SUPLEMENTARY MATERIAL

Table S1. Technical description of the experimental areas[†]. ILFS-EP: integrated livestock-forestry system with *Eucalyptus pellita*; ILFS-ST: integrated livestock-forestry system with *Samanea tubulosa*; AU: animal units.

Characteristic	ILFS-EP	ILFS-ST
Tree species	*Eucalyptus pellita* (exotic)	*Samanea tubulosa* (native, N-fixing)
Establishment	Feb 2018 (4 years old at soil sampling)	
Tree strips	One 300 m double-row strip per species with 6.0 m (inter-row) x 3.5 m (in-row) spacing, oriented NW-SE (320° azimuth), 240 m apart	
Total height (m)[‡]	14.6–16.8	4.7–5.8
Canopy diameter (m)[‡]	3.8–4.3	4.0–7.2
Tree fertilization	350 g plant^{-1} (twice annually in 2018 and 2019, and once annually onward)[¶]	
Forage component	*Urochloa brizantha* 'Marandu'[§]	
Pasture management	Mob grazing (high stocking density for short occupation periods followed by adequate pasture recovery intervals). Rare fertilization/liming[#]	
Average stocking rate	2.0 AU ha^{-1}	

[†]The native forest (NF) area consists of a primary tropical rainforest fragment (41 ha) containing approximately 99 woody species (Bentes-Gama et al., 2009)[i].

[‡]Cipriani et al. (2023), Oliveira et al. (2021) and Welke et al. (2022)[ii].

[¶]Localized NPK (20-05-20 + micronutrients) application as top-dressing near the trees.

[§]The pasture had been established for more than 30 years prior to tree planting.

[#]Last whole-area fertilization and liming occurred in 2013 (5 years prior to tree planting and 9 years before soil sampling).

[i] Bentes-Gama M de M, Leal GS, Barros J de O, Lopes RH, López GFZ, Silveira JC da. Características da estrutura de uma floresta de terra firme em Porto Velho, Rondônia. Porto Velho: Embrapa Rondônia; 2009.

[ii] Cipriani HN, Salman AKD, Silva CHSD, Rodrigues ML, Santos ESD, Cruz PGD. Crescimento inicial de *Samanea tubulosa* e *Eucalyptus pellita* em sistemas de integração pecuária-floresta em Porto Velho, Rondônia. ST IPEF. 2023;26:310-4. https://doi.org/10.18671/sertec.v26n48.061.

Oliveira MM de, Salman AKD, Cipriani HN, Moura AR de, Teixeira O de S. Desempenho inicial de espécies arbóreas para sombreamento natural em sistema de integração pecuária-floresta. In: Encontro de Iniciação a Pesquisa da Embrapa Rondônia, 11.; Encontro de Pós-graduação, 6. – Anais...; 2021; Porto Velho, RO. Embrapa Rondônia; 2021. p. 36-41.

Welke S, Salman AKD, Cipriani HN, Monteiro Filho LC, Teixeira O de S, Ghedin GM. Duas espécies arbóreas para sombreamento de pastagem em sistema de integração pecuária-floresta. In: ENCONTRO DE INICIAÇÃO À PESQUISA DA EMBRAPA RONDÔNIA, 12.; ENCONTRO DE PÓS-GRADUAÇÃO, 7. – Anais...; 2022; Porto Velho. Embrapa Rondônia; 2022. p. 39-44.

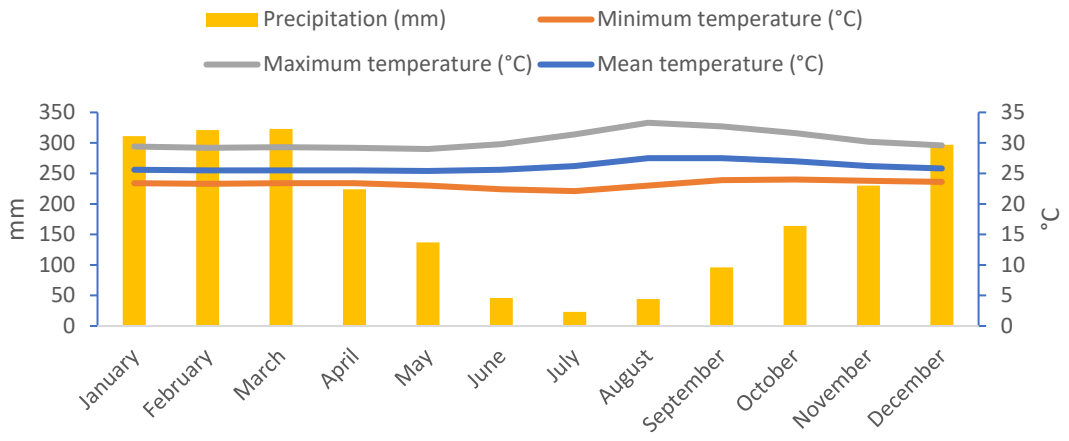


Figure S1. Average monthly precipitation (rainfall) and temperatures for Porto Velho, Brazil. Source: Climate-Data.org (2022).

Table S2. Soil particle-size distribution by area and layer at the Embrapa experimental field.

Area	Soil layer	Sand	Silt	Clay	Textural class
	cm	---------- g kg^{-1} ----------			
ILFS-ST	0-10	27.50	16.10	56.40	Clay
	10-20	23.40	17.80	58.80	
	20-40	19.10	14.30	66.60	
ILFS-EP	0-10	19.90	15.40	64.70	
	10-20	16.09	16.73	67.18	
	20-40	12.84	14.20	72.96	
NF	0-10	34.00	12.00	54.00	
	10-20	28.50	13.00	58.50	
	20-40	22.50	27.50	50.00	

Soil granulometry was determined by the pipette methodology, using NaOH as a dispersant, separating the sand fraction by sieve-washing, clay in suspension, and silt by difference. This analysis was made at Qualita Laboratório Agroambiental, Ji-Paraná, Brazil. ILFS-ST: integrated livestock-forestry system with *Samanea tubulosa*; ILFS-EP: integrated livestock-forestry system with *Eucalyptus pellita*; NF: native forest.

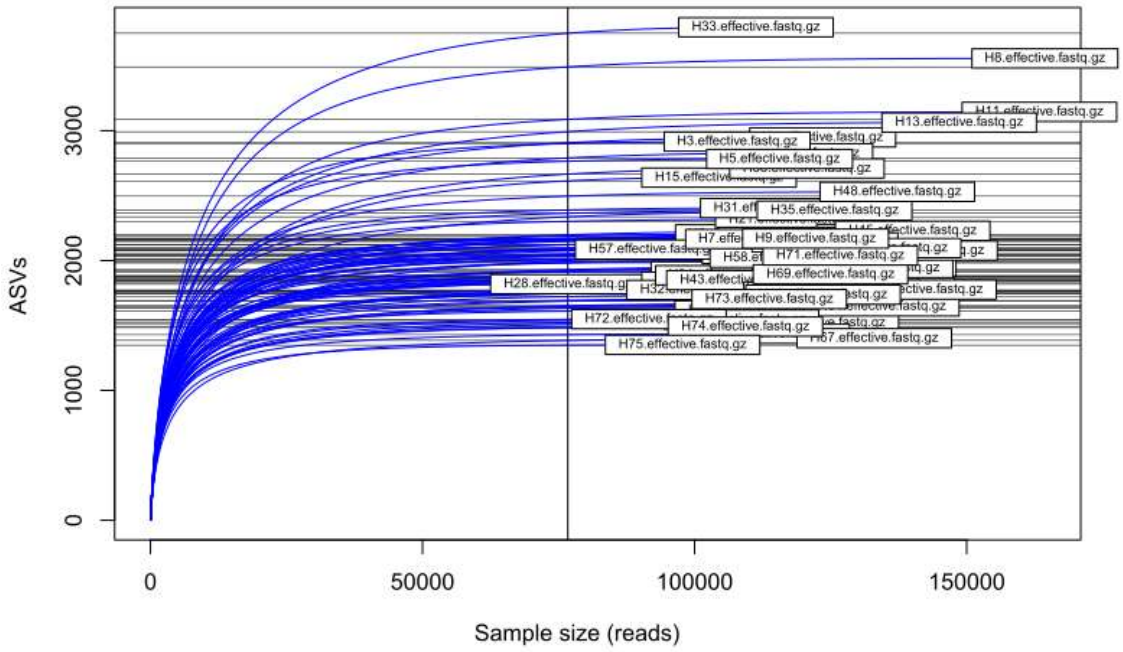
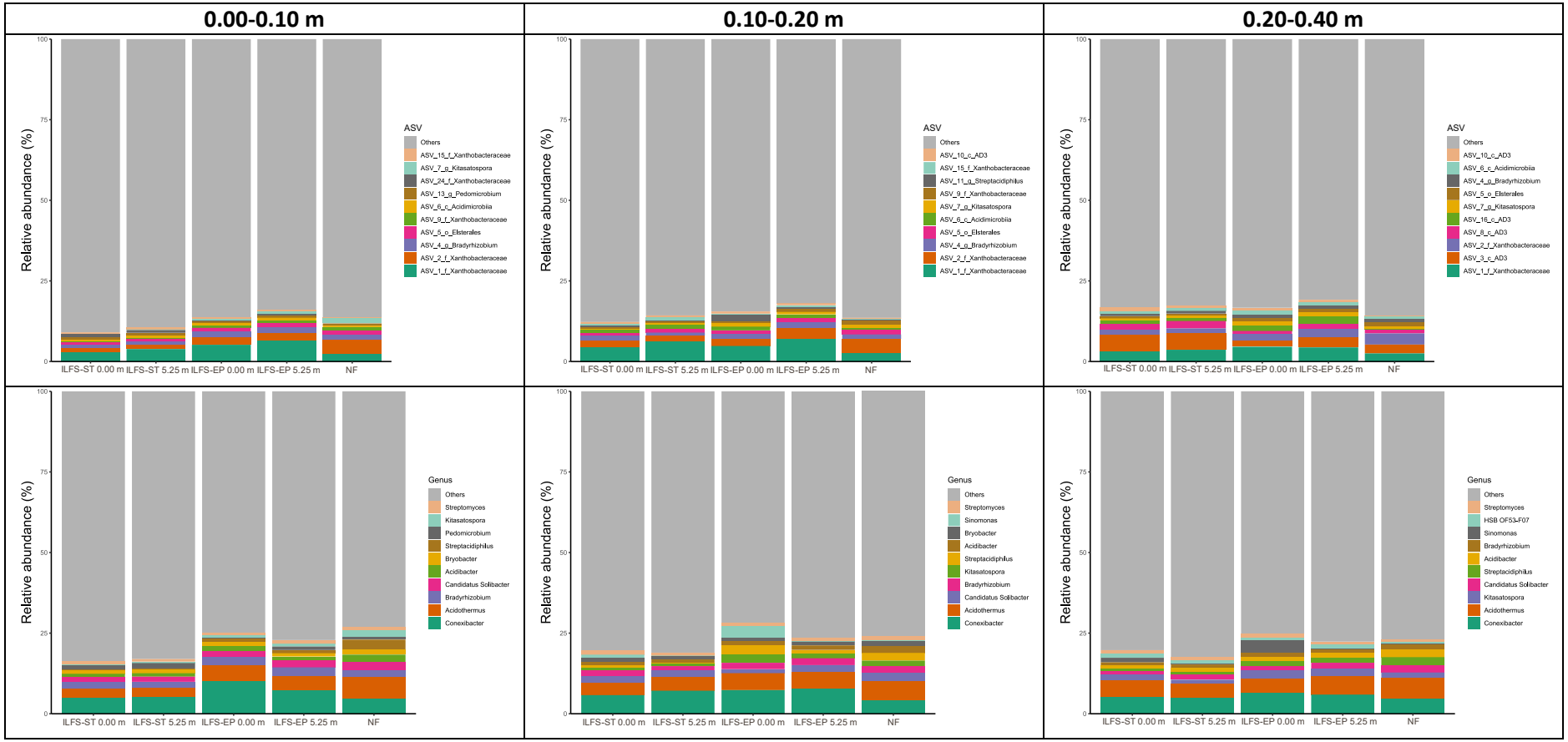
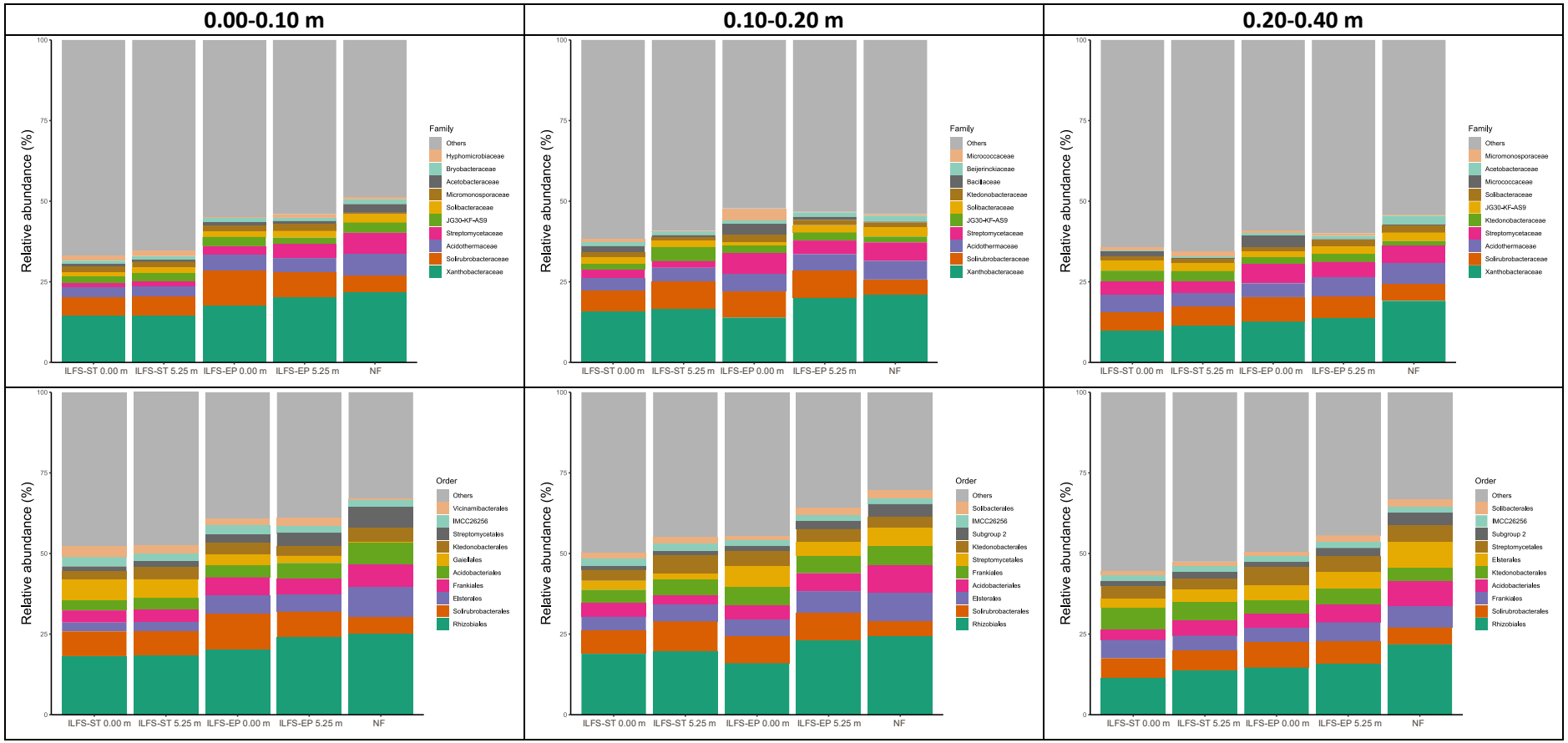


Figure S2. Rarefaction curves of the 75 soil samples used in the study.


0.00-0.10 m
0.10-0.20 m
0.20-0.40 m
Relative abundance (%)
ILFS-ST 0.00 m
ILFS-ST 5.25 m
ILFS-EP 0.00 m
ILFS-EP 5.25 m
NF
ASV
Others
ASV_15_f_Xanthobacteraceae
ASV_7_g_Kitasatospora
ASV_24_f_Xanthobacteraceae
ASV_13_g_Pedomicrobium
ASV_6_c_Acidimicrobiia
ASV_9_f_Xanthobacteraceae
ASV_5_o_Elsterales
ASV_4_g_Bradyrhizobium
ASV_2_f_Xanthobacteraceae
ASV_1_f_Xanthobacteraceae
ASV_10_c_AD3
ASV_11_g_Streptacidiphilus
ASV_16_c_AD3
ASV_8_c_AD3
ASV_3_c_AD3
Genus
Streptomyces
Kitasatospora
Pedomicrobium
Streptacidiphilus
Bryobacter
Acidibacter
Candidatus Solibacter
Bradyrhizobium
Acidothermus
Conexibacter
Sinomonas
HSB OF53-F07


0.00-0.10 m
0.10-0.20 m
0.20-0.40 m
Relative abundance (%)
0
25
50
75
100
ILFS-ST 0.00 m
ILFS-ST 5.25 m
ILFS-EP 0.00 m
ILFS-EP 5.25 m
NF
Family
Others
Hyphomicrobiaceae
Bryobacteraceae
Acetobacteraceae
Micromonosporaceae
Solibacteraceae
JG30-KF-AS9
Streptomycetaceae
Acidothermaceae
Solirubrobacteraceae
Xanthobacteraceae
Micrococcaceae
Beijerinckiaceae
Bacillaceae
Kledonobacteraceae
Order
Vicinamibacterales
IMCC26256
Streptomycetales
Kledonobacterales
Gaiellales
Acidobacteriales
Frankiales
Elsterales
Solirubrobacterales
Rhizobiales
Solibacterales
Subgroup 2

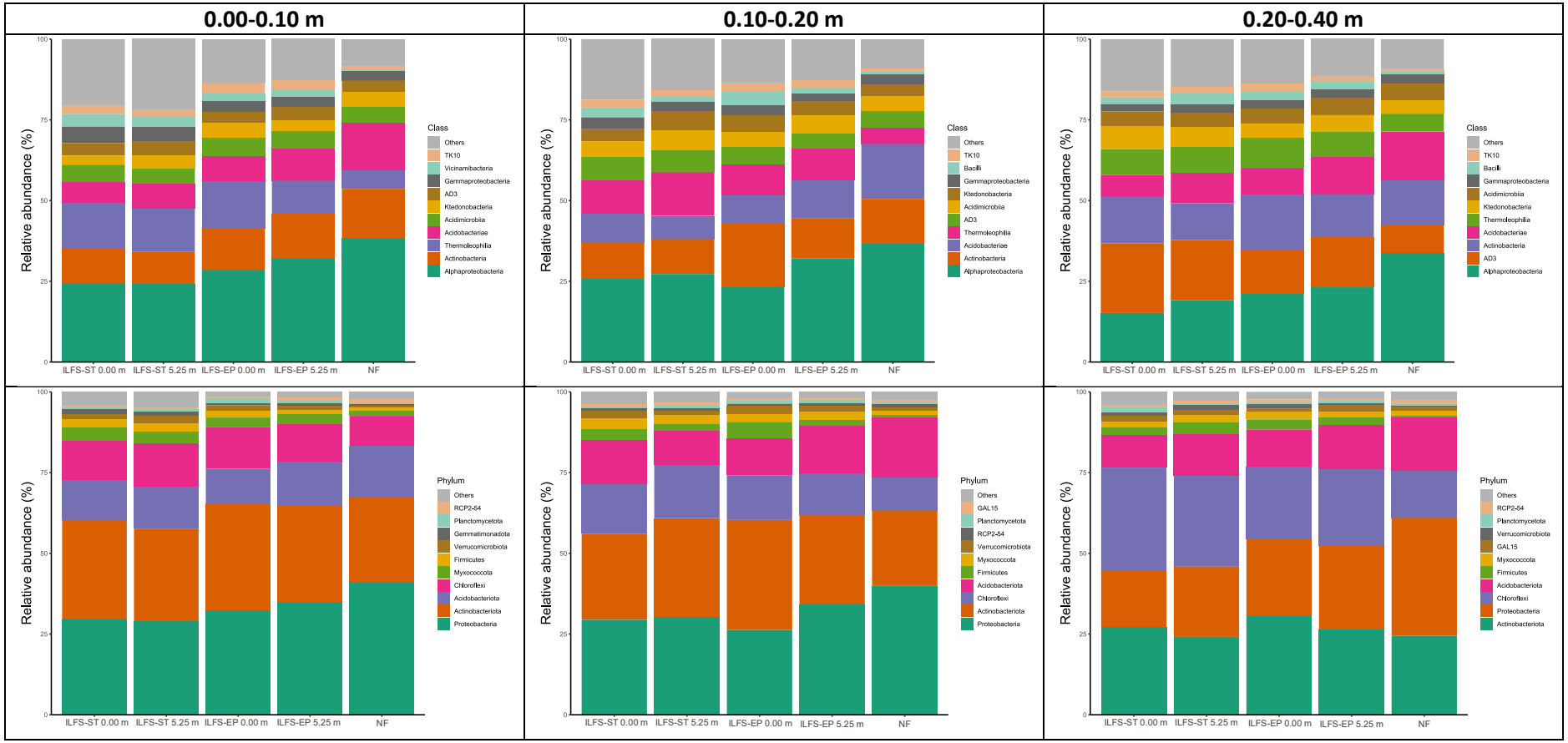


Figure S3. Relative abundance of the most abundant prokaryotic taxa across all soil layers and areas. ILFS-ST: integrated livestock-forestry system with *Samanea tubulosa*; ILFS-EP: integrated livestock-forestry system with *Eucalyptus pellita*; 0.00 and 5.25 m: distance from the trees in the ILFSs; NF: native forest.

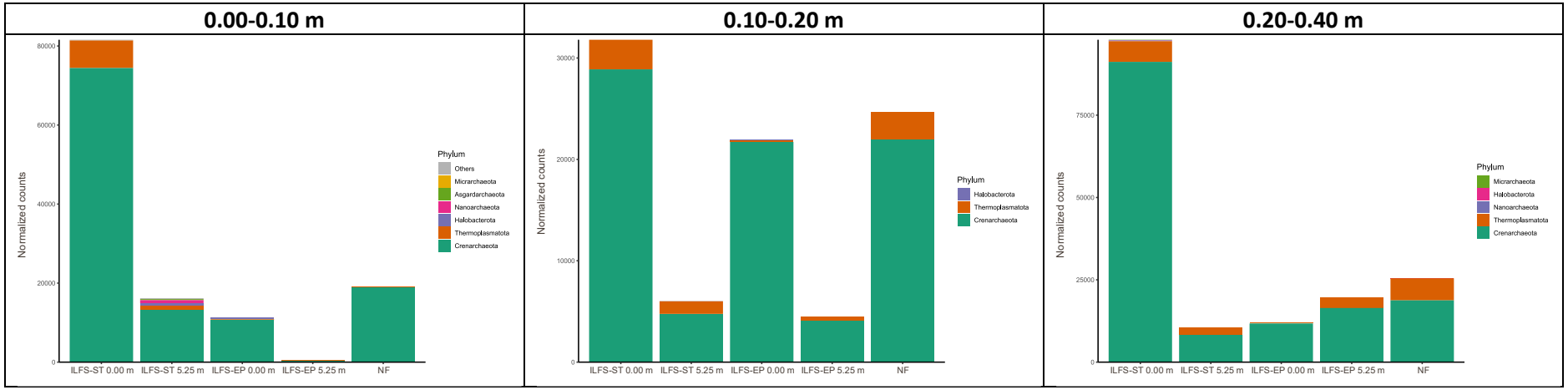


Figure S4. Normalized counts (sum of five replicates) of *Archaea* phyla across all soil layers and areas. ILFS-ST: integrated livestock-forestry system with *Samanea tubulosa*; ILFS-EP: integrated livestock-forestry system with *Eucalyptus pellita*; 0.00 and 5.25 m: distance from the trees in the ILFSs; NF: native forest.

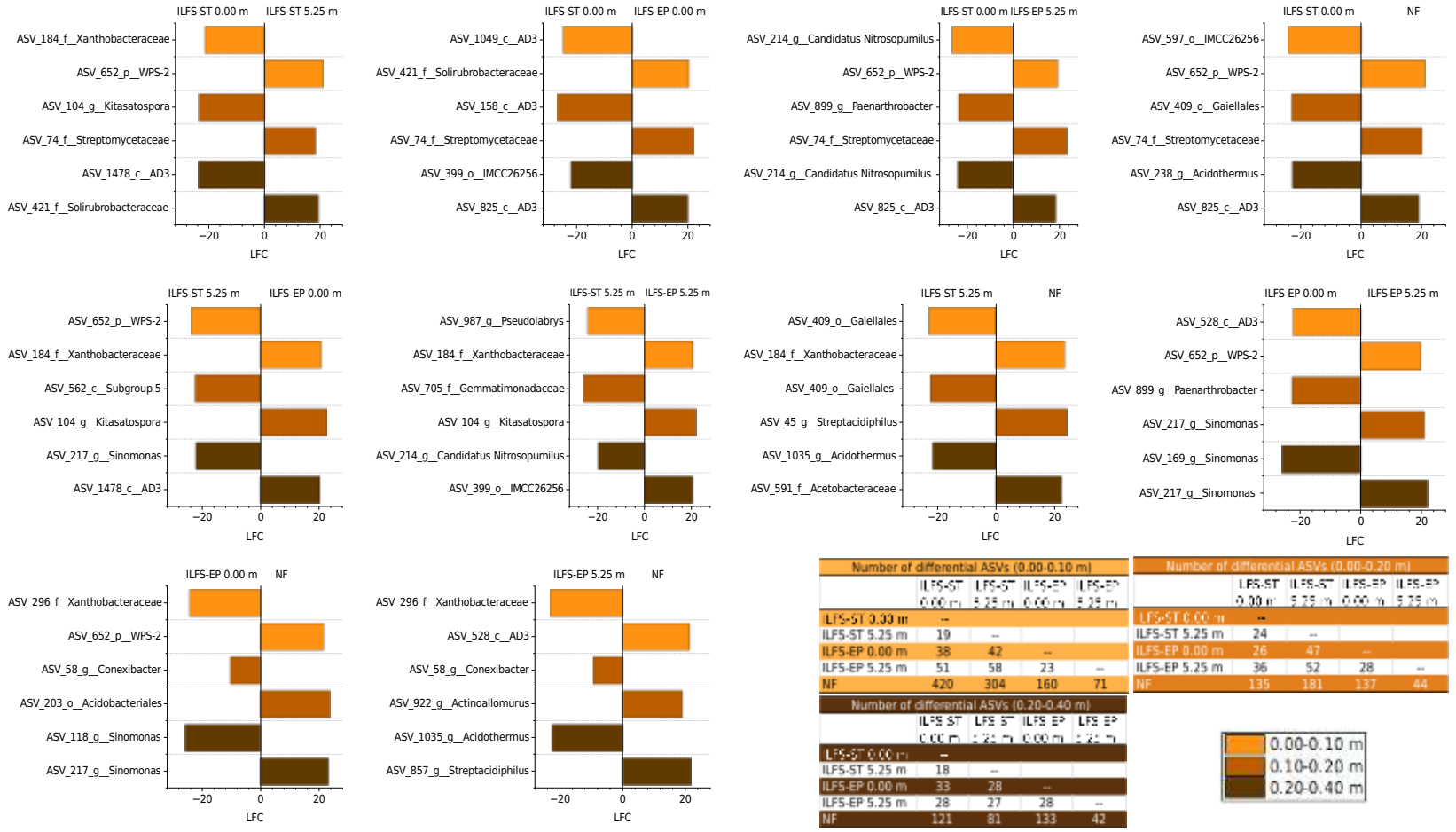


Figure S5. Top significantly differently abundant ASVs in pairwise comparisons (DESeq2) among experimental areas and soil layers. The embedded table shows the number of significantly differently abundant ASVs in each pairwise comparison. ILFS-ST: integrated livestock-forestry system with *Samanea tubulosa*; ILFS-EP: integrated livestock-forestry system with *Eucalyptus pellita*; 0.00 m and 5.25 m: distance from the trees in the ILFSs; NF: native forest.

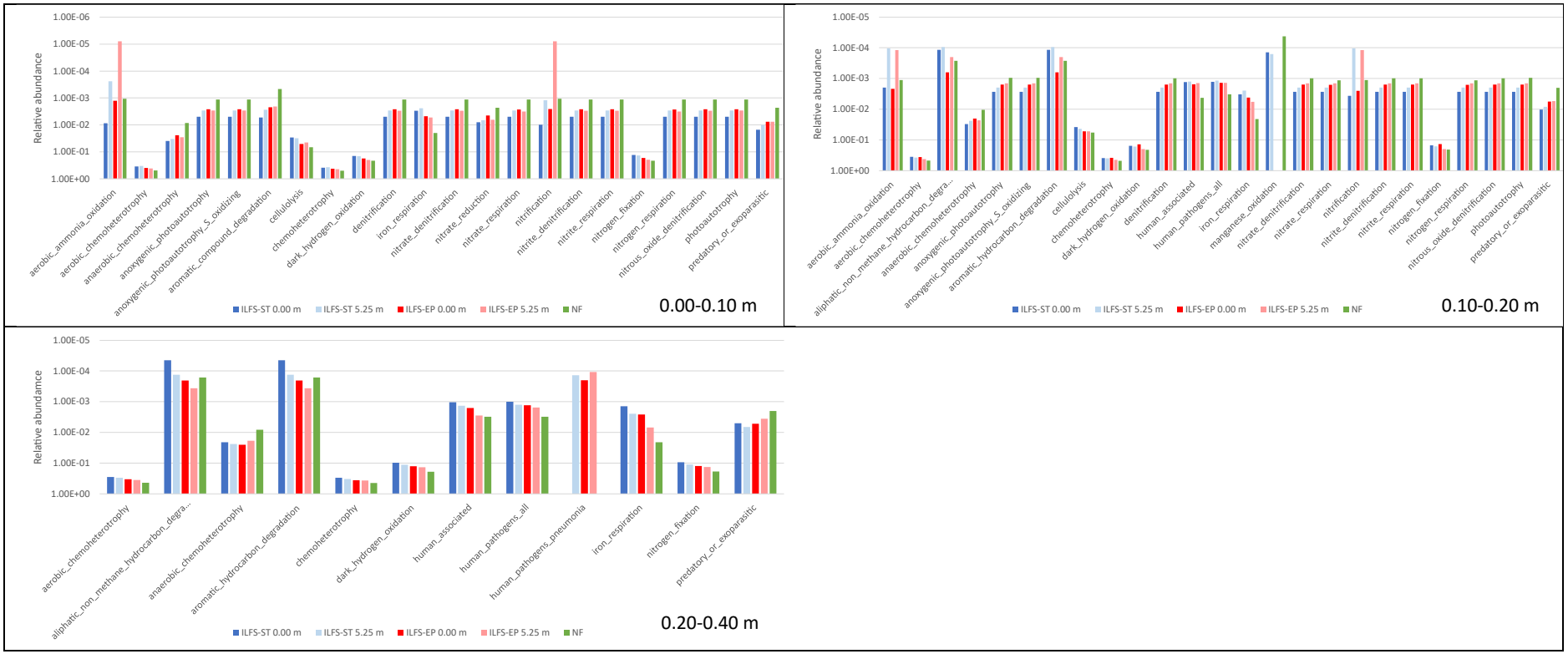


Figure S6. Mean relative abundance of putative soil functional groups (FAPROTAX) for each area and soil layer. Only significantly different functions, according to LEfSe analysis at the 5% level with FDR correction, are shown. The graphics are in reverse scale (the higher the bar, the lower the mean relative abundance). Functions are in alphabetical order. ILFS-ST: integrated livestock-forestry system with *Samanea tubulosa*; ILFS-EP: integrated livestock-forestry system with *Eucalyptus pellita*; 0.00 and 5.25 m: distance from the trees in the ILFSs; NF: native forest.

Table S3. Differential abundance of the *Streptomycetaceae* family in pairwise comparisons. LFC: log2 fold change; LFC SE: log2 fold change standard error; Adjusted p-value: p-value corrected for FDR; ns: not significant at the 5% level; *, ** and ***: significant at the 5%, 1% and 0.1% levels, respectively; ILFS-ST: integrated livestock-forestry system with *Samanea tubulosa*; ILFS-EP: integrated livestock-forestry system with *Eucalyptus pellita*; 0.00 and 5.25 m: distance from the trees in the ILFSs; NF: native forest.

Soil layer	Reference	Comparison	Base mean	LFC	LFC SE	Statistics	p-value	Adjusted p-value	Significance	Prevalence
0.00-0.10 m	ILF-ST 0.00 m	ILFS-ST 5.25 m	2912.092	0.0337	0.409	0.082	0.934	0.995	ns	ILFS-ST 5.25 m
		ILFS-EP 0.00 m	2912.092	0.980	0.409	2.393	0.017	0.078	ns	ILF-EP 0.00 m
		ILFS-EP 5.25 m	2912.092	1.718	0.409	4.199	2.68E-05	0.001	***	ILFS-EP 5.25 m
		NF	2912.092	3.048	0.409	7.451	9.28E-14	2.56E-12	***	NF
	ILFS-ST 5.25 m	ILFS-EP 0.00 m	2912.092	0.946	0.409	2.311	0.021	0.126	ns	ILFS-EP 0.00 m
		ILFS-EP 5.25 m	2912.092	1.684	0.409	4.117	3.83E-05	0.002	**	ILFS-EP 5.25 m
		NF	2912.092	3.014	0.409	7.369	1.72E-13	7.29E-12	***	NF
	ILFS-EP 0.00 m	ILFS-EP 5.25 m	2912.092	0.738	0.409	1.806	0.071	0.387	ns	ILFS-EP 5.25 m
		NF	2912.092	2.068	0.409	5.058	4.23E-07	6.32E-06	***	NF
	ILFS-EP 5.25 m	NF	2912.092	1.330	0.409	3.253	0.001	0.004	**	NF
0.10-0.20 m	ILF-ST 0.00 m	ILFS-ST 5.25 m	3478.664	-0.264	0.525	-0.503	0.615	0.920	ns	ILF-ST 0.00 m
		ILFS-EP 0.00 m	3478.664	1.403	0.525	2.672	0.008	0.055	ns	ILFS-EP 0.00 m
		ILFS-EP 5.25 m	3478.664	0.801	0.525	1.526	0.127	0.250	ns	ILFS-EP 5.25 m
		NF	3478.664	1.811	0.525	3.451	0.000559	0.002	**	NF
	ILFS-ST 5.25 m	ILFS-EP 0.00 m	3478.664	1.667	0.525	3.175	0.002	0.010	**	ILFS-EP 0.00 m
		ILFS-EP 5.25 m	3478.664	1.065	0.525	2.028	0.042	0.147	ns	ILFS-EP 5.25 m
		NF	3478.664	2.075	0.525	3.953	7.71E-05	0.000	***	NF
	ILFS-EP 0.00 m	ILFS-EP 5.25 m	3478.664	-0.602	0.525	-1.147	0.252	0.582	ns	ILFS-EP 0.00 m
		NF	3478.664	0.409	0.525	0.779	0.436	0.567	ns	ILFS-EP 0.00 m
	ILFS-EP 5.25 m	NF	3478.664	1.010	0.525	1.925	0.054	0.157	ns	NF
0.20-0.40 m	ILF-ST 0.00 m	ILFS-ST 5.25 m	3645.409	-0.284	0.392	-0.723	0.470	0.982	ns	ILF-ST 0.00 m
		ILFS-EP 0.00 m	3645.409	0.395	0.392	1.007	0.314	0.612	ns	ILFS-EP 0.00 m
		ILFS-EP 5.25 m	3645.409	0.355	0.392	0.906	0.365	0.505	ns	ILFS-EP 5.25 m

Soil layer	Reference	Comparison	Base mean	LFC	LFC SE	Statistics	p-value	Adjusted p-value	Significance	Prevalence
		NF	3645.409	0.920	0.392	2.345	0.019	0.049	*	NF
	ILFS-ST 5.25 m	ILFS-EP 0.00 m	3645.409	0.679	0.392	1.730	0.084	0.998	ns	ILFS-EP 0.00 m
		ILFS-EP 5.25 m	3645.409	0.639	0.392	1.629	0.103	0.834	ns	ILFS-EP 5.25 m
		NF	3645.409	1.203	0.392	3.068	0.0022	0.008	**	NF
	ILFS-EP 0.00 m	ILFS-EP 5.25 m	3645.409	-0.040	0.392	-0.102	0.919	0.975	ns	ILFS-EP 0.00 m
		NF	3645.409	0.525	0.392	1.337	0.181	0.293	ns	NF
	ILFS-EP 5.25 m	NF	3645.409	0.564	0.392	1.439	0.150	0.337	ns	NF