Wind and Water Erosion on Abandoned Land in High Andalusia – First Results of a Portable Wind and Rainfall Simulator

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Introduction
Wind and water erosion are the main driving factors causing soil degradation on abandoned land in semi-arid environments. Recent research has proven the existence of very complex interactions between both processes. A portable wind and rainfall simulator was constructed and used in a field study in High Andalusia to assess the influence of these interactions on soil erosion rates.

Main objective
The main objective is to get first results for comparison of erosion rates with and without the influence of wind on abandoned land in a semi-arid environment on plot scale.

Study area

- Location: Hoya de Baza sedimentary basin
- Land use: Old fallow land

Geology:
Pliocene Marls
Soils:
Calcification Lithosols
Climate:
Semi-arid
Vegetation:
Low shrubland
Stipa tenacissima

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Method
Portable wind and rainfall simulator

Specifications:
- Plot size: 2.2 m²
- Water discharge per nozzle: Lecher 460, 650 ml/lh
- Rainfall intensity: 60 - 80 mm/h
- Pressure: 0.2 bar
- Wind velocity: 7.5 m/s

Combined sediment trap

- Wedge trap
- Shear Wedge Trap
- Modified Wilson and Cooke Simpler

Experimental setting

- Plot characteristics:
  - Vegetation cover: 25%
  - Rock fragment cover: 50%
  - Position: upper hillside
  - Exposition: ENE

- Test procedure:
  - Test duration: 30 min
  - Measurement interval: 2.5 min
  - Test runs:
    - 17/09/2008
    - Run 1: wind & rainfall
    - Run 2: wind & rainfall

Results

- Run 1 (wind & rainfall):
  - Runoff Coefficient: 65%
  - Total Sediment Load: 35 g

- Run 2 (wind & rainfall):
  - Runoff Coefficient: 65%
  - Total Sediment Load: 45 g

- Run 3 (single rainfall):
  - Runoff Coefficient: 75%
  - Total Sediment Load: 14 g

- Run 4 (wind & rainfall):
  - Runoff Coefficient: 70%
  - Total Sediment Load: 49 g

The sediment loss with wind driven rain (Runs 1, 2, 4) is considerably higher than without wind (Run 3) although no distinctive differences in runoff rates can be found.

Conclusions

- The preliminary results indicate the influence of wind on the kinetic energy of raindrops and consequently on the detachment and provision of soil particles.

- A problem with interpreting the results might be caused by the order of the test runs on one plot. Therefore, a regular order still needs to be specified (e.g. Run 1: single wind / Run 2: single rainfall / Run 3: combined wind & rainfall) Further field measurements are necessary to solve this problem and to improve data quantity and quality.

- If future results confirm these results, it could be concluded that the inclusion of wind in addition to conventional rainfall simulations will assist a better understanding of soil erosion processes.