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Design, Development and Testing of an Improved Tilting Hydraulic Flume for Runoff and Soil Loss Simulation Studies

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ABSTRACT

Concentrated overland flow and percolation are two very important aspects in the sheet flow, which affect the soil and nutrient loss through runoff. An improved tilting hydraulic flume has been constructed at Central Soil and Water Conservation Research and Training Institute, Research Centre, Bellary (Karnataka) for simulation studies of soil erosion, deep drainage and related hydraulic parameters with provisions for soil depth variations, arrangements for precise measurement of deep percolations, provision for measuring infiltration rates at various discharge and slopes, mechanisms for adjustable discharges and leveling of the tilting hydraulic flume in both lateral and longitudinal direction. The rectangular tilting hydraulic flume with M.S of size 10 m × 0.75 m × 0.75 m was designed, fabricated and installed for present study. This is having transparent tuffen glass panels on both the sides (0.5 m × 0.5 m) to have inside view of soil profile, water flow and transportation/movement of soil on the soil surface / bed within the flume. There are equally spaced perforations in flume bed (50 ×50 cm in staggered manner)for collection and estimation of deep drainage, besides runoff and soil loss through suitable mechanism. The tilting flume is also having a mechanism to vary the depth of soil in the flume channel, using an adjustable notch. A re-circulating system of water with adjustable gate at inlet and outlet was also provided for control of discharge in the flume. Testing results showed that stone barrier is more effective at lower discharge rates than higher discharge rates. In the case where vegetative covers cannot be properly established in ephemeral streams of arid and semi arid regions of black soil in south India, stone check may be useful in reducing runoff, soil loss and increasing deep drainage and for ground water recharge irrespective of the slope.