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Runoff estimation using modified SCS CN model coupled with GIS for Nethravathi river basin of India

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Abstract

The SCS-CN method is one of the most widely used method for quick and accurate estimation of surface runoff. The coupling of this technique with the Geographic Information System (GIS) helps to predict runoff spatially and in an efficient manner. Keeping in view of this, in the present study an attempt was made to estimate the daily runoff spatially using GIS coupled slope modified SCS-CN method for Nethravathi river basin, lies along the west coast region of India. Even though huge amount of water from Nethravathi river is flowing out into the Arabian Sea during monsoon season, there is insufficient water during summer season (February to May). Hence, rainwater harvesting and insitu moisture conservation are very essential for this basin. The daily runoff depends on the daily rainfall, antecedent moisture condition (AMC), soil properties, land use land cover, slope of the land etc. Hence, the different thematic layers were prepared in ARCGIS, intercepted and the runoff was estimated. ASTER 30 m DEM data was used for generating the basin map, drainage network, slope map etc. The basin area generated from the DEM (3211 km^2) was on par with the values reported earlier by Central Water Commission (3184 km^2). The slope output derived from DEM showed that the major portion of the basin has slope below 25 degrees with mountain ranges upto 40-70 degrees. The land use land cover map AWFIS 2007-08 data showed that the major portion of this basin is under forest followed by plantation crops. The surface runoff estimated using SCS-CN and slope modified SCS-CN techniques were validated for the Nethravathi river basin using the runoff data recorded data for the period 2003 to 2006 at Directorate of Cashew Research (DCR) Puttur and the river discharge data of Nethravathi river at Bantwal Station. It was found that the slope adjusted CN method performed the best (R^2 =0.89) followed by standard CN method (R^2=*0.87*). This methodology can be adopted for estimating the runoff potential from unguaged watersheds with deficient data. It is concluded that in order to ensure long-term and sustainable groundwater utilization in the region, proper estimation of runoff and implementation of suitable water harvesting measures are the need of the hour.

Keywords: ArcGIS, cashew, curve number, SCS-CN model, slope, surface runoff

Biography

Rejani R has completed her M.Tech and Ph.D from Indian Institute of Technology, Kharagpur and received DAAD fellowship during 2000-01 and done part of her Ph.D programme at University of Hannover, Germany. She is the working as Scientist (Soil and Water Conservation Engg.) at Central Research Institute for Dryland Agriculture (ICAR). She has published more than 15 papers in reputed journals, 4 book chapters and serving as reviewer for the Journal of Water Resources Management.