

CHARACTERIZATION AND RUNOFF MODELING OF ALANTHURAI WATERSHED OF COIMBATORE DISTRICT IN TAMILNADU

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ABSTRACT

Water is the elixir of life. The increase in population and urbanization necessitates growth in the agricultural and industrial sectors, which demands for more freshwater. In Tamil Nadu, nearly 95% of surface water and 85% of groundwater resources have been harnessed. Agricultural sector is the major consumer of water. The study was carried out to estimate the surface runoff potential and the catchment characteristics in Alanthurai watershed. It covers an area of 161.275 sq. km of western part of Coimbatore district along the Noyyal river basin in Tamil Nadu. The relationship between rainfall and runoff was obtained by best-fit curve method.

INTRODUCTION

Water is the basic requirement of all life on the earth. Rainfall is the predominant form of precipitation in India and is responsible for causing stream flow in rivers. The average annual rainfall of India is 1194 mm. It contributes about 400 M ha.m of water of which 115 M ha.m is lost as surface runoff, 70 M ha.m has immediate evaporation and the remaining infiltrates into the soil including deep percolation loss (Soni 2000). In order to conserve the existing water bodies and to avoid the water scarcity problem of an area, the available water resources must be managed properly. By keeping this view, the present study was conducted to estimate the surface runoff and the characterization of Alanthurai watershed located near the western guards of Coimbatore district in Tamil Nadu. This study gives an idea about the implementation of suitable irrigation schemes and soil erosion assessment (Wijesekera 2001, Saplaco 2001) in the catchment area and to select the site for recharging the surface water in order to raise the ground water level in that area.

STUDY AREA

The study area lies between 10°50' and 11°5' north latitudes and 76°40' and 76°50' east longitudes and covers an area of 161.275 sq. km from the western guards in the west to Alanthurai village to the east area. Most of the catchments are surrounded by hilly region and higher vegetation. The average annual rainfall in the watershed is 718 mm for the period from 1990 to 2004. River Noyyal originates from western guards and flows through this watershed. Based on the surface soil investigation study, the soil in Alanthurai watershed is sandy clay loam weak medium subangular blocky for a depth of 18 cm from the top soil. The top soil has a property of moderately rapid permeability and the underlying layer up to a depth of 47 cm also confirms that the soil has moderately rapid permeability. The maximum monthly normal temperature is 34.7°C in April and minimum monthly temperature is 19.2°C in January. The maximum normal wind velocity is 16.3 km/hr in June and minimum normal wind velocity is 5.4 km/hr in November.

METHODOLOGY

The watershed maps and other data were collected from the Soil Science Department, Agricultural

Engineering Department and PWD, Coimbatore. The collected maps were scanned for digitization. The scanned maps are geo-referenced to their latitudes and longitudes and digitized using Map Info software package. Twenty five numbers of undisturbed surface soil samples were collected throughout the watershed area by using the mould of size of 15 cm diameter with 20 cm height. The nature of soil, soil moisture and permeability of collected soil samples were analysed. Strange's tables (Satya Narayana Murthy Challa 1997) were used to calculate runoff corresponding to the annual rainfall of the watershed with the catchment soil conditions. Rainfall-runoff modeling (Band 1986) were developed with the help of Microsoft Excel package.

RESULTS AND DISCUSSION

The base map for Alanthurai watershed was successfully prepared using Map Info software package as shown in Fig. 1. Using this manipulation and modeling of any parameter related to watershed and runoff characteristics can be found out.

The basin characteristics (Jayarami Reddy 2004) such as area of the watershed, length of the stream, average length of overland flow, stream order, drainage density, stream density, form factor and stream pattern were calculated and listed in Table 1. By knowing the basin characteristics runoff of the catchments was identified.

The average permeability value of the collected soil samples shows that soil has moderately rapid permeability. The value ranges from 1.48×10^{-2} cm/sec to 7.18×10^{-3} cm/sec.

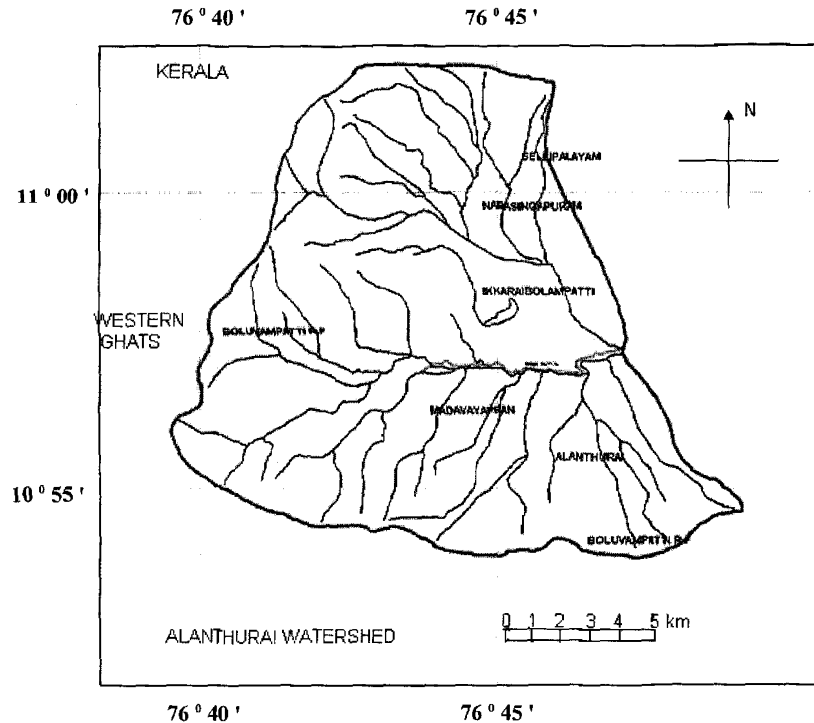


Fig. 1: The location map of Alanthurai watershed of Coimbatore district in Tamil Nadu.

Table 1: Results of basin characteristics of Alanthurai watershed.

Sl.No.	Basin Characteristics	Value
1.	Area of the basin (A)	161.275 sq. km
2.	Length of the stream (L)	26.872 km
3.	Length of overland flow (L_o)	2.99 km
4.	Drainage density (D_d)	0.167
5.	Stream density (N_s)	0.26
6.	Form factor	0.22
7.	Stream pattern	Sub-dendritic

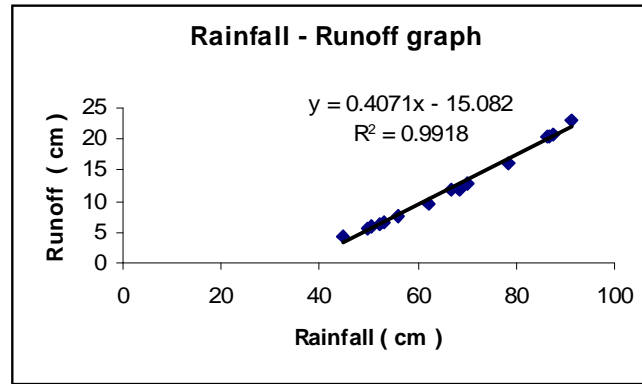


Fig. 2: Relationship between rainfall and runoff of Alanthurai watershed.

Based on the soil survey studies and the monsoon rainfall of the catchment, the monsoon runoff was estimated using Strange's tables. Finally, the calculated rainfall and runoff values were entered into the database. With the database, surface runoff modeling was developed with the square of correlation coefficient $R^2 = 0.9918$ as shown in Fig. 2. The result being in the range of 0.85 to 1.00 proves that the basin possess a perfectly positive correlation and can be considered for implementation of irrigation schemes in the catchment area.

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