

THESIS

**RUNOFF ESTIMATION FOR VARIOUS SIZED
CATCHMENTS USING SCS AND MODIFIED SCS METHODS
AND THEIR COMPARISON**



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By

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(2004-PG-EHY-53)

For the Degree of
MASTER OF SCIENCE
IN
ENGINEERING HYDROLOGY

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
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2007

ABSTRACT

Indus River and its five left bank tributary i.e. Jhelum, Chanab, Ravi, Sutlaj and Beas and one major right bank tributary the Kabul are main surface water resources for irrigation, power generation and domestic water supply in Pakistan. After signing Indus basin treaty 1960, Ravi, Sutlaj and Beas (three eastern rivers) went to India while the water of remaining three (western rivers) were given to Pakistan. The prime source of water of River Indus and its tributaries are snow, ice and rainfall.

Increase in demand of water with passage of time for irrigation and hydropower lead Pakistan to conserve its all water resources. A comprehensive strategy has been adopted to build small and large dams on each perennial river or nullah for maximum exploitation of this precious resource. Unfortunately the absence of long term runoff record makes it difficult to estimate the availability of water. Therefore for estimation of runoff certain other techniques are used i.e. regression synthetic approach etc. The most common method in practice for estimation of runoff from rainfall is SCS-CN method. This method can be successfully used in the catchments, where reliable rainfall data is available and catchment characteristics are known. All the rainfall that occurs on certain catchment does not reflect into the runoff because some of the water loss due to interception, storage, infiltration and evaporation.

SCS-CN technique shows the catchment response of precipitation in the form of runoff. Mishira and Singh (1999a) modified its equation by introducing two more parameter 'a' and redefining the term I_a and recommended that the modified model with 'a' = 0.5 and $\lambda = 0$ performs significantly better than the existing SCS-CN method.

The present study aims to test the Modified SCS Methods on different sized catchments after establishing spread sheet model in comparison with existing SCS-CN method for runoff estimation and comparing these results with the observed flow to select best approach for runoff estimation.

The runoff of three different sized catchments i.e. Soan River, Ling River and Darmalak Dam is estimated by using SCS Method and Modified SCS Method with three variants i.e. ($\lambda=0$, $a=1$), ($\lambda=0.2$, $a=1$) and ($\lambda=0$, $a=0.5$). With the help of monthly point rainfall data recorded at Palanderi, Kallar, Rawal and Kohat stations which was transformed to areal rainfall by weighted average method.

The results of runoff computation for a period of 16 years (1963-1978) SCS Method were compared with observed flows. These show that SCS Method gives results promising with observed one in each of three different sized catchments in comparison to Modified SCS Method. However out of three different approaches of Modified SCS Method, each with different variants overestimated but modified SCS-CN method with variant ($\lambda=0.2$, $a=1$) is nearer to observed runoff in all cases. The results obtained with modified SCS-CN method show larger variations, so it is not recommended under local conditions, thus the validity of modified SCS-CN method is doubtful. However it is suggested that the parameters should need to redefine and re-test against before its adaptation at local scale.

As a final word, it may be recommended that SCS Method be preferred on Modified SCS Method in different sized catchments i.e. Soan River, Ling River and Darmalak dam and its suitability is more significant for small sized catchment.