ABSTRACT

Continuous Contour Trench (CCT) system, developed for plantation in non-arable lands in low rainfall areas, has been found to be very effective in soil and water conservation, leading to considerably high groundwater recharge. However, no scientific methodology has been adopted to study the detailed hydrological behaviour of a CCT treated watershed. Further, no effort has been made to standardise the design dimensions of the CCT.

In the present study, physically based distributed hydrological modelling system MIKE SHE was applied to a CCT treated watershed for assessing the impact of the conservation treatment. Two adjacent micro-watersheds, one CCT treated and the other untreated, belonging to a 25ha Model Watershed in Akola, Maharashtra, India, were selected and extensive field data collected over two calendar years, i.e., 1998 and 1999. For standardizing the design dimensions of CCT, the maximum surface runoff was estimated using a physical model of water balance on the soil surface and equated with the volume of CCT over the entire area. For designing CCT dimensions for a given area, a computer software *CCT_Designer* has also been developed.

The modelling results show that MIKE SHE simulated the groundwater levels, soil moisture, surface runoff and peak runoff rates satisfactorily. Further, the model was observed to be capable of simulating the hydrological balance correctly even for the past years, in spite of non-availability of extensive data. The model was found to be sensitive to grid size; vertical and horizontal hydraulic conductivities, Strickler's roughness coefficient for overland flow and vegetation parameter, C_2. The CCT system resulted in 89-100% reduction in surface runoff, 32% increase in groundwater recharge and 30% increase in the plant evapotranspiration with respect to the untreated watershed. Further, the application of *CCT_Designer* resulted in reduced CCT dimensions, leading to about 32.2% reduction in total volume of

excavation and a saving of INR 12635 per ha. The results, therefore, clearly demonstrate the advantages of Continuous Contour Trench (CCT) as a moisture conservation measure in low rainfall areas. The study further demonstrates the advantages of applying a comprehensive hydrological modelling tool in studying the detailed hydrological behaviour of a CCT treated watershed. The study also shows the importance of scientific input while designing the CCT dimensions, as it could economise the cost of earthwork and thus, prove beneficial in propagation and field adaptation of this technology. *CCT_Designer* developed in the study, therefore, could prove to be an appropriate tool for meeting this challenge.

Key words: Continuous Contour Trench, Hydrological modelling, Hydrological water balance, Watershed management, Conservation