

## Supplementary Tables

**Supplementary Table 1.** *Statistical parameters (Df, F value and p value) for figure 2, which depicts the cumulative respiration during community establishment. Cumulative respiration for the overall incubation period (C) and cumulative respiration for the time-points chosen when the fluctuating temperature treatment was incubated at 23°C in both temperature regimes (D).*

Manuscript Figure	Model	Parameters		
Fig. 2C	aov(respiration ~ dilution treat. * temperature treat.)	Df	F value	<i>P value</i>
	dilution treat.	3	8.113	0.00065
	temperature treat.	1	3.301	0.08173
	dilution treat. : temperature treat.	3	21.325	< 0.0001
Fig. 2D	aov(log(respiration) ~ dilution treat. * temperature treat.)	Df	F value	<i>P value</i>
	dilution treat.	3	8.127	0.00066
	temperature treat.	1	18.215	0.00027
	dilution treat. : temperature treat.	3	0.94	0.4367

**Supplementary Table 2.** *Statistical parameters (Df, F value and p value) for the supplementary figure 1, which depicts the carbon quality measurements. Total organic carbon (A), and labile fraction of total organic carbon (B).*

Manuscript Figure	Model	Parameters		
Sup.Fig. 1A	aov(log(TOC) ~ dilution treat. * temperature treat.)	Df	F value	<i>P value</i>
	dilution treat.	3	22.66	<0.0001

	temperature treat.	1	0.066	0.7999
	dilution treat. : temperature treat.	3	1.479	0.2454
	aov(log(I_index) ~ dilution treat. + temperature treat.)	Df	F value	<i>P value</i>
Sup.Fig. 1B	dilution treat.	3	2.452	0.0849
	temperature treat.	1	0.049	0.8262

**Supplementary Table 3.** *Statistical parameters (Df, F value and p value) for the supplementary figure 2, which depicts the response of C-cycling processes to a 10°C increase in temperature (Q<sub>10</sub>). Temperature sensitivity for the distinct C-cycling processes: Q<sub>10</sub> of growth (A), respiration (B), and CUE (C) at the two temperature regime treatments within all dilution levels.*

<b>Manuscript Figure</b>	<b>Model</b>	<b>Parameters</b>		
Sup.Fig. 2A	aov(log(Q_growth) ~ dilution treat. * temperature treat.)	Df	F value	<i>P value</i>
	dilution treat.	3	1.062	0.3926
	temperature treat.	1	0.849	0.3707
	dilution treat. : temperature treat.	3	0.444	0.7246
Sup.Fig. 2B	aov(log(Q_respiration) ~ dilution treat. * temperature treat.)	Df	F value	<i>P value</i>
	dilution treat.	3	0.919	0.4541
	temperature treat.	1	0.442	0.5158
	dilution treat. : temperature treat.	3	0.116	0.9495
Sup.Fig. 2C	aov(log(Q_cue) ~ dilution treat. * incubation temperature)	Df	F value	<i>P value</i>
	dilution treat.	3	0.89	0.4687

incubation temperature	1	0.011	0.9196
dilution treat. : incubation temperature.	3	0.946	0.4434

**Supplementary table 4.** *Statistical parameters (Df, F value and p value) for the supplementary figure 3, which depicts the DNA yield.*

Manuscript Figure	Model	Parameters		
	aov(log(DNA_yield) ~ dilution treat. + incubation temperature + temperature treat.)	Df	F value	<i>P value</i>
Sup.Fig. 3	dilution treat.	3	5.162	0.0025
	incubation temperature	1	0.565	0.4543
	temperature treat.	1	1.296	0.258

**Supplementary Table 5.** *Soil properties from the TwinWin agricultural experiment used for preparing the dilution treatments. Metals are presented on g kg<sup>-1</sup>; and the cation exchange capacity on cmol kg<sup>-1</sup>.*

Soil properties	pH	Ca	P	K	Mg	S	B	Cu	Mn	Zn	Cation Capacity	C/N ratio
TwinWin Experiment	6.31	2925.0	14.7	256.5	164.2	20.16	0.56	22.44	6.83	9.91	20.14	13.68