Supplementary Materials

A numerical assessment and prediction for meeting the demand for agricultural water and sustainable development in irrigation area

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Table S1. Statistical results of meteorological data in the study area.

Precipitation			Evaporation			Temperature		
Max.	Min.	MA	Max.	Min.	MA	Max.	Min.	Mean
91.9 mm (Aug)	5.3 mm (Dec)	548.5 mm	436.9 mm (Jun to Aug)	75.7 mm (Dec to Feb)	1003.1 mm	44.2 ℃	-15.8 ℃	13.4 ℃

Notes: MA is the multi-year average values.

Table S2. The recharge parameter values of groundwater in the model.

Month	Recharge (mm/a)					
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
1	2.66	100.07	110.73	96.34	84.36	12.93
2	2.11	-1.05	7.38	11.72	9.37	10.14
3	1.34	-1.81	3.56	0.88	0.7	6.31
4	0.46	97.86	99.69	-9.65	-9.92	1.89
5	0.13	97.54	98.08	-8.18	-8.31	0.28
6	0.16	97.57	98.22	-10.98	-11.03	0.42
7	0.27	97.67	98.74	-21.99	-22.29	0.94
8	0.54	97.95	100.1	-36.59	-36.89	2.3
9	0.82	98.23	101.52	-77.66	-78.14	3.72
10	1.47	98.88	104.76	-86.83	-88.63	6.96
11	1.62	99.03	105.51	4.98	4.37	7.7
12	2.71	100.12	110.96	61.51	60.06	13.16

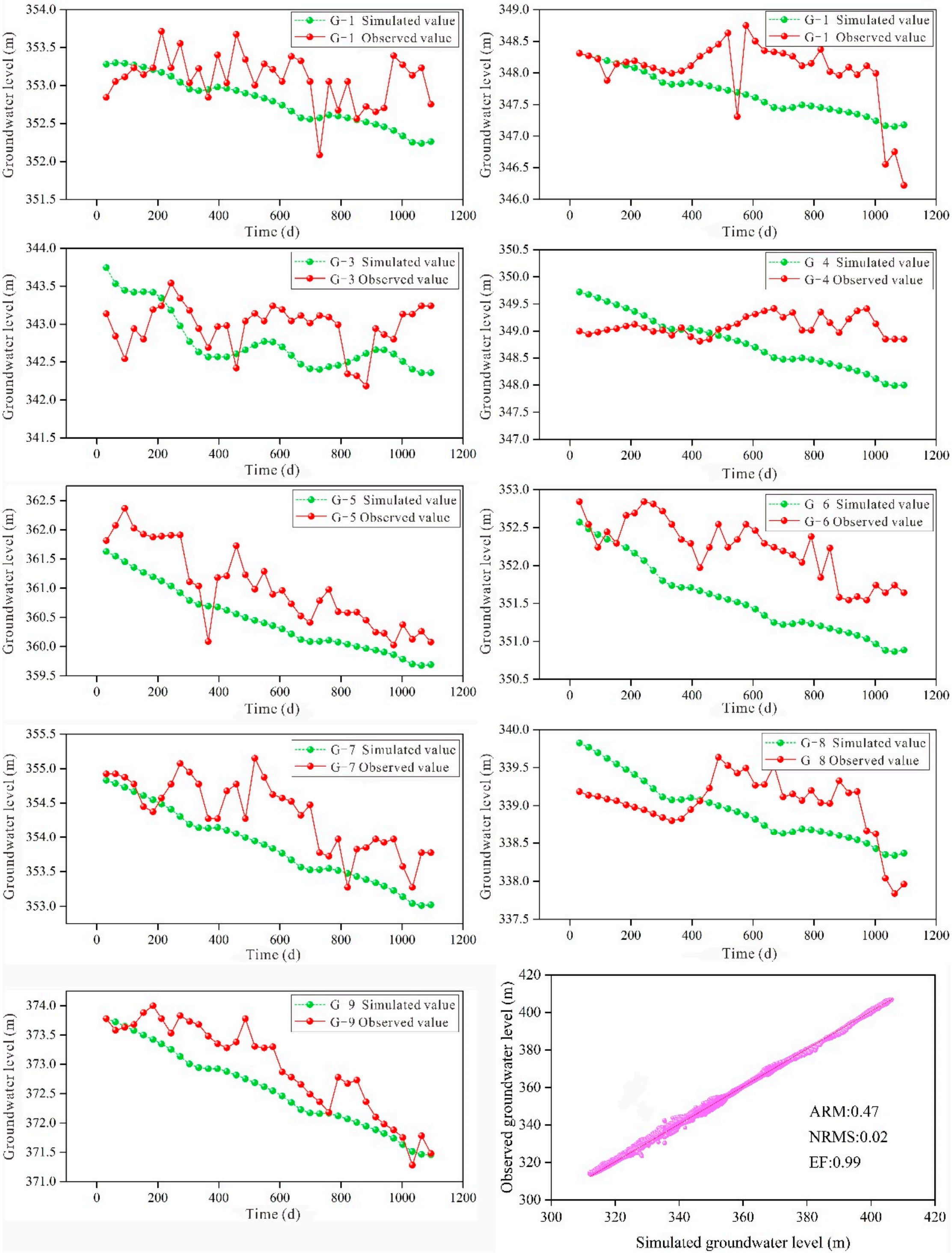

Figure S1 Observed and simulated groundwater levels at the monitoring wells. The insets depict temporal variations over one year in calculated water levels (green lines) as compared to field measurements (red lines) at 9 selected observation wells. Water levels are shown in meters (m) above sea level.

Table S3. Groundwater and surface water allocation for scenario 1.

Month	Surface water supply (10^4 m^3)	Groundwater supply (10^4 m^3)
1		339.9
2		642.2
3		1153.7
4		234.5
5		2900
6	1445	1250.2
7	1445	658.2
8	1445	407.2
11		321.4
12		266.4
Total	4335	10284.2

Table S4. Groundwater and surface water allocation for scenario 2.

Month	Surface water supply (10^4 m^3)	Groundwater supply (10^4 m^3)
1	113.30	226.60
2	214.07	428.13
3	384.57	769.13
4	781.67	1563.33
5	966.67	1250.20
6	1445.00	1250.20
7	1445.00	658.20
8	1445.00	407.20
11	107.13	214.27
12	88.80	177.60
Total	6991.21	7627.99

Table S5. Observation well water level changes in 50 years for scenario 2.

Observation wells	Initial water level (m)	Water level after 50 years (m)	Depth of groundwater after 50 years (m)
G-1	354.37	352.66	1.71
G-2	347.84	344.87	2.97
G-3	343.11	339.88	3.23
G-4	343.64	338.49	5.15
G-5	360.43	353.93	6.50
G-6	352.68	348.24	4.44
G-7	354.78	347.62	7.16
G-8	339.93	336.47	3.46
G-9	372.95	362.82	10.13

Table S6. Water resources allocation plan during the water level restoration period.

Month	Surface water supply (10^4 m^3)	Groundwater supply (10^4 m^3)
1	339.9	
2	642.2	
3	1153.7	
4	2345	
5	2900	
6	1445	1250.2
7	1445	658.2
8	1445	407.2
11	321.4	
12	266.4	
Total	12303.6	2315.6

Table S7. Water resources allocation plan after water level restoration for predictive model (scenario 3).

Month	Surface water supply (10^4 m^3)	Groundwater supply (10^4 m^3)
1	239.1	100.8
2	388.2	254
3	790.9	362.8
4	1599.2	745.8
5	1985.7	914.3
6	1445	1250.2
7	1445	658.2
8	1445	407.2
11	220.6	100.8
12	145.5	120.9
Total	9704.2	4915.1

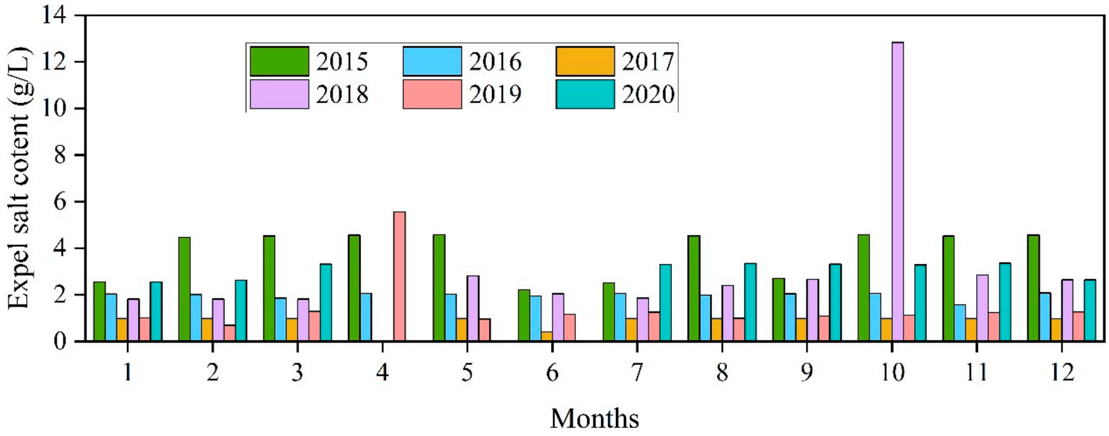

Figure S2 Change in salt discharge from drains in the study area from 2015 to 2020.

The specific calculation process of the critical depth

The specific calculation process of the critical depth of the study area is as follows:

$$H_e = 2.59 \times M^{0.142} - 1$$

where H_e is the critical depth, M is the salinity.

According to the information of Jiaokou Irrigation District, the salinity of floodplain and first terrace of Wei River is 1.5 g/L (maximum), and the second terrace and loess plateau are 15 g/L (maximum). Therefore, the critical burial depth determined to be in the first terrace and floodplain is 1.74 m, and the critical burial depth on the second terrace of the Wei River and the loess plateau is 2.8 m.

Table S8. Observation well water level changes in 50 years for scenario 3.

Observation wells	Initial water level (m)	Water level after 50 years (m)	Depth of groundwater after 50 years (m)
G-1	354.37	354.13	0.24
G-2	347.84	347.12	0.72
G-3	343.11	342.15	0.96
G-4	343.64	342.01	1.63
G-5	360.43	357.52	2.91
G-6	352.68	351.05	1.63
G-7	354.78	351.99	2.79
G-8	339.93	338.35	1.58
G-9	372.95	368.40	4.55