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*Soil Research*

### **Supplementary Material**

#### **Impact of green manure crop species on rhizosphere soil phosphorus**

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Table S1. Mean concentrations of P fractions (all in mg P kg<sup>-1</sup>) in bulk soil and the change in the P fraction, and total P depletion in the rhizosphere relative to bulk soil ( $\Delta P$ ) for green manure plant species grown in the pumice and volcanic ash soils after 40 days. Values for  $\Delta P$  represent the estimated marginal mean (via the two-way linear model) and its standard error in parentheses; values are bolded when the 95% confidence interval excludes zero; positive and negative  $\Delta P$  indicate rhizosphere P accumulation and depletion, respectively. Bolded values denote cases where the difference in P concentrations between the bulk soil and the rhizosphere soil is significant according to the 95% CI. Ef = early flowering; Lf = late flowering.

P fractions		-----Pumice-----					-----Volcanic ash-----				
		Ef-lupin	Lf-lupin	Pea	Chickpea	Buck-wheat	Ef-lupin	Lf-lupin	Pea	Chickpea	Buck-wheat
		(mg kg <sup>-1</sup> )									
Labile inorganic P	Bulk soil	35	37	38	39	35	79	88	81	88	87
	ΔP	<b>-6.11</b>	<b>-8.44</b>	-1.06	<b>-5.52</b>	<b>-4.56</b>	<b>-11.3</b>	<b>-13.3</b>	<b>-5.5</b>	<b>-8.99</b>	<b>-5.42</b>
		<b>(2.04)</b>	<b>(1.91)</b>	(1.91)	<b>(1.91)</b>	<b>(2.04)</b>	<b>(1.91)</b>	<b>(2.2)</b>	<b>(2.04)</b>	<b>(2.04)</b>	<b>(2.04)</b>
Labile organic P	Bulk soil	59	71	71	66	58	99	99	95	103	97
	ΔP	<b>17.7</b>	<b>27.8</b>	3.24	<b>14.2</b>	<b>10.5</b>	0.46	<b>10.5</b>	1.93	2.42	2.72
		<b>(3.83)</b>	<b>(3.33)</b>	(3.33)	<b>(3.33)</b>	<b>(3.56)</b>	(3.33)	<b>(3.85)</b>	(3.56)	(3.56)	(3.56)
	Bulk soil	271	278	283	282	259	953	993	962	1011	987

Moderately labile inorganic P	$\Delta P$	<b>-63</b> <b>(17.6)</b>	<b>-61.5</b> <b>(16.5)</b>	-19.6 (16.5)	-23.9 (16.5)	-20.1 (17.6)	<b>-101</b> <b>(16.5)</b>	-30 (19.1)	<b>-38.5</b> <b>(17.6)</b>	-19.9 (17.6)	-16.2 (17.6)
Moderately labile organic P	Bulk soil	556	493	496	473	506	721	752	745	783	733
	$\Delta P$	-44.5 (24.3)	-13.7 (22.8)	<b>-62.3</b> <b>(22.8)</b>	-23 (22.8)	-7.26 (24.3)	-23.5 (22.8)	26 (26.3)	-34 (24.3)	-1.69 (24.3)	1.49 (24.3)
Acid-soluble inorganic P	Bulk soil	138	128	130	113	135	277	259	235	244	237
	$\Delta P$	-15.6 (11.5)	-14.5 (10.8)	-6.29 (10.8)	-0.56 (10.8)	-0.02 (11.5)	-16.5 (10.8)	2.21 (12.4)	9.5 (11.5)	-9.17 (11.5)	-3.31 (11.5)
Stable inorganic P	Bulk soil	28.7	21.5	24.1	23.3	24.4	224	215	211	210	214
	$\Delta P$	-6.49 (3.56)	-0.76 (3.85)	1.09 (3.56)	-1.83 (3.33)	-1.93 (3.56)	<b>-17.7</b> <b>(3.33)</b>	<b>-10.3</b> <b>(3.85)</b>	1.92 (3.56)	<b>-7.41</b> <b>(3.56)</b>	<b>-9.84</b> <b>(3.85)</b>
	Bulk soil	53.7	61.5	74.6	74.8	53.4	181	180	180	197	188

Stable	$\Delta P$	<b>-28.9</b>	<b>-34.9</b>	-17.3	<b>-22.3</b>	<b>-18.9</b>	<b>-27.1</b>	<b>-36.5</b>	-2.04	-11.8	-9.32
organic P		<b>(8.87)</b>	<b>(9.59)</b>	(8.87)	<b>(8.3)</b>	<b>(8.87)</b>	<b>(8.3)</b>	<b>(9.59)</b>	(8.87)	(8.87)	(8.87)
Residual P	Bulk soil	61.2	68.0	68.8	70.1	62.6	227	228	219	214	204
	$\Delta P$	-4.01	-8.4	-5.15	-1.47	-6.34	-4.99	2.2	12	-1.48	-6.14
		(5.8)	(5.42)	(5.42)	(5.42)	(5.8)	(5.42)	(6.26)	(5.8)	(5.8)	(5.8)
Total	Bulk soil	472.7	464.5	475.1	457.3	453.4	1533	1555	1489	1553	1525
inorganic P	$\Delta P$	<b>-91.2</b>	<b>-84.4</b>	<b>-21.1</b>	<b>-31.8</b>	<b>-26.6</b>	<b>-147</b>	-51.3	-32.5	-45.5	-)2.9
depletion		<b>(7.79)</b>	<b>(16.2)</b>	<b>(9.91)</b>	<b>(4.6)</b>	<b>(10.1)</b>	<b>(21.2)</b>	(61.1)	(38.2)	(42.8)	(25.6)
Total	Bulk soil	668.7	625.5	641.6	613.8	614.4	1001	1031	1020	1083	1018
organic P	$\Delta P$	<b>-62.4</b>	-30.0	<b>-72.4</b>	-31.1	-15.6	-50.1	+0.05	-34.1	-11.1	-5.1
depletion		<b>(19.5)</b>	(20.0)	<b>(24.5)</b>	(20.2)	(12.6)	(41.9)	(50.1)	(27.2)	(21.1)	(31.8)

