



Measuring Sediment Transport Capacity of Concentrated Water Flow with a New Erosion Feeding Method

Liqin Qu¹, Tingwu Lei^{2,3}, Chenyan Zhou², and Zhiqiang Liu²

¹China Institute of Water Resources and Hydropower Research, International Research and Training Center on Erosion and Sedimentation, Beijing, China (liqin.qu@iwahr.com)

²China Agricultural University, College of Water Resources and Civil Engineering

³Shandong Agricultural University, College of Water Conservancy and Civil Engineering

Sediment transport capacity is not only an important parameter for rill erosion modeling but also a critical parameter for estimating other rill erosion model parameters. Sediment capacity is difficult to be measured, especially at gentle slopes with limited rill length. In this study, a special flume with variable slope gradients in different sections was implemented to feed and to transport sediments. Silt loam soil materials, collected from Beijing, were used in the laboratory experiments to measure sediment transport capacity to verify the method. The experiments were designed under slope gradients of 5, 10, 15, 20 and 25° and flow rate of 2, 4, 8 and 16 L/min. Measured sediment transport capacity values were compared with reference measurements from other rill erosion experiments with similar soil materials. At high slope gradients of 15, 20 and 25°, the newly-suggested method produced almost the same transport capacity values as measured through rill erosion process data. Under the low slope gradients of 5 and 10°, limited length of eroding rill used in the previous experiments was not capable of producing sufficient sediments to make the flow reach sediment transport capacity. Data analysis indicates that rill erosion with a 8 m long flume produced maximum sediment concentrations about 36% lower than the values measured with the new method under low slope gradients of 5 and 10°. The sediment transport capacities at lower slopes measured with the new method followed the same trend as those at higher slopes. The experimental results indicated that the new method is capable of supplying sufficient sediments to ensure the flow approach transport capacity measurement. The method proposed in this study can provide a feasible approach for estimating sediment transport capacity as an important model parameter for soil erosion prediction.