



Design, Operation and Construction of a Large Rainfall Simulator for the Field Study on Acidic Barren Slope

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Abstract

The utilization of rainfall simulators has turned out to be more far reaching with the automated instrumentation and control systems. This paper portrays a rainfall simulator designed for analysis of erosion on steep (2.5H: 1V). A rainfall simulator designed to perform experiments in slope is introduced. The large scale of the apparatus allows the researcher to work in remote areas and on steep slopes. This simulator was designed to be effortlessly set up and kept up as well as able and additionally ready to create a variety of rainfall regimes. The nozzle performance tests and lateral spacing tests were performed at Research Center for Soft Soil (RECESS), which is another Research and Development (R and D) activity by Universiti Tun Hussein Onn Malaysia. This test system is the standard for research involving simulated rainfall. The rainfall simulator is a pressurized nozzle type simulator. It discharges uniform rainfall on a square plot 6 m wide by 6 m (19.685 ft) long. The fundamental parts of a sprinkler rainfall simulator are a nozzle, a structure in which installs the nozzle, and the connections with the water supply and the pumping system. The structure of the test system was manufactured created with four fixed hollow rectangular galvanised on which a header with 25 nozzles attached to it. The nozzles are spaced 1 m apart. Flow meters control the inflow of water from the storage tank, ensuring each nozzle has a similar release rate, regardless of the introduction of the test system. The tank that was utilized has the 200 gallons of water which is 757.08 Lit and the full with water in tank can run the artificial rainfall simulation roughly around 50 to 60 minutes. The support system is collapsible, easy to set up and maintain. The subsequent test system is conservative (under RM9,000 to build), made with industrially accessible parts, simple to set-up and maintain and highly accurate.

Keywords: Rainfall Simulator; Large Scale; Nozzles; Barren Slope.

1. Introduction

In the most recent decades, rainfall simulators have represented a widespread tool for studying hydrologic interactions of rainwater with soils, the main fields of investigation including soil erosion, overland flow generation, and infiltration [1, 2]. The designing, building and testing of a portable field rainfall simulator for simulating rainfalls that induce runoff and soil erosion [3]. Rainfall simulators are used on experimental hydrology, in areas such as, e.g., urban drainage and soil erosion, with important timesaving when compared to real scale hydrological monitoring [4, 5]. Aksoy et al. [6] designed a rainfall simulator which is easy to operate and transport while maintaining the intensity, distribution and energy characteristics of the natural rainfall. Artificial rainfall experiments on small plots provide a relatively quick and economical way to obtain necessary erosion information in a controlled [7]. Requirements for small portable rainfall simulations in soil erosion and soil hydrology studies [8-10]. A rainfall simulator allows producing rainfall with a known intensity and duration on an erosion plot in a controlled manner, making it possible to evaluate superficial runoff and

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