How agriculture, connectivity and water management can affect water quality of a Mediterranean coastal wetland

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Supplementary material

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Number of figures: 4

Table S1. Classification of sampling points according to their corresponding aquatic habitat, the agricultural activity carried out in its vicinity, the irrigation zone and their water body typology. Water body typology established according to the Water Framework Directive [24] and the Decret 1/2016 (reference: BOE-A-2016-439).

Sample code	Aquatic habitat	Type of cultivation	Irrigation zones	Water body typology	Type designation
W-1	Turia River	Mosaic cultivation	Turia River	R- T14	Mediterranean low altitude axes
W-2	Turia River	Mosaic cultivation	Turia River	R- T14	Mediterranean low altitude axes
W-3	Irrigation channel	Traditional orchard	Huerta Oeste	R-T14-HM	Low altitude Mediterranean axes. Heavily modified.
W-5	Irrigation channel	Mosaic cultivation	Huerta Oeste	R-T14-AR	Low altitude Mediterranean axes. Artificial.
W-6	Irrigation channel - WWTP	Mosaic cultivation	Huerta Oeste	R-T14-AR	Low altitude Mediterranean axes. Artificial.
W-7	Irrigation channel	Traditional orchard	Favara	R-T14-AR	Low altitude Mediterranean axes. Artificial.
W-8	Irrigation channel	Traditional orchard	Favara	R-T14-AR	Low altitude Mediterranean axes. Artificial.
W-9	Irrigation channel	Rice cultivation	Oro	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-10	Irrigation channel	Rice cultivation	Oro	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-11	Irrigation channel	Fruit tree cultivation	ARJ	R-T17	Large axes in a Mediterranean environment
W-13	Irrigation channel	Rice cultivation	Favara	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-14	Irrigation channel	Rice cultivation	Oro	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-15	Irrigation channel	Rice cultivation	Favara	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-16	Irrigation channel	Rice cultivation	Favara	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-17	Irrigation channel	Rice cultivation	Favara	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-18	Irrigation channel	Rice cultivation	Favara	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-20	Lake	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-21	Outlet channel (Pujol)	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.

W-23	Irrigation channel	Rice cultivation	ARJ	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-24	Irrigation channel	Mosaic cultivation	ARJ	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-25	Lake	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-26	Lake	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-28	Lake	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-29	Irrigation channel	Rice cultivation	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-30	Lake	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-31	Irrigation channel	Rice cultivation	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-32	Outlet channel (Perellonet)	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-33	Irrigation channel	Rice cultivation	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-34	Irrigation channel	Rice cultivation	ARJ	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-35	Irrigation channel	Rice cultivation	Sueca	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-36	Irrigation channel	Fruit tree cultivation	ARJ	R-T17	Large axes in a Mediterranean environment
W-37	Outlet channel (Perelló)	Lake	Lake	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-38	Magro River	Fruit tree cultivation	Magro River	R-T17	Large axes in a Mediterranean environment
W-39	Irrigation channel	Fruit tree cultivation	Magro River	R-T17	Large axes in a Mediterranean environment
W-40	Irrigation channel	Fruit tree cultivation	Magro River	R-T17	Large axes in a Mediterranean environment
W-41	Irrigation channel	Fruit tree cultivation	ARJ	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-42	Irrigation channel	Rice cultivation	Sueca	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-43	Irrigation channel	Rice cultivation	Sueca	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-44	Irrigation channel	Rice cultivation	Sueca	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.

W-45	Irrigation channel	Rice cultivation	Sueca	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-46	Irrigation channel	Rice cultivation	Sueca	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-48	Irrigation channel	Fruit tree cultivation	ARJ	R-T17	Large axes in a Mediterranean environment
W-49	Irrigation channel	Fruit tree cultivation	ARJ	R-T17	Large axes in a Mediterranean environment
W-50	Irrigation channel	Fruit tree cultivation	ARJ	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-51	Irrigation channel	Rice cultivation	Sueca	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-52	Irrigation channel	Rice cultivation	Cullera	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-53	Irrigation channel	Fruit tree cultivation	Cullera	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.
W-54	Irrigation channel	Rice cultivation	Sueca	R-T17	Large axes in a Mediterranean environment
W-55	Irrigation channel	Fruit tree cultivation	Sueca	R-T17	Large axes in a Mediterranean environment
W-56	Jucar River	Fruit tree cultivation	ARJ	R-T17	Large axes in a Mediterranean environment
W-57	Irrigation channel	Rice cultivation	ARJ	L-T28-HM	Coastal lagoons without marine influence. Heavily modified by artificial level fluctuations.

Table S2. Limit of detection (LOD) and limit of quantification (LOQ) of the main physico-chemical and biological variables determined in the laboratory, studied in the water bodies during rice cultivation (May to October 2019).

Variable	Unit	LOD	LOQ
Organic matter	mg L^{-1}	0.0002	0.0002
Ammonium nitrogen	mgN L^{-1}	0.0003	0.001
Nitrite nitrogen	mgN L^{-1}	0.0003	0.001
Nitrate nitrogen	mgN L^{-1}	0.0003	0.001
Dissolved nitrogen (DN)	mgN L^{-1}	0.05	0.05
Total nitrogen (TN)	mgN L^{-1}	0.05	0.05
Soluble reactive phosphorus (SRP)	mgP L^{-1}	0.0001	0.0001
Total phosphorus (TP)	mgP L^{-1}	0.0002	0.0002
Chorophyll-a (Chl-a)	mg m^{-3}	0.003	1.0
Carotene	mg m^{-3}	0.003	1.0
Inorganic carbon (TIC)	mgC L^{-1}	0.05	0.05
Dissolved organic carbon (DOC)	mgC L^{-1}	0.05	0.05
Total organic carbon (TOC)	mgC L^{-1}	0.05	0.05

Table S3. Mean, standard error, maximum and minimum values of the physico-chemical and biological variables studied in water bodies for the two sampling campaigns at the beginning and the end of rice cultivation (see *Section 2* for more details).

Variable	First sampling campaign (May - June 2019)				Second sampling campaign (September - October 2019)			
	Mean	SE	Maximum	Minimum	Mean	SE	Maximum	Minimum
Turbidity (NTU)	12.93	1.91	77.30	0.70	9.97	1.27	38.40	0.50
pH	7.52	0.04	8.40	7.00	8.23	0.06	10.00	7.40
Conductivity ($\mu S\ cm^{-1}$)	1668.6	75.8	3900.0	956.0	1426.9	113.6	6372.0	307.0
Organic matter ($mg\ L^{-1}$)	1.187	0.124	3.449	0.003	1.224	0.087	2.760	0.382
Ammonium ($mgN\ L^{-1}$)	0.669	0.179	7.588	0.002	0.404	0.165	7.357	0.002
Nitrite ($mgN\ L^{-1}$)	0.169	0.026	0.703	0.002	0.099	0.022	0.709	0.001
Nitrate ($mgN\ L^{-1}$)	1.910	0.199	4.421	0.013	2.061	0.232	5.471	0.013
Dissolved inorganic nitrogen (DIN; $mgN\ L^{-1}$)	2.747	0.308	10.233	0.043	2.565	0.316	9.864	0.066
Dissolved organic nitrogen (DON; $mgN\ L^{-1}$)	3.345	0.794	26.736	0.020	2.358	0.747	25.410	0.000
Dissolved nitrogen (DN; $mgN\ L^{-1}$)	6.09	0.77	27.54	0.40	4.92	0.76	25.48	0.79
Total nitrogen (TN; $mgN\ L^{-1}$)	6.95	0.78	28.94	1.09	5.43	0.76	25.99	0.92
Soluble reactive phosphorus (SRP; $mgP\ L^{-1}$)	0.054	0.014	0.621	0.001	0.093	0.047	2.281	0.001
Particulate phosphorus (Ppart; $mgP\ L^{-1}$)	0.199	0.084	3.940	0.0001	0.198	0.054	2.451	0.012
Total phosphorus (TP; $mgP\ L^{-1}$)	0.253	0.082	4.056	0.003	0.106	0.027	1.328	0.007
Chlorophyll-*a* (Chl-*a;* $mg\ m^{-3}$)	29.0	5.1	117.1	1.0	21.4	3.4	92.0	1.0
Carotene ($mg\ m^{-3}$)	12.8	2.3	51.5	1.0	9.5	1.6	36.2	1.0
Inorganic carbon (TIC; $mgC\ L^{-1}$)	34.64	1.79	58.43	3.73	24.25	2.06	52.58	4.08
Dissolved organic carbon (DOC; $mgC\ L^{-1}$)	5.31	0.57	17.22	1.21	4.92	0.45	14.23	1.25
Total organic carbon (TOC; $mgC\ L^{-1}$)	6.18	0.68	17.74	1.32	5.55	0.52	14.36	1.30
Total carbon (TC; $mgC\ L^{-1}$)	40.82	1.47	63.96	20.09	29.81	2.21	60.22	7.36
Alkalinity ($meq\ L^{-1}$)	2.89	0.15	4.87	0.31	2.02	0.17	4.38	0.34

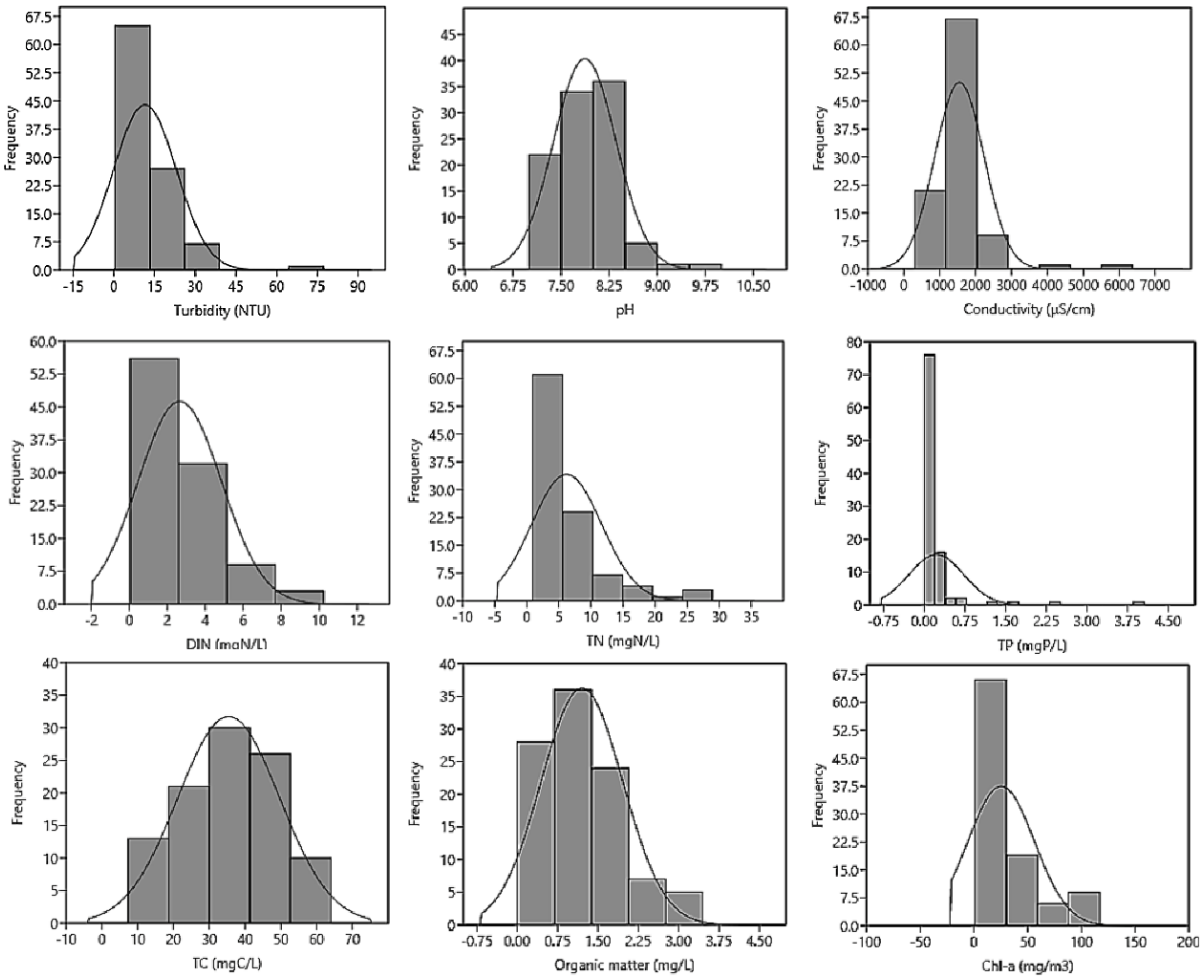

Figure S1. Frequency distribution and adjustment curves of turbidity, pH, conductivity, total nutrients, organic matter and phytoplactonic chlorophyll for the values of the two sampling periods.

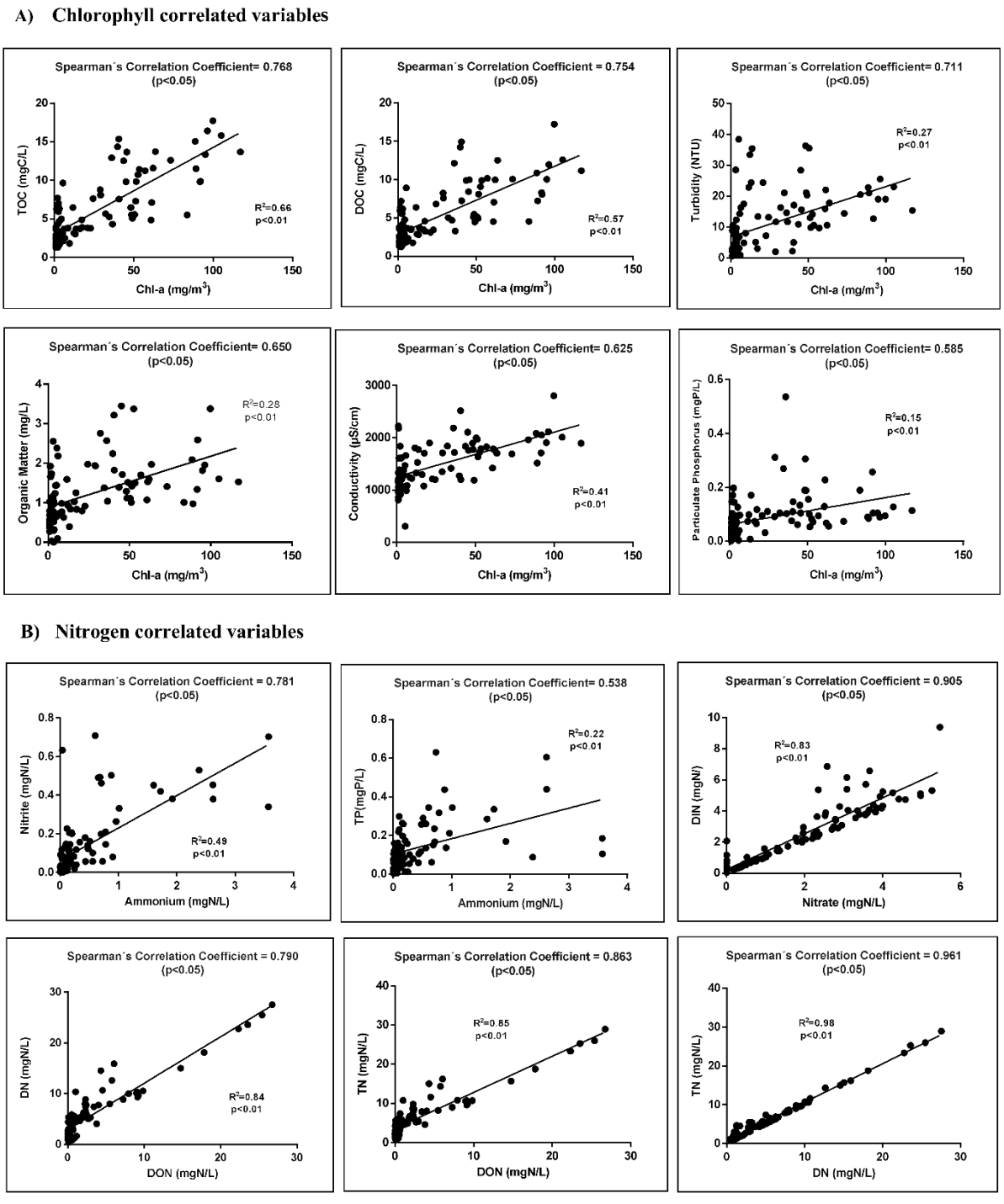

Figure S2. Significant linear relationships ($p < 0.01$) of the study variables related to chlorophyll (A) and nitrogen (B), together with the values of Spearman's correlation coefficient.

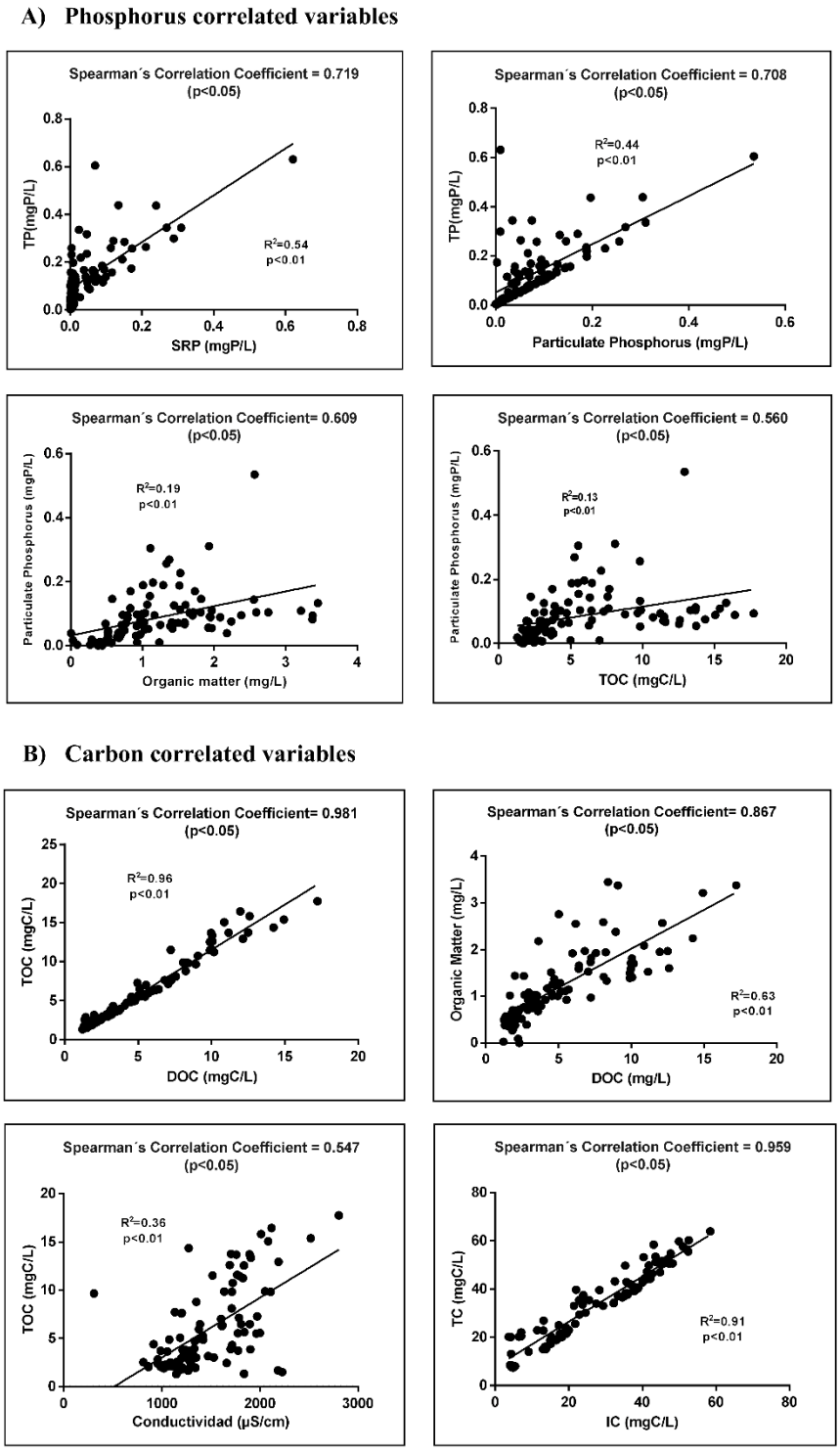

Figure S3. Significant linear relationships ($p < 0.01$) of the study variables related to phosphorus (A) and carbon (B), together with the value of Spearman's correlation coefficient.

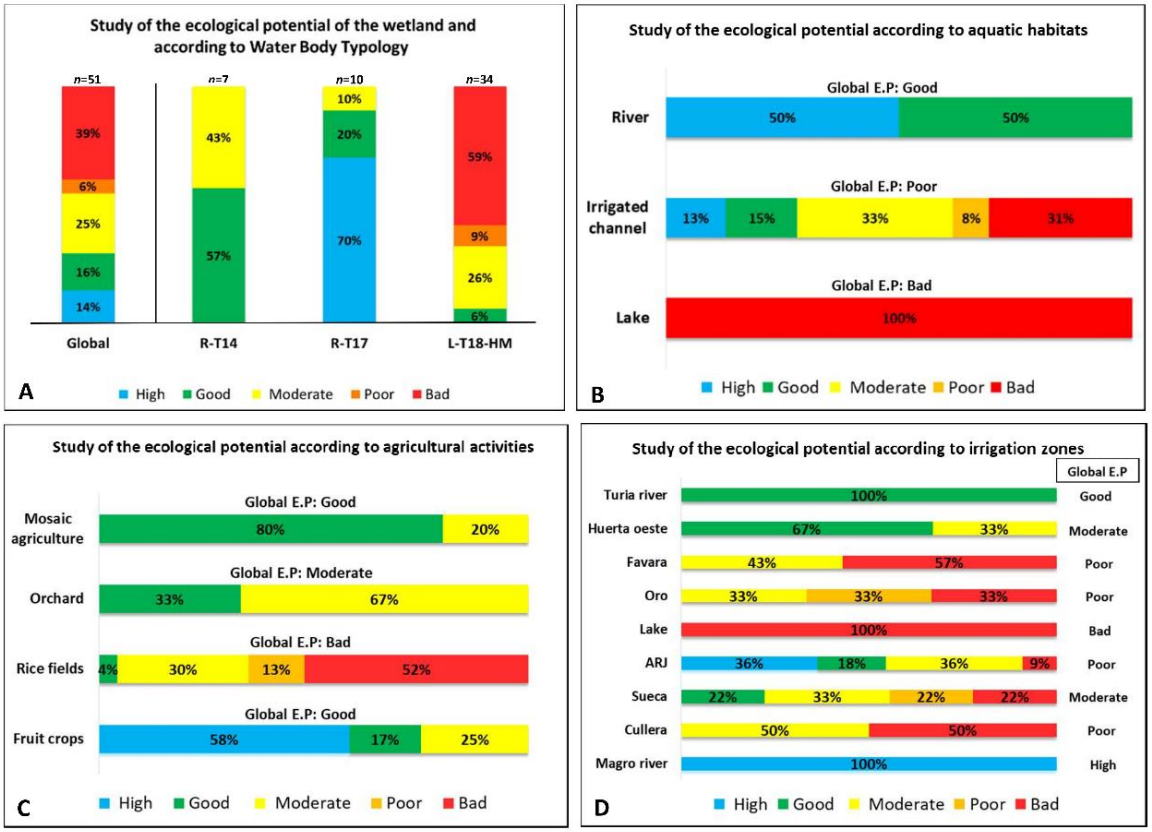

Figure S4. Percentages of the ecological potential for the different aquatic ecosystems and typologies [24,64]. Results for (A) the global study of the wetland and for the distinct water body typologies, (B) considering aquatic habitats, (C) according to agricultural activities, (D) according to irrigation zones.