

# Supplementary Material

## 1. Contents of this file

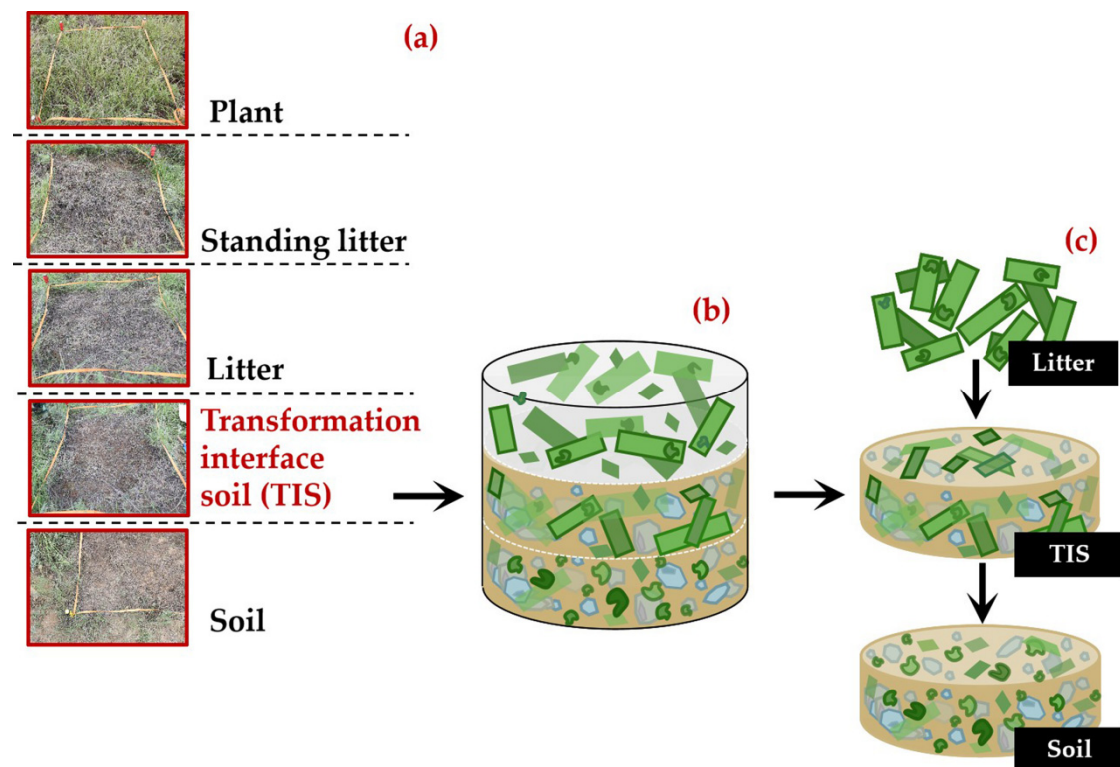
Figure S1

Figure S2

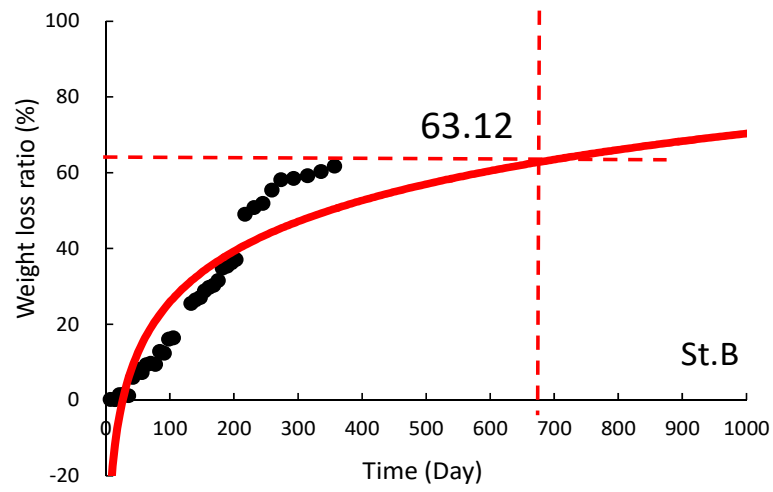
Table S1

Table S2

## 2. Supplementary Figures and Tables



**Figure S1.** Definition of the transformation interface soil layer (TIS). (a) Sample plot; (b) Spatial structure diagram of the transformation interface soil layer; (c) Division of litter, transformation interface soil layer (0-0.5cm), and mineral soil. TIS, transformation interface soil layer.



**Figure S2.** Dynamic fitting of weight loss rates and decomposition processes of *Stipa bungeana* (St. B).

**Table S1.** Basic information on the soil extracellular enzymes (EEAs) investigated here.

EEAs	Abbreviation	ECN	Corresponding substrate	Function
$\beta$ -1,4-glucosidase	BG	3.2.1.21	4-MUB- $\beta$ -D-glucoside	Cellulose degradation: hydrolyses glucose from cellobiose
$\beta$ -D-cellobiohydrolase	CBH	3.2.1.91	4-MUB- $\beta$ -D-cellobioside	Cellulose degradation: hydrolyses cellobiose dimers from non-reducing ends of cellulose molecules.
Leucine-aminopeptidase	LAP	3.4.11.1	L-leucine-7-amido-4-methylcoumarin hydrochloride	Proteolysis: hydrolyses leucine and other hydrophobic amino acids from the N-terminus of oligo- and polypeptides
$\beta$ -N-acetylglucosaminidase	NAG	3.2.1.14	4-MUB-N-acetyl- $\beta$ -D-glucosaminide	Chitin and peptidoglycan degradation: hydrolyses glucosamine from chitobiose, chitosan, and chitin
alkaline phosphatase	AP	3.1.3.1	4-MUB-phosphate	Organophosphorus decomposition: Hydrolyses terminal phosphate moieties from phospho-monoesters

**Table S2.** Variation in substrate properties.

Day	SOC	TN	TP	DC	DN	DP	MBC	MBN	MBP
s	(g·kg <sup>-1</sup> )	(g·kg <sup>-1</sup> )	(g·kg <sup>-1</sup> )	(mg·kg <sup>-1</sup> )	(mg·kg <sup>-1</sup> )	(mg·kg <sup>-1</sup> )	(mg·kg <sup>-1</sup> )	(mg·kg <sup>-1</sup> )	(mg·kg <sup>-1</sup> )
1	23.87±0.61	2.03±0.02	0.76±0.02	450.3±18.34	150.29±2.11	14.68±0.47	644.47±8.78	161.24±2.66	24.83±0.46
6	21.8±0.55	1.97±0.03	0.7±0.01	428.73±0.07	142.52±7.27	12.79±0.73	648.35±13.09	160.65±3.16	20.71±0.76
13	21.73±0.29	2.02±0.01	0.66±0.03	394.46±1.52	115.41±2.68	14.24±0.11	606.99±7	133.33±1.59	24.66±0.57
20	22.48±0.04	2.04±0.05	0.64±0.05	343.83±0.32	107.85±2.32	12.83±0.42	567.79±8.22	128.77±2.09	23.83±0.47
28	21.16±0.07	1.99±0.08	0.61±0.01	340.53±44.66	97.96±1.46	13.95±1.31	608.84±7.62	145.89±1.75	23.3±0.64
36	21.24±0.11	1.99±0.05	0.63±0.01	270.12±22.15	80.58±4.84	11.59±0.26	483.27±8.76	97.01±3.6	22.28±0.32
45	21.84±0.07	1.99±0.13	0.63±0.03	230.62±7.93	80.34±8.02	9.34±0.98	445.9±6.99	102.82±2.5	20.29±1.12
54	20.34±0.09	1.92±0.14	0.63±0.02	195.85±10.18	89.79±1.45	9.79±0.6	345.69±8.17	84.08±1.51	15.4±0.15
64	21.42±0.79	2.04±0.01	0.65±0.02	127.23±16.16	71.08±0.09	8.95±0.54	347.84±1.11	71.09±1.4	12.15±0.14
74	25.38±0.38	2.01±0.08	0.68±0.03	175.09±2.43	96.83±7.72	10.12±0.6	404.12±1.42	97.03±0.81	14.3±0.28
84	23.18±0.4	1.97±0.01	0.7±0.02	147.22±9.91	92.59±0.45	12.65±1.44	300.54±2.01	106.86±1.64	14.6±0.22
95	22.01±1.81	1.91±0.07	0.66±0.03	127.93±7.13	77.02±6.53	14.61±1.12	383.25±6.1	75.12±1.06	13.18±0.96
106	22.35±1.3	1.97±0.15	0.69±0.02	138.82±5.17	68.71±0.75	10.6±0.44	435.91±20.1	59.57±1.56	9.93±0.11
117	22.47±0.07	1.92±0.11	0.7±0.01	131.26±9.3	61.26±7.17	12.95±0.06	373.41±7.9	61.47±1.97	8.69±0.09
129	21.21±0.27	1.86±0.08	0.68±0.01	107.1±3.69	49.34±5.44	12.66±0.5	314.05±7.17	44.57±1.43	8.64±0.19
141	21.79±1.03	1.83±0.05	0.7±0.03	126.74±1.12	36.18±0.82	14.21±0.25	406.71±8.87	36.37±0.45	7.98±0.67
153	19.84±0.24	1.96±0.07	0.71±0.03	136.44±1.56	42.86±4.18	16.31±0.54	378.5±8.53	38.28±0.98	5.09±0.23
166	21.34±1.55	2.06±0.18	0.67±0.02	130.78±3.44	42.2±3.68	16.85±0.72	410.85±7.42	47.35±0.3	4.6±0.22
179	22.08±0.78	1.89±0.16	0.69±0.01	128.56±3.78	37.15±0.74	17.98±0.42	401.21±8.12	35.79±0.86	6.15±0.14
192	19.95±0.35	1.88±0.07	0.68±0.02	138.85±1.84	38.32±0.75	19.36±1.09	390.3±6.05	43.95±1.51	6.12±0.17

205	18.83±	1.85±	0.68±	127.85±	43.92±	18.33±	384.28±	41.8±	6.52±
	0.13	0.08	0.02	3.46	0.86	0.24	1.65	2.22	0.33
219	20.82±	1.94±	0.67±0	131.04±	30.9±	17.53±	354.3±6.05	32.41±	7.15±
	0.47	0.03		5.07	2.49	0.02		2.15	0.14
233	19.36±	1.84±	0.68±	145.1±1.52	35.75±	16.76±	369.15±	44.09±	5.34±
	1.21	0.06	0.01		1.77	0.19	0.23	1.94	0.23
247	18.71±	1.97±	0.66±	136.17±	43.28±	13.97±	388.96±	39.7±0.5	4.16±
	0.24	0.14	0.03	3.29	1.86	0.91	13.42		0.13
261	18.79±	2.05±	0.69±	133.7±0.79	34.61±	12.66±	379.99±	34.76±	7.56±
	0.26	0.03	0.01		3.47	0.54	0.52	0.4	0.43
276	18.98±	1.87±	0.71±	120.9±2.58	39.54±	12.04±	332.18±	37.85±	6.47±
	0.31	0.03	0.02		1.67	0.34	7.29	0.67	0.4
291	19.03±	1.88±	0.7±	106.4±	32.03±	11.88±	334.22±	25.23±	6.63±
	0.47	0.01	0.02	11.88	15.08	0.25	22.63	1.18	0.35
306	18.02±	1.94±	0.7±	133.6±8.49	46.85±	10.53±	282.11±	9.17±	9.75±
	0.83	0.13	0.02		1.48	0.32	6.76	2.03	1.06
321	17.56±	1.9±	0.68±	148.6±	30.91±	9.4±0.21	300.89±	14.31±	11.56±
	0.2	0.02	0.02	14.42	0.83		13.2	0.53	0.09
337	18.3±	1.92±	0.67±	178±5.09	64.34±	11.9±	223.11±	43.84±	14.5±
	1.34	0.05	0.01		3.49	0.14	13.83	3.99	0.18
353	20.95±	2.02±0	0.69±	147.2±6.79	55.31±	14.55±	191.33±	30.96±	12.06±
	0.77		0.02		5.17	0.21	2.83	1.04	0.8
369	19.78±	2.06±	0.68±	151±17.82	54±3.83	12.53±	203.33±	5.37±	8.69±
	1.63	0.01	0.01			0.46	5.34	1.46	0.44
385	20.23±	1.96±	0.69±0	140.6±4.24	56.9±	17±0.42	137.78±	7.36±1.1	11.06±
	2.59	0.18			1.41		21.37		0.09
401	21.23±	1.81±	0.68±	221.4±8.77	62.7±	10.48±	110.22±	29.66±	10.38±0
	0.17	0.18	0.02		3.23	0.46	13.83	1.71	
418	19.42±	1.92±	0.7±	203.2±2.83	61.84±	14.23±	145.33±	29.23±	8.5±2.3
	1.26	0.09	0.01		0.08	0.04	15.71	0.49	
436	17.39±	1.78±0	0.67±	259.2±	70.25±	19.55±	156.44±	23.19±	7.81±
	0.91		0.03	17.54	0.07	0.35	1.26	2.69	0.44
453	18.01±	1.7±	0.7±	248.8±4.53	75.35±	14.43±	179±3.3	15.92±	6.44±
	0.13	0.11	0.02		0.35	0.67		0.52	0.62
471	18.83±	1.82±	0.64±	254.8±1.7	74.32±	21.03±	164.67±	13.03±	5.31±
	1.15	0.04	0.03		3.73	0.74	4.09	3.38	1.5
490	18.09±	1.63±	0.67±	239.2±	96.8±	19.65±	182.22±	10.42±	8.31±
	0.65	0.06	0.02	48.08	7.28	0.35	6.29	0.22	0.8
512	17.37±	1.73±	0.66±	263.4±	94.23±	17.8±1.7	171.56±	9.86±	7.63±
	0.4	0.11	0.03	13.86	3.64		13.83	0.39	0.35