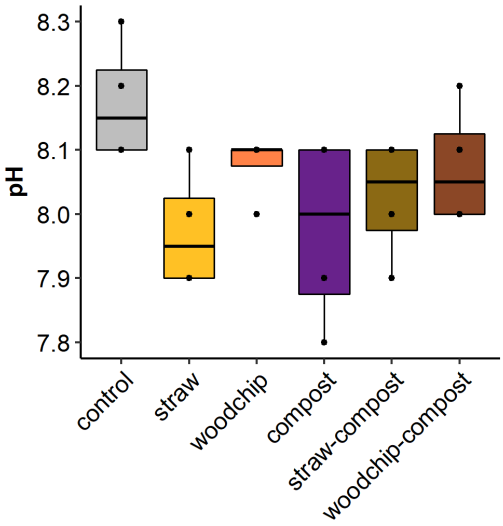

Figure S3: Soil pH after different treatments. Lower and upper hinges correspond to the 25th and 75th percentiles; black dots represent individual data points, occasionally overlapping (n = 4).

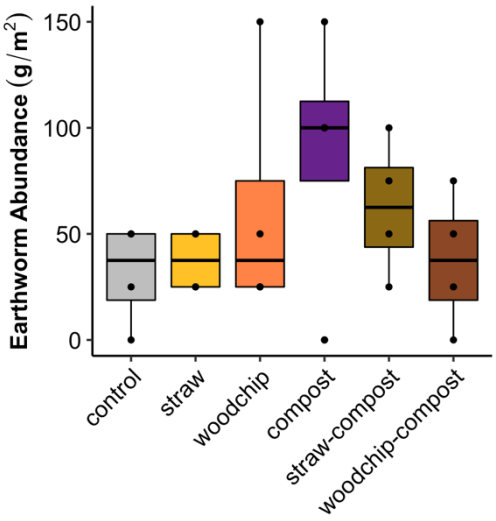

Figure S4: Earthworm abundance per plot after different treatments. Lower and upper hinges correspond to the 25th and 75th percentiles; black dots represent individual data points, occasionally overlapping (n = 4).

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S3. Calculation of amount of nutrients added to the soil via residue mixtures

First the mass of nutrients applied per plot was calculated, using the application rate of each residue (mg nutrient/plot) and the amount of each nutrient in the residues (g nutrient/kg residue). Then, using the bulk density (g/cm^3) and assuming nutrients from the residues applied remained in the top 20 cm of the soil (the sampling depth) resulting in a sampled soil volume of 0.2 m × 6 m × 2 m = 2.4 m^3/plot, the amount of nutrients added to the soil via the residues (mg nutrients/g soil sampled) was calculated as:

(mg nutrient / plot) / (m^3 / plot) / (g sampled soil / m^3) = mg nutrient / g sampled soil

Then, the difference between the amount of nutrients measured in each plot and the average amount of nutrients measured in the control plots was calculated as:

(mg nutrient / g soil in plot) – (mean mg nutrient / g soil in control plots) = mg nutrients / g soil increase relative to control

Then we determined this increase in soil available nutrients (relative to control) as a proportion of the amount of nutrients added to the soil via residue amendments:

(mg nutrient increase relative to control / g soil) / (mg nutrient added via residue amendment / g sampled soil) * 100%

Table S1: Increase in soil available nutrients (relative to control treatment) as a proportion (%) of the quantity of nutrients added to the soil (assuming nutrients added via residues remained in the top 20 cm of the soil that was sampled). Numbers in bold are significantly different ($p < 0.05$) from 0 (SEM indicated in parentheses).

	straw	woodchip	compost	straw-compost	woodchip-compost
P	**-95 (4)**	15(65)	12 (15)	-2 (10)	1 (7)
K	10 (37)	57 (68)	**53 (12)**	**31 (3)**	**49 (13)**
Mg	**-242 (42)**	38 (74)	25 (30)	15 (25)	**35 (10)**
N	**-19 (5)**	-3 (5)	-2 (4)	2 (3)	1 (3)

S4. Statistical outputs

Table S2: Statistical outputs of baseline soil properties. Significance indicated as **p < 0.05** and p < 0.1.

Variable	**two-way ANOVA** (per *factor*) (*residue*; *compost*; *residue*compost*)		**Levene**		**Shapiro-Wilk of residuals**	
	F	p	F	p	W	p
SOM (LOI)	2.433; 0.914; 0.938	0.116; 0.352; 0.410	2.092	0.114	0.966	0.578
Soil moisture	0.843; 2.425; 0.315	0.447; 0.137; 0.733	2.911	**0.043**	0.965	0.536
pH	1.142; 3.241; 0.345	0.341; 0.089; 0.713	0.881	0.513	0.932	0.108
C:N	0.427; 1.094; 0.328	0.659; 0.310; 0.725	0.809	0.558	0.948	0.244
Variable	**one-way ANOVA** (per treatment)		**Levene**		**Shapiro-Wilk of residuals**	
	F	p	F	p	W	p
SOM (LOI)	1.206	0.350	1.727	0.175	0.966	0.574
Soil moisture	1.067	0.420	1.598	0.208	0.947	0.228
pH	1.382	0.278	0.735	0.628	0.950	0.275
C:N	0.410	0.862	0.692	0.659	0.948	0.242

Table S3: Statistical outputs of per-treatment results. Significance indicated as **p < 0.05** and p < 0.1.

Variable	**two-way ANOVA** (per *factor*) (*residues*; *compost*; *residues*compost*)		**Levene**		**Shapiro-Wilk of residuals**	
	F	p	F	p	W	p
Available N	0.509; 2.566; 1.930	0.609; 0.127; 0.174	1.871	0.150	0.950	0.273
Mineralisable N	0.504; 2.936; 0.797	0.612; 0.104; 0.466	1.508	0.237	0.981	0.909
Mineralisable:Available	0.372; 0.597; 0.204	0.695; 0.450; 0.818	0.656	0.661	0.973	0.759
Available+Mineralisable	0.680; 3.877; 1.895	0.519; **0.065**; 0.179	1.313	0.303	0.958	0.391
Total biomass	1.625; 1.306; 0.303	0.225; 0.268; 0.742	0.883	0.513	0.971	0.697
CO_2 Burst	2.289; 0.033; 1.091	0.130; 0.859; 0.357	0.323	0.893	0.906	0.029
Earthworm abundance	0.136; 1.221; 1.945	0.874; 0.284; 0.172	0.449	0.809	0.956	0.361
P (mg/g soil)	1.547; 1.214; 0.440	0.240; 0.285; 0.651	1.300	0.308	0.967	0.586
K (mg/g soil)	0.291; 7.761; 0.009	0.751; **0.012**; 0.991	2.369	0.081	0.987	0.918
Mg (mg/g soil)	2.067; 4.953; 0.450	0.156; **0.039**; 0.645	2.573	0.063	0.960	0.437
SOM (LOI)	1.219; 0.574; 0.945	0.319; 0.458; 0.407	1.434	0.260	0.954	0.331
pH	1.459; 1.459; 3.405	0.259; 0.243; **0.056**	1.600	0.211	0.902	0.024
Bulk density	3.283; 1.269; 0.994	**0.062**; 0.276; 0.391	1.214	0.345	0.966	0.589
Aggregate stability	0.836; 0.022; 0.646	0.449; 0.883; 0.536	0.685	0.641	0.955	0.342
Quality impairment	0.653; 2.294; 3.568	0.532; 0.147; **0.050**	0.466	0.796	0.946	0.233