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Assessment on effects of Artificial Recharge using Ground Water Modeling

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Water resources are renewable natural entities and their usage needs to be managed skillfully in order to ensure sustainability of crop production. The availability of ground water in various kinds of underground aquifers depends on recharge from rainfall and percolation from water storage bodies. It has been witnessed over the years that the groundwater is being extracted at rates higher than its recharge from the various sources. As a result of this, it is common to observe receding water tables at an alarming rate. Artificial recharge may be defined as the process of replenishing ground water by augmenting the natural infiltration of rain water or surface water into under ground formations through various methods designed depending on the topographic, geologic and soil conditions. Artificial recharge is becoming more prevalent in the recent years because it can be used to buffer against climatic variability and associated floods and droughts.

The principal objective of this study is to provide a tool for assessing ground-water availability in the Cuddalore aquifer system of Tamil Nadu, India. The study will develop a model that will improve understanding of the aquifer-system flow paths and artificial recharge. It will provide a scientifically based management tool for optimizing conjunctive water-use strategies. The ground-water flow model will be developed using FEMWATER which is a three-dimensional finite element groundwater model and will use the GMS graphical user interface. It can be used to simulate flow and transport in both the saturated and the unsaturated zone. GMS is the most sophisticated ground-water modeling environment available today. GMS integrates and simplifies the process of ground-water flow and transport modeling by seamlessly integrating all of the tools needed for a successful study.

The recharge area in the study is 420km^2. The general topography consists of highlands in the northwest and a flat terrain in southeast. The elevation of the recharge area varies from 30m in the south to 100m in the northern region. The artificial recharge arrangements used in the study area include recharge wells, check dams and percolation ponds. The depth of wells ranged from 50m–70m.

The model provides a consistent regional representation of the overall groundwater flow and contaminant transport in the recharge area. There was 20%-30% increase in the quantity and quality of ground water after recharge. Based on the investigation results, regional ground water protection efforts should focus depending on the impact of ground water quantity and quality on a regional scale.

Key words: Artificial recharge; Recharge wells; Check dams; Percolation ponds; FEMWATER; GMS