

An Experimental Simulation Method of Erosion Process on Gully Erosion in Loess Plateau in China

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In view of simulation difficult of the field gully erosion process because of complex of rainfall runoff erosion mechanism and gully geometry [U+FF0C] a design means and experimentation technology and its verification test were given based on similarity theory and hydrodynamic principles. The basic ideas was that the erosion process of the field erosion gully was forecast by constructing similar model. The model and antetype should be in obedience to the same physical equations of rainfall, runoff, erosion, sediment transport, bed deformation and Soil water transport. The geometric, kinematical and dynamic similarity must be obeyed for these models. The primary similarity scale relation expressions were the ones of the geometric, rainfall, flow, erosion sediment transport and soil water movement similarity etc. The similarity of the hydraulic boundary was the necessary and sufficient condition between the model and the prototype. The gully prototype is one of Majiagou of Ansai county of Yanan City of Shaanxi Province in China. Its location is 36°53'55.75"N and 109°13'39.08"E.

The model experiment wan carried out in State Key Laboratory of Soil Erosion and Dry land Farming On the Loess Plateau in Institute of Soil and Water Conservation of Northwest A&F University. First soil was selected by starting velocity similar. Second, the normal and scale 10 experiment model was built under complying with the similarities of geometric, rainfall, flow, erosion production sediment transport and bed deformation etc. The model hydraulic boundary from the prototype was the factor of the test process of rainfall. The experiment results indicated that the extreme rainstorm gully erosion process of the prototype could be reappeared. The equivalent rainfall process of gully prototype were that the rainfall intensity was 1.25 mm/min and the lasting time was 508 min and precipitation was 636mmn. Both the erosion amount and the erosion gully topography of the scale model were successfully verified by the measured data of the prototype. And it was an effective method in researching the gully erosion generation, development, evolution process and the field gully erosion control through laboratory experiment.