

Table S1: Soil Characterisation

Parameter	Unit	
pH		5.9
Total Carbon	mass-%	0.4
Nitrogen	mg 100 g ⁻¹	3.41
Phosphorous	mg 100 g ⁻¹	<1
Potassium	mg 100 g ⁻¹	2.2
Calcium	mg kg ⁻¹	1150
Magnesium	mg 100 g ⁻¹	12.7
Iron	g kg ⁻¹	305
Aluminum	g kg ⁻¹	153
CEC	cmol ⁺ kg ⁻¹	6.4
WHC	%	68.95

Tab. S1: Analytical parameters of the relict Oxisol

Table S2: Biochar Characterisation

Parameter	Unit	Fresh Biochar	Dried Biochar
Density	g cm ⁻³	-	1.5
Specific surface (BET)	m ² g	-	179
Ash 550 °C	mass-%	6.7	8
Hydrogen	mass-%	0.8	1.0
Carbon	mass-%	71.3	85.3
Nitrogen	mass-%	0.42	0.5
Oxygen	mass-%	6.2	7.4
Carbonate CO ₂	mass-%	2.8	3.4
Organic carbon	mass-%	70.5	84.4
H/C org. (molar)		0.14	0.14
O/C (molar)		0.065	0.065
pH		10.1	-
Electric conductivity	μS cm ⁻¹	3000	-
Salt content	g kg ⁻¹	8.19	9,8
Phosphorous	mass-%	-	2.3
Magnesium	mass-%	-	3.6
Calcium	mass-%	-	37.4
Potassium	mass-%	-	11.2
Sodium	mass-%	-	1.8
Iron	mass-%	-	1.8
Silicium	mass-%	-	13.1
Sulphur	mass-%	-	1.5

Tab. S2:. Biochar-characterization, following analytical methods of the European Biochar Certificate (EBC, 2020).

Table S3: Mean Aboveground Biomass

Treatment Legend					
Zero-Control Group		+ Factor: Substrate			
		I: Biochar	II: NPK	III: NPK+ Biochar	IV: NPK+ Fermented Biochar
+ Factor: Placement	A: Topsoil incorporation	A_I	A_II	A_III	A_IV
	B: Root-zone Hotspot	B_I	B_II	B_III	B_IV
	C: Root-zone Layer	C_I	C_II	C_III	C_IV

A_II = farmer practice

	Mean aboveground biomass [g dm]	Change relative to Zero- Control [%]	Change relative to farmer practice [%]
A_I	14.80	0	-13
A_II	17.00	15	0
A_III	20.00	35	18
A_IV	19.10	29	12
B_I	14.00	-5	-18
B_II	23.60	59	39
B_III	25.60	73	51
B_IV	20.30	37	19
C_I	15.20	3	-11
C_II	20.80	41	22
C_III	26.50	79	56
C_IV	24.90	68	46
Control	14.80	0	-13

Table S4: Mean Leaf Area

Treatment Legend		+ Factor: Substrate			
Zero-Control Group		I: Biochar	II: NPK	III: NPK+ Biochar	IV: NPK+ Fermented Biochar
+ Factor: Placement	A: Topsoil incorporation	A_I	A_II	A_III	A_IV
	B: Root-zone Hotspot	B_I	B_II	B_III	B_IV
	C: Root-zone Layer	C_I	C_II	C_III	C_IV

A_II = farmer practice

	Mean leaf area [cm ²]	Change relative to Zero-Controll [%]	Change relative to farmer practice [%]
A_I	622	43	-19
A_II	772	77	0
A_III	1177	171	52
A_IV	978	125	27
B_I	454	4	-41
B_II	1660	282	115
B_III	1900	337	146
B_IV	1352	211	75
C_I	589	35	-24
C_II	1285	195	66
C_III	2485	471	222
C_IV	1926	343	149
Control	435	0	-44

Table S5: Mean Chlorophyll Content Index

Treatment Legend					
Zero-Control Group		+ Factor: Substrate			
		I: Biochar	II: NPK	III: NPK+ Biochar	IV: NPK+ Fermented Biochar
+ Factor: Placement	A: Topsoil incorporation	A_I	A_II	A_III	A_IV
	B: Root-zone Hotspot	B_I	B_II	B_III	B_IV
	C: Root-zone Layer	C_I	C_II	C_III	C_IV

A_II = farmer practice

	Mean Chlorophyll Index	Change relative to Zero-Control [%]	Change relative to farmer practice [%]
A_I	8.04	4	-3
A_II	8.26	7	0
A_III	10.7	39	30
A_IV	10.4	35	26
B_I	7.21	-6	-13
B_II	13	69	57
B_III	17	121	106
B_IV	11.5	49	39
C_I	7.09	-8	-14
C_II	11.4	48	38
C_III	19.8	157	140
C_IV	15.2	97	84
Control	7.7	0	-7

Table S6: Mean Belowground Biomass

Treatment Legend					
Zero-Control Group		+ Factor: Substrate			
		I: Biochar	II: NPK	III: NPK+ Biochar	IV: NPK+ Fermented Biochar
+ Factor: Placement	A: Topsoil incorporation	A_I	A_II	A_III	A_IV
	B: Root-zone Hotspot	B_I	B_II	B_III	B_IV
	C: Root-zone Layer	C_I	C_II	C_III	C_IV

A_II = farmer practice

	Mean belowground biomass [g dw]	Change relative to Zero-Controll [%]	Change relative to farmer practice [%]
A_I	6.65	-2	-8
A_II	7.22	6	0
A_III	7.51	10	4
A_IV	8	17	11
B_I	6.41	-6	-11
B_II	9.03	32	25
B_III	8.71	28	21
B_IV	7.58	11	5
C_I	6.78	-1	-6
C_II	7.89	16	9
C_III	8.39	23	16
C_IV	9.15	34	27
Control	6.82	0	-6

Table S7: Mean Foliar Phosphorous Content

Treatment Legend		+ Factor: Substrate			
Zero-Control Group		I: Biochar	II: NPK	III: NPK+ Biochar	IV: NPK+ Fermented Biochar
+ Factor: Placement	A: Topsoil incorporation	A_I	A_II	A_III	A_IV
	B: Root-zone Hotspot	B_I	B_II	B_III	B_IV
	C: Root-zone Layer	C_I	C_II	C_III	C_IV

A_II = farmer practice

	Mean foliar Phosphorus [mg g ⁻¹]	Mean foliar Phosphorus [% of dry matter]	Change relative to Zero-Control [%]	Change relative to farmer practice [%]
A_I	0.712	0.0712	6	12
A_II	0.633	0.0633	-6	0
A_III	0.717	0.0717	7	13
A_IV	0.631	0.0631	-6	0
B_I	0.724	0.0724	8	14
B_II	0.699	0.0699	4	10
B_III	0.818	0.0818	22	29
B_IV	0.688	0.0688	3	9
C_I	0.672	0.0672	0	6
C_II	0.729	0.0729	9	15
C_III	0.967	0.0967	44	53
C_IV	0.84	0.084	25	33
Control	0.671	0.0671	0	6

Figure S1: Plant Hight Growthcurve

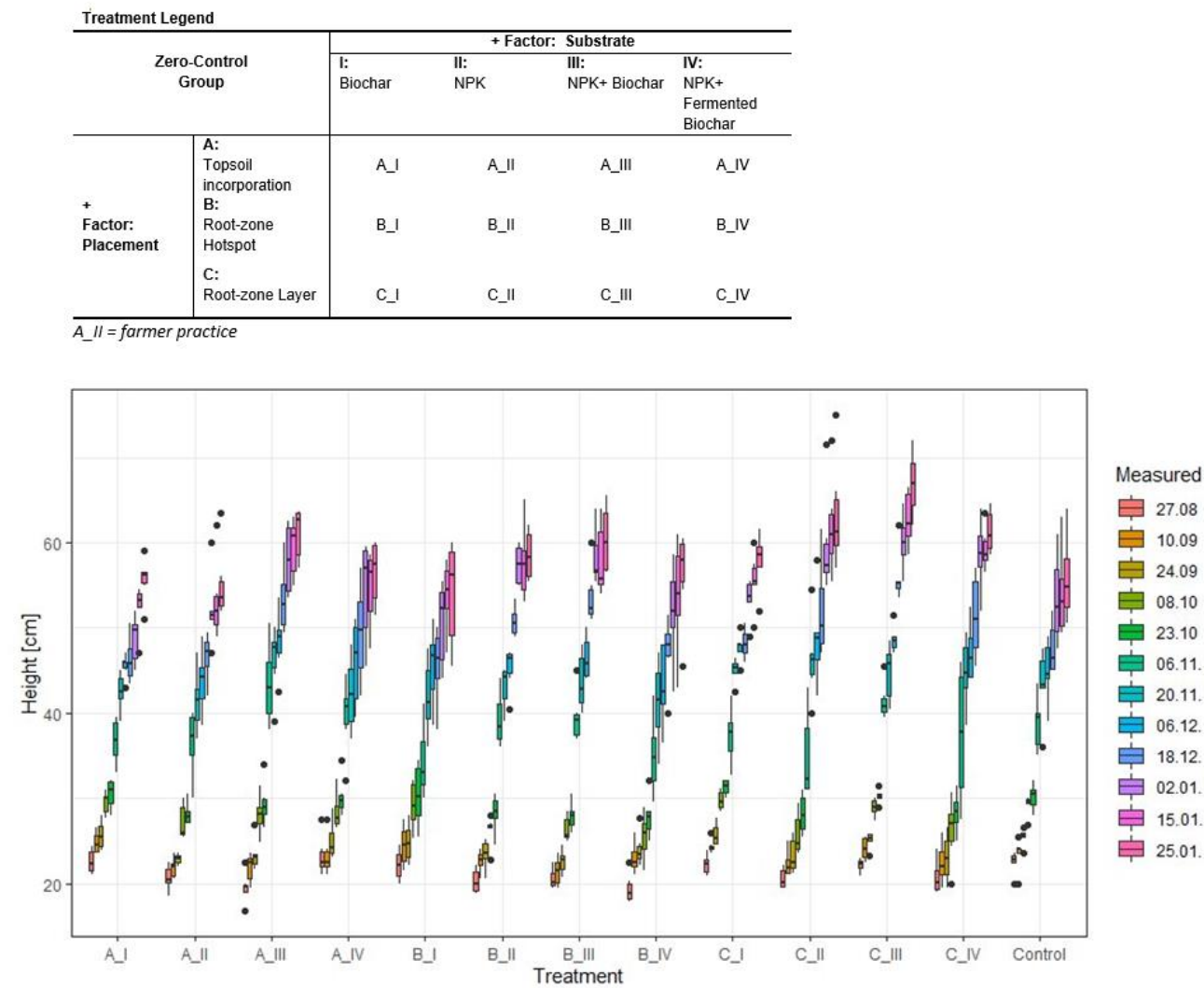


Figure S2: Diameter at Base Development Curve

Treatment Legend		+ Factor: Substrate			
Zero-Control Group		I: Biochar	II: NPK	III: NPK+ Biochar	IV: NPK+ Fermented Biochar
+ Factor: Placement	A: Topsoil incorporation	A_I	A_II	A_III	A_IV
	B: Root-zone Hotspot	B_I	B_II	B_III	B_IV
	C: Root-zone Layer	C_I	C_II	C_III	C_IV

A_II = farmer practice

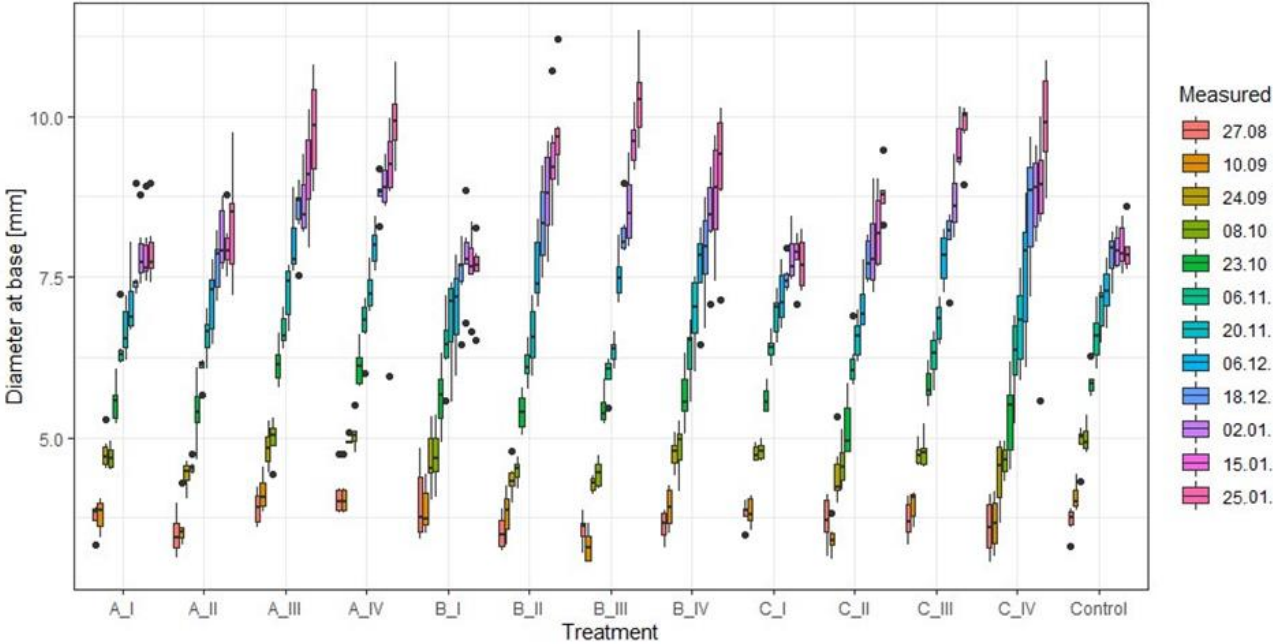


Figure S3: Foliar Nitrogen Content

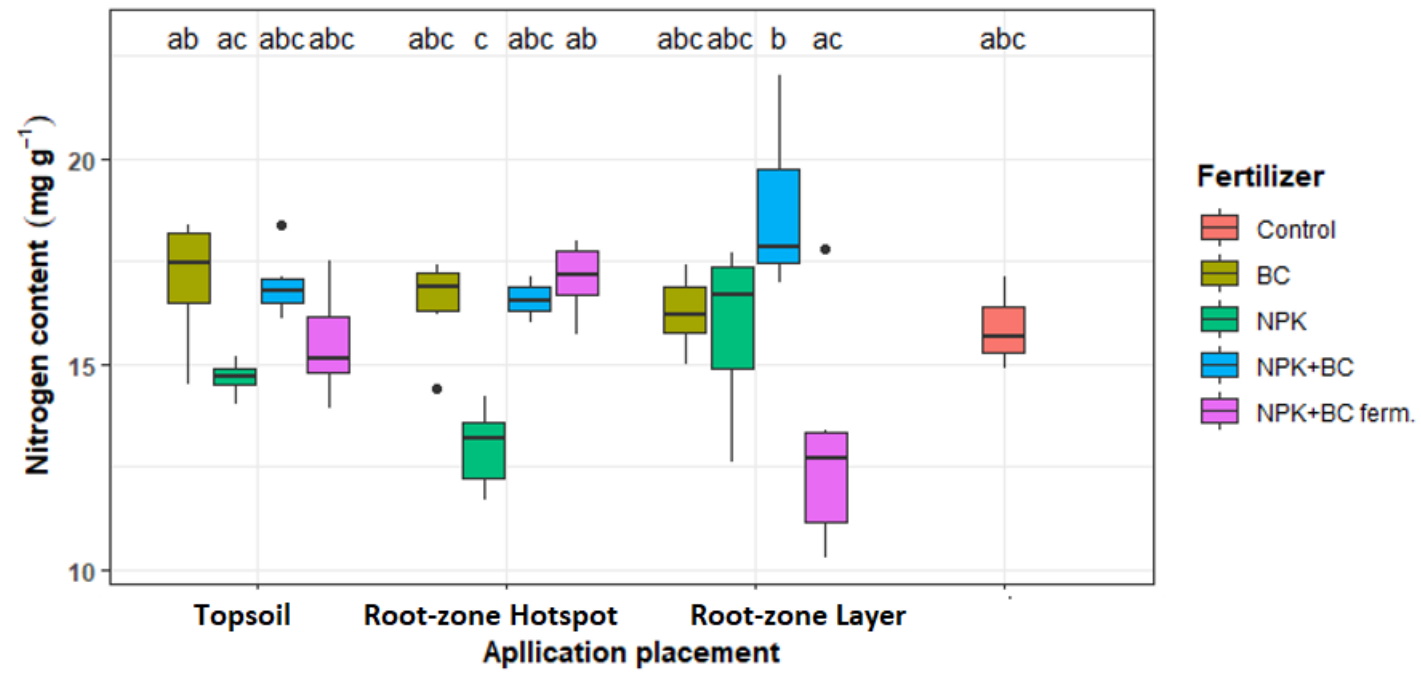


Figure S4: Foliar Potassium Content

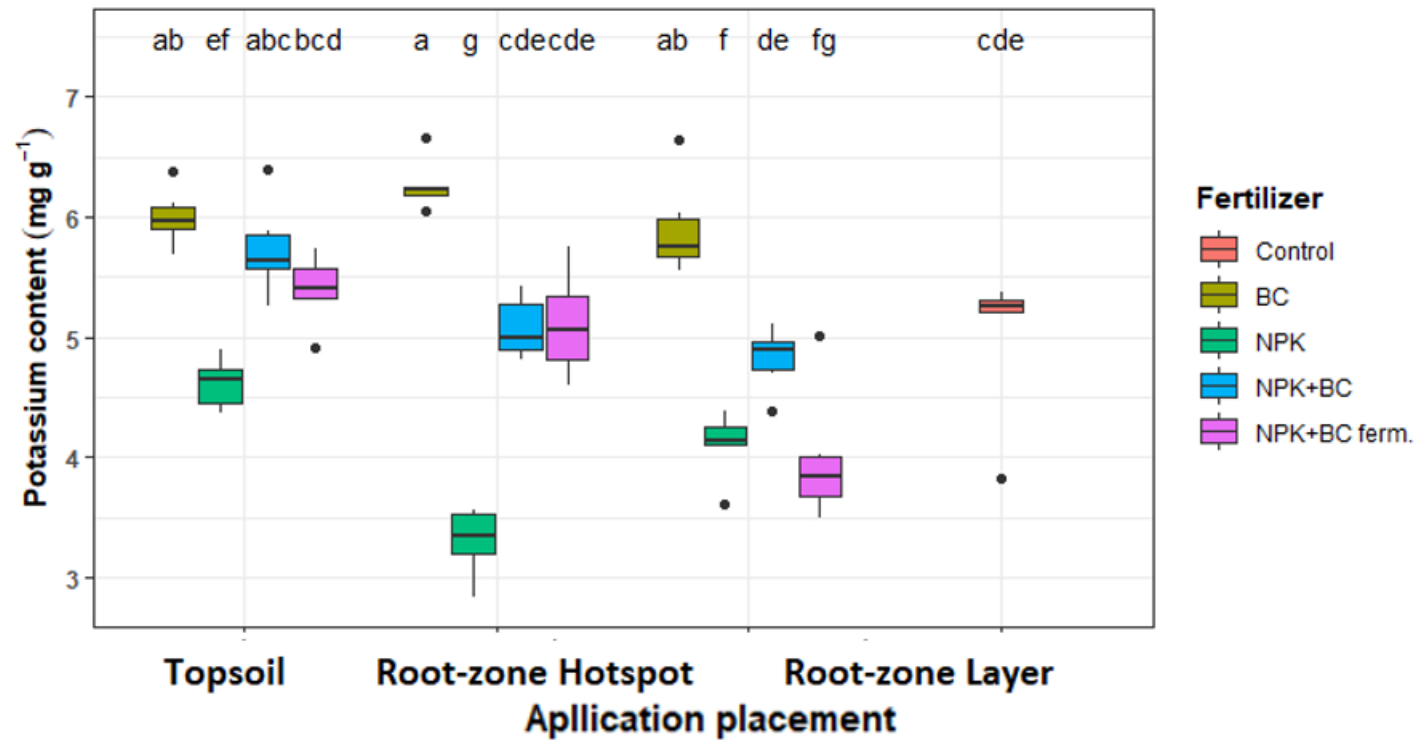


Figure S5: Foliar Calcium, Sulphur, Sodium, Manganese, Iron and Magnesium contents.

