A software application for calculating the groundwater level

D.S.R. Wijewardane[1], C.M. Navarathne[1], R.U.K. Piyadasa[2] and K.K.L.B. Adikaram[1]

[1] Department of Agricultural Engineering, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupituiya,
[2] Department of Geography, Faculty of Arts, University of Colombo, Colombo.

Abstract

Groundwater is the most cost effective source of fresh water supply for domestic use and for irrigation. It is exploited through the construction of open dug wells or boreholes depending on the depth at which it occurs. It is observed that the quality of groundwater is drastically decreasing due to over exploitation of groundwater from wells, urbanization and land use changes etc.Poor quality groundwater and lowering of the groundwater table have disastrous consequences like making the groundwater unfit to drink and for other domestic uses, not suitable for irrigation means failure of crops. Therefore, it is important to improve the quality of groundwater and assess the safe yield that can be extracted from an aquifer to prevent a significant drop of the groundwater level and thereby prevent the development of any of the above situation. In this regard, quantification of the rate of natural groundwater recharge is a pre-requisite for efficient groundwater resource management. The main objective of this research is to develop a software model to estimate the height of recharge and the present level of groundwater table capable of data storage and data displaying ability either by graphically or through reports.

Using this model, groundwater recharge is calculated either by an equation that is specified by the user or the equation in-built within the model. Groundwater balance Equation is used as the in-built equation for the new system. According to the equation provided, all parameter were calculated by the model or the user may use own values as he wishes. All the results are stored in the system for further analysis and those data are obtained in a report form.

After commencing the study, the monthly rainfall values at the end of first, second and third months were 120 mm, 247.85 mm, and 219 mm respectively. The average output from the well was 60 mm per month. When the date of the study was commenced, the initial depth to the groundwater table was 183 cm from the surface. At the end of the first, second and third months, the values were recorded as 182 cm, 180 cm and 181cm respectively. The depth to the ground water table estimated using the developed software model for the first, second and third months were 195.78 cm, 188.33 cm and 188.42 cm respectively. According to the t-test analysis a significant difference between actual values and calculated values could not identified in 5% α level. Finally

it is concluded that the in-built equation (Groundwater balance Equation) in the developed model is acceptable for the site at Mapalana.

Keywords: Software Model, Meteorology, Ground Water, Water Table Estimation, Water Resource Management