

REVIEW

TECHNICAL REPORT ON COMPUTER MODELLING FOR REGIONAL GROUND-WATER SIMULATION AND ESTIMATION OF IRRIGATION POTENTIAL FOR VEDAVATI RIVER BASIN by Dr. K. Sridharan, Dr. K. V. N. Sharma, Dr. S. Vedula and Prof. N. S. Lakshmana Rao, Indian Institute of Science, Bangalore 12. Study undertaken for the Vedavati River Basin Groundwater Project of the Central Ground-water Board, India.

Studies for Groundwater Potential have been carried out on a compact basin, having principal characteristics near similar to large portions of the Deccan, situated in the rain shadow region of the Western Ghats. These tracts are prone to severe drought conditions each year.

The basin studied, has an area of $24 \times 10^3 \text{ km}^2$ lying in latitude $13^\circ\text{--}15^\circ\text{N}$, subject to the uncertainties in rainfall of the Monsoon depression zone. Vedavati which drains the basin joins the main Tungabhadra River. Rainfall in the region is not intense enough to generate sufficient run-off to be held in storage reservoirs for irrigation. Agriculture in the region is mainly rainfed.

The study is mainly directed to get as near a physical definition of the actual basin, which would enable a systematic mathematical treatment. The basin has been divided into a network grid of $5 \text{ km} \times 5 \text{ km}$ size elements, identified with the suffix notation of ij.

The main characteristics forming the basis for analysis are :

- i) the approach of a modified leaky aquifer with provision for double permeability-storativity.
- ii) conducting site tests using dye tracers to verify the vertical flow assumption
- iii) the mesh of $5 \text{ km} \times 5 \text{ km}$ seems to satisfy sufficiently, conditions of homogeneity.

The finite difference equations for the aquifer system has been worked out, both for homogeneous and non-homogeneous conditions. A mathematical model has been formulated on this basis and the computer programme developed. The model was calibrated using field data obtained from field tests. The computer model was run using the data and the results obtained compared with actual field measurements. Satisfactory agreement is reported.

The model has been found useful in making reliable forecasts of the Ground-water potential, for safe yield, in order to prevent over exploitation either by accident or intent. The forecast has further enabled to propose a crop-pattern to yield maximum production by optimal use of water available in the basin. The proposed irrigation potential of 85,000 Ha is a significant contribution to the resources estimate of the region. Besides the suggested location of 910 mCM of storage and 230 mCM from seepage for helping tanks are good contributions in the conservation of water resource.

The study besides making a timely contribution to suggesting new possibilities of managing the water resources of rainfed regions, also highlights :

- i) the basic contribution that an Education/Research Institution can make in such critical resource problems through a new approach
- ii) the need to extend such studies to similar basins of the Peninsula, vulnerable to recurring droughts
- iii) the Vedavati data, and data from similar studies should be stored in Electronic data bank ; retrievable for further research and studies on groups of basins, or intensive studies of the same basin
- iv) the possibilities of manufacturing special purpose economically priced computers to control basins, for conjunctive/interactive use of resources at optimal levels.

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