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Supplement of

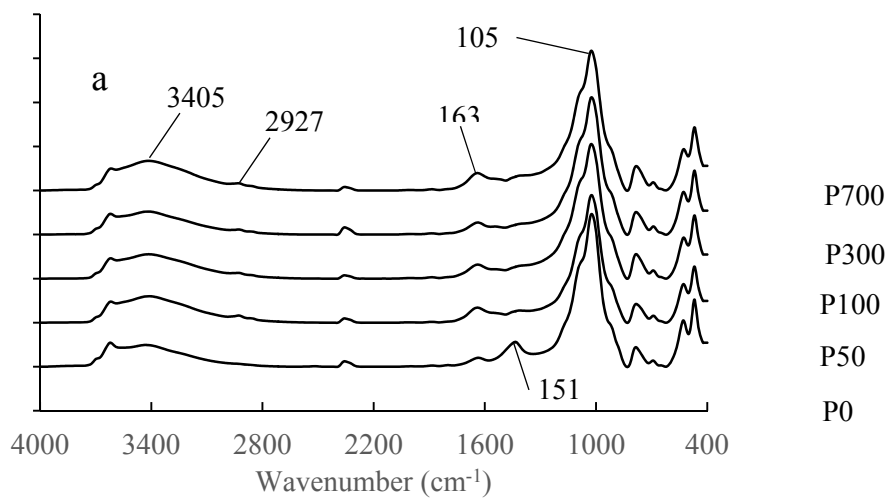
Microbial activity promoted with organic carbon accumulation in macroaggregates of paddy soils under long-term rice cultivation

Yalong Liu et al.

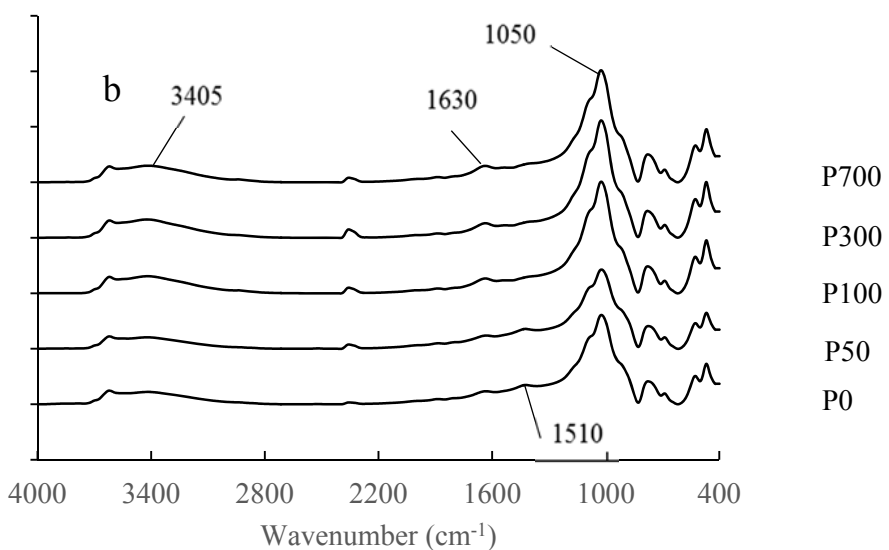
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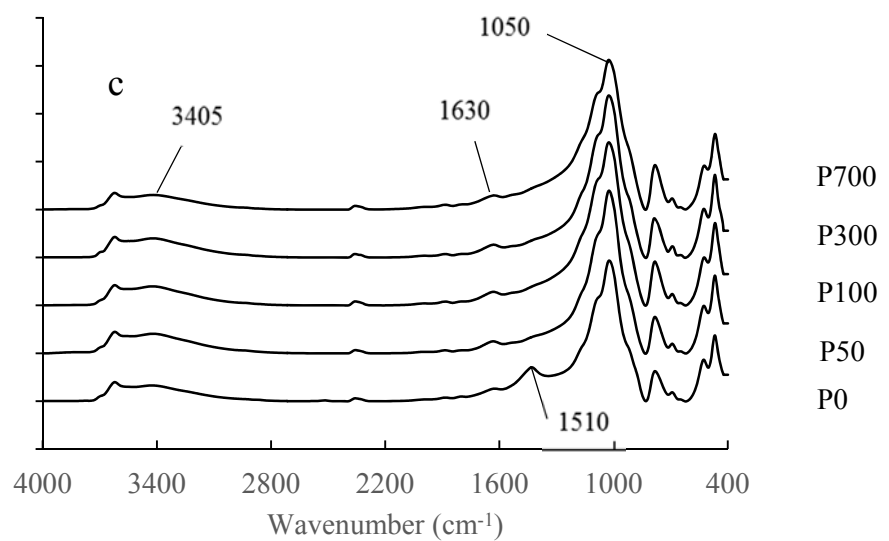
1 Supplement figure captions



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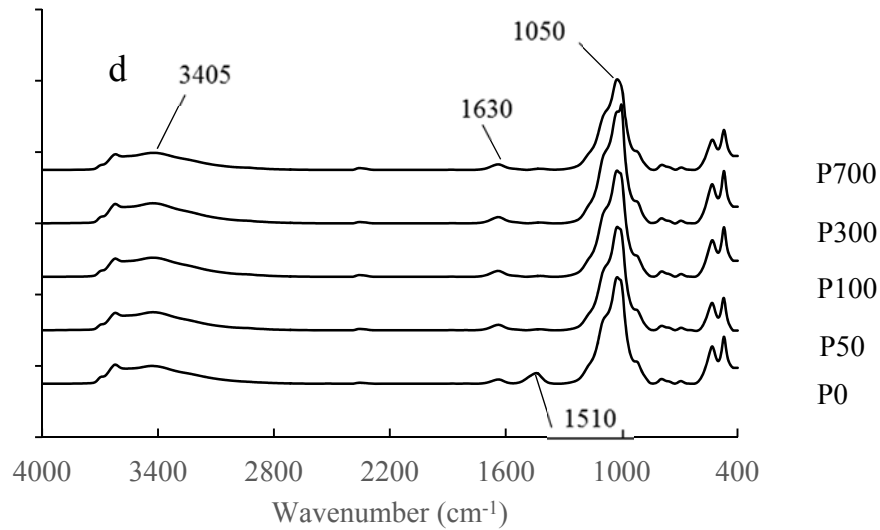


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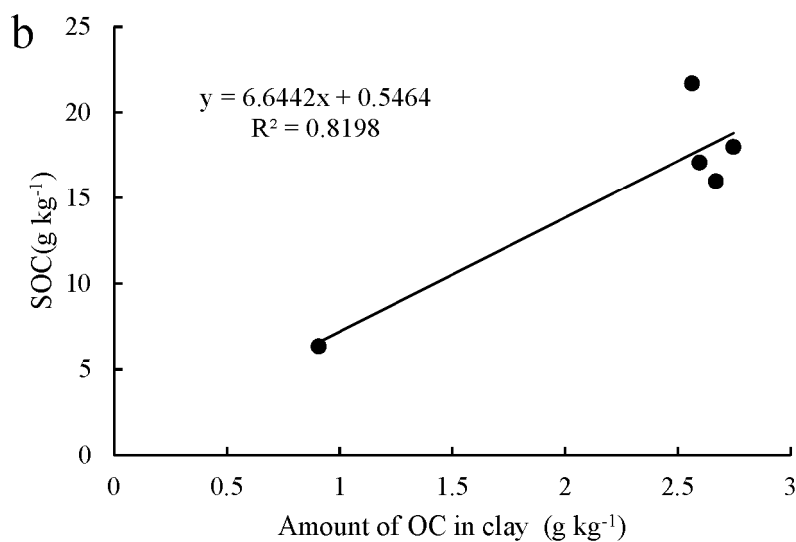
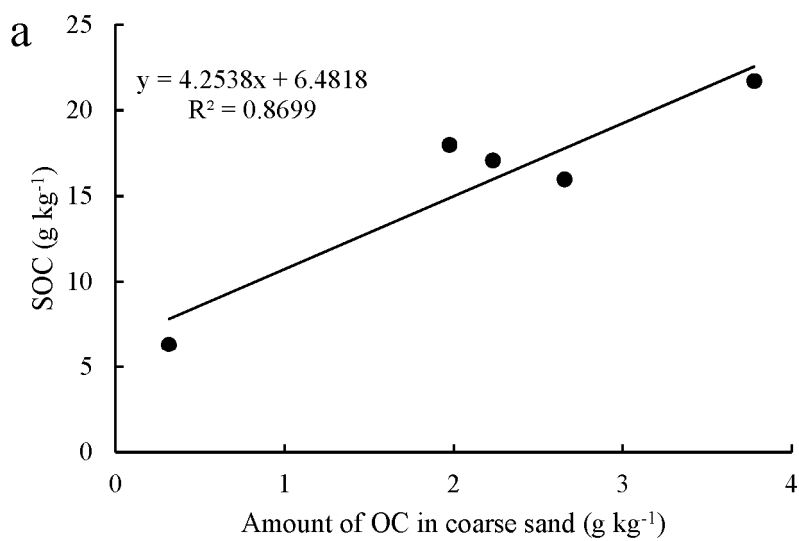
7 **Fig. S1** FTIR spectrum of aggregate size fractions of the paddy soil chronosequence

8 (a: 2000-200 μ m; b: 200-20 μ m; c: 20-2 μ m; d: <2 μ m). The code of P0 and P50-

9 P700 denotes respectively the uncultivated marsh soil, and soils shifted under

10 rice cultivation for 50-700 years.

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13 **Fig. S2** Correlation of bulk SOC with amount of OC in coarse sand (a) and clay (b)

14 size fractions of soil aggregates.

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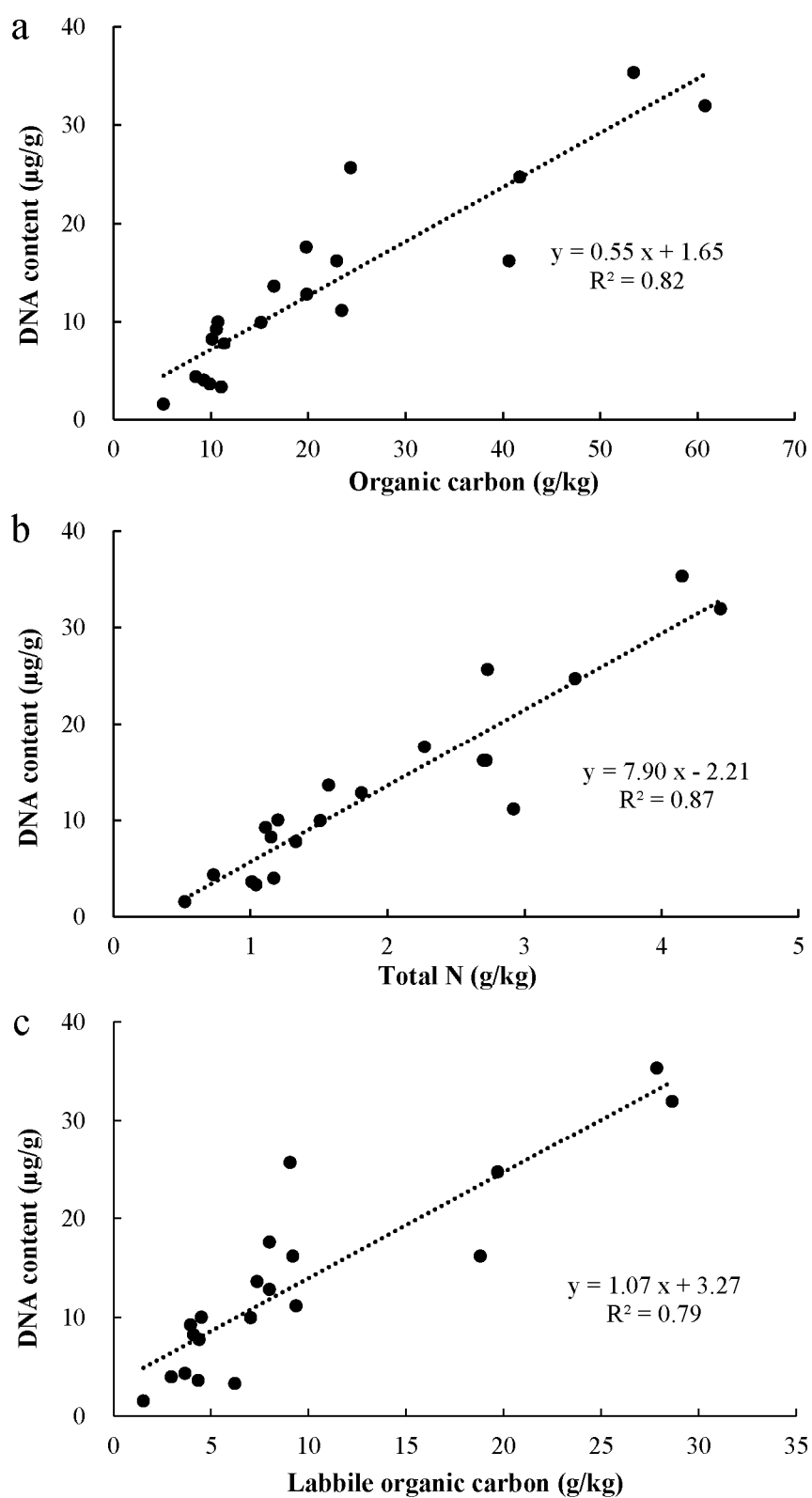
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22 **Fig. S3** Correlation of total DNA content to organic carbon (a), total N (b) and labile

23 carbon (c) of the size fractions of soil aggregates.

24 **Supplement Tables**

25 **Table S1.** Shannon diversity index of bacterial (BD), fungal (FD) and archaeal (ArD)
 26 of soil size fraction of the studied chronosequence. Different capital and low case letters
 27 in a single column indicate a significant ($p<0.05$) difference respectively between
 28 fractions of a single soil, and between soils for a single fraction.

Size fraction	Soil	Bacteria	Fungi	Archaeal
Coarse sand (2000-200 μ m)	P0	2.06 \pm 0.36 Abb	1.90 \pm 0.12 Ad	1.24 \pm 0.07Ab
	P50	2.12 \pm 0.19 ABb	2.84 \pm 0.29 Aa	1.47 \pm 0.04Aa
	P100	2.76 \pm 0.02 Aa	2.58 \pm 0.04 Aab	1.52 \pm 0.12Aa
	P300	2.55 \pm 0.28 Aab	2.57 \pm 0.14 Aab	1.48 \pm 0.06Aa
	P700	2.35 \pm 0.23 Ab	2.33 \pm 0.08 Abc	1.48 \pm 0.07Aa
Fine sand (200-20 μ m)	P0	1.09 \pm 0.42 Cd	1.97 \pm 0.21 Aa	1.29 \pm 0.02Ac
	P50	2.27 \pm 0.60 ABabc	1.93 \pm 0.20 Ba	1.23 \pm 0.02Bc
	P100	2.74 \pm 0.23 Aa	1.99 \pm 0.14 Ba	1.62 \pm 0.04Aa
	P300	2.10 \pm 0.09 Bb	1.72 \pm 0.21Bac	1.41 \pm 0.03Ab
	P700	1.75 \pm 0.12 Bc	1.80 \pm 0.06 Ba	1.43 \pm 0.02Ab
Silt (20-2 μ m)	P0	1.76 \pm 0.07 Bd	1.02 \pm 0.16 Bcd	1.21 \pm 0.03Ab
	P50	1.94 \pm 0.18 Bcd	2.05 \pm 0.20 Ba	1.40 \pm 0.03Aa
	P100	2.54 \pm 0.14 Aa	1.12 \pm 0.24 Ccd	1.50 \pm 0.05Aa
	P300	1.98 \pm 0.11 Bc	1.60 \pm 0.17 Bb	1.42 \pm 0.03Aa
	P700	2.25 \pm 0.12 Ab	1.29 \pm 0.29 Cabc	1.47 \pm 0.02Aa
Clay (<2 μ m)	P0	1.93 \pm 0.06 Ac	0.64 \pm 0.01 Cb	1.39 \pm 0.12Aa
	P50	2.44 \pm 0.10 Aab	1.31 \pm 0.48 Ca	1.44 \pm 0.06Aa
	P100	2.65 \pm 0.15 Aa	1.34 \pm 0.63 BCa	1.53 \pm 0.11Aa
	P300	2.33 \pm 0.11 Ab	1.54 \pm 0.25 Ba	1.58 \pm 0.12Aa
	P700	2.57 \pm 0.22 Aab	1.13 \pm 0.15 Cab	1.48 \pm 0.06Aa

30 **Table S2** Activity of invertase, urease, acid phosphatase, β -glucosidase, β -cellobiosidase and peroxidase in particle size fractions of soils over
 31 the chronosequence

Size fraction	Soil	Invertase	Urease	Acid phosphatase	β -glucosidase	β -cellobiosidase	Peroxidase
Coarse sand (2000-200 μ m)	P0	66.01 \pm 1.97	0.34 \pm 0.19	0.0546 \pm 0.0020	12.16 \pm 2.70	2.28 \pm 1.46	1.22 \pm 0.43
	P50	141.47 \pm 1.48	0.90 \pm 0.18	0.1689 \pm 0.0030	262.12 \pm 12.90	48.78 \pm 5.45	1.47 \pm 0.28
	P100	97.83 \pm 1.68	0.68 \pm 0.20	0.0873 \pm 0.0014	151.19 \pm 18.81	41.88 \pm 5.36	2.90 \pm 0.52
	P300	113.29 \pm 2.57	0.58 \pm 0.01	0.0735 \pm 0.0007	170.24 \pm 25.41	30.49 \pm 5.87	3.81 \pm 0.74
	P700	127.55 \pm 2.96	1.06 \pm 0.05	0.1414 \pm 0.0130	370.78 \pm 28.84	113.52 \pm 9.93	5.12 \pm 0.98
Fine sand (200-20 μ m)	P0	4.87 \pm 0.20	0.55 \pm 0.01	0.0238 \pm 0.0012	26.13 \pm 3.40	2.29 \pm 0.59	1.15 \pm 0.34
	P50	7.47 \pm 1.42	0.67 \pm 0.02	0.0268 \pm 0.0009	29.32 \pm 4.49	2.12 \pm 0.70	1.92 \pm 0.32
	P100	7.44 \pm 2.25	0.71 \pm 0.11	0.0492 \pm 0.0045	68.57 \pm 11.04	10.65 \pm 0.86	2.68 \pm 0.44
	P300	15.61 \pm 2.37	1.11 \pm 0.05	0.0522 \pm 0.0087	80.07 \pm 10.16	12.84 \pm 1.12	2.79 \pm 0.51
	P700	18.78 \pm 0.96	1.73 \pm 0.02	0.0355 \pm 0.0001	103.15 \pm 7.49	10.47 \pm 0.56	2.77 \pm 0.40
Silt (20-2 μ m)	P0	3.48 \pm 0.02	0.44 \pm 0.01	0.0140 \pm 0.0003	2.05 \pm 0.35	1.75 \pm 0.45	0.99 \pm 0.28
	P50	7.31 \pm 0.19	0.51 \pm 0.20	0.0300 \pm 0.0007	59.15 \pm 3.96	4.97 \pm 0.99	2.07 \pm 0.3
	P100	7.31 \pm 0.02	0.75 \pm 0.01	0.0300 \pm 0.0013	20.66 \pm 3.20	0.49 \pm 0.41	1.49 \pm 0.14
	P300	6.14 \pm 0.02	0.92 \pm 0.05	0.0522 \pm 0.0139	56.28 \pm 5.23	4.69 \pm 0.58	3.38 \pm 0.42
	P700	8.66 \pm 0.97	1.38 \pm 0.05	0.0326 \pm 0.0009	61.476 \pm 2.84	4.90 \pm 1.05	4.94 \pm 0.25
Clay (<2 μ m)	P0	23.46 \pm 0.64	0.98 \pm 0.06	0.0362 \pm 0.0040	6.06 \pm 0.49	0.19 \pm 0.06	1.46 \pm 0.34
	P50	14.13 \pm 2.67	1.31 \pm 0.04	0.0582 \pm 0.0004	31.14 \pm 3.29	1.84 \pm 0.37	2.50 \pm 0.30
	P100	13.01 \pm 0.99	0.61 \pm 0.14	0.0730 \pm 0.0032	30.29 \pm 2.98	1.46 \pm 0.55	2.22 \pm 0.37
	P300	13.88 \pm 0.35	1.12 \pm 0.07	0.1023 \pm 0.0058	37.63 \pm 4.37	4.48 \pm 0.72	2.89 \pm 0.59
	P700	12.94 \pm 3.36	1.88 \pm 0.18	0.0653 \pm 0.0018	32.64 \pm 2.71	2.58 \pm 0.36	3.82 \pm 0.65

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Table S3 Mean soil respiration quotient (portion of respired CO₂-C to SOC) and soil metabolic quotient (ratio of respired CO₂-C to MBC) of the soil aggregate size fractions estimated using the data in Table 3 in the text. N.d., not determined due to the very small amount of the fraction

Size fraction	Soil	RQ	qCO ₂
Coarse sand (2000-200µm)	P0	n. d.	n. d.
	P50	0.044	2.95
	P100	0.055	2.17
	P300	0.039	1.15
	P700	0.048	1.97
Fine sand (200-20µm)	P0	0.057	3.01
	P50	0.127	3.48
	P100	0.076	2.84
	P300	0.083	2.82
	P700	0.062	2.74
Silt (20-2µm)	P0	0.058	1.79
	P50	0.069	2.50
	P100	0.123	4.34
	P300	0.110	3.20
	P700	0.128	3.89
Clay (<2µm)	P0	0.053	3.19
	P50	0.072	5.00
	P100	0.061	5.02
	P300	0.044	3.17
	P700	0.059	4.40