Responses of Soil C, N, P Stoichiometrical Characteristics, Enzyme Activities and Microbes to Land Use Changes in Southwest China Karst

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Supplementary Table S1: Basic information of sample squares in the present study

No. of square	Land use	Soil type	Average of vegetation coverage (%)	Slop (°)	Aspect	Elevation (m)	pH			Moisture content (%)		
							0~10cm	10~20cm	0~20cm	0~10cm	10~20cm	0~20cm
FL01	FL	Yellow soil	45.26	22	Southwest	1064	8.02	7.89	7.96	28.36	29.32	28.84
FL02	FL	Yellow soil	47.54	19	Southeast	1062	7.99	8.10	8.04	24.67	19.96	22.32
FL03	FL	Yellow soil	42.36	23	South	1072	8.07	8.15	8.11	28.40	28.47	28.44
FL04	FL	Yellow soil	49.28	20	Southwest	1055	8.13	8.21	8.17	27.47	25.23	26.35
FL05	FL	Yellow soil	45.45	18	Southeast	1071	8.25	8.28	8.26	27.55	26.36	26.96
FL06	FL	Yellow soil	46.26	20	Southwest	1075	8.38	8.27	8.32	26.93	27.39	27.16
FL07	FL	Yellow soil	40.78	22	Southwest	1081	7.82	7.72	7.77	27.63	26.48	27.06
FL08	FL	Yellow soil	41.85	26	Southwest	1081	8.11	8.04	8.08	25.31	24.58	24.95
FL09	FL	Yellow soil	49.55	15	Southwest	1082	8.11	8.12	8.12	38.04	33.28	35.66
FL10	FL	Yellow soil	47.78	25	Southwest	1079	7.85	7.86	7.85	35.28	34.06	34.67
FL11	FL	Yellow soil	47.65	15	Southeast	1070	7.96	8.12	8.04	25.56	25.06	25.31
SF01	SF	Yellow soil	45.63	25	Northwest	1075	8.09	8.14	8.11	27.12	27.18	27.15
SF02	SF	Yellow soil	62.68	25	Southwest	1069	8.42	8.40	8.41	23.16	23.36	23.26
SF03	SF	Yellow soil	63.56	20	Southwest	1062	8.42	8.43	8.42	26.89	26.95	26.92
AF01	AF	Yellow soil	49.55	15	South	1071	7.84	7.88	7.86	24.02	23.40	23.71
AF02	AF	Yellow soil	50.25	13	Northwest	1068	8.18	8.18	8.18	19.84	19.84	19.84
AF03	AF	Yellow soil	45.26	25	Southwest	1068	8.02	8.17	8.09	26.68	27.18	26.93
AF04	AF	Yellow soil	45.35	15	Southwest	1057	8.31	8.32	8.31	25.24	26.94	26.09
AF05	AF	Yellow soil	51.26	16	Southwest	1067	7.73	7.81	7.77	27.15	23.92	25.54
AF06	AF	Yellow soil	52.24	20	Southwest	1065	8.35	8.30	8.32	24.98	24.14	24.56
AF07	AF	Yellow soil	41.82	15	Southeast	1063	8.31	8.31	8.31	22.83	25.81	24.32

Not: FL, forest land; SF, slope farmland; AF, abandoned land.

Supplementary Table S2: Contents and stoichiometrical ratios of soil C, N and P of the sample squares

No. of square	C ($g \cdot kg^{-1}$)			N ($g \cdot kg^{-1}$)			P ($g \cdot kg^{-1}$)			C:N			C:P			N:P		
	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)
FL01	38.97	31.30	35.14	4.87	4.16	4.52	1.06	1.40	1.23	8.00	7.53	7.76	36.86	22.36	29.61	4.61	2.97	3.79
FL02	59.41	38.85	49.13	9.10	5.28	7.19	1.70	1.50	1.60	6.53	7.36	6.94	34.99	25.85	30.42	5.36	3.51	4.44
FL03	27.63	23.92	25.77	1.53	1.01	1.27	0.50	0.48	0.49	18.11	23.73	20.92	54.76	49.75	52.25	3.02	2.10	2.56
FL04	39.29	31.30	35.30	3.01	2.17	2.59	1.15	0.95	1.05	13.05	14.43	13.74	34.15	32.96	33.56	2.62	2.28	2.45
FL05	28.11	36.42	32.26	3.54	3.14	3.34	0.79	0.63	0.71	7.94	11.61	9.77	35.60	58.23	46.92	4.49	5.01	4.75
FL06	36.73	37.05	36.89	2.51	2.62	2.56	1.45	1.48	1.47	14.66	14.15	14.41	25.28	25.08	25.18	1.72	1.77	1.75
FL07	42.64	34.98	38.81	2.90	2.32	2.61	2.33	2.21	2.27	14.72	15.05	14.88	18.33	15.83	17.08	1.25	1.05	1.15
FL08	41.69	36.10	38.89	3.18	1.85	2.51	1.21	1.08	1.14	13.12	19.53	16.32	34.59	33.46	34.02	2.64	1.71	2.17
FL09	44.72	28.75	36.73	6.78	7.35	7.06	1.22	1.35	1.28	6.60	3.91	5.26	36.56	21.37	28.97	5.54	5.46	5.50
FL10	47.91	59.09	53.50	7.05	5.84	6.45	0.98	1.04	1.01	6.79	10.12	8.46	49.01	56.74	52.87	7.21	5.61	6.41
FL11	37.68	28.76	33.22	2.58	1.19	1.88	1.38	1.13	1.26	14.63	24.17	19.40	27.24	25.40	26.32	1.86	1.05	1.46
SF01	39.61	35.62	37.61	3.26	2.59	2.93	0.82	0.73	0.77	12.14	13.75	12.95	48.39	48.91	48.65	3.99	3.56	3.77
SF02	45.04	38.49	41.77	3.40	1.92	2.66	1.49	1.42	1.46	13.24	20.07	16.65	30.16	27.13	28.65	2.28	1.35	1.82
SF03	32.26	25.08	28.67	1.99	1.76	1.88	0.71	0.54	0.63	16.23	14.22	15.22	45.44	46.18	45.81	2.80	3.25	3.02
AF01	45.20	33.70	39.45	2.46	1.55	2.01	0.85	0.79	0.82	18.34	21.69	20.02	53.44	42.50	47.97	2.91	1.96	2.44
AF02	66.77	66.77	66.77	4.34	4.34	4.34	1.09	1.09	1.09	15.38	15.38	15.38	61.41	61.41	61.41	3.99	3.99	3.99
AF03	28.47	35.42	31.94	4.00	2.74	3.37	0.65	0.57	0.61	7.11	12.91	10.01	44.03	61.62	52.82	6.19	4.77	5.48
AF04	37.05	30.03	33.54	3.42	2.76	3.09	1.21	1.09	1.15	10.85	10.89	10.87	30.66	27.43	29.04	2.83	2.52	2.67
AF05	40.73	35.80	38.26	3.28	1.89	2.58	1.09	0.76	0.92	12.43	18.94	15.69	37.23	47.41	42.32	2.99	2.50	2.75
AF06	38.49	36.26	37.37	2.28	2.63	2.46	0.80	0.91	0.86	16.87	13.77	15.32	47.84	39.80	43.82	2.84	2.89	2.86
AF07	38.81	34.38	36.60	2.48	2.13	2.30	0.86	0.71	0.78	15.66	16.16	15.91	45.10	48.54	46.82	2.88	3.00	2.94

Supplementary Table S3: soil enzyme activities of the sample squares in period of April to May

No. of square	Urease			Sucrase			Alkaline phosphatase			Amylase			Protease		
	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)
FL01	0.64	0.59	0.61	45.18	21.90	33.54	10.37	7.38	8.87	0.92	0.50	0.71	0.38	0.34	0.36
FL02	0.62	0.52	0.57	46.82	25.90	36.36	7.08	4.05	5.57	0.65	0.32	0.49	0.39	0.36	0.38
FL03	0.59	0.48	0.53	21.40	17.46	19.43	4.22	4.05	4.13	0.73	0.40	0.57	0.32	0.28	0.30
FL04	0.69	0.57	0.63	23.32	16.04	19.68	6.45	4.69	5.57	0.88	0.79	0.84	0.34	0.24	0.29
FL05	0.88	0.64	0.76	48.56	20.32	34.44	15.30	8.44	11.87	1.32	0.54	0.93	0.50	0.39	0.44
FL06	0.64	0.60	0.62	30.80	24.20	27.50	8.02	7.03	7.53	0.90	0.58	0.74	0.31	0.24	0.27
FL07	0.85	0.69	0.77	37.24	30.40	33.82	7.03	5.80	6.42	1.58	0.78	1.18	0.27	0.24	0.26
FL08	0.66	0.52	0.59	31.34	23.26	27.30	9.32	5.80	7.56	0.66	0.42	0.54	0.32	0.26	0.29
FL09	0.99	0.91	0.95	56.94	38.66	47.80	18.17	14.84	16.51	1.72	0.72	1.22	0.47	0.38	0.42
FL10	0.95	0.86	0.91	49.62	40.22	44.92	19.60	12.73	16.17	1.80	0.96	1.38	0.50	0.39	0.45
FL11	0.55	0.46	0.51	43.82	22.62	33.22	6.33	4.75	5.54	0.81	0.45	0.63	0.26	0.22	0.24
SF01	0.74	0.54	0.64	21.74	12.24	16.99	4.39	3.05	3.72	0.39	0.30	0.35	0.36	0.28	0.32
SF02	0.56	0.56	0.56	31.12	19.04	25.08	6.20	5.79	6.00	0.28	0.22	0.25	0.35	0.31	0.33
SF03	0.53	0.42	0.48	14.66	12.56	13.61	5.21	3.51	4.36	0.27	0.20	0.24	0.36	0.31	0.33
AF01	0.62	0.56	0.59	44.40	16.08	30.24	7.60	5.21	6.40	0.84	0.48	0.66	0.32	0.28	0.30
AF02	0.54	0.54	0.54	20.34	20.34	20.34	4.56	4.56	4.56	0.67	0.67	0.67	0.30	0.30	0.30
AF03	0.51	0.38	0.44	27.64	22.90	25.27	9.08	6.67	7.88	0.79	0.56	0.68	0.28	0.26	0.27
AF04	0.48	0.41	0.45	34.16	21.86	28.01	5.98	4.05	5.01	0.83	0.52	0.68	0.28	0.26	0.27
AF05	0.44	0.30	0.37	32.72	18.82	25.77	6.37	4.79	5.58	0.72	0.41	0.57	0.31	0.26	0.29
AF06	0.53	0.53	0.53	31.98	15.78	23.88	5.35	4.85	5.10	0.51	0.32	0.42	0.30	0.27	0.29
AF07	0.53	0.43	0.48	33.60	14.92	24.26	3.84	2.67	3.26	0.53	0.31	0.42	0.31	0.29	0.30

Supplementary Table S4: soil enzyme activities of the sample squares in period of September to October

No. of square	Urease			Sucrase			Alkaline phosphatase			Amylase			Protease		
	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)	0~10 (cm)	10~20 (cm)	0~20 (cm)
FL01	0.55	0.44	0.49	48.86	39.27	44.06	8.92	6.91	7.91	0.65	0.33	0.49	0.44	0.33	0.38
FL02	0.91	0.85	0.88	62.80	43.78	53.29	11.05	10.26	10.65	0.68	0.42	0.55	0.63	0.36	0.50
FL03	0.45	0.41	0.43	25.82	12.91	19.37	4.22	2.99	3.61	0.56	0.28	0.42	0.29	0.14	0.21
FL04	0.65	0.59	0.62	36.42	20.72	28.57	5.85	3.92	4.89	1.06	0.44	0.75	0.30	0.24	0.27
FL05	0.78	0.50	0.64	48.30	43.12	45.71	11.43	7.21	9.32	1.02	0.84	0.93	0.97	0.40	0.69
FL06	0.52	0.49	0.50	25.06	18.56	21.81	6.85	5.09	5.97	0.98	0.33	0.66	0.28	0.24	0.26
FL07	0.82	0.48	0.65	42.08	21.98	32.03	6.43	4.74	5.59	1.40	0.52	0.96	0.26	0.22	0.24
FL08	0.63	0.88	0.76	37.10	31.68	34.39	9.09	8.61	8.85	1.18	1.08	1.13	0.35	0.41	0.38
FL09	0.94	0.89	0.91	58.36	52.26	55.31	18.71	11.83	15.27	1.52	1.09	1.31	0.75	0.42	0.58
FL10	0.92	0.73	0.83	55.60	40.64	48.12	17.85	9.74	13.80	1.32	0.85	1.09	1.06	0.42	0.74
FL11	0.53	0.49	0.51	40.26	22.54	31.40	5.33	2.61	3.97	1.06	0.68	0.87	0.28	0.20	0.24
SF01	0.61	0.42	0.52	26.48	10.68	18.58	2.29	2.11	2.20	0.32	0.20	0.26	0.32	0.26	0.29
SF02	0.53	0.46	0.50	32.40	22.16	27.28	4.75	4.05	4.40	0.24	0.14	0.19	0.47	0.29	0.38
SF03	0.48	0.34	0.41	23.26	15.14	19.20	3.17	1.23	2.20	0.20	0.12	0.16	0.31	0.20	0.26
AF01	0.52	0.42	0.47	30.44	21.61	26.03	5.45	5.06	5.25	0.54	0.36	0.45	0.24	0.21	0.22
AF02	0.79	0.79	0.79	17.96	17.96	17.96	3.76	3.76	3.76	0.56	0.56	0.56	0.43	0.43	0.43
AF03	0.47	0.45	0.46	31.90	14.62	23.26	5.49	5.73	5.61	1.51	1.57	1.54	0.56	0.31	0.43
AF04	0.46	0.44	0.45	21.40	13.14	17.27	2.76	1.11	1.93	0.77	0.47	0.62	0.41	0.23	0.32
AF05	0.38	0.28	0.33	38.54	18.94	28.74	5.45	3.58	4.52	0.97	0.95	0.96	0.27	0.22	0.25
AF06	0.44	0.49	0.46	33.90	15.70	24.80	4.26	1.25	2.75	0.46	0.20	0.33	0.48	0.26	0.37
AF07	0.41	0.45	0.43	30.86	16.26	23.56	2.08	1.96	2.02	0.35	0.19	0.27	0.33	0.36	0.34

Supplementary Table S5: Phospholipid fatty acids (PLFAs) of FL01, SF01 and AF01

PLFA	FL01		SF01		AF01	
	0-10 (cm)	10-20 (cm)	0-10 (cm)	10-20 (cm)	0-10 (cm)	10-20 (cm)
14:0	0.0748	0.0570	0.0544	0.0553	3.1846	0.0571
i16:0	1.2372	0.4271	0.4168	0.4202	1.4427	0.7092
20:0	0.1062	0.0650	0.0539	0.0576	0.5724	0.0392
16:1	0.6900	0.0711	0.0639	0.0663	0.6877	0.1171
18:0	0.4586	0.3292	0.3077	0.3148	0.8722	0.5045
18:1ω9c	0.1903	0.0309	0.0273	0.0285	0.4352	0.0374
18:2ω6t	0.0653	0.0602	0.0538	0.0559	0.1510	0.0573
18:2ω6c	0.6380	0.2411	0.1999	0.2136	1.1427	0.2214
18:3ω3	0.0578	0.0462	0.0451	0.0455	0.3820	0.0570
14:1	0.0551	0.0000	0.0000	0.0000	0.0097	0.0511
15:0	0.0632	0.0086	0.0043	0.0057	0.0869	0.0337
17:0	0.0558	0.0098	0.0049	0.0065	0.0983	0.3535
17:1	0.0771	0.0378	0.0412	0.0401	0.0940	0.0522
18:1ω9t	0.1003	0.1103	0.0642	0.0796	0.1748	0.0923
10Me16:0	0.0536	0.0640	0.0565	0.0590	0.1128	0.0416
10Me17:0	0.2561	0.2158	0.1542	0.1747	0.1043	0.1658
20:2	0.0657	0.0101	0.0296	0.0231	0.0717	0.0452
22:0	0.0380	0.0133	0.0158	0.0150	0.0849	0.0079
20:4ω6	0.0203	0.0093	0.0047	0.0062	0.0750	0.0000
23:0	0.0000	0.0000	0.0363	0.0242	0.0388	0.0817
22:2	0.0106	0.0087	0.0044	0.0058	0.0000	0.0217
24:0	0.0428	0.0000	0.0000	0.0000	0.0523	0.0000
20:5ω3	0.1636	0.1127	0.0760	0.0882	0.1008	0.0562
24:1	0.0201	0.0226	0.0202	0.0210	0.0876	0.0180
22:4	0.0351	0.0395	0.0497	0.0463	0.0068	0.0372
22:6ω3	0.1415	0.1927	0.1468	0.1621	0.1083	0.0808

Supplementary Table S6: PLFAs of FL02, SF02 and AF02

PLFA	FL02		SF02		AF02	
	0-10 (cm)	10-20 (cm)	0-10 (cm)	10-20 (cm)	0-10 (cm)	10-20 (cm)
14:0	0.0845	0.0275	0.0723	0.0319	0.0706	0.0510
i16:0	1.9845	0.2243	0.9567	0.2479	1.6355	0.8079
20:0	0.1296	0.0000	0.0699	0.0000	0.0957	0.0494
16:1	1.2031	0.0427	0.6476	0.1119	0.9050	0.4498
18:0	0.4759	0.1319	0.3186	0.1388	0.5727	0.3172
18:1ω7c	0.2715	0.0341	0.1322	0.0502	0.2935	0.1358
18:2ω6t	0.8416	0.0413	0.3890	0.0369	0.9147	0.3774
18:2ω6c	0.0486	0.0242	0.0358	0.0185	0.0380	0.0282
18:3ω3	0.0410	0.0000	0.0229	0.0000	0.0479	0.0160
i14:0	0.3061	0.3061	0.2659	0.0000	0.3466	0.1772
14:1	0.0507	0.0507	0.0578	0.0422	0.0950	0.0549
17:0	0.1903	0.1903	0.1933	0.0161	0.2132	0.0898
18:1ω7t	0.0533	0.0533	0.0628	0.0000	0.1603	0.0534
18:1ω6t	0.0293	0.0293	0.0278	0.0000	0.0403	0.0134
10Me16:0	0.0608	0.0608	0.0619	0.0599	0.0793	0.0664
10Me17:0	0.0821	0.0821	0.0743	0.0423	0.0767	0.0570
20:2	0.0136	0.0136	0.0744	0.0058	0.0320	0.0144
22:0	0.0876	0.0876	0.0816	0.0420	0.0793	0.0576
20:3ω6	0.0171	0.0171	0.0000	0.0326	0.0109	0.0000
20:3ω3	0.0906	0.0906	0.1432	0.0231	0.0845	0.0489
20:4ω6	0.1468	0.1468	0.1884	0.1875	0.1732	0.1638
23:0	0.0671	0.0671	0.0690	0.0368	0.0677	0.0388
22:2	0.0122	0.0122	0.0198	0.0000	0.0350	0.0117
24:0	0.0529	0.0529	0.0587	0.0291	0.0527	0.0313
20:5ω3	0.0000	0.0000	0.1201	0.0117	0.0039	0.0000
22:4	0.0097	0.0097	0.0105	0.0000	0.0111	0.0037

Supplementary Table S7: PLFAs of FL03, SF03 and AF03

PLFA	FL03		SF03		AF03	
	0-10 (cm)	10-20 (cm)	0-10 (cm)	10-20 (cm)	0-10 (cm)	10-20 (cm)
14:0	0.0437	0.0000	0.0531	0.0000	0.0384	0.0000
i16:0	1.0732	0.1053	1.2290	0.2294	0.8798	0.3959
20:0	0.1345	0.0000	0.1642	0.0000	0.1117	0.0000
16:1	0.7327	0.1418	0.9845	0.1375	0.6393	0.1972
18:0	0.3768	0.1697	0.4226	0.1680	0.3332	0.2503
18:1ω7c	0.1972	0.0599	0.1876	0.0263	0.1786	0.0429
18:2ω6t	0.8730	0.1705	0.8266	0.0939	0.7499	0.0978
18:2ω6c	0.0350	0.0266	0.0263	0.0107	0.0253	0.0183
18:3ω3	0.1296	0.0000	0.0534	0.0000	0.0606	0.0000
i14:0	0.1438	0.0000	0.0666	0.0000	0.0466	0.0000
14:1	0.2969	0.3805	0.0000	0.1132	0.0000	0.0000
15: 0	0.0275	0.0000	0.0458	0.0049	0.0445	0.0175
17:1	0.1429	0.0466	0.0167	0.0150	0.0326	0.0000
18:1ω7t	0.0724	0.0487	0.8601	0.1030	0.8686	0.1454
10Me16:0	0.0542	0.0558	0.0798	0.0600	0.0696	0.0557
10Me17:0	0.0670	0.0517	0.0637	0.0311	0.0542	0.0407
20:2	0.0174	0.0000	0.0269	0.0000	0.0197	0.0000
22:0	0.1276	0.0586	0.0847	0.0450	0.0734	0.0496
20:3ω3	0.2365	0.0000	0.1490	0.0000	0.1330	0.0000
20:4ω6	0.1944	0.2260	0.1945	0.1409	0.1639	0.1571
23:0	0.0616	0.0594	0.0625	0.0330	0.0556	0.0446
22:2	0.0160	0.0168	0.0352	0.0000	0.0000	0.0000
24:0	0.1314	0.0436	0.1305	0.0507	0.1101	0.0476
22:4	0.0000	0.0000	0.0497	0.0136	0.0424	0.0274