1   Supplementary Material

2   Table S1. Phosphorus sorption index (PSI, L kg^{-1} soil) calculated at four levels of P addition
3   levels ($n = 4$).

Site	Position	Treatment	500 mg P kg^{-1}	1000 mg P kg^{-1}	5000 mg P kg^{-1}	10,000 mg P kg^{-1}
El Verde	Slope	Anoxic	616±70a	505±14a	1018±19a	1513±31a
		Oxic	363±18b	405±14b	877±29b	1236±27b
	Valley	Anoxic	637±86a	740±28b	1622±62a	2079±109a
		Oxic	-385±152b	1229±147a	1408±16b	1893±62a
Rio Icacos	Slope	Anoxic	1552±267a	785±59a	972±25a	1398±17a
		Oxic	783±21b	565±5b	614±48b	967±29b
	Valley	Anoxic	12143±4275a	1257±150a	1218±26a	1883±157a
		Oxic	-1635±2527b	954±53a	1073±59a	1266±157b

4   Different letters indicate significant differences at α = 0.05.

5   Table S2. Saturation index of vivianite calculated by Visual MINTEQ using soluble Fe(II),

6   inorganic P, and solution pH as input. Results from slope soils from El Verde under anoxic

7   conditions are shown. Bold values indicate oversaturation.

P loading rate (mg P kg^{-1} soil)	500	1000	5000	10,000
Average HCl-Fe(II) (mg g^{-1} soil)	3.4	3.4	3.4	3.4
Estimated water-soluble Fe(II) (mg L^{-1})[a]	34	34	34	34
Average P in solution (mg P L^{-1})	5.5	26.4	249.5	571.3
Soil pH[b]	5.9	5.9	5.9	5.9
Saturation index[c]	**3.5**	**4.8**	**5.9**	**5.9**

8   [a] Peretyazhko and Sposito (2005) found that ~10% of the HCl-Fe(II) was soluble in H_2O in a

9   similar soil after anaerobic incubation, which is consistent with Fe(II) sorption reported by

10   Wilmoth et al. (2018); the soil:water ratio was 1:10 (mass:volume).

11   [b] estimated based on similar soils (Lin et al. unpublished)

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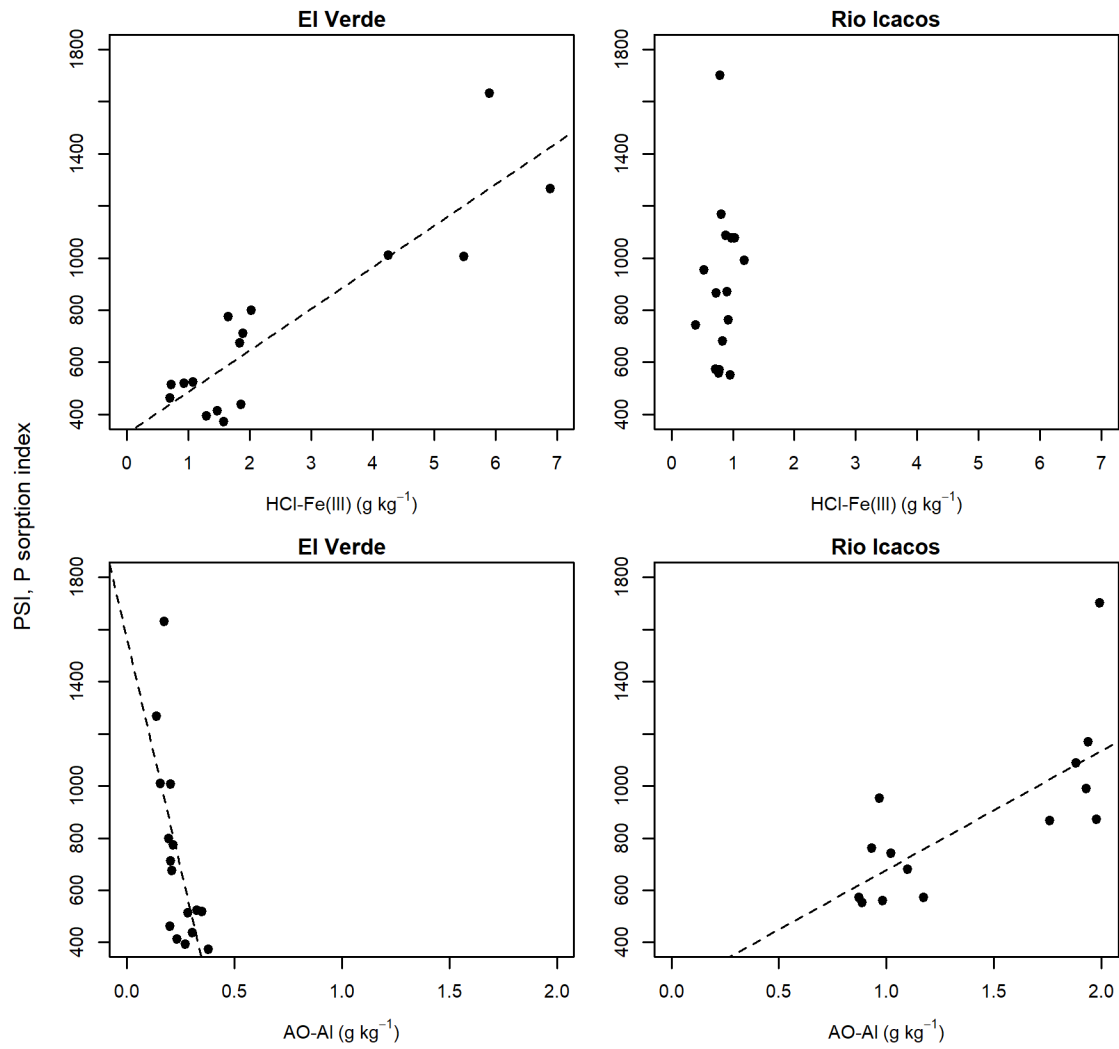
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16 Figure S1. Correlations between phosphorus sorption index (PSI) and soil HCl-extractable

17 Fe(III) (HCl-Fe(III)) and ammonium oxalate-extractable Al (AO-Al) concentrations at El Verde

18 and Rio Icacos. Dash lines indicate significant correlations.

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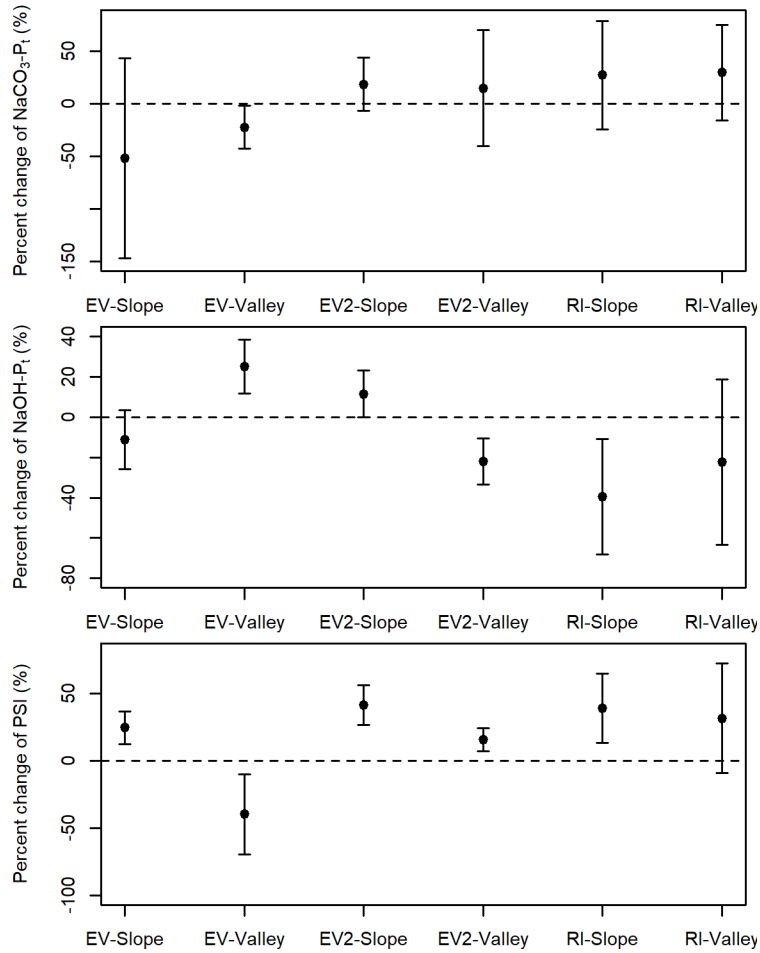
Figure S2. Percent changes of soil NaHCO$_3$-extractable total P (NaHCO$_3$-P$_t$) concentration,

NaOH-extractable total P (NaOH-P$_t$) concentration, and phosphorus sorption index (PSI) in

response to anoxic conditions. Error bars indicate 95% confidence interval. EV-2 refers to the 2nd

sampling of El Verde soils for measuring the solubility of sorbed P.

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