

## Derivation of runoff coefficient for a wasteland treated with micro-catchment

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### ABSTRACT

The study was undertaken at the field of wasteland development project at Bharathiar University Campus, in Coimbatore district of Tamil Nadu, characterized by low annual mean rainfall and degraded land. The total area of watershed was 45.36 ha. Curve number technique was used for runoff estimation from watershed. Analysis showed that the daily runoff value came to be negligible, so seasonal runoff value was taken for computation of runoff coefficient. The runoff coefficient values for the study watershed for 25 years seasonal runoff producing rainfall events for AMC I, II and III were 0.087, 0.126 and 0.306 respectively.

**Key words :** Runoff Coefficient, Curve number technique, Micro-catchment, Watershed.

### INTRODUCTION

Runoff management is one of the major components of Watershed development. It is achieved by gully plugging, nala bunding, construction of farm ponds and percolation tanks along with inter-terrace and terrace level conservation structures that not only reduce the erosion hazards and induce groundwater recharge, but also increase productivity of land per unit area and time. In India, 53.3 million hectares of land is considered as wasteland (1985, Report of the National Remote Sensing Agency, Hyderabad). In India, some soil and water conservation practices were followed for conserving valuable soil and water. But wasteland needs some in situ moisture conservation techniques due to which moisture availability in wasteland is increased and some less water requirement plants like cashew, energy plants are grown.

Some techniques were available for finding out runoff coefficient for watershed. But no such study had been conducted to find runoff coefficient for wasteland-based watershed treated with microcatchment for area where no runoff measurement is available. Therefore it was necessary to develop runoff coefficient for this condition.

The soil conservation service curve number (USDA – SCS, 1972) was one of the most widely used methods for runoff estimation for small watersheds. The curve number method was simple that provided reasonably accurate results under certain conditions (Pathak *et al.*, 1989). In this method, rainfall, land use surface infiltration conditions and hydrological soil groups were considered.

### MATERIALS AND METHODS

The site selected for the research study was located at the Bharathiar University Campus, Coimbatore district of Tamil Nadu, India at the foothills of Maruthamalai hills. It had a sandy loam soil type along with 840 mm average annual rainfall. Under a wasteland development project, in situ moisture conservation treatments in the field were Microcatchments and Compartmental bunds. Some of the Agroforestry plants like Neem, Tamarind, Amala, Mahogany, Rosewood were planted in microcatchments.

#### *Estimation of runoff :*

Out of different methods of runoff estimation the method used was US- Soil Conservation Service Curve Number Technique (also known as Hydrological Soil Cover Complex Method).

#### *SCS curve number technique :*

The development of the technique has originated from following relationship

$$\frac{F}{S} = \frac{P_e}{P - I_a} \quad \text{----- (a)}$$

The depth of excess precipitation or direct runoff,  $P_e$  is always less than or equal to the depth of precipitation,  $P$  likewise. After runoff starts, the additional depth of water retained in the catchment,  $F$  is less than or equal to the potential maximum retention,  $S$ . There is some amount of rainfall,  $I_a$  (Initial abstraction) for which more runoff occurs. So the potential runoff is  $(P - I_a)$ .

The assumption of this method was that the ratio of the two actual and potential quantities (retention and

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