Table S1. Irrigation systems, corresponding to 5 farms, that present annual and permanent crops, and fertilizers applied during the irrigation campaigns of 2018-2019-2020 (Data sourced EDIA [21] and from farmers).

Irrigation Systems (hydrants)	Predominant Soil Type[a]	Crops (area)	Fertilizers		
			2018	2019	2020
H5-A	Calcaric Cambisols; Chromic Vertisols	Vineyard (9 ha)	**Application data: Dc_17, Mr, Ap, M, Jn, Jl** **N** (kg N ha⁻¹): 96 **P** (kg P₂O₅ ha⁻¹): 102 **K** (kg K₂O ha⁻¹):180 **Other Type** (kg ha⁻¹): Fe: 7.5; CaO: 53	**Application data: Fb, Mr, Jn, Jl, Sp** **N** (kg ha⁻¹): 85 **P** (kg P₂O₅ ha⁻¹): 62 **K** (kg K₂O ha⁻¹): 59 **Other Type** (kg ha⁻¹): Fe: 8; CaO: 53; B: 0.012; Mn: 0.062.	**Application data: Mr, Ap, Jn, Jl, Sp** **N** (kg ha⁻¹): 88 **P** (kg P₂O₅ ha⁻¹): 25 **K** (kg K₂O ha⁻¹): 32 **Other Type** (kg ha⁻¹): MgO: 0.04; S: 0.04; Fe: 0.01; Mn: 0.01; Zn: 0.01; CaO: 0.07.
H6-A	Chromic Vertisols; Calcaric Cambisols	Maize (2018)/ Sunflower (2019)/ Maize (2020) (10 ha)	**Application data: Jl, Ag, Sp** **N** (kg ha⁻¹): 202 **P** (kg P₂O₅ ha⁻¹): 144 **K** (kg K₂O ha⁻¹): 216 **Other Type** (kg ha⁻¹): S: 27	**Application data: M, Jl** **N** (kg ha⁻¹): 82 **P** (kg P₂O₅ ha⁻¹): 19 **K** (kg K₂O ha⁻¹): 20 **Other Type** (kg ha⁻¹): S: 8	**Application data: Jl, Ag, Sp** **N** (kg ha⁻¹): 82 **P** (kg P₂O₅ ha⁻¹): 59 **K** (kg K₂O ha⁻¹): 122 **Other Type** (kg ha⁻¹): S: 6; Zn: 3
H7-B	Pellic Vertisols; Calcaric Cambisols	Sunflower (15 ha: 2018) / Clover (15 ha: 2019)/ Onion (7 ha:2020	**Application data: Ap, M, Jl** **N** (kg ha⁻¹): 110 **P** (kg P₂O₅ ha⁻¹): 40 **K** (kg K₂O ha⁻¹): 12 **Other Type** (kg ha⁻¹): S: 17	**Application data: Mr, M** **N** (kg ha⁻¹): 0.15 **P** (kg P₂O₅ ha⁻¹): 87.8 **K** (kg K₂O ha⁻¹): 0.00063 **Other Type** (kg ha⁻¹): S: 0.22; Mg: 0.12; B: 0.19	**Application data: Mr, Ap** **N** (kg ha⁻¹): 113 **P** (kg P₂O₅ ha⁻¹): 0.73 **K** (kg K₂O ha⁻¹): 0.07 **Other Type** (kg ha⁻¹): Zn: 1.7; Mn: 0.86; MgO: 0.09; S: 210; CaO: 65.
H21-A	Chromic Vertisols; Pellic Vertisols	Olive Grove (9 ha)	**Application data: Fb, Mr** **N** (kg ha⁻¹): 84 **P** (kg P₂O₅ ha⁻¹): 84 **K** (kg K₂O ha⁻¹): 92 **Other Type** (kg ha⁻¹): B: 0.3	Without application of fertilizers	**Application data: Mr, Ap, M, Jl, Ag, Sp** **N** (kg ha⁻¹): 127 **P** (kg P₂O₅ ha⁻¹): 58 **K** (kg K₂O ha⁻¹): 145 **Other Type** (kg ha⁻¹): Zn: 0.17; MgO: 0.17. B: 0.35; S: 33

H23-A	Calcaric Cambisols; Chromic Vertisols	Sunflower (2018)/ Maize (2019) (14 ha)	**Application data: Ap, M, Jn** **N** (kg ha^{-1}): 127 **P** (kg P$_2$O$_5$ ha^{-1}): 34 **K** (kg K$_2$O ha^{-1}): **Other Type** (kg ha^{-1}): B: 0.2; S: 16	**Application data: Jn, Jl, Ag** **N** (kg ha^{-1}): 254	Without plantation
	Chromic Vertisols	Vineyard (4.5 ha)	**Application data: Mr, Ap, Jl, Oc** **N** (kg ha^{-1}): 51 **P** (kg P$_2$O$_5$ ha^{-1}): 50 **K** (kg K$_2$O ha^{-1}): 56	**Application data: Fb, M, Jn** **N** (kg ha^{-1}): 58 **P** (kg P$_2$O$_5$ ha^{-1}): 72 **K** (kg K$_2$O ha^{-1}): 101 **Other Type** (kg ha^{-1}): B: 0.4	**Application data: Fb** **N** (kg ha^{-1}): 34 **P** (kg P$_2$O$_5$ ha^{-1}): 61 **K** (kg K$_2$O ha^{-1}): 50

[a] information about soil classification adapted from Tomaz *et al.* [22];

Application data: Fb – February; Mr – March; Ap – April; M – May; Jn – June; Jl – July; Ag – August; Sp – September; Oc – October; Dc – December.

Table S2. FAO guidelines for interpretation of water quality for irrigation (adapted from Ayers and Westcot [18]).

Potential irrigation problem	Degree of restriction on use		
	None	**Slight to moderate**	**Severe**
Salinity [1]			
EC (dS m^{-1})	< 0.7	0.7 – 3.0	> 3.0
Infiltration [2]			
SAR 0 – 3 and EC (dS m^{-1})	> 0.7	0.7 – 0.2	< 0.2
SAR 3 – 6 and EC (dS m^{-1})	> 1.2	1.2 – 0.3	< 0.3
SAR 6 – 12 and EC (dS m^{-1})	> 1.9	1.9 – 0.5	< 0.5
SAR 12 – 20 and EC (dS m^{-1})	> 2.9	2.9 – 1.3	< 1.3
SAR 20 – 40 and EC (dS m^{-1})	> 5.0	5.0 – 2.9	< 2.9
Specific ion toxicity [3]			
Sodium			
Surface irrigation (SAR)	< 3	3 – 9	> 9
Sprinkler irrigation ([Na]; mg L^{-1})	< 69	> 69	
Chloride ([Cl]; mg L^{-1})			
Surface irrigation	< 142	143 – 355	> 355
Sprinkler irrigation	< 106	> 106	
Boron ([B]; mg L^{-1})	< 0.7	0.7 – 3.0	> 3.0
Miscellaneous effects [4]			
Nitrate ([NO$_3$]; mg L^{-1})	< 5	5 – 30	> 30
pH	Normal range: 6.5 – 8.4		

1) Affects crop water availability; 2) Affects infiltration rate of water into the soil; 3) Affects sensitive crops; 4) Affects susceptible crops. EC – Electric conductivity; SAR – Sodium Adsorption ratio; Na – Sodium.

Table S3. Spearman correlation coefficients between the climate conditions and water physico-chemical parameters in the Lage reservoir: significant at $p<0.05$.

	P	Trans	T	pH	EC	DO	BOD₅	TP	TN	NH₄	NO₃	NO₂	TSS	B	Ca	Mg	Na	K	Cl	Fe	Mn
Trans (m)	0.228																				
T (ºC)	**-0.528**	-0.123																			
pH	-0.063	0.062	0.250																		
EC (µS cm⁻¹)	0.354	**0.537**	-0.049	-0.202																	
DO (%)	**0.486**	-0.095	**-0.500**	-0.044	0.016																
BOD₅ (mg L⁻¹)	-0.263	-0.304	0.321	0.082	-0.027	0.061															
TP (mg L⁻¹)	-0.198	-0.077	**0.587**	0.040	0.121	-0.164	0.234														
TN (mg L⁻¹)	-0.412	-0.058	0.302	0.025	0.100	-0.121	-0.145	**0.565**													
NH₄ (mg L⁻¹)	0.058	0.204	-0.192	0.292	0.116	-0.262	**-0.562**	-0.161	0.107												
NO₃ (mg L⁻¹)	0.263	-0.184	-0.139	-0.043	0.325	0.142	-0.150	0.026	0.230	0.376											
NO₂ (mg L⁻¹)	0.380	0.301	**-0.460**	-0.362	0.312	-0.009	**-0.596**	-0.193	0.029	0.352	0.363										
TSS (mg L⁻¹)	-0.374	-0.389	-0.185	-0.128	-0.346	-0.184	0.171	0.042	0.272	-0.083	0.067	-0.050									
B (mg L⁻¹)	0.111	0.179	0.192	-0.157	**0.631**	-0.172	0.030	0.270	0.194	0.307	**0.501**	0.190	-0.264								
Ca (mg L⁻¹)	0.263	0.058	0.024	0.052	0.381	-0.160	**-0.416**	-0.141	0.074	**0.437**	**0.557**	0.178	-0.280	**0.516**							
Mg (mg L⁻¹)	0.214	**0.491**	-0.085	-0.098	**0.622**	-0.087	**-0.601**	0.201	**0.429**	**0.628**	**0.480**	**0.552**	-0.238	**0.621**	**0.483**						
Na (mg L⁻¹)	0.357	-0.093	-0.198	-0.083	0.293	0.221	-0.117	-0.376	-0.147	0.347	**0.538**	0.015	-0.219	**0.443**	**0.618**	0.327					
K (mg L⁻¹)	-0.377	-0.133	0.120	0.015	0.258	-0.272	0.069	0.370	**0.669**	0.254	**0.433**	0.138	**0.447**	0.277	0.127	0.342	-0.111				
Cl (mg L⁻¹)	0.226	0.399	-0.351	0.211	**0.475**	-0.162	**-0.447**	-0.145	0.095	**0.711**	**0.463**	0.356	0.010	0.237	**0.510**	**0.605**	0.226	**0.449**			
Fe (mg L⁻¹)	-0.192	-0.331	0.089	0.001	-0.034	0.007	**0.699**	-0.073	-0.384	-0.402	-0.234	-0.311	0.106	-0.018	**-0.420**	**-0.546**	-0.155	-0.137	-0.344		
Mn (mg L⁻¹)	-0.045	**-0.433**	0.252	0.097	-0.075	0.183	**0.634**	**0.489**	-0.087	-0.264	0.021	**-0.560**	0.016	0.250	-0.194	-0.288	-0.046	-0.044	-0.298	**0.540**	
SAR	-0.116	**-0.461**	-0.099	-0.037	**-0.463**	0.283	**0.699**	-0.340	**-0.497**	**-0.545**	-0.310	**-0.513**	0.218	-0.390	**-0.481**	**-0.855**	0.040	-0.388	**-0.602**	**0.644**	0.366

Table S4. Physico-chemical parameters analysed during the study (average value ± standard error; n=3)

Location	Year	Month	T (ºC)	Transp (m)	DO (% O$_2$)	pH	EC (µS cm^{-1})	TSS (mg L^{-1})	BOD$_5$ (mg O$_2$ L^{-1})	TP (mg P L^{-1})	TN (mg N L^{-1})	NH$_4$ (mg NH$_4$ L^{-1})	NO$_3$ (mg NO$_3$ L^{-1})	NO$_2$ (mg NO$_2$ L^{-1})	Fe (mg Fe L^{-1})	Mn (mg Mn L^{-1})
L	2018	Ap	21.00	3.90	93.10	8.18 ± 0.02	610.50 ± 17.68	11.00 ± 0.24	2.00 ± 0.00	0.05 ± 0.004	1.36 ± 0.10	< DL	< DL	< DL	< DL	0.01 ± 0.0007
		Jl	24.50	1.25	120.50	8.24 ± 0.62	604.50 ± 10.94	64.00 ± 2.83	7.50 ± 0.71	0.05 ± 0.002	2.18 ± 0.01	< DL	0.86 ± 0.02	< DL	0.25 ± 0.04	0.02 ± 0.002
		Sp	19.50	2.20	110.90	7.80 ± 0.00	712.00 ± 2.65	46.00 ± 2.83	9.33 ± 0.58	0.04 ± 0.004	1.63 ± 0.01	< DL	0.87 ± 0.05	< DL	0.36 ± 0.04	0.02 ± 0.002
		Dc	12.20	3.00	92.10	7.03 ± 0.05	555.33 ± 1.53	21.00 ± 1.41	4.00 ± 0.41	0.01 ± 0.002	1.14 ± 0.01	< DL	< DL	< DL	0.16 ± 0.01	0.01 ± 0.002
	2019	Ap	20.00	n.d.	98.90	8.44 ± 0.00	567.00 ± 1.41	20.00 ± 2.00	5.50 ± 0.71	0.01 ± 0.00	1.16 ± 0.11	0.04 ± 0.002	0.88 ± 0.05	< DL	0.10 ± 0.01	0.01 ± 0.002
		Jl	26.00	3.50	61.30	8.53 ± 0.01	590.33 ± 0.58	28.00 ± 2.41	4.00 ± 0.00	0.04 ± 0.003	1.41 ± 0.04	0.06 ± 0.0007	< DL	< DL	0.09 ± 0.006	0.01 ± 0.004
		Sp	21.00	4.50	76.70	8.60 ± 0.01	668.67 ± 2.52	33.00 ± 1.41	6.00 ± 0.00	0.03 ± 0.00	1.37 ± 0.03	0.10 ± 0.004	0.76 ± 0.06	< DL	0.16 ± 0.02	0.02 ± 0.0007
		Dc	10.50	5.00	128.80	8.49 ± 0.02	668.33 ± 2.31	10.00 ± 0.00	3.50 ± 0.37	0.01 ± 0.002	1.34 ± 0.11	0.09 ± 0.002	0.71 ± 0.05	< DL	0.12 ± 0.004	<DL
	2020	M	24.50	4.00	97.60	8.56 ± 0.01	759.00 ± 2.00	4.00 ± 0.00	8.00 ± 0.00	0.07 ± 0.002	1.29 ± 0.12	< DL	0.95 ± 0.03	< DL	0.25 ± 0.02	0.02 ± 0.001
		Jl	25.50	3.50	91.10	8.30 ± 0.01	634.67 ± 0.58	6.00 ± 0.00	7.00 ± 0.00	0.06 ± 0.003	1.71 ± 0.03	< DL	< DL	< DL	0.14 ± 0.02	0.01 ± 0.001
		Sp	22.00	2.50	97.70	7.95 ± 0.05	64.67 ± 0.58	32.00 ± 2.83	4.00 ± 0.00	0.13 ± 0.002	1.86 ± 0.01	< DL	1.71 ± 0.04	< DL	< DL	0.03 ± 0.002
		Dc	12.00	3.50	84.80	7.86 ± 0.01	678.33 ± 0.58	25.00 ± 1.41	< DL	0.04 ± 0.0004	1.36 ± 0.06	0.08 ± 0.002	1.38 ± 0.16	< DL	0.07 ± 0.01	<DL
LS	2018	Jl	25.00	1.20	73.93	8.65 ± 0.01	541.50 ± 3.54	94.00 ± 5.66	7.50 ± 0.71	0.05 ± 0.003	1.98 ± 0.003	0.02 ± 0.001	0.85 ± 0.05	< DL	0.34 ± 0.01	0.02 ± 0.00
		Sp	20.00	2.00	89.24	8.21 ± 0.00	495.20 ± 0.27	48.00 ± 0.00	10.00 ± 0.00	0.04 ± 0.004	1.20 ± 0.02	0.03 ± 0.001	0.88 ± 0.03	< DL	0.26 ± 0.01	0.03 ± 0.003
		Dc	12.00	1.50	113.30	8.32 ± 0.00	524.60 ± 0.58	26.00 ± 0.00	6.50 ± 0.71	0.01 ± 0.00	1.22 ± 0.01	< DL	< DL	< DL	0.72 ± 0.02	0.03 ± 0.00
	2019	Ap	21.50	n.d.	88.88	8.39 ± 0.01	576.50 ± 10.61	30.0 ± 0.00	5.00 ± 0.00	<DL	0.96 ± 0.05	0.04 ± 0.001	0.92 ± 0.06	< DL	0.26 ± 0.02	0.02 ± 0.001
		Jl	28.00	2.50	66.58	8.40 ± 0.01	593.67 ± 0.58	8.00 ± 0.66	3.50 ± 0.37	0.05 ± 0.003	1.51 ± 0.06	0.06 ± 0.002	< DL	< DL	0.21 ± 0.03	0.02 ± 0.002
		Sp	22.30	3.50	76.74	8.31 ± 0.01	683.33 ± 1.53	21.00 ± 2.17	6.50 ± 0.71	0.04 ± 0.003	1.31 ± 0.03	0.17 ± 0.004	0.75 ± 0.03	< DL	0.17 ± 0.02	0.02 ± 0.002
		Dc	10.90	3.50	139.64	8.36 ± 0.01	672.00 ± 1.73	6.00 ± 0.00	4.00 ± 0.00	0.01 ± 0.00	1.04 ± 0.07	0.11 ± 0.0009	1.04 ± 0.18	0.07 ± 0.0001	0.31 ± 0.03	0.02 ± 0.001
	2020	M	25.10	3.00	79.35	8.10 ± 0.01	762.00 ± 2.65	6.00 ± 0.00	8.50 ± 0.71	0.12 ± 0.01	1.05 ± 0.06	< DL	< DL	< DL	0.95 ± 0.01	0.05 ± 0.005
		Jl	26.40	2.50	81.98	8.11 ± 0.01	643.00 ± 0.00	8.00 ± 0.00	7.00 ± 0.71	0.06 ± 0.002	1.32 ± 0.04	< DL	0.94 ± 0.07	< DL	0.32 ± 0.02	0.02 ± 0.001
		Sp	23.00	1.80	116.08	8.48 ± 0.01	664.00 ± 0.00	4.00 ± 0.00	4.00 ± 0.00	0.14 ± 0.0007	2.44 ± 0.05	0.11 ± 0.003	2.32 ± 0.05	< DL	0.06 ± 0.002	0.03 ± 0.0005
		Dc	12.50	2.60	67.58	7.73 ± 0.01	697.67 ± 0.00	32.00 ± 0.00	2.00 ± 0.00	0.05 ± 0.002	2.30 ± 0.07	0.29 ± 0.002	5.00 ± 0.27	0.09 ± 0.0002	0.11 ± 0.001	<DL

Detection limit (DL): TP: 0.0075 mg P L^{-1}; TN: 0.169 mg N L^{-1}; NH$_4$: 0.013 mg NH$_4^+$ L^{-1}; NO$_3$: 0.667 mg NO$_3$ L^{-1}; NO$_2$: 0.017 mg NO$_2$ L^{-1}; BOD$_5$: 1.667 mg O$_2$ L^{-1}; Fe: 0.033 Fe mg L^{-1}; Mn: 0.008 mg Mn L^{-1}.

Table S5. Loadings of 22 physico-chemical parameters represented on the seven principal components (PC) for surface samples from Lage reservoir. Bold values correspond to the higher factor loadings (>0.70) of the variables in each PC [28].

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Precipitation (mm)	0.326	**-0.728**	0.131	-0.181	-0.341	0.198	0.140
Transp (m)	0.283	0.395	-0.057	-0.693	-0.109	-0.329	0.157
T (ºC)	-0.344	**0.764**	0.334	0.151	0.359	0.094	-0.228
pH	-0.099	0.268	0.408	0.222	0.343	0.290	0.612
EC (μS cm^{-1})	0.533	0.114	0.546	-0.354	-0.212	-0.212	-0.162
OD (%)	-0.156	-0.374	0.183	-0.288	-0.559	0.487	0.156
BOD$_5$ (mg L^{-1})	**-0.763**	0.210	0.437	0.187	-0.264	-0.163	0.063
TP (mg L^{-1})	0.046	**0.889**	0.109	-0.270	-0.117	0.045	0.092
TN (mg L^{-1})	0.350	0.674	-0.055	0.190	-0.234	0.310	-0.218
NH$_4$ (mg L^{-1})	0.614	-0.200	0.076	0.228	0.471	-0.039	0.401
NO$_3$ (mg L^{-1})	**0.728**	0.129	0.247	0.393	-0.239	0.258	-0.037
NO$_2$ (mg L^{-1})	**0.771**	-0.221	-0.308	-0.086	-0.153	-0.103	0.076
SST (mg L^{-1})	-0.136	0.156	-0.552	0.629	-0.327	-0.046	0.021
B (mg L^{-1})	0.406	0.108	0.650	0.045	-0.296	-0.120	-0.011
Ca (mg L^{-1})	0.552	-0.303	0.452	0.186	0.332	-0.185	-0.261
Mg (mg L^{-1})	**0.892**	0.223	0.234	-0.055	0.032	0.124	0.019
Na (mg L^{-1})	0.245	-0.558	0.599	0.318	0.009	0.076	-0.256
K (mg L^{-1})	0.446	0.581	-0.139	0.451	-0.361	-0.119	0.052
Cl (mg L^{-1})	**0.748**	-0.152	-0.169	0.246	-0.177	-0.217	0.285
Fe (mg L^{-1})	-0.444	-0.098	0.331	0.268	-0.263	-0.632	0.177
Mn (mg L^{-1})	**-0.717**	0.144	0.523	-0.046	-0.098	0.071	0.212
SAR	**-0.857**	-0.358	0.014	0.187	-0.212	0.045	-0.042
Eigenvalues	6.379	3.618	2.776	2.060	1.765	1.264	1.046
% Total variance	29.00	16.44	12.61	9.36	8.02	5.75	4.75
% Accumulated variance	29.00	45.44	58.06	67.42	75.44	81.19	85.94