Supplementary Information

Table S1. Soil properties (bulk density, water content, Fe concentrations and total C and N) measured for soils from valley and slope position in wet tropical forest in Puerto Rico. An asterisk (*****) designates statistically significant differences between soils ($p<0.01$).

Soil	Bulk Density ($g\ cm^{-3}$)	Water content (%)	pH	Fe (II) ($\mu g\ Fe^{2+}\ g\ soil^{-1}$)	Fe (III) + Fe (II) ($\mu g\ Fe\ g\ soil^{-1}$)	Total C (%)	Total N (%)
Slope	0.54 ±0.1	30.1±4.2	5.2±0.15	53.3±9	1100±90	3.81±0.2	0.3±0.0
Valley	0.63 ±0.1	*55.2±8.3	5.0±0.11	*340±10	*5700±270	4.17±0.2	0.4±0.1

Figure S1. Soil Fe (II) concentrations ($\mu g\ Fe\ g\ soil^{-1}$) measured after to oxic and anoxic pre-incubations for soils from valley (up) and slope (bottom) positions in wet tropical forest in Puerto Rico. An asterisk (*****) designates statistically significant differences between treatments ($p<0.01$).

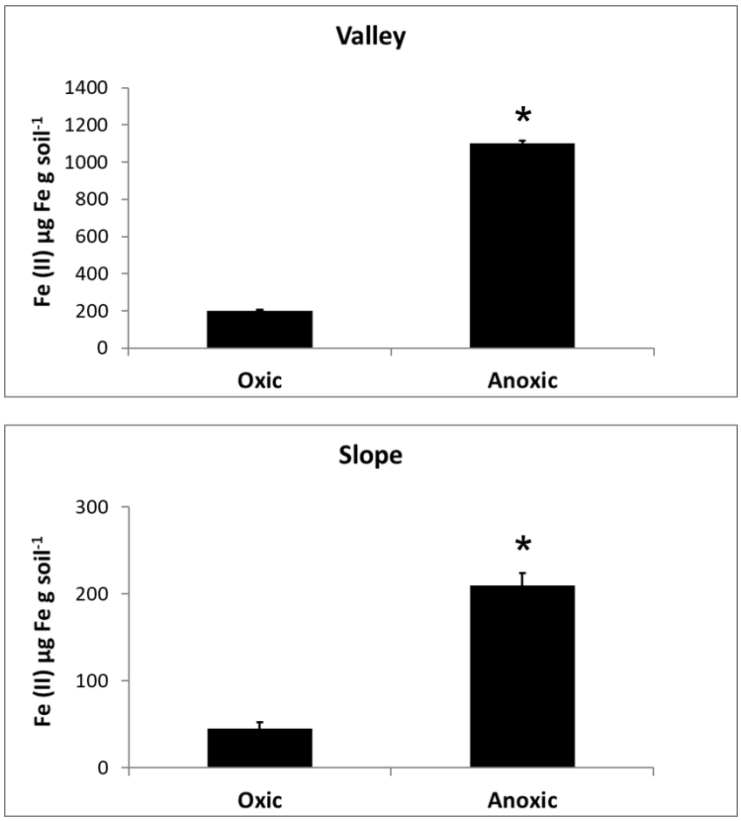

Table S2. P concentrations in different soil P fractions (μg P g soil^{-1}) and soil CO_2 production (μg C g soil^{-1} day^{-1}) measured for soil from valley and slope positions in wet tropical forest in Puerto Rico, pre-incubated under oxic (O+) or anoxic (O-) headspace and amended with P and C or DI water (control). * designates statistically significant differences between samples ($p<0.01$).

Soil	Treatment	Resin P	Microbial P	Inorganic P	Organic P	Respired CO_2
Valley	P+C, O+	1.8±1.8	26.6±0.1	49±12.3	173.2±25.0	8.1±2.0
Valley	P+C, O-	4.7±0.5	25.2±0.5	38.0±4.3	197.1±20.7	*5.0±1.1
Valley	DI only, O+	0.1±0.0	15.8±1.0	25.2±6.0	179.9±12.2	1.8±0.4
Valley	DI only, O-	0.3±0.1	12.9±0.8	17.9±3.4	169.6±36.3	1.1±0.3
Slope	P+C, O+	37.1±16.0	133.4±10.0	148.4±20.2	59.1±11.2	122.5±16.2
Slope	P+C, O-	37.4±10.0	*102.0±7.0	*73.9±30.5	*188.3±24.7	*80.1±9.7
Slope	DI Only, O+	0.1±0.0	82.1±4.0*	52.2±9.6*	44.6±7.2	32.6±3.7
Slope	DI Only, O-	0.1±0.0	*49.2±7.0*	*31±2.2	*119.8±37.1	24.7±1.5

Fe (II)	
Factor	**P**
Soil type	<0.001
Headspace	<0.001
Substrate	NA
Soil type/Headspace	<0.321
Soil type/Substrate	NA
Headspace/Substrate	NA
Soil type/Headspace/Subsrate	NA

CO2	
Factor	**P**
Soil type	<0.001
Headspace	<0.238
Substrate	<0.001
Soil type/Headspace	<0.001
Soil type/Substrate	<0.001
Headspace/Substrate	<0.214
Soil type/Headspace/Subsrate	<0.135

Pmic	
Factor	**P**
Soil type	<0.001
Headspace	<0.169
Substrate	<0.001
Soil type/Headspace	<0.001
Soil type/Substrate	<0.001
Headspace/Substrate	<0.197
Soil type/Headspace/Subsrate	<0.187

NaOH Pi	
Factor	**P**
Soil type	<0.125
Headspace	<0.001
Substrate	<0.001
Soil type/Headspace	<0.001
Soil type/Substrate	<0.118
Headspace/Substrate	<0.434
Soil type/Headspace/Subsrate	<0.356

NaOH Po	
Factor	**P**
Soil type	<0.001
Headspace	<0.001
Substrate	<0.242
Soil type/Headspace	<0.001
Soil type/Substrate	<0.187
Headspace/Substrate	<0.115
Soil type/Headspace/Subsrate	<0.254

Table S3. Three-way ANOVA test was preformed, in which soil type, headspace treatment and substrate addition were included as independent variables and Fe (II) concentrations, soil CO_2 production, microbial P, NaOH Pi and NaOH Po were included as dependent variables. Substrate addition was not included as an independent variable for Fe (II) variable.