Supporting information for:

Agricultural soil organic matters and microbiome are shaped by management and hedgerows

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Edaphic properties measurements

Soil pH was measured in as suspension with a soil-to-water ratio of 1:2.5 (w/v) by a pH meter. Total nitrogen (TN) was determined using a Kjeltec 2200 Auto Distillation Unit (Foss Tecator AB, Sweden). Total phosphorus (TP) was measured by the molybdenum blue method using a UV-vis spectrophotometer (UV-2550, Shimadzu, Japan). Soil organic matter (OM) was quantified using the potassium dichromate oxidation titration method (LY/T, 1237-1999). The nitrate (NO3.N) and ammonia (NH4.N) nitrogen in the soil were determined using a flow injection analyzer (Skalar Analytical, Breda, The Netherlands). Alkali-hydrolyzable nitrogen (ahN) was assayed using the alkaline-hydrolysis and diffusion method. Available phosphorus (aP) was determined by the molybdenum blue method after extraction by 0.5 mol/L $NaHCO_3$. Soil total potassium (TK) was digested in a nickel crucible with sodium hydroxide at 750 °C, and the available potassium (aK) was extracted using 1 mol/L ammonium acetate. The concentrations of potassium were determined with an atomic absorption spectrophotometer (AAnalyst 400, PerkinElmer, US).

Table S1. The soil chemical properties in the CM, EM, and EMH systems.

ID	TN (g/Kg)	TP (g/Kg)	TK (g/Kg)	OM (g/Kg)	ahN (mg/Kg)	NH4.N (mg/Kg)	NO3.N (mg/Kg)	aP (mg/Kg)	aK (mg/Kg)	pH
CM1A	1.26	0.51	11.3	19.3	157	6.94	10.6	10.0	109	8.37
CM1B	1.30	0.50	11.2	19.0	111	5.51	24.2	10.3	126	8.41
CM2A	1.32	0.51	15.6	23.0	108	4.82	29.2	10.1	131	8.36
CM2B	1.30	0.55	16.5	21.1	62.6	4.19	25.1	9.2	114	8.51
CM3A	1.46	0.55	14.9	20.6	118	3.94	39.0	15.7	103	8.46
CM3B	1.27	0.59	14.6	17.6	94	3.78	24.1	13.1	129	8.39
CM4A	1.55	0.54	14.7	26.5	115	3.90	28.3	8.1	90	8.59
CM4B	1.35	0.56	13.5	24.7	122	3.78	24.6	7.5	119	8.44
EM1A	1.65	0.60	11.1	27.1	125	5.01	40.2	21.5	109	8.03
EM1B	1.74	0.72	15.1	21.0	157	2.89	37.6	27.9	134	8.08
EM2A	1.62	0.62	13.3	27.8	150	4.20	50.5	26.5	119	7.96
EM2B	1.57	0.56	13.5	25.8	118	9.25	47.8	21.0	120	7.89
EM3A	1.40	0.56	17.2	27.0	125	3.31	46.0	11.7	113	7.93
EM3B	1.30	0.56	16.2	21.0	111	3.42	33.4	9.6	129	8.04
EM4A	1.82	0.70	15.3	28.8	146	3.43	54.6	28.6	116	7.89
EM4B	1.64	0.73	16.1	27.8	122	3.87	43.8	21.8	116	7.95
EMH1A	1.42	0.53	11.1	26.3	90.5	4.17	17.8	13.3	118	8.02
EMH1B	1.41	0.55	11.8	21.4	101	3.79	20.8	12.6	105	8.10
EMH2A	1.68	0.74	13.3	25.6	139	7.01	28.1	28.3	134	8.13
EMH2B	1.69	0.79	12.9	24.0	122	3.98	39.2	33.1	100	8.02
EMH3A	1.82	0.90	14.4	31.8	184	4.25	54.7	41.4	112	7.89
EMH3B	1.92	1.04	14.9	26.5	173	4.12	49.0	54.0	115	7.99
EMH4A	1.83	0.90	16.1	27.9	122	8.71	64.5	34.9	84.1	8.07
EMH4B	1.81	0.88	15.9	21.9	104	8.44	52.2	33.2	361	8.08

Table S2. Effects of management and hedgerow on environmental factors and soil DOM as assessed by the three complementary non-parametric multivariate statistical tests.

	Management (M)		**Hedgerow (H)**		**M × H**	
	F	*p*	F	*p*	F	*p*
TN	17.58	0.002	7.598	0.013	9.862	0.001
TP	9.128	0.007	16.22	0.003	9.947	0.001
TK	0.074	0.786	0.504	0.496	0.505	0.591
OM	10.13	0.006	1.724	0.196	4.837	0.001
Ammonium	0.229	0.657	1.821	0.211	0.892	0.443
Nitrate	11.67	0.004	0.952	0.336	5.841	0.013
alkali-hydrolytic N	3.02	0.096	0.459	0.500	1.458	0.252
available P	13.50	0.001	13.09	0.002	10.59	0.001
available K	0.448	0.666	1.135	0.342	0.556	0.912
pH	24.2	0.001	0.455	0.511	14.98	0.001
TFI	14.31	0.002	13.38	0.003	11.16	0.003
FI	11.75	0.004	2.336	0.145	5.626	0.011
HIX	10.63	0.006	3.429	0.075	5.284	0.013
BIX	4.397	0.038	1.472	0.238	2.142	0.125
Region I	15.23	0.001	52.58	0.001	35.04	0.001
Region II	3.795	0.014	6.201	0.002	3.491	0.001
Region III	23.05	0.001	23.34	0.001	22.76	0.001
Region IV	26.91	0.001	34.17	0.001	35.82	0.001
Region V	23.08	0.001	19.65	0.001	20.06	0.001

Table S3. Effects of management and hedgerow on bacterial and eukaryotic alpha-diversity as assessed by the three complementary non-parametric multivariate statistical tests.

	Adonis		**ANOSIM**		**MRPP**	
	F	*P*	R	*P*	δ	*P*
Bacterial (Sobs)						
Management (M)	1.321	0.262	0.0401	0.262	233.7	0.340
Hedgerow (H)	0.453	0.448	Neg	0.942	239	0.708
M × H	0.644	0.535	Neg	0.823	242.3	0.737
Bacterial (Shannon)						
Management (M)	2.557	0.125	Neg	0.736	0.118	0.176
Hedgerow (H)	10.46	0.003	0.201	0.034	0.106	0.01
M × H	5.041	0.019	0.0407	0.208	0.109	0.045
Bacterial (Evenness)						
Management (M)	2.688	0.119	Neg	0.476	0.0112	0.211
Hedgerow (H)	17.25	0.002	0.407	0.003	0.0086	0.001
M × H	8.236	0.001	0.256	0.009	0.0088	0.004
Eukaryotic (Sobs)						
Management (M)	3.278	0.095	0.0839	0.149	22.71	0.097
Hedgerow (H)	0.006	0.929	Neg	0.467	24.43	0.753
M × H	2.082	0.143	0.0415	0.215	22.92	0.194
Eukaryotic (Shannon)						
Management (M)	2.173	0.165	0.0435	0.298	0.227	0.425
Hedgerow (H)	0.003	0.963	Neg	0.671	0.224	0.267
M × H	1.500	0.247	0.0101	0.363	0.222	0.259
Eukaryotic (Evenness)						
Management (M)	1.296	0.287	0.3435	0.004	0.006	0.067
Hedgerow (H)	0.221	0.64	Neg	0.982	0.006	0.443

M × H	0.624	0.567	0.0432	0.190	0.006	0.238

Table S4. Effects of management and hedgerow on different phylogenetic groups as assessed by the three complementary non-parametric multivariate statistical tests.

	Adonis		**ANOSIM**		**MRPP**	
	F	*P*	R	*P*	δ	*P*
Acidobacteria						
Management (M)	2.237	0.062	0.144	0.057	0.268	0.036
Hedgerow (H)	1.584	0.132	0.029	0.324	0.272	0.085
M × H	1.672	0.089	0.117	0.056	0.267	0.056
Actinobacteria						
Management (M)	2.905	0.008	0.188	0.042	0.227	0.008
Hedgerow (H)	4.810	0.001	0.375	0.002	0.221	0.001
M × H	3.578	0.001	0.344	0.001	0.214	0.001
Proteobacteria						
Management (M)	2.483	0.014	0.249	0.011	0.264	0.018
Hedgerow (H)	2.765	0.006	0.128	0.036	0.262	0.013
M × H	2.587	0.003	0.244	0.004	0.255	0.004
Chloroflexi						
Management (M)	2.069	0.030	0.203	0.022	0.225	0.024
Hedgerow (H)	4.441	0.001	0.256	0.014	0.214	0.001
M × H	3.321	0.001	0.366	0.001	0.211	0.001
Gemmatimonadetes						
Management (M)	3.034	0.004	0.205	0.019	0.248	0.005
Hedgerow (H)	3.311	0.002	0.237	0.010	0.246	0.002
M × H	3.330	0.001	0.358	0.001	0.236	0.001
Firmicutes						
Management (M)	2.593	0.023	0.197	0.039	0.371	0.026
Hedgerow (H)	0.630	0.75	Neg	0.691	0.387	0.593
M × H	2.178	0.032	0.155	0.019	0.364	0.021
Bacteroidetes						
Management (M)	2.253	0.031	0.191	0.026	0.394	0.028
Hedgerow (H)	3.971	0.001	0.315	0.003	0.382	0.003
M × H	2.736	0.002	0.270	0.004	0.377	0.001
Rokubacteria						
Management (M)	4.177	0.010	0.207	0.031	0.283	0.012
Hedgerow (H)	0.773	0.513	Neg	0.692	0.301	0.49
M × H	2.559	0.032	0.121	0.037	0.284	0.025
Planctomycetes						
Management (M)	1.895	0.015	0.194	0.020	0.453	0.008
Hedgerow (H)	2.658	0.001	0.285	0.002	0.447	0.001
M × H	2.091	0.001	0.316	0.001	0.442	0.001
Nitrospirae						
Management (M)	2.851	0.046	0.033	0.265	0.206	0.051
Hedgerow (H)	0.643	0.551	0.073	0.189	0.217	0.558
M × H	1.733	0.154	0.102	0.076	0.206	0.115
Ascomycota						
Management (M)	5.956	0.001	0.596	0.001	0.289	0.001
Hedgerow (H)	2.882	0.009	0.030	0.346	0.302	0.002
M × H	4.542	0.001	0.383	0.001	0.275	0.001
Basidiomycota						

Management (M)	2.294	0.050	0.009	0.415	0.359	0.135
Hedgerow (H)	0.411	0.897	Neg	0.894	0.371	0.866
M × H	1.753	0.075	0.164	0.347	0.358	0.162
Mucoromycota						
Management (M)	1.097	0.310	0.160	0.074	0.293	0.286
Hedgerow (H)	1.201	0.261	Neg	0.568	0.291	0.183
M × H	1.261	0.255	0.029	0.219	0.289	0.224
Ciliophora						
Management (M)	2.476	0.066	0.1737	0.047	0.332	0.086
Hedgerow (H)	1.562	0.168	Neg	0.692	0.330	0.045
M × H	2.409	0.028	0.148	0.015	0.321	0.027
Zoopagomycota						
Management (M)	3.381	0.005	0.173	0.047	0.333	0.004
Hedgerow (H)	1.194	0.289	Neg	0.692	0.330	0.275
M × H	2.131	0.010	0.148	0.015	0.321	0.022
Choanoflagellida						
Management (M)	1.567	0.152	0.331	0.003	0.564	0.213
Hedgerow (H)	1.570	0.175	Neg	0.605	0.585	0.077
M × H	2.376	0.014	0.129	0.022	0.562	0.013
Blastocladiomycota						
Management (M)	0.967	0.430	0.129	0.105	0.732	0.604
Hedgerow (H)	2.433	0.022	Neg	0.655	0.695	0.026
M × H	1.921	0.040	0.121	0.036	0.696	0.059

Table S5. Effects of management and hedgerow on the functional profiles of bacteria and eukarya as assessed by the three complementary non-parametric multivariate statistical tests.

	Adonis		**ANOSIM**		**MRPP**	
	F	*P*	R	*P*	δ	*P*
Bacteria (FAPROTAX)						
Management (M)	2.401	0.094	0.113	0.106	0.131	0.139
Hedgerow (H)	11.47	0.001	0.375	0.001	0.112	0.001
M × H	6.054	0.003	0.303	0.002	0.111	0.002
Eukarya (FUNGuild)						
Management (M)	8.468	0.001	0.546	0.001	0.214	0.001
Hedgerow (H)	2.700	0.032	0.134	0.038	0.233	0.015
M × H	6.066	0.001	0.416	0.001	0.203	0.001

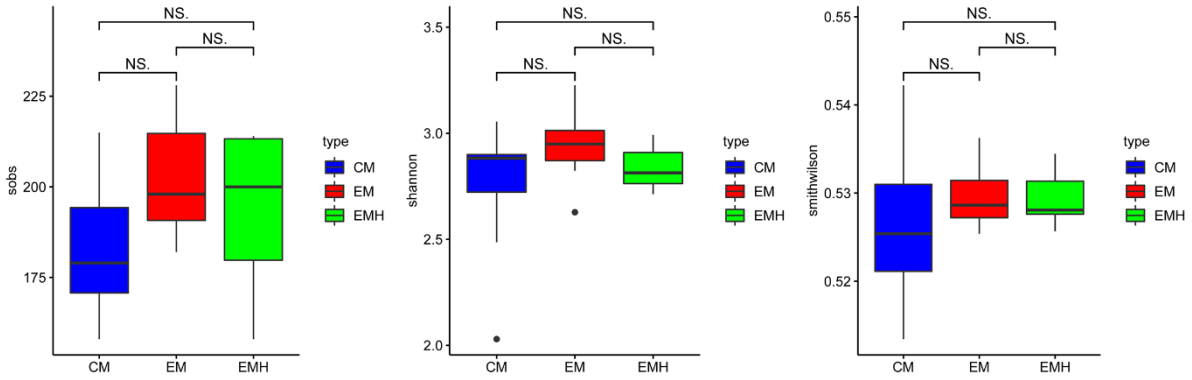

Figure S1. The alpha diversity estimates of eukaryotic communities in CM, EM, and EMH samples.

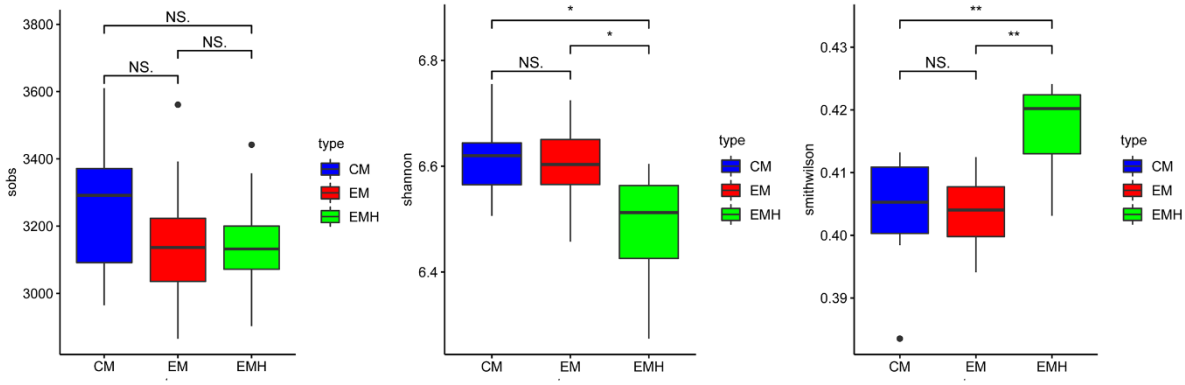

Figure S2. The alpha diversity estimates of bacterial communities in CM, EM, and EMH samples.

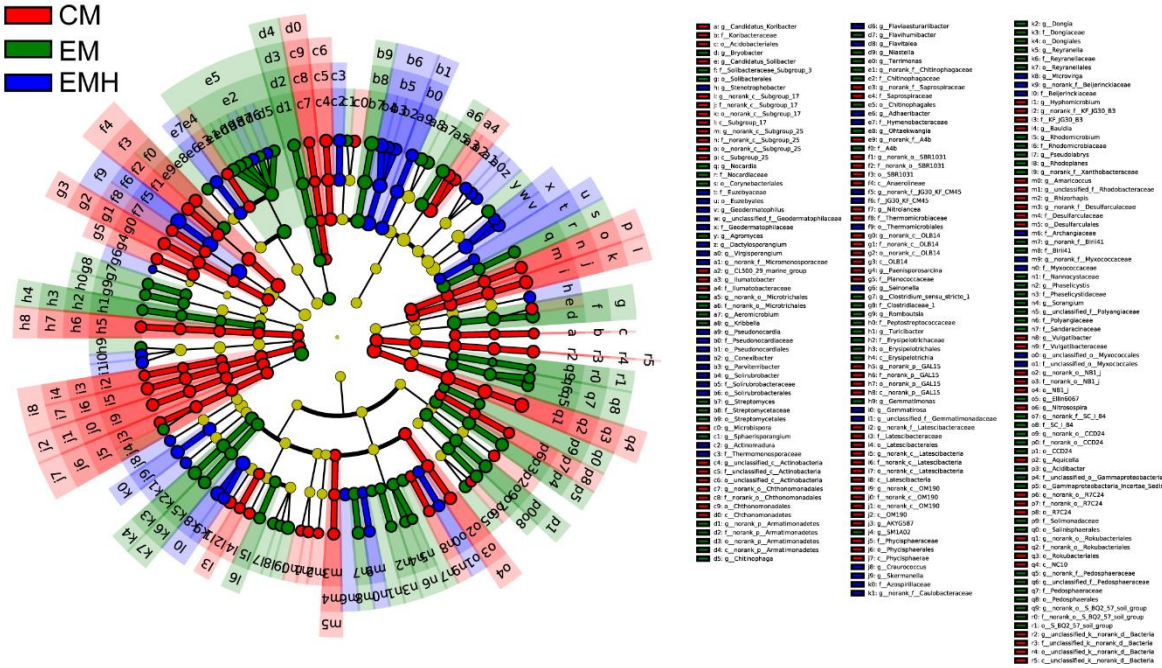

Figure S3. Bacterial cladogram of LEfSe results of according to the different farming systems.

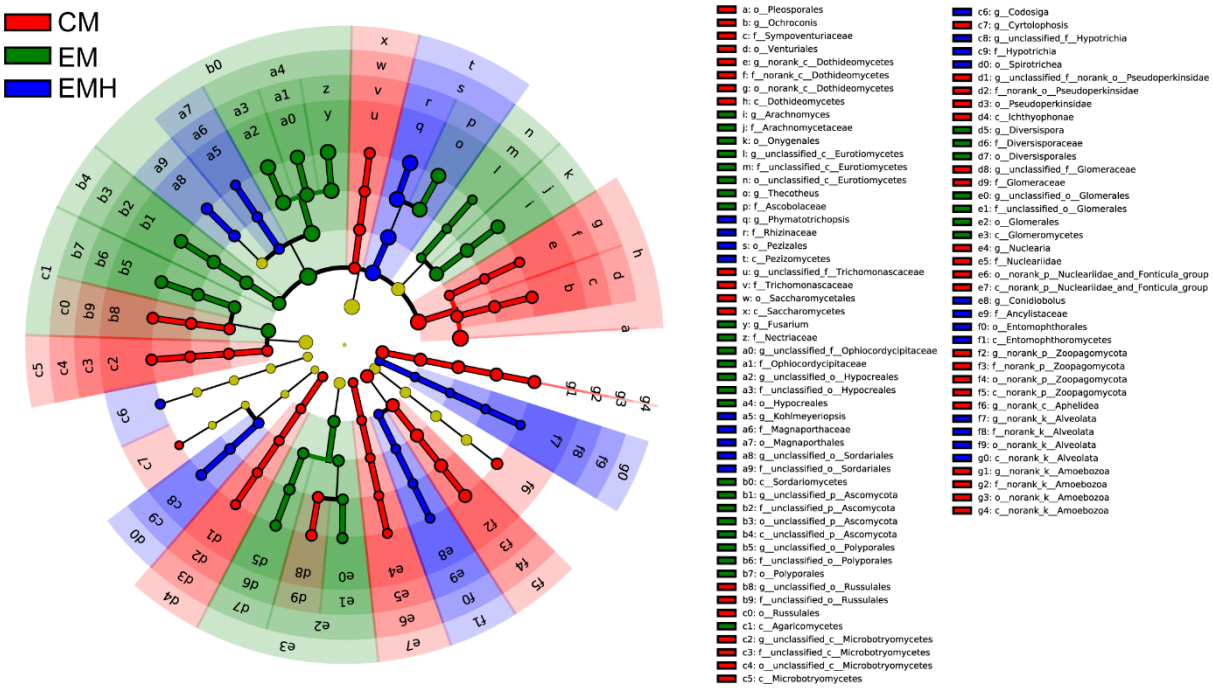

Figure S4. Eukaryotic cladogram of LEfSe results of according to the different farming systems.

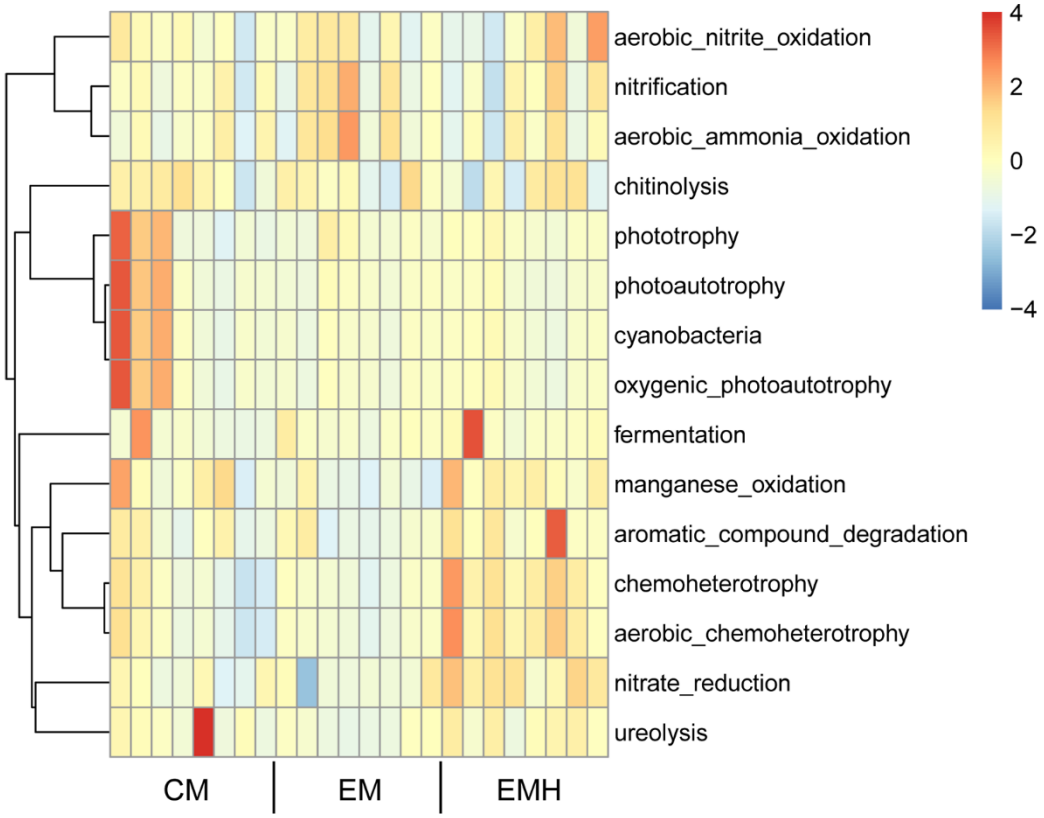

Figure S5. Heatmap of predicted functions based on FAPROTAX.

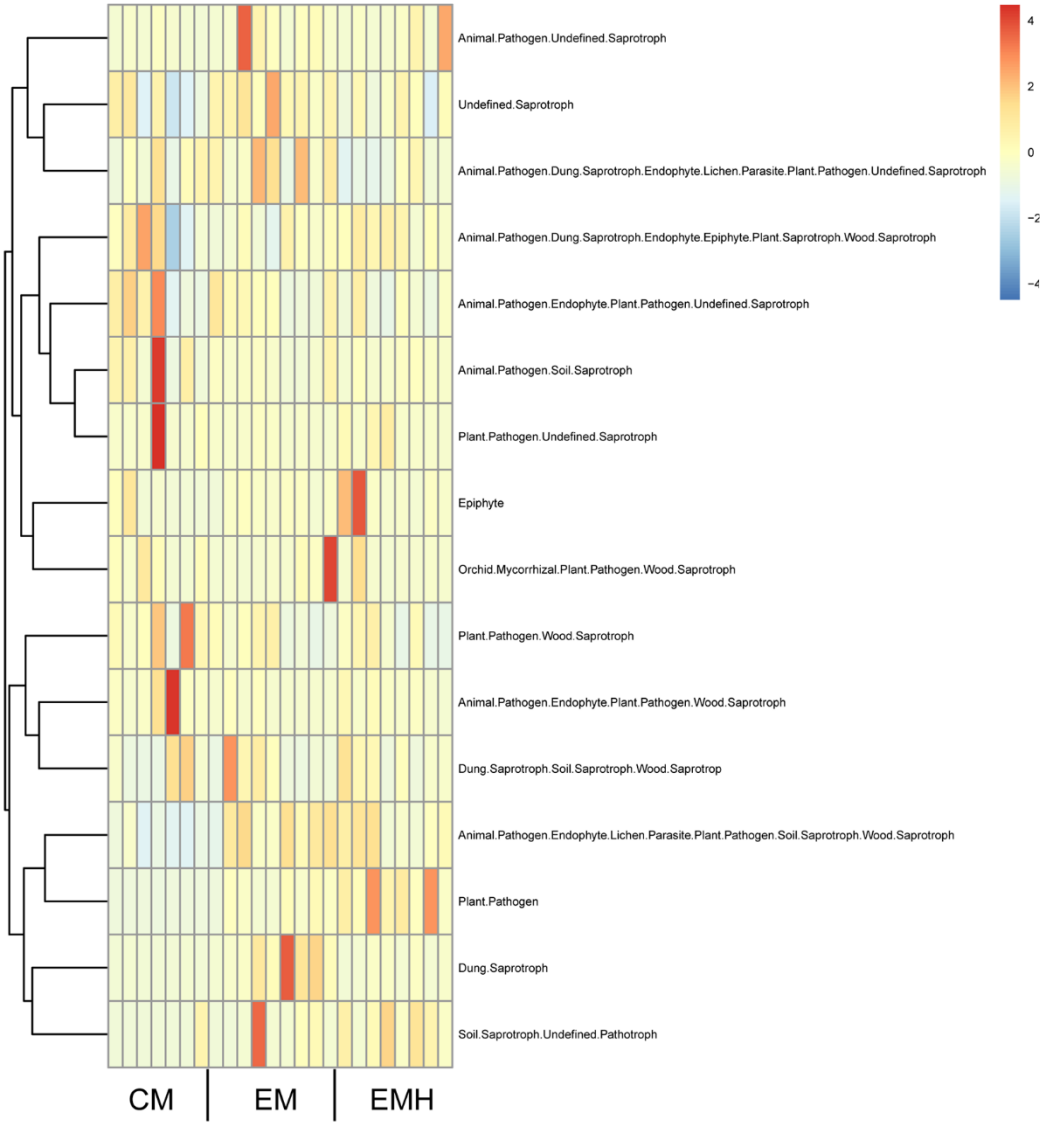

Figure S6. Heatmap of predicted functions based on FUNGuild.