Countermeasures and Measures for Overloading of Surface Water Resources of the Yellow River under Deep Water Saving and Water Control

Gu Xiaowei[1,2],Han Jinxu[1,2]

1. Water Resources Department, Yellow River Institute of Hydraulic Research, YRCC, Zhengzhou 450003, China; 2.Henan Key Laboratory of Ecological Environment Protection and Restoration of Yellow River Basin, Zhengzhou 450003,China

Objectives

Zhongwei City is the first place for gravity irrigation of the Yellow River. The agricultural water consumption accounts for more than 90% of the total water consumption, and is listed as the surface water overload area by the Ministry of Water Resources. According to the local conditions, this study makes water-saving technology, puts forward differentiated governance measures and implementation paths. When implementing water resources overload management, we can more accurately apply the right medicine to the case, ensure that the measures are clear, operable, implementable, and effectively solve the problem of water resources overload.

Methods

Make specific measures based on the judgment of overload.

$$W_{\mathrm{C}} = \delta W_{\mathrm{D}} \quad (1)$$

$$\delta = D_I / D_{\mathrm{A}} \quad (2)$$

Where W_{C} is the annual water control indicators; W_{D} is the allocated water consumption indicators; D_I is the annual allocated water consumption indicators of Ningxia; D_{A} is the allocated water consumption indicators of Ningxia in 1987, $D_{\mathrm{A}} = 40 \times 10^8 m^3$, W_{n} is the actual water consumption.

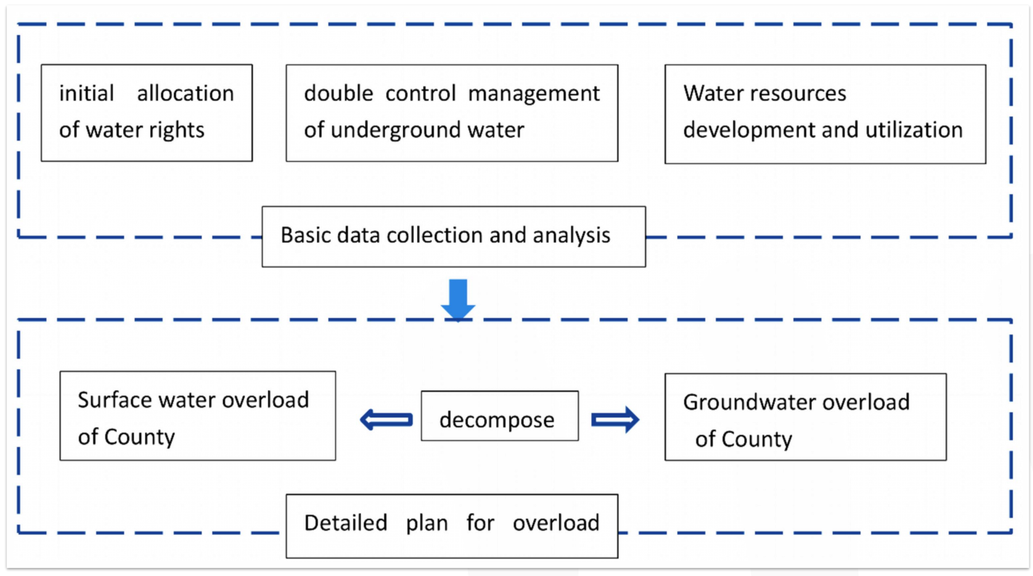
When $W_{\mathrm{n}} > W_{\mathrm{C}}$, the Yellow River water resources overload;

When $W_n \leq W_{\mathrm{C}}$, the Yellow River water resources do not overload.

In response to the overloading situation of Zhongwei, the following measures have been made: ①Scientifically promoting agricultural water-saving;②Reasonably setting ecological goals;③Promoting the construction of water source replacement projects;④Strengthening the construction of mechanisms and systems.

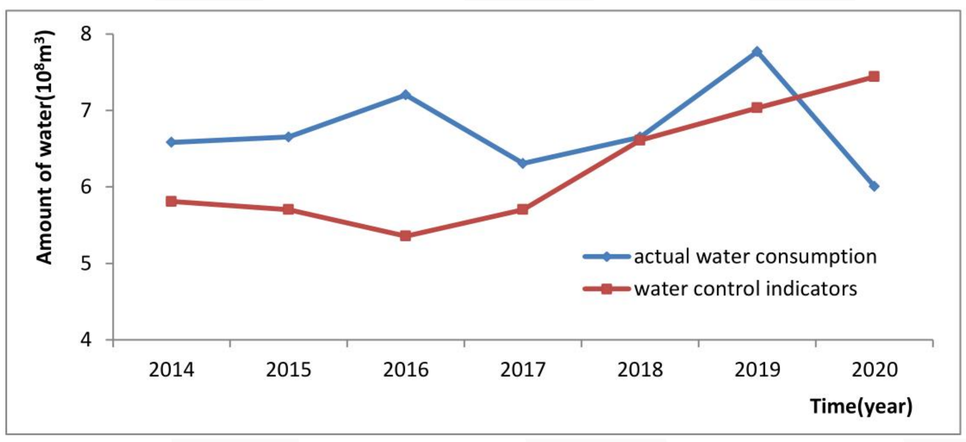
Results

This study fully considered the requirements of local poverty alleviation, water conservation and efficiency enhancement, combined with the local ethnic characteristics and management characteristics, determined the development model of agriculture in dry areas, which focused on efficient irrigation and supplemented by quota fine management. Reduce water consumption by 1.23×$10^8 m^3$, promote the transformation of water use mode in Zhongwei City from extensive and inefficient to economical and efficient, and arouse public awareness of water crisis.



Conclusions

Zhongwei City has not overloaded for two years after the measures were put forward. The control effect is remarkable. It has solved the contradiction between regional economic development and water resource shortage, and helped the government to implement precise policies and targeted governance.



Measures		Reduced water volume（$10^4 m^3$）
Agricultural water-saving measures	Reduce high water consuming crop	2427
	Build efficient water-saving irrigation	2386
	Strengthen field management	4545
Industrial water-saving measures	Make technological transformation	63.5
Domestic water-saving measures	Reduce pipeline leakage	5
Ecological water-saving measures	Reduce ecological and green water use	2172
Water source replacement measures	Increase unconventional water use	705
Management of water-saving measures	Control irrigation scale, and improve measurement facilities measures	0
Total		12304