

Introduction

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Field rainfall simulators are designed to study soil erosion processes and provide urgently needed data for various geomorphological, hydrological and pedological issues.

Extensive discussions at the Rainfall Simulator Workshop 2011 in Trier and the Splinter Meeting at EGU 2013 "Rainfall simulation: Big steps forward!" lead to the opinion that the rectangular shape is the more suitable plot shape compared to the round plot. A horizontally edging Gerlach trough is installed for sample collection without forming unnatural necks as is found at round or triangle plots. Since most research groups did and currently do work with round plots at the point scale (<1m²), a precise analysis of the differences between the output of round and square plots are necessary.

Flow control Needle valve

Power: 55 - 65 W Voltage: 12 V

Objectives

Our hypotheses are:

- Round plot shapes disturb surface runoff, unnatural fluvial dynamics for the given plot size such as pool development especially directly at the plot's outlet occur.
- A square plot shape prevent these problems.

Round versus rectangular: Does the plot shape matter?

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Methods

Small portable rainfall simulator of Trier University

Manomer: pressure 0.2 bar Flow meter: KSK1200HIG100 water flow ~ 45 l/h

Electric bilge pump Head of the pump: max. 4.5m Flow rate: max. 1512 l/h



Specifications:

Water discharge nozzle (Lechler 460.608): 40-45 L/h; rainfall intensity **40 mm/h**; pressure ~ **0.2 bar** Test duration: **30 min** à 6 measurement intervals

Results







Universität Trier



- Two plot shapes of the same size
- Two different plot outlets
- Same calibrated rainfall
- Same sieved substrate (78% silt)
- Same sediment amount
- Same bulk density
- Three different inclinations (2°, 6°, 12°)

Summary & Conclusions			
Does the plot shape matter? Yes!			
	round		square
Runoff	23 L	+42%	33 L
Eroded Material	45 g	+104%	92 g
Sediment Conc.	1.9 g/L	+44%	2.8 g/L

- The test provides results on the best performance concerning undisturbed surface runoff and soil/water sampling at the plot's outlet.
- The analysis of plot shape concerning its influence on runoff and erosion shows that clear methodological standards are necessary in order to make rainfall simulation experiments comparable.

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Special Issue: "Rainfall Simulators as a tool in Soil Science, Geomorphology and Hydrology research and teaching"

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