

Supplementary Materials

Table S1. Pearson’s correlation coefficient (*r*) and related significance between physical, chemical, and biological parameters at farm A (*p*-value < 0.05*; *p*-value < 0.001**;
p-value < 0.0001***).

	TN	NH ₄ ⁺ -N	NO ₃ ⁻ -N	SOC	P ₂ O ₅	K ₂ O	Cu	Zn	Fe	Mn	pH	K ⁺	Na ⁺	Ca ²⁺	Mg ²⁺	Elect. Cond.	Bulk Density	Soil Moisture	Total Aerobic Bacteria	N-Fixing Bacteria	Denitrifying Bacteria	Fungi
TN	*																					
NH ₄ ⁺ -N	0.841*	*																				
NO ₃ ⁻ -N	0.774*	0.890*	*																			
SOC	0.578	0.139	0.265	*																		
P ₂ O ₅	0.911**	0.768*	0.736*	0.574	*																	
K ₂ O	0.925**	0.854*	0.809*	0.532	0.976**	*																
Cu	0.627	0.355	0.449	0.608	0.792*	0.668*	*															
Zn	0.666	0.534	0.597	0.413	0.856*	0.763*	0.946**	*														
Fe	0.178	-0.127	-0.412	0.322	0.051	0.034	-0.134	-0.268	*													
Mn	0.626	0.295	0.036	0.472	0.513	0.473	0.265	0.199	0.849*	*												
pH	0.463	0.202	0.349	0.884*	0.564	0.562	0.545	0.414	0.064	0.187	*											
K ⁺	0.935**	0.837*	0.809*	0.568	0.984***	0.998***	0.710*	0.790*	0.026	0.475	0.581	*										
Na ⁺	0.431	0.565	0.845*	0.261	0.513	0.568	0.447	0.555	-0.731*	-0.395	0.481	0.577	*									
Ca ²⁺	0.689*	0.645	0.800*	0.597	0.716*	0.732*	0.664	0.650	-0.367	-0.004	0.731*	0.753*	0.819*	*								
Mg ²⁺	0.845*	0.673*	0.810*	0.673*	0.888*	0.870*	0.832*	0.846*	-0.221	0.242	0.669*	0.897*	0.746*	0.875*	*							
Elect. Cond.	0.738*	0.888*	0.995***	0.213	0.715*	0.789*	0.449	0.609	-0.476	-0.030	0.326	0.787*	0.867*	0.803*	0.798*	*						
Bulk Density	0.027	0.263	0.034	-0.295	-0.263	-0.087	-0.658	-0.570	0.114	-0.039	-0.145	-0.116	-0.074	-0.005	-0.208	0.059	*					
Soil Moisture	-0.089	-0.303	-0.629	-0.046	-0.212	-0.242	-0.439	-0.522	0.939*	0.737	-0.373	-0.259	-0.903*	-0.665	-0.571	-0.679	0.141	*				
Total Aerobic Bacteria	0.726	0.522	0.212	0.715	0.614	0.610	0.202	0.174	0.768	0.955*	0.453	0.597	-0.218	0.165	0.301	0.149	0.061	0.606	*			
N-Fixing Bacteria	0.538	0.265	-0.035	0.596	0.410	0.388	0.048	-0.013	0.917*	0.998***	0.189	0.377	-0.469	-0.130	0.057	-0.111	-0.027	0.771	0.941*	*		
Denitrifying Bacteria	0.851*	0.840*	0.635	0.826*	0.928*	0.937*	0.680	0.705	0.192	0.511	0.928*	0.927*	0.385	0.734	0.747	0.621	-0.010	-0.037	0.692	0.477	*	
Fungi	-0.082	-0.292	-0.613	-0.057	-0.230	-0.252	-0.477	-0.556	0.932*	0.734	-0.391	-0.269	-0.893*	-0.664	-0.572	-0.664	0.177	0.997***	0.606	0.767	-0.060	*

Table S2. Pearson’s correlation coefficient (*r*) and related significance between physical, chemical, and biological parameters at farm B (*p*-value < 0.05*; *p*-value < 0.001**; *p*-value < 0.0001***).

	TN	NH ₄ ⁺ -N	NO ₃ ⁻ -N	SOC	P ₂ O ₅	K ₂ O	Cu	Zn	Fe	Mn	pH	K ⁺	Na ⁺	Ca ²⁺	Mg ²⁺	Elect. Cond.	Bulk Density	Soil Moisture	Total Aerobic Bacteria	N-Fixing Bacteria	Denitrifying Bacteria	Fungi
TN	*																					
NH ₄ ⁺ -N	0.641	*																				
NO ₃ ⁻ -N	0.801*	0.764*	*																			
SOC	0.725*	0.223	0.205	*																		
P ₂ O ₅	0.622	0.183	0.490	0.513	*																	
K ₂ O	0.800*	0.372	0.700	0.534	0.299	*																
Cu	-0.022	0.212	-0.155	0.099	-0.429	0.106	*															
Zn	0.699	0.680	0.424	0.704	0.208	0.529	0.594	*														
Fe	-0.126	0.343	-0.103	-0.140	-0.748*	0.030	0.843*	0.437	*													
Mn	-0.393	0.100	-0.270	-0.417	-0.890*	-0.134	0.729*	0.098	0.934**	*												
pH	0.461	-0.227	0.010	0.751*	0.474	0.551	0.212	0.405	-0.227	-0.352	*											
K ⁺	0.893*	0.767*	0.952**	0.409	0.525	0.731*	-0.095	0.594	-0.077	-0.317	0.122	*										
Na ⁺	0.784*	0.519	0.911*	0.301	0.704	0.650	-0.478	0.240	-0.476	-0.618	0.127	0.894*	*									
Ca ²⁺	0.876*	0.285	0.592	0.790*	0.857*	0.660	-0.263	0.490	-0.515	-0.741*	0.652	0.714*	0.762*	*								
Mg ²⁺	0.611	-0.039	0.121	0.933**	0.490	0.597	-0.036	0.490	-0.291	-0.493	0.849*	0.294	0.297	0.770*	*							
Elect. Cond.	0.716*	0.655	0.971***	0.064	0.402	0.713*	-0.161	0.277	-0.092	-0.188	-0.006	0.873*	0.868*	0.497	0.027	*						
Bulk Density	0.352	0.869	0.835	-0.452	-0.306	0.227	-0.034	0.268	0.912	0.809	-0.759	0.787	0.803	-0.305	-0.628	0.856	*					
Soil Moisture	-0.247	0.420	0.360	-0.789	-0.802	-0.304	-0.503	-0.341	0.690	0.895	-0.976*	0.289	0.311	-0.787	-0.784	0.399	0.813	*				
Total Aerobic Bacteria	-0.126	0.394	0.333	-0.503	-0.732	-0.059	-0.675	-0.314	0.486	0.653	-0.808	0.239	0.351	-0.617	-0.467	0.357	0.760	0.915	*			
N-Fixing Bacteria	-0.274	0.401	0.341	-0.812	-0.814	-0.338	-0.498	-0.360	0.689	0.905	-0.984*	0.272	0.287	-0.806	-0.804	0.381	0.800	0.999**	0.901	*		
Denitrifying Bacteria	-0.450	-0.456	-0.497	0.054	-0.543	-0.144	-0.934	-0.664	-0.511	-0.218	-0.084	-0.581	-0.392	-0.329	0.309	-0.499	-0.156	0.218	0.502	0.206	*	
Fungi	0.056	-0.477	-0.463	0.770	0.266	0.364	-0.345	-0.095	-0.842	-0.861	0.683	-0.489	-0.315	0.464	0.921	-0.502	-0.583	-0.544	-0.181	-0.564	0.655	*