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RESPONSES OF SHALLOW GROUNDWATER SYSTEM TO DIFFERENT WATER-SAVING PRACTICES IN TYPICAL IRRIGATION AREA IN NORTHWEST CHINA

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Abstract

The Jinghui Canal Irrigation District (JCID) is a highly productive agricultural area of Shaanxi province, China. Because of severe water scarcity, implementing water-saving renovation practices for agricultural sustainability is necessary. To determine the influence of different water saving practises on the shallow groundwater system in the JCID, ArcGIS and Processing MODFLOW are used to simulate changes in shallow groundwater in the irrigated farmland in this area. The results show that field water-saving measures can reduce 18.5%-33.4% of well irrigation water, and the control effect on groundwater level drawdown is prominent. The shallow groundwater level's declining rate in some areas is increased, owing to the adjustment of the agricultural planting structure. Moreover, the spatiotemporal distributions of water and soil resources do not reasonably match, which offsets the active impact of water-saving renovation in the mitigation of falling groundwater tables. The groundwater's annual average decline rate has increased from 0.535 m year⁻¹ during 1981-1997 to 0.734 m year⁻¹ during 2000-2014. The groundwater cone of depression shows a continuous expanding tendency. The area in which the groundwater depth is larger than 13 m has increased from 358.56 km² in September 1997 to 612.92 km² in September 2014. However, successful agricultural water-saving renovation requires a practical feasibility of water-saving projects, in addition to an appropriate planting structure, strong bearing capacity of farmers, water-saving propaganda, and policy implementation of agricultural subsidy and water resource management.

Key words: groundwater level, Jinghui canal irrigation district, processing MODFLOW for windows, water-saving renovation

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