Supplementary Materials

Effects of Combined Main Ditch and Field Ditch Control Measures on Crop Yield and Drainage Discharge in the Northern Huaihe River Plain, Anhui Province, China

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The coefficient of determination (R^2), standardized root mean square error (*NRMSE*), root mean square error (*RMSE*), and the relative error (*RE*) were selected as indexes to evaluate the simulation results. The evaluation criteria of these indexes for model simulation are shown in Equations (S1–S4) (Inam et al., 2017):

$$R^2 = \frac{\left[\sum_{u=1}^{n}\left(m_u - m\right)\left(s_u - s\right)\right]^2}{\sum_{u=1}^{n}\left(m_u - m\right)^2 \sum_{u=1}^{n}\left(s_u - s\right)^2} \quad (S1)$$

$$NRMSE = \sqrt{\frac{\sum_{u=1}^{n}\left(m_u - s_u\right)^2}{n}} \times \frac{100}{m} \quad (S2)$$

$$RMSE = \sqrt{\frac{\sum_{u=1}^{n}\left(m_u - s_u\right)^2}{n}} \quad (S3)$$

$$RE = \frac{\sum_{u}^{n} m_u}{\sum_{u}^{n} s_u} - 1 \quad (S4)$$

where s_u and m_u denote the simulated and measured values of the u-th sample, respectively; m and s denote the mean value; and n denotes the number of measured values. In general, the model simulation can be judged as excellent with a *NRMSE* of less than 0.25, within the acceptable range, if the *NRMSE* is greater than 0.25 and less than 0.3 (Xue and Ren, 2017). An *RE* less than 0.2 is generally satisfactory (Chen et al., 2014). The *RMSE* is as small as possible, and any R^2 greater than 0.65 is acceptable (Moriasi et al., 1983).

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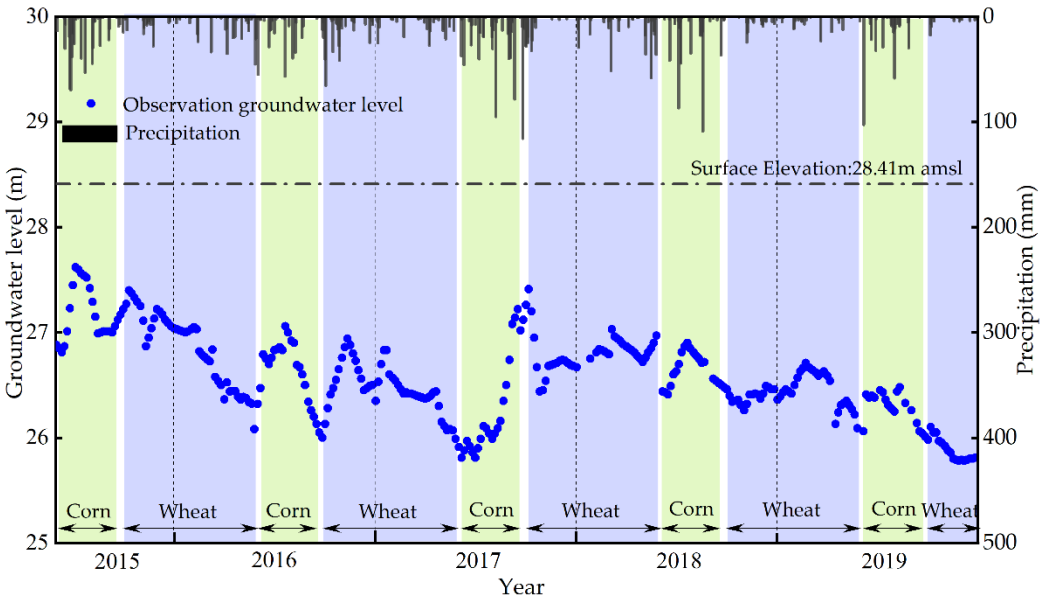
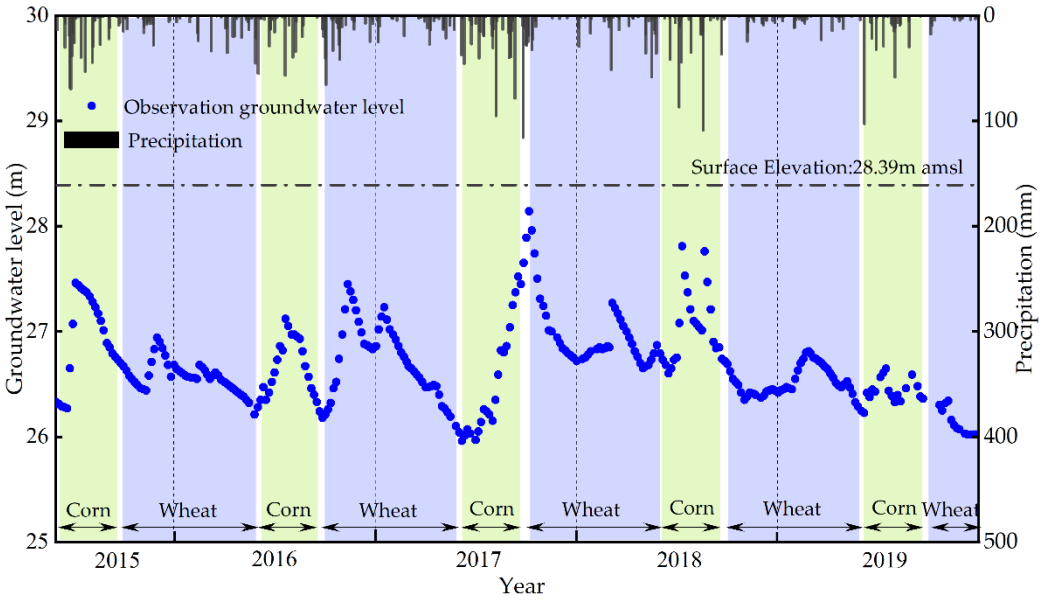


(a)M2



(b)M5

Figure S1. The rainfall and observed groundwater level change process of the representative field near the Chezhe ditch M2 (a) and far from the Chezhe ditch M5 (b) from 2015 to 2019.

Table S1. Main parameters of surface runoff generation module

Landuse	CN2A	CN2B	CN2C	CN2D
Building	77	86	91	94
Grassland	49	69	79	84
Forest	45	66	77	83
Crop	62	73	81	84
Bare land	45	66	77	83
Water	92	92	92	92

Note: A (Low runoff potential), B (The soils have a moderate infiltration rate when thoroughly wetted.), C (The soils have a slow infiltration rate when thoroughly wetted.) and D (High runoff potential) were soil permeability conditions, CN2 is the moisture condition II curve number.

Table S2. Main parameters of ditch confluence module

Main ditch	Permeability coefficient (*k*, m/d)	Roughness (*n*)
Xihongsi ditch	0.1	0.1
Chezhe ditch	0.2–0.4	0.013
Zhuma ditch	0.1–0.4	0.013
Zhonghongsi ditch	0.4	0.013
Donghongsi ditch	0.4	0.013

Table S3. Main parameters of soil water and groundwater module

Depth(m)	0–0.2	0.2–0.4	0.4–0.8	0.8–6	6–35
θ_r (cm^3cm^{-3})	0.01	0.02	0.01	0.01	0.01
θ_s (cm^3cm^{-3})	0.37	0.4	0.38	0.38	0.38
α (cm^{-1})	0.011	0.011	0.006	0.003	0.003
n (–)	1.58	1.45	1.15	1.1	1.1
K_s (m/d)	2.5	8	10	15	15
l (–)	0.5	0.5	0.5	0.5	0.5
Specific yield	0.05	0.05	0.05	0.1	0.1

Table S4. Main parameters of crop growth module

Parameters	Corn	Wheat
Max root depth (m)	2	1.3
Potential harvest index (–)	0.5	0.47
Optimal temperature for crop (℃)	25	18
Radiation use efficiency (kg hm^{-2}/MJ m^{-2})	39	30
Base temperature (℃)	8	0
Max potential LAI (–)	6	4
Crop growing degree fraction since leaf area decline (–)	0.7	0.5
Light extinction coefficient (–)	0.65	0.65
Biomass die-off fraction (–)	0.1	0.1
WAVP (–)	7.2	6

Table S5. Comparison of observed and simulated crop yields (kg/ha)

Crop	Corn		Wheat	
Year	simulated value	Observed value	simulated value	Observed value
2017	8639.2	—	7595.9	7685
2018	8608.9	—	7115.5	6977
2019	9147.7	9173.6	7281.1	7321
2020	7738.6	7592.3	7388.5	7400
2021	—	7564.9	7303.9	7609.8

Note: "—" indicates that data is missing.

Table S6. The crop yield and regional drainage discharge (Q) under the single-factor main ditch water depth control schemes were better than the current situation

Crop	Scenario number corresponding to crop yield superior to current situation	Scenario number corresponding to Q superior to current situation
Corn	5,6,9,10,12,13,14,15,16	4,5,9,12,14
Wheat	5,9,11,12,14	

Note: Corresponding to the scenario number in Table S6

Table S7. The crop yield and regional drainage discharge (Q) under the single-factor field ditch control schemes were better than the current situation

Crop	Scenario number corresponding to crop yield superior to current situation	Scenario number corresponding to Q superior to current situation
Corn	10,14,16,17,19,22,23,25,26	1,2,3,4,5,6,8,10,11,12,14,
Wheat	11,16,17	15,17,18,20,21,23,24,26,27

Note: Corresponding to the scenario number in Table S7.