

Supplementary Materials

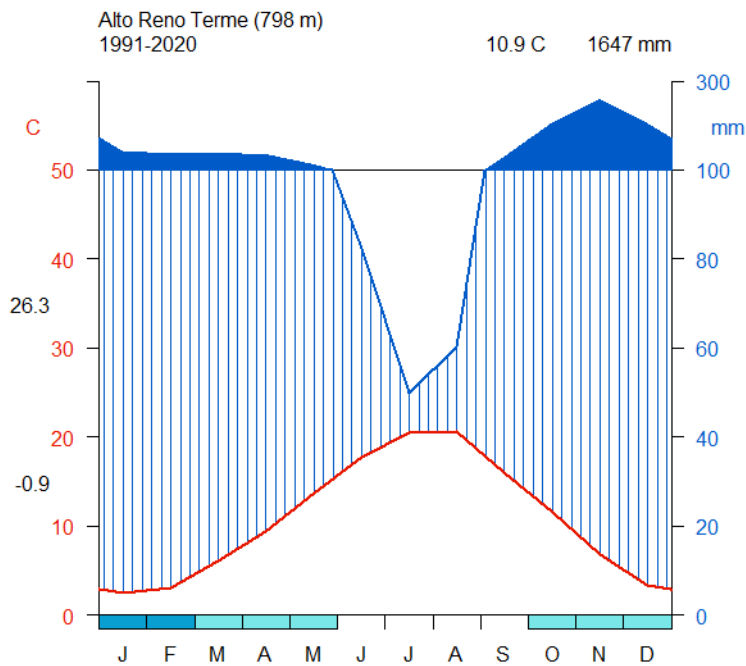


Figure S1. Walter & Lieth climatic diagram of the municipality of Alto Reno Terme for the period 1991-2020. Numbers at the top indicate mean annual temperature and annual precipitation; numbers on the left indicate daily maximum average temperature of the hottest month and daily minimum average temperature of the coldest month. Plotted with R package “climatoI”.



INK 1



INK 2



INK 3

Figure S2. Pictures showing symptomatic chestnut plant in INK1 site, and asymptomatic chestnut plants in INK2 and INK3 study sites.

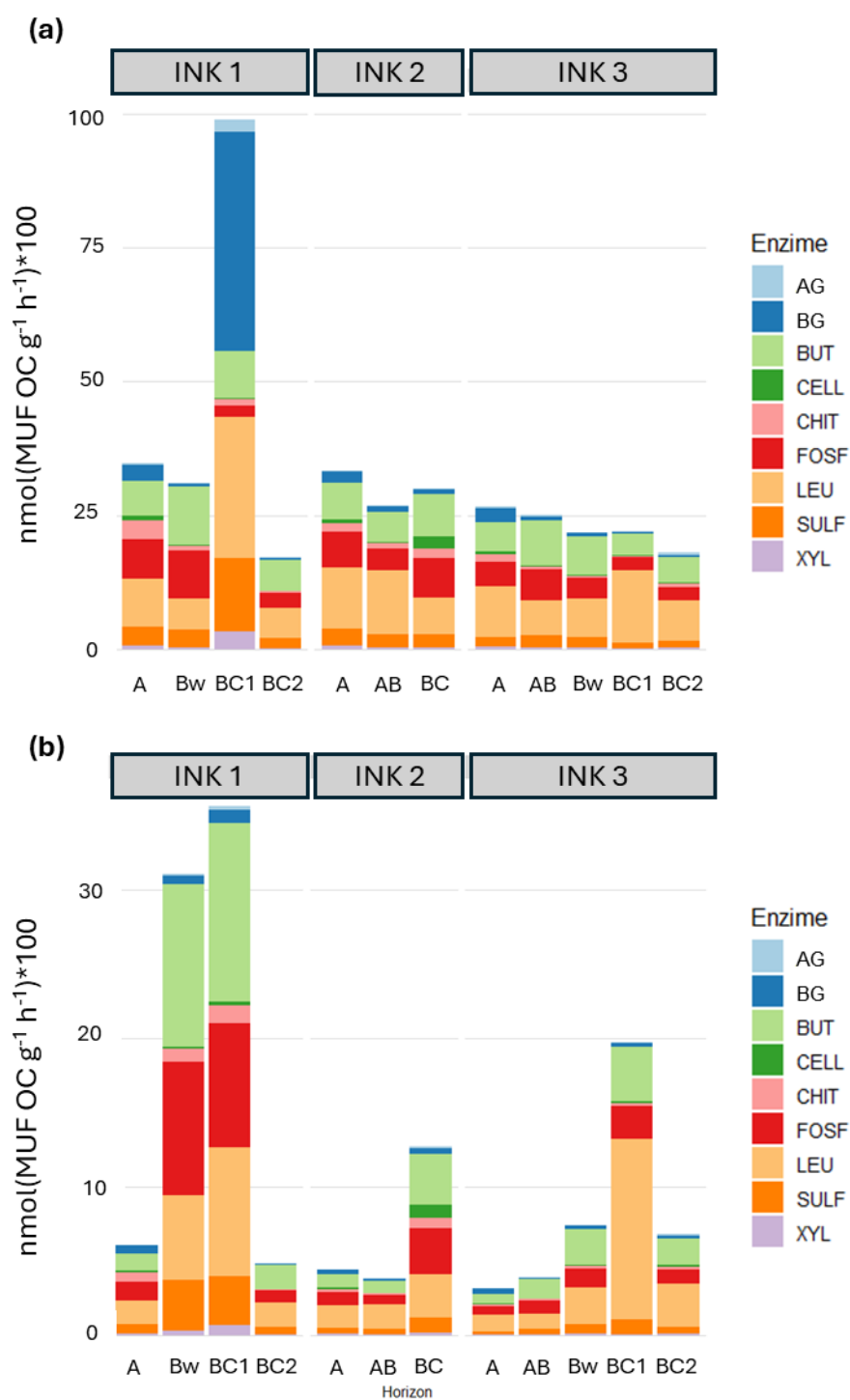
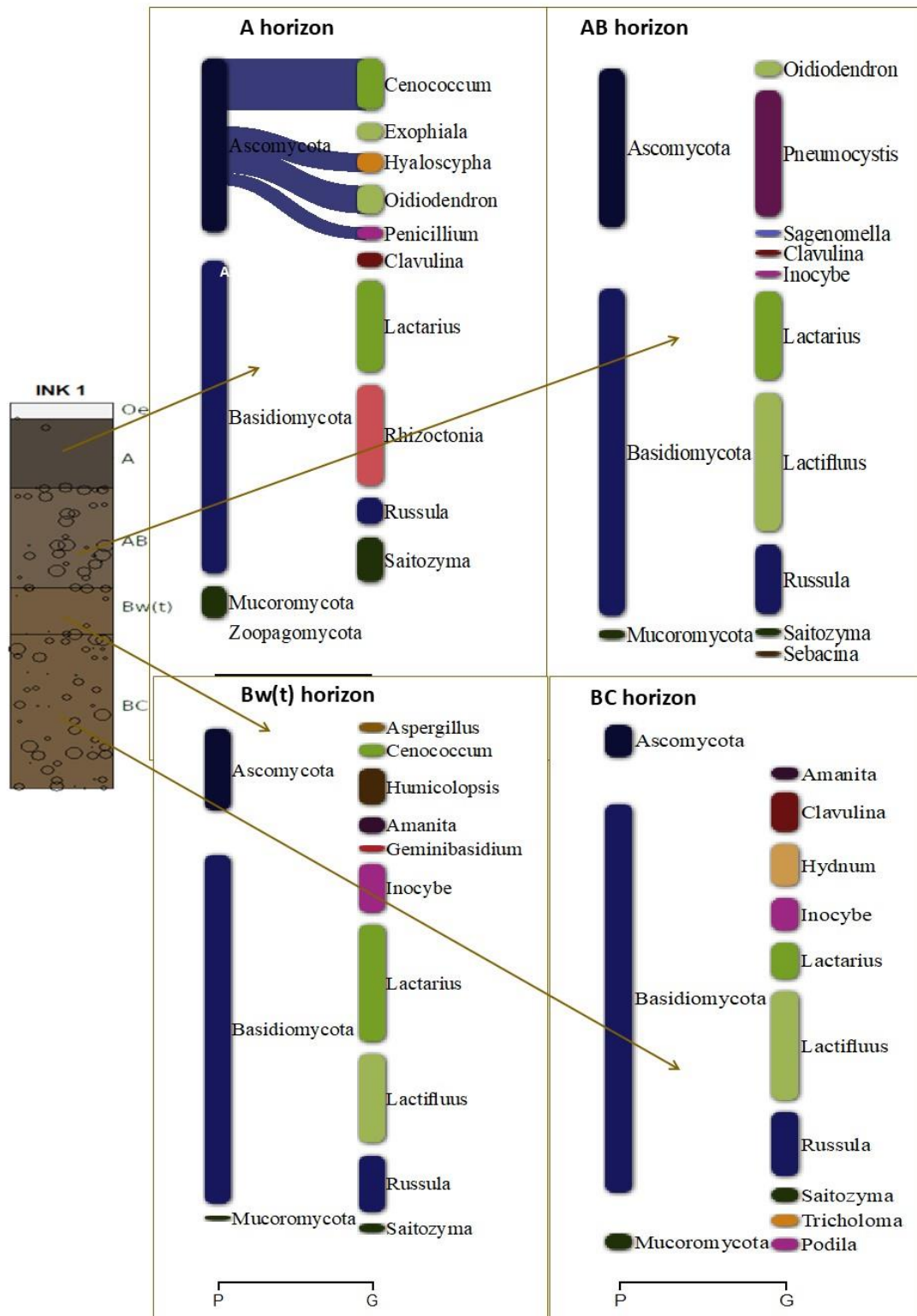
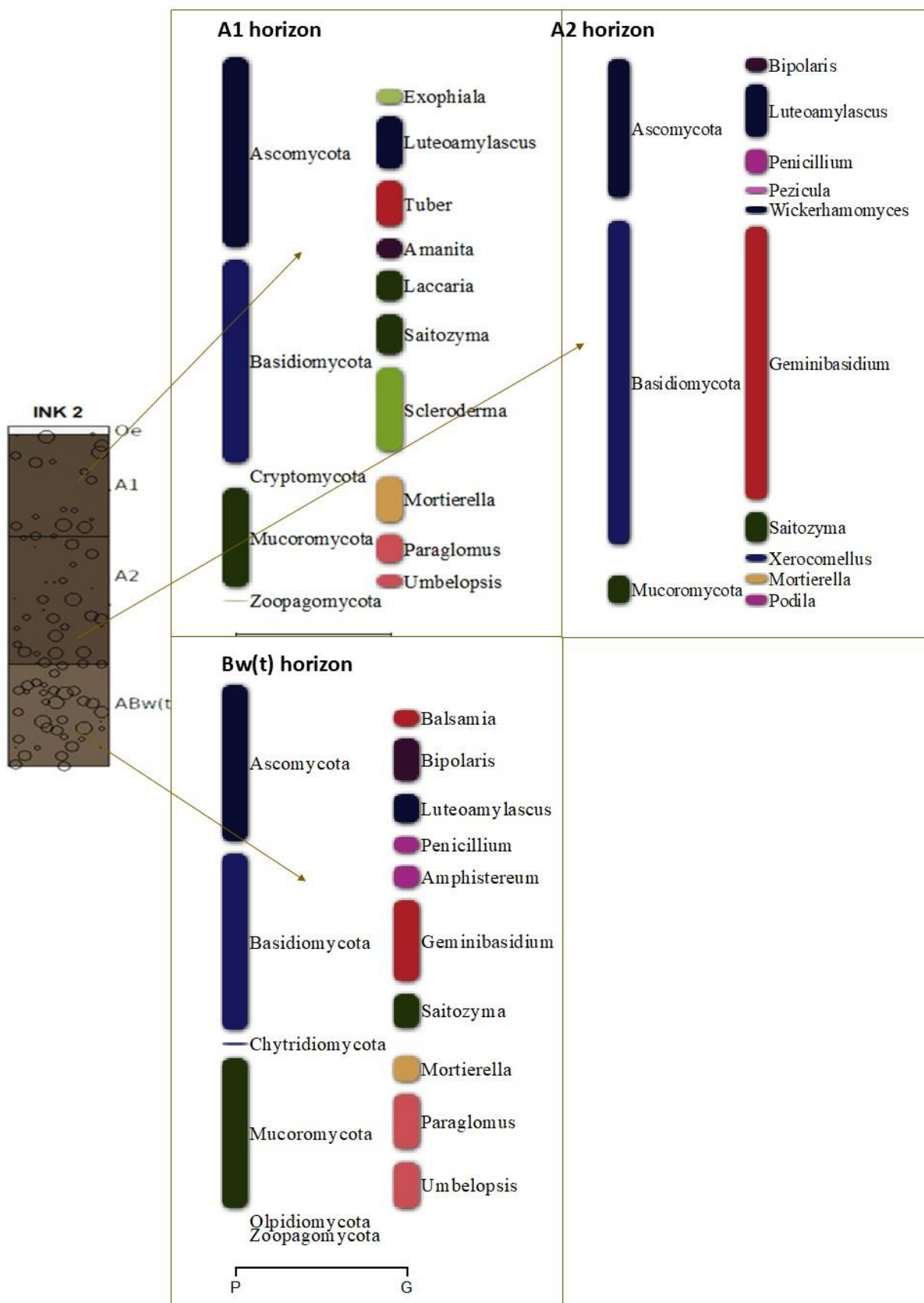


Figure S3. Specific enzymatic activities along the horizons of soil profiles per unit of OC (a) and Cmic (b). CELL (cellulase), NAG (chitinase), BG (β -glucosidase), AG (α -glucosidase), PHOS (phosphatase), SU (sulphatase), XY (xylase), BUT (butyrase), LAP (leucine aminopeptidase).





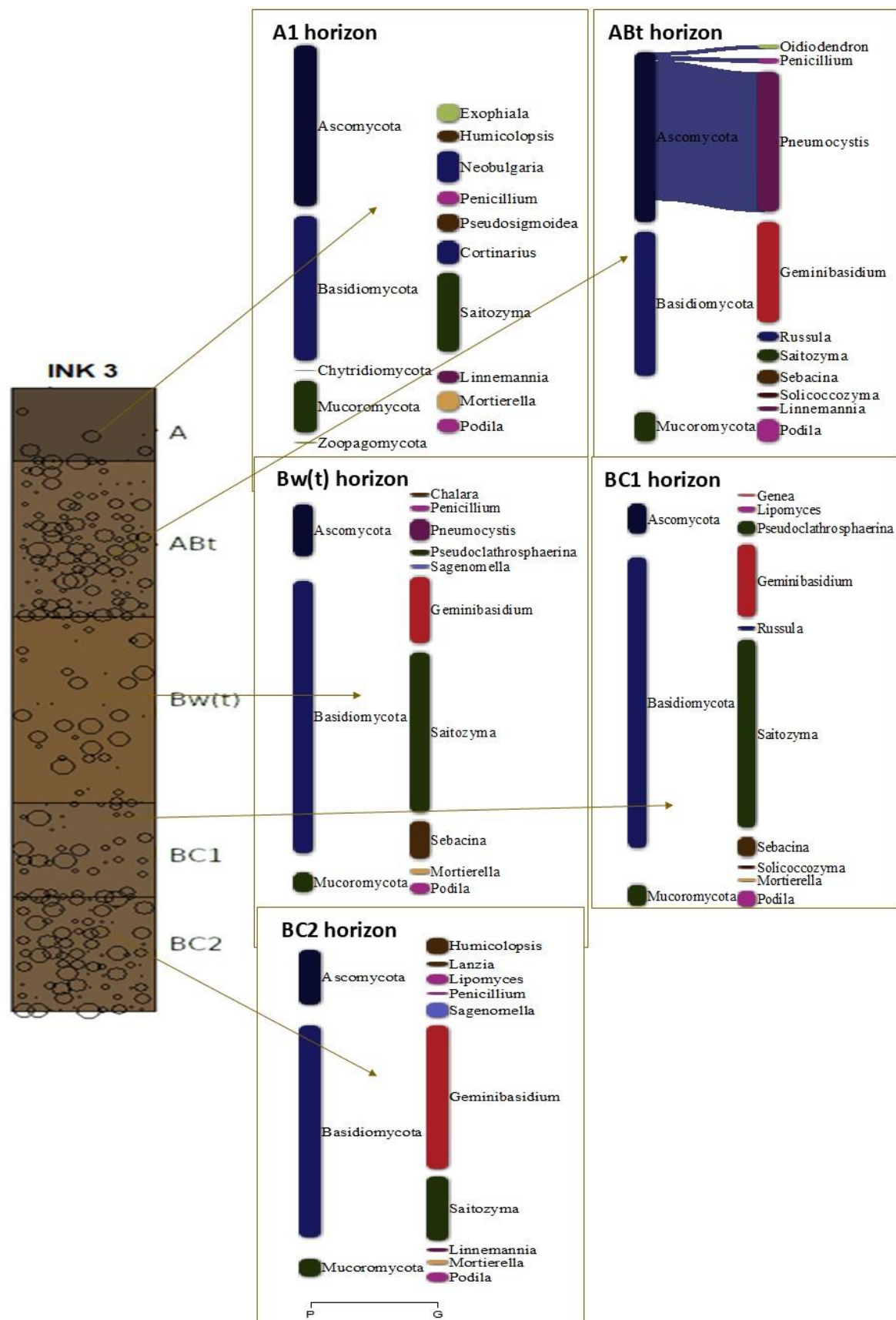


Figure S4. Sankey diagram of the 10 most representative genera for each soil horizon and site: a) INK1 profile, b) INK2 profile and c) INK3 profile.

Table S1. Physicochemical characteristics of the soil under ill chestnut plants (INK1) and healthy chestnut plants (INK2 and INK3). CEC: cation exchange capacity; Caexch: exchangeable Ca; BS: base saturation; BD: bulk density.

Horizon		pH	Texture			CEC	Caexch	BS	BD
			Sand	Silt	Clay				

Table S2. Hydraulic properties of the soil under ill chestnut plants (INK1) and healthy chestnut plants (INK2 and INK3). THS: water content at saturation; FC: water content at field capacity = -33 kPa; WP: water content at permanent wilting point = -1,500 kPa; AWC: available water capacity; KS: saturated hydraulic conductivity.

Horizon		THS %	FC %	WP %	AWC %	KS mm h ⁻¹
INK1						
A	2-10/12	68.5	58.7	20.3	38.5	10.3
AB	10/12-24	45.3	26.9	13.3	13.6	22.96
Bw(t)	24-30	49.6	31.1	18.7	12.4	31.08
BC	30-50+	44.0	27.8	12.3	15.5	23.94
INK2						
A1	1-13	59.9	46.5	11.6	34.8	0.28
A2	13-28	47.7	27.9	11.8	16.1	0.74
Bw(t)	28-40+	41.2	25.5	11.7	13.8	12.80
INK3						
A	0-5/9	49.0	29.2	9.9	19.3	1.07
AB	5/9-22	17.2	10.7	5.0	5.7	2.30
Bw(t)	22-40	44.1	28.4	12.7	15.7	16.55
BC1	40-49	33.4	20.0	8.8	11.1	10.11
BC2	49-60+	16.8	10.0	3.9	6.1	2.34

Table S3. Values of properties related to organic matter in the soil under ill chestnut plants (INK1) and healthy chestnut plants (INK2 and INK3). OC: soil organic carbon; TN: total nitrogen; Cmic: microbial biomass-C; SBR: soil basal respiration; WEOC: water-extractable organic carbon; WEN: water-extractable nitrogen.

Horizon	OC	TN	C:N	Cmic	SBR	WEOC	WEN	WEOC:OC	WEOC:WEN
	g kg ⁻¹	g kg ⁻¹		mg kg ⁻¹	mg C-CO ₂ kg s.s. ⁻¹ h ⁻¹	mg kg ⁻¹	mg kg ⁻¹	%	
INK1									
A	87.5	5.64	15.5	500.00	7.00	540	60.0	0.62	9.00
AB	18.7	1.50	12.5	20.40	1.57	481	26.4	2.57	18.23
Bw(t)	12.0	1.04	11.5	10.00	1.19	318	21.2	2.66	15.00
BC	12.5	1.08	11.5	44.00	1.22	266	15.2	2.14	17.52
INK2									
A1	52.12	3.90	13.4	400.00	4.16	290	60.0	0.56	4.83
A2	29.23	2.65	11.0	204.56	2.08	180	31.0	0.62	5.81
Bw(t)	13.69	1.46	9.4	32.24	1.15	165	20.4	1.20	8.07
INK3									
A	50.9	3.43	14.9	430.04	5.35	260	36.5	0.51	7.14
AB	13.5	1.24	10.8	86.08	1.38	166	19.6	1.23	8.47
Bw(t)	9.3	1.07	8.7	27.44	1.45	158	15.2	1.69	10.39
BC1	9.0	1.02	8.9	10.00	1.60	163	14.9	1.81	10.93
BC2	9.8	1.11	8.9	25.80	1.84	148	13.3	1.51	11.18

Table S4. Enzymatic activities in the soil under ill chestnut plants (INK1) and healthy chestnut plants (INK2 and INK3). CELL (cellulase), NAG (chitinase), BG (β -glucosidase), AG (α -glucosidase), PHOS (phosphatase), SU (sulpha tase), XY (xylase), BUT (butyrase), LAP (leucine aminopeptidase), SEI (Synthetic Enzymes Index); OC (organic C); Cmic (microbial biomass-C).

Horizon	CELL	NAG	BG	AG	PHOS	SU	XY	BUT	LAP	SEI	SEI/OC	SEI/Cmic
	nmol MUF	mg C ⁻¹ h ⁻¹										
INK 1												
A	73.2	303.2	272.4	27.3	640.7	296.8	62.6	571.7	797.7	3045	35	12
AB	3.5	17.4	11.0	2.9	183.5	69.3	6.7	223.4	116.1	634	31	62
Bw(t)	2.5	11.9	8.6	2.9	83.4	32.8	6.7	120.8	87.1	357	99	71
BC	0.7	3.7	4.9	1.9	36.1	22.7	2.7	71.4	70.6	215	17	10
INK 2												
A1	35.8	88.0	115.4	11.9	347.8	161.4	35.7	349.2	596.0	1741	33	9
A2	5.3	29.4	32.5	4.3	118.6	74.2	9.0	162.0	348.6	784	27	8
ABw(t)	30.1	24.1	13.2	3.0	100.2	33.1	5.3	108.7	95.0	413	30	25
INK 3												
A	26.7	68.9	141.5	11.0	228.5	88.2	22.9	278.5	489.6	1356	27	6
ABt	1.9	8.0	10.6	2.8	78.0	31.2	3.6	113.0	88.8	338	25	8

Bw(t)	1.6	4.1	6.3	1.0	35.7	18.5	2.7	66.8	66.5	203	22	15
BC1	1.1	1.8	2.6	0.2	22.3	10.3	0.5	37.0	121.5	197	22	39
BC2	2.2	5.7	4.5	3.9	25.2	12.4	2.6	46.1	73.8	176	18	14
