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**Intensive annual crop production and root development in a tropical acid soil under long-term no-till and soil-amendment management**

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**Supplementary Table 1. ANOVA significance for soil chemical attributes**

Depth (m)	Blocks	Treatments (T)	Time Sampling (TS)	T x TS
<u>pH</u>				
0-0.05	0,9228	<0,0001	0,0016	0,1288
0.05-0.10	0,1300	<0,0001	0,2819	0,1127
0.10-0.20	0,2485	<0,0001	0,9301	0,1000
0.20-0.40	0,0616	0,0993	0,4655	0,4166
0.40-0.60	0,1287	0,0791	0,0030	0,7699
<u>Al<sup>3+</sup></u>				
0-0.05	0,5284	<0,0001	<0,0001	0,0902
0.05-0.10	0,0967	<0,0001	<0,0001	0,1022
0.10-0.20	0,0731	<0,0001	<0,0001	0,1001
0.20-0.40	0,5437	<0,0001	<0,0001	0,3778
0.40-0.60	0,1030	0,1169	<0,0001	0,5764
<u>P<sub>resin</sub></u>				
0-0.05	0,2912	0,0631	0,0008	0,1097
0.05-0.10	0,5513	0,0045	0,0001	0,6258
0.10-0.20	0,5221	0,7737	0,0044	0,9640
0.20-0.40	0,6342	0,3784	0,3290	0,7700
0.40-0.60	0,4747	0,4598	<0,0001	0,4193
<u>SOM<sup>†</sup></u>				
0-0.05	0,8583	0,0062	<0,0001	0,7489
0.05-0.10	0,5321	0,0038	<0,0001	0,2456
0.10-0.20	0,1587	<0,0001	<0,0001	0,1146
0.20-0.40	0,2360	0,0067	0,0040	0,8120
0.40-0.60	0,2288	0,0001	0,0001	0,5102
<u>S-SO<sub>4</sub><sup>2-</sup></u>				
0-0.05	0,3120	0,0091	0,03576	0,1002
0.05-0.10	0,0755	0,0046	<0,0001	0,1014
0.10-0.20	0,9058	0,0042	<0,0001	0,1145
0.20-0.40	0,2165	<0,0001	<0,0001	0,2111
0.40-0.60	0,3752	<0,0001	<0,0001	0,1112
<u>Ca<sup>2+</sup></u>				
0-0.05	0,5470	<0,0001	0,0367	0,5775
0.05-0.10	0,1806	<0,0001	0,6050	0,1003
0.10-0.20	0,5246	<0,0001	0,0756	0,1381
0.20-0.40	0,9265	0,0002	0,0023	0,6134
0.40-0.60	0,3098	0,0005	0,0004	0,3807
<u>Mg<sup>2+</sup></u>				
0-0.05	0,3773	<0,0001	0,0280	0,9149
0.05-0.10	0,2627	<0,0001	0,0134	0,1024
0.10-0.20	0,7508	<0,0001	0,8354	0,1069
0.20-0.40	0,8835	0,0001	0,0019	0,7573
0.40-0.60	0,6224	0,0025	0,0080	0,4365
<u>K<sup>+</sup></u>				
0-0.05	0,1037	0,9867	0,0043	0,5379
0.05-0.10	0,0971	0,8719	0,4102	0,4625
0.10-0.20	0,2045	0,7399	0,3144	0,1477
0.20-0.40	0,3249	0,0709	0,0032	0,3318
0.40-0.60	0,4598	0,0827	0,0131	0,1089
<u>BS</u>				
0-0.05	0,7340	<0,0001	<0,0001	0,4052
0.05-0.10	0,1350	<0,0001	<0,0001	0,1166

0.10-0.20	0,2746	<0,0001	<0,0001	0,3018
0.20-0.40	0,5175	0,0006	<0,0001	0,6642
0.40-0.60	0,2417	0,0005	<0,0001	0,0714

†SOM: soil organic matter; BS: base saturation.

**Supplementary Table 2. ANOVA significance for root length density, root length distribution, and root diameter of Wheat**

	0-0.05 m	0.05-0.10 m	0.10-0.20 m	0.20-0.40 m	0.40-0.60 m
<u>Root length density</u>					
<b><i>F probability</i></b>					
Treatments (T)	<0.0001	<0.0001	<0.0001	<0.0001	0.0088
Season (S)	<0.0001	0.0017	<0.0001	0.0989	0.9753
T x S	0.8824	0.6376	0.2120	0.8159	0.3009
<u>Root length distribution</u>					
<b><i>F probability</i></b>					
Treatments (T)	0.1594	0.3293	0.7946	0.0198	0.6354
Season (S)	0.0001	0.1985	<0.0001	0.0002	0.2055
T x S	0.8820	0.5032	0.8710	0.1953	0.2865
<u>Root diameter</u>					
<b><i>F probability</i></b>					
Treatments (T)	<0.0001	0.2569	0.2310	0.1682	0.0757
Season (S)	<0.0001	0.9024	0.9053	0.5076	0.3875
T x S	0.5099	0.1419	0.7588	0.1205	0.5483

**Supplementary Table 3. ANOVA significance for root length density, root length distribution, and root diameter of Common Bean**

	0-0.05 m		0.05-0.10 m		0.10-0.20 m		0.20-0.40 m		0.40-0.60 cm	
	R	BR	R	BR	R	BR	R	BR	R	BR
<u>Root length density</u>										
<b><i>F probability</i></b>										
Treatments (T)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001
Season (S)	<0.0001	<0.0001	<0.0001	<0.0001	0.8817	<0.0001	0.0017	0.8892	0.0783	<0.0001
T x S	0.3569	0.5578	0.6591	0.7824	0.3981	0.3874	0.5646	0.8019	0.6273	0.7284
<u>Root length distribution</u>										
<b><i>F probability</i></b>										
Treatments (T)	0.1519	0.3586	0.0010	0.5143	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.3575
Season (S)	<0.0001	<0.0001	0.2292	0.0722	<0.0001	<0.0001	0.7978	<0.0001	<0.0001	<0.0001
T x S	0.8920	0.7132	0.3028	0.2598	0.3512	0.4752	0.5780	0.3741	0.2851	0.3684
<u>Root diameter</u>										
<b><i>F probability</i></b>										
Treatments (T)	0.0027	0.1963	0.0819	0.9057	<0.0001	<0.0001	<0.0001	0.0741	0.0006	0.1088
Season (S)	<0.0001	<0.0001	<0.0001	0.0909	0.4923	0.2815	<0.0001	<0.0001	0.8570	<0.0001
T x S	0.5263	0.5693	0.3287	0.4562	0.2189	0.7492	0.8269	0.4803	0.3367	0.5871

**Supplementary Table 4. ANOVA significance for plant nutrition, yield components and grain yield of Maize, Crambe, Cowpea, Wheat, and Common Bean**

<b>Maize</b>												
	SDM	N	P	K	Ca	Mg	S	POP	EP	GE	W-100	GY
<u>F probability</u>												
Treatments (T)	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0005	0.1181	<0.0001	<0.0001	<0.0001	<0.0001
Season (S)	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.3321	0.0100	<0.0001	<0.0001	<0.0001
T x S	0.0922	0.1008	0.1296	0.1197	0.1001	0.1026	0.1200	0.7272	0.1474	0.5837	0.2269	0.1322
<b>Crambe</b>												
	SDM	N	P	K	Ca	Mg	S	POP	GP	W-1000		GY
<u>F probability</u>												
Treatments (T)	0.0001	0.0790	0.0048	0.1162	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.1662		<0.0001
Season (S)	<0.0001	0.2144	<0.0001	<0.0001	<0.0001	0.1280	0.0001	0.0001	<0.0001	0.4672		<0.0001
T x S	0.3501	0.2814	0.1301	0.3889	0.1047	0.1801	0.3004	0.1211	0.0911	0.5137		0.1239
<b>Cowpea</b>												
	SDM	N	P	K	Ca	Mg	S	POP	PP	GP	W-100	GY
<u>F probability</u>												
Treatments (T)	0.0007	0.0025	0.0035	0.9866	0.0004	<0.0001	0.0006	0.5201	0.0002	0.0048	<0.0001	<0.0001
Season (S)	<0.0001	0.1337	0.3889	<0.0001	<0.0001	<0.0001	<0.0001	0.3563	<0.0001	<0.0001	<0.0001	<0.0001
T x S	0.6768	0.4472	0.5190	0.3043	0.2856	0.7014	0.3830	0.7866	0.2281	0.0743	0.0901	0.0647

<b>Wheat</b>												
	SDM	N	P	K	Ca	Mg	S	NE	SE	GS	W-1000	GY
<u>F probability</u>												
Treatments (T)	<0.0001	<0.0001	0.4036	<0.0001	<0.0001	<0.0001	0.3684	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Season (S)	<0.0001	<0.0001	0.5001	<0.0001	<0.0001	<0.0001	0.8729	<0.0001	<0.0001	0.4384	<0.0001	<0.0001
T x S	0.5472	0.1371	0.0991	0.6822	0.1829	0.1911	0.1128	0.1121	0.2050	0.2255	0.1754	0.6916
<b>Common Bean</b>												
Factors	SDM	N	P	K	Ca	Mg	S	POP	PP	GP	W-100	GY
<u>F probability</u>												
Treatments (T)	<0.0001	0.0047	0.0005	0.0786	<0.0001	<0.0001	0.0205	<0.0001	<0.0001	0.0033	0.2069	<0.0001
Season (S)	0.0254	<0.0001	<0.0001	0.1131	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.2594	0.0999	<0.0001
T x S	0.9781	0.4769	0.1249	0.1872	0.0981	0.2947	0.9240	0.0867	0.0867	0.1233	0.7230	0.0983