
Estimation of land allocation for crops with a water management plan for Udawalawe water reservoir irrigation scheme

Lakmini R.M.V. and Samarathunga D.M.*

Department of Mathematics, University of Ruhuna, Wellamadama, Matara, Sri Lanka.

Water reservoir management is one of the most significant aspects of a country's social and economic development. Key functions of water reservoirs are hydropower generation, irrigation, industrial and domestic water release, and flood control. Due to the high demand and the scarcity of water, a proper water management plan is a necessity. By this study, a stochastic model and a deterministic model are presented for estimating the proportion of land allocation for crop cultivation according to the availability of water. Udawalawe irrigation scheme is considered as a case study. Udawalawe water reservoir is mainly functioning as an irrigation water release which feeds about 22187 hectares for paddy and other crops. A chance constrained linear programming model is applied to determine the reliability of water releases from the Udawalawe reservoir alone which meets the irrigation demands. Then a goal linear programming model (GLPM) is proposed to determine the water release plan for irrigation, considering 5 main reservoirs of the Udawalawe irrigation scheme. MATLAB programming language is used to solve the proposed models. Inflow is forecasted using the monthly averages which gives the minimum Root Mean Square Error among the other compared models; seasonal naive, linear regression with least square error and minimizing maximum error, Holt-Winters' seasonal method and Seasonal Autoregressive Integrated Moving Average. Using the proposed GLPM, with an estimation of the proportion of lands allocation for paddy and other crops, a year ahead water release plan for irrigation is obtained.

Keywords: Water reservoir management, Goal programming, Stochastic model

*Corresponding author: samaremath@gmail.com