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GROUNDWATER MANAGEMENT OF A CANAL COMMAND IN EASTERN INDIA USING MODFLOW

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ABSTRACT

Land and water resources allocation policies are imperative for sustainable natural resources management of an irrigation project. The groundwater resource of the irrigation system is very complex and dynamic in nature. For understanding and managing these resources for future policy development and implementation, mathematical modeling approach is highly essential. Therefore, a three-dimensional transient groundwater flow model is developed using MODFLOW for simulating hydraulic head, using available well data and general hydro-geological information. The layer property flow (LPF) package of the MODFLOW model is used in the present study. The developed model is applied to the Hirakud canal command (416 km^2) of western Odisha. Transient calibration of the groundwater flow model is accomplished by varying model parameters (horizontal and vertical hydraulic conductivity, specific storage, specific yield, and recharge rate) by matching simulated hydraulic head distribution with the groundwater levels observed data for the period January, 2005 to January 2006. Trial and error method is adopted in the present study for the calibration. After calibration, groundwater model is utilized for verification of the optimal water allocation policy. Keeping the values of calibrated parameter fixed, model is run with changing agricultural water demand to develop various scenarios of groundwater withdrawal policy guidelines for agricultural water management of the study area. Thus, the model study served the purpose of proper utiliziation of the groundwater resources precisely in a sustainable manner and policy implementation of the study area.

KEYWORDS: MODFLOW, Hirakud canal command, Groundwater resources, Irrigation system planning, Simulation, Eastern India

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