Dynamic modelling of natural spring discharge in mid-Himalaya

Sudarshan Prasad¹, Ambrish Kumar² and H.C. Sharma³

¹College of Technology, Rajendra Agricultural University, Pusa, Bihar; ²Central Soil and Water Conservation Research and Training Institute, 218 Kaulagarh Road, Dehradun-248195, Uttarakhand; ³Irrigation & Drainage Engineering, College of Technology, GBPUA&T, Pantnagar-263145, Distt. U.S. Nagar, Uttarakhand.
²E-mail: sp_28783@yahoo.com

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ABSTRACT

In mountains, springs and seepages are the main sources of drinking water. The shortage of drinking water arises mainly due to drastic reduction in spring discharge during summer. The inhabitants are compelled to collect potable water from far off distances, reduce water consumption, consume unhygienic water and face social conflicts. Keeping it in view, two perennial natural springs of Uttarakhand, viz., 'Hill Campus Spring (HCS)' and 'Fakua Spring (FS)' were selected for the study with the objective to develop dynamic models for prediction of their discharge. The daily spring discharge data collected from 1999 to 2001 was used for formulation and calibration, and validation of the models was done with discharge data of 2002. The maximum and minimum discharge of HCS and FS varied from 30 lpm to 4.70 lpm and 80 lpm to 1.20 lpm, respectively. Efforts were made to develop generalized models such as annual, monsoon and non-monsoon, which are capable to address the variability in discharge owing to erratic behaviour of monsoon and non-monsoon rains. Time variant linear dynamic models for monsoon season were found to be more suitable models having more Coefficient of Multiple Determination (CMD) values (94.18% and 92.11% for HCS and FS, respectively) than annual models (87.28% and 90.48% for HCS and FS, respectively) to predict the daily spring discharge of monsoon months for both springs. Thus monsoon season model could be recommended for extensive application for prediction of discharge of monsoon months.