



WATER QUALITY MONITORING OF THE FIRST AQUIFER IN THE AREA OF IRRIGATION SYSTEMS OF SOUTHWESTERN BAČKA



AUTHORS: Ksenija Mačkić^{a*}, Ljiljana Nešić^a, Borivoj Pejić^a, Milivoj Belić^a, Vladimir Ćirić^a, Lazar Pavlović^a

^a University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia

* Corresponding author: ksenija@polj.uns.ac.rs

The groundwater of the first aquifer in Vojvodina is more or less mineralized, which is closely related to the hydrology, geology, and geomorphology of the Pannonian Plain. Irrigation increases soil productivity and the effectiveness of applied agronomic measures. However, irrigation can cause soil degradation and reduced yields in case the soil and irrigation water quality is not compatible. In addition, in conditions of intensive irrigation, the level and quality of groundwater may be impaired.

MATERIAL AND METHODS

The water quality of the first aquifer was determined on four irrigation systems in the area of southwestern Bačka. Six piezometers were installed to observe, monitor, and collect data on the state and regime of groundwater over a long-term period (four piezometers were installed on chernozem soil and two on meadow soil). The paper presents the results of groundwater quality testing before the commissioning of the irrigation system as well as during the operation of the system on two occasions (1st and 2nd term) for monitoring purposes. The American Salinity Laboratory classification and the FAO classification were used to assess water quality.



RESULTS

The values of the total concentration of ionized components and the ionic balance indicate that the quality of groundwater from all piezometers and in all three examined terms was mainly in the C3S1 class according to the US Salinity Laboratory classification. It is salt water with a low content of sodium, in which dominate the water-soluble salts consisted of bicarbonates of calcium and magnesium, which in poorly drained soils can cause the process of salinization but not alkalization. The determined chemical composition of groundwater can pose a danger in terms of salinization of the soil in the zone of the root system, in the case when the groundwater level is above the critical depth for a long period. According to the FAO classification, the analyzed water samples have a weak to moderate degree of restriction of use. If such waters are used for irrigation, it is necessary to pay special attention to the choice of cultivated plant species, i.e. to avoid sensitive and even moderately sensitive crops to salts. Values of the residual sodium carbonate doesn't indicate the alkalinity hazard for soil. However, values of above 2.5 were determined at two localities during monitoring, indicating the necessity of monitoring water quality.

Locality	Term	Depth (m)	pH	EC _w dS/m	DM mg/l	Anions (meq/l)				Cations (meq/l)			
						CO ₃ ²⁻	HCO ₃ ⁻	Cl ⁻	SO ₄ ²⁻	Ca ²⁺	Mg ²⁺	K ⁺	Na ⁺
1	Start		8,90	0,36	169	0,84	0	1,05	0,23	0,67	0,01	0,60	2,00
	1st	4,4	7,59	0,85	493	0	11,60	1,30	0,50	4,89	3,87	0,07	1,36
	2nd		8,12	0,85	436	0	8,27	0,98	0,09	4,78	4,07	0,04	1,72
2	Start		8,00	0,64	585	0	9,84	0,15	1,58	4,37	4,55	1,00	0,80
	1st	5,9	7,80	1,20	899	0	13,52	2,50	4,46	5,57	9,95	0,10	0,44
	2nd		7,79	1,18	1550	0	14,66	1,78	0,03	5,58	5,66	0,40	0,67
3	Start		8,40	0,86	657	0,84	9,00	0,19	3,16	3,39	7,53	0,60	0,45
	1st	5,1	7,58	1,22	891	0	13,61	1,92	4,21	5,49	10,20	0,08	0,40
	2nd		7,99	1,22	770	0	11,02	1,70	3,21	4,78	10,00	0,01	0,45
4	Start		8,05	2,59	1792	0	9,41	6,79	4,08	7,18	14,60	1,55	1,00
	1st	4,4	7,57	2,18	1886	0	13,63	7,44	4,01	15,70	13,40	0,25	1,08
	2nd		7,90	2,35	1673	0	9,67	6,10	3,33	12,80	14,56	0,09	0,85
5	Start		8,35	1,13	586	0	4,01	4,65	4,91	6,31	0,20	0,10	2,00
	1st	1,8	7,90	0,98	665	0	10,08	2,19	1,16	6,43	2,77	0,02	2,00
	2nd		8,00	0,97	453	0	8,76	1,77	0,27	6,38	2,87	0,01	1,97
6	Start		8,46	1,11	583	1,14	11,12	1,37	6,28	3,33	0,70	0,09	1,00
	1st	1,2	8,03	1,12	759	0,40	13,11	3,16	0,86	5,55	7,07	0,07	1,50
	2nd		8,07	1,05	552	0	10,62	1,76	0,17	4,78	5,48	0,05	3,23

Klasa vode (prema US Salinity Laboratory)

Locality	Start	1 st term	2 nd term
1	C2S1	C3S1	C3S1
2	C2S1	C3S1	C3S1
3	C3S1	C3S1	C3S1
4	C4S1	C3S1	C4S1
5	C3S1	C3S1	C3S1
6	C3S1	C3S1	C3S1

CONCLUSION

Salts from groundwater can accumulate near the surface of the soil, through the capillary rise, especially in the absence of abundant rainfall. For these reasons, it is necessary to periodically control the salinity and salt balance of groundwater and soil, to prevent the harmful process of salinization and alkalization of the soil in the future.