

Assessment of groundwater potential for irrigation

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ABSTRACT

For optimal utilization of water resources in an irrigation command, assessment of surface and groundwater resources is essential activity. Canal water is the main source of water in an irrigated command. Methodology for assessment canal water availability is comparatively simpler and well tested. Assessment of groundwater potential requires careful consideration of the recharge and withdrawal components. Major source of recharge in canal command is rainfall, seepage from the canal and return flow from the irrigation. Assessment of groundwater potential includes determination of total groundwater recharge, prevailing groundwater pumping, subsurface inflow/outflow and groundwater balance for future utilization. To estimate the recharge from rainfall, two approaches namely, rainfall infiltration method and water table fluctuation method are adopted by Central Groundwater Board. It assumes total subsurface inflow into a region to be equal to the subsurface out flow from the region on an annual basis, which may lead to erroneous results when adopted for short-term (within the year) groundwater assessment. In the present study, a regional groundwater balance model was used for assessment of groundwater resources of an irrigation command located in Western Uttar Pradesh. Results revealed that in the study considered, the sub surface inflow or outflow were substantial. The procedure adopted by the Central Ground Water Board for groundwater assessment assumes the inflow-outflow component to balance each other on an annual basis. Consideration of the actual inflow-outflow as done in the present case gives a more realistic assessment of groundwater potential of an irrigation command.

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Groundwater potential of an area is the maximum amount of groundwater that can be pumped without causing the imbalance between annual withdrawal and recharge. Due to lack of scientific data and incomplete understanding of the recharge and discharge parameters, assessment of groundwater resource in India has always been subjected to revisions. According to the National Commission on Agriculture (1976) groundwater potential of the country was 67 million hectares meters (m.ha.m.) excluding soil moisture of which 26 m.ha.m were considered as available for irrigation considered sufficient to irrigate 40 million hectares (m.ha.). In 1979, Groundwater Exploitation Committee assessed the gross and net groundwater recharge as 46.79 and 32.49 m.ha.m. With further advancement and understanding of the subject, Groundwater Estimation Committee (1984) came up with a revised methodology for assessment of the groundwater potential. Based on these and the recommendation of the Working Group constituted by different states, the annual replenishable groundwater resource of the country was estimated to be 45.33 m.ha.m. Out of this resource, groundwater for irrigation was computed as 38.34 m.ha.m. per year and ultimate irrigation potential in terms of area was estimated as 80.38 m.ha. which was double of the estimate of National Commission on Agriculture (1976). This estimate was further refined

by adopting separate norms for estimate from canal commands and non-command areas and water requirement of the crops in different zones. Accordingly the total rechargeable groundwater resource potential of the country was fixed at 43.19 m.ha.m. The available groundwater resource for irrigation is 36.08 m.ha.m of which the utilizable groundwater is 32.47 m.ha.m. In terms of area, utilizable irrigation potential of the country is now estimated as 64.05 m.ha.(CGWB, 2000).

In India, groundwater assessment is done by the Central Groundwater Board using the norms developed by Groundwater Estimation Committee (C.G.W.B; 1984, 1997). At first, gross ground water recharge from various sources is determined. Thereafter, the water needed for drinking and other domestic purposes are subtracted from gross groundwater recharge to obtain the groundwater availability for irrigation. To estimate the recharge from rainfall, two approaches namely, rainfall infiltration method and water table fluctuation method are adopted. The norms for rainfall infiltration contributing to ground water recharge have been evolved based on the studies undertaken in various regions and rainfall infiltration factors have been recommended for these regions. The normal rainfall figures are taken from India Meteorological Department. In water table fluctuation method, the difference between post and pre-monsoon water levels