Supplementary Material

Supplementary Table S1. Detailed information on the classification of three soil types and the stratification of their profiles.

Chinese soil geogenetic types	Chinese soil classification systems	Soil pedogenic environment	Layers of soil profile	Boundary	Color	Structure	Soil texture	Soil cement persistence	Abundance of soil gel film	Soil streaks	Rock layer cementation degree
Order: Luvisols Suborder： Temperate-Humid Luvisols Group: Dark-brown soil Subgroup: Typic Dark-brown soil Family: Gravelly Dark-brown soil Series: Thin-Humus Gravelly Dark-brown soil	Order: Luvisols Suborder: Humid Luvisols Great Group: Ferri-Humid Luvisols Subgroup: Humic-Humid Luvisols	Large terrain: Hilly	Ap 0-17 cm	Clear wavy	10Y R3/4	Granular	Sandy loam	Loose	None	Iron-Manganese oxide	None
		Slope and direction: slight slope (2～6°), east	AB 17-52 cm	Clear wavy	10Y R3/3	Blocky	Clay loam	Friable	None	Iron-Manganese oxide	Weak
		Parent rock type: Basalt	Bt 52-70 cm	Clear smooth	10Y R4/4	Prismatic	Clay	Friable	None	Silicon Dioxide	Weak
		Parent material type: residue	C 70-105 cm	Clear smooth	2.5Y 4/3	Massive	Clay	Firm	None	Silicon Dioxide	Weak
Order: Gleysols Suborder: Mollic	Order: Gleysols Suborder: Typic	Large terrain: Hilly	Ap 0-23 cm	Gradual smooth	7.5Y R4/4	Granular	Loam	loose	None	Iron-Manganese oxide	None

Gleysols Group: Meadow soil Subgroup: Typic Meadow soil Family: Loamic Meadow soil Series: Thin decomposed Meadow soil	Gleysols Great Group: Dark chernozemic gleyic normal soil Subgroup: Common Dark Chernozemic Gleyic Normal Hydromorphic Soil	Slope and direction: slight slope (2～6°), northwest	AB 23- 52 cm	Clear smooth	7.5Y R6/6	Platy	Loam	loose	None	Iron-Manganese oxide	None
		Parent rock type: Quaternary loose sediment	Bg 52-96 cm	Clear smooth	10Y R6/6	Platy	Clay loam	Friable	Less	Iron-Manganese oxide	Weak
		Parent material type: loess-like material slope deposits	Br 96-125 cm	Abrupt smooth	7.5Y R5/8	Blocky	Clay	Friable	More	Iron-Manganese oxide	Weak
Order: Anthrosols Suborder: Hydragric Anthrosols Group: Paddy Soil Subgroup: Submergenic Paddy Soils Family: Shallow Tidal Mud-Sandy Paddy Field Series: Thin-decomposed Shallow Tidal Mud-Sandy Paddy Field	Order: Anthrosols Suborder: Hydragric Anthrosols Great Group: Hapludanthric Hydroponic Anthrosols Subgroup: Gleyic-Hypolimnetic Leptosol Hydroponic Anthrosols	Large terrain: Hilly	Ap1 0-21 cm	Diffuse smooth	7.5Y R3/3	Granular	Loam	loose	None	Iron-Manganese oxide	None
		Slope and direction: slight slope (2～6°), west	Ap2 21-44 cm	Diffuse smooth	7.5Y R3/4	Platy	Loam	loose	None	Iron-Manganese oxide	None
		Parent rock type: Quaternary loose sediment	Br 44-99 cm	Gradual smooth	10Y R3/6	Platy	Loam	loose	None	Iron-Manganese oxide	None
		Parent material type: diluvium	C 99-129 cm	Gradual smooth	7.5Y R3/2	Granular	Loam	loose	Rare	Iron-Manganese oxide	Weak

Supplementary Table S2. Semi-quantitative analysis of clay mineral composition in different soil layers of three soil types.

Chinese soil geogenetic types	Soil profile levels	W_B/%						Kübler index	ICI
		w(Ver)	*w*(Kaol)	*w*(Chl)	*w*(I)	*w*(S)	*w*(I/S)		
Dark-brown soil	Ap	14.0	16.6	5.2	24.5	4.3	35.4	0.69	1.56
	AB	11.8	10.4	6.8	39.1	12.3	19.6	0.57	0.96
	Bt	9.6	8.6	8.8	48.4	11.9	12.7	0.49	0.78
	C	6.9	6.8	13.4	46.7	16.7	9.5	0.38	0.33
Meadow soil	Ap	19.8	8.9	4.4	28.4	3.6	34.9	0.60	0.93
	AB	14.6	6.8	6.8	40.1	7.8	23.9	0.51	0.88
	Bg	10.6	6.2	8.0	48.9	8.4	17.9	0.50	0.84
	Br	7.1	5.6	10.6	54.2	13.6	8.9	0.61	0.78
Paddy soil	Ap1	13.1	13.6	3.1	23.9	3.4	42.9	0.68	0.88
	Ap2	11.2	9.9	5.7	39.7	6.7	26.8	0.63	0.82
	Bt	9.5	8.7	6.3	46.9	9.9	18.7	0.57	0.77
	C	6.7	7.8	7.9	51.4	14.1	12.1	0.41	0.41

Note: Ver: Vermiculite; Kaol: kaolinite; Chl: chlorite; I: illite; S: montmorillonite; I/S: Montmorillonite illite mixed layer; ICI: Illite chemical index. The data presented in Table S2 represented the best result obtained from three repeated trials.