ABSTRACT

An Irrigation project involves construction of structures to store the water during excess flow and to utilize the same when scarcity arises. The irrigation projects are created with major physical structures like dam, head works and canals etc that have fixed life span. The utility of an irrigation project is determined during project formulation itself. Periodical assessment of performance is essential for an irrigation project to identify any shortfall. The present study is to evaluate the performance of Parambikulam Aliyar irrigation scheme located in Tamil Nadu, India lies between North latitudes from $10^o10'00''$ to $10^o\ 57'20''$ and East longitudes from $73^o43'00''$ to $77^o12'30''$. This project is a multi basin, multi river and multipurpose project formulated during the year 1955. This scheme comprises of eight interlinked reservoirs, six located at hills used for the purpose of storage, diversion and power generation. Two reservoirs located in plains are utilized for supplying water for irrigation and drinking purpose. The variation in the altitude of the reservoirs made the possibility for development of many hydro power projects. Parambikulam Aliyar basin covers an area of 2388.72 Sq. km. This project is an interstate project and an agreement was drawn between Tamil Nadu and Kerala States regarding sharing of water. In this scheme, construction of reservoirs was started during 1961 and the last reservoir Lower Nirar was completed only during 1982. Due to long and continuous run, the efficiency of the project is reduced. Hence this study is carried out to assess the efficiency of the prestigious irrigation project at present using

scientific approach such as remote sensing, GIS, Statistical analysis of farmers' feedback and Artificial Neural Network.

The data such as surface water flow, groundwater level and rainfall were collected for the period of 1972-2010. Groundwater samples from 39 locations covering the study area were collected. Satellite imageries were purchased from National Remote Sensing Centre (NRSC) for the years January 1990 and February 2011. The farmers' views on this scheme were collected through questionnaire. The quantity of surface water realized at various structures were assessed using the flow data based on 75% dependability and compared with the quantity predicted to be available. The variation in the groundwater level during 1990 and 2011 was assessed from the groundwater level data collected from the State Ground and Surface Water Resources Data Centre, Chennai, Tamil Nadu using water table fluctuation method. The variation in the rainfall was also studied for the same period. Groundwater samples were analyzed for various physicochemical parameters to assess its suitability for drinking and irrigation. The groundwater quality was assessed by comparing the water quality test results with WHO (1993) and IS (2012) standards. The groundwater quality was compared for both pre and post monsoon of the years 1990 and 2011. Groundwater models using Artificial Neural Network and Intutionistic fuzzy based Artificial Neural Network were developed for prediction of future monthly groundwater level using the past groundwater level and rainfall data as input. Both the models were compared for their performance. The base map of the study area was prepared from the Survey of India topographical maps. Land use and land

cover map was prepared from the satellite imageries. Change detection analysis was also carried out to assess the variation in land use pattern. The farmers' responses were analyzed statistically using SPSS package. Correlation analysis also carried out to identify the influencing factors.

Result shows that only 65% of the surface water quantity predicted during project formulation is available currently. The increase in groundwater level is noticed in the 71% of the wells located in the study area. This study shows that the groundwater status and its quality are not affected due to utilization of groundwater in this project area at present. The Change detection analysis shows that increase in the agriculture area and forest plantations were noted. Farmers' opinion about the water delivery and system maintenance shows that most of the farmers are not satisfied with the performance of the project. There is a moderate positive correlation between the variables sufficient water availability for irrigation and satisfaction over present method of water distribution. Based on the statistical results, the performance of the ANN model is good and the model is able to forecast the groundwater levels with reasonable accuracy during calibration and validation period. The IFANN model has lower RMSE value and higher R^2 value on comparing with ANN model, which shows that the IFANN model performs well and predict the water level better than ANN.