ConServe Terra
Towards Conservation Agriculture in the Mediterranean Area

PRACTICE ABSTRACT

Building and using a rainfall simulator

Problem

Knowledge on soil mechanisms and ecology will encourage their investments in soil conservation. Without a basic understanding of soil as a living entity, farmers can not be expected to practice soil conservation.

the impact of various rainfall patterns on soil erosion mechanisms under different soil management options is needed. Demonstrating different rainfall durations and intensity this impact in field experiments is timely and different rainfall durations and intensities cannot be reproduced.

Figure 1: Rainfall simulator

Solution

Rainfall simulators are effective tools for demonstrating how soil responds to different rainfall intensities and durations, as the level of soil erosion varies with different management options (Figure 1). The management options that can be demonstrated with a simulator include tilled and non-tilled soils, bare soils, soils covered with residues and soils covered with crops at different stages of development.

A rainfall simulator can be used by agricultural advisors and farmers organizations on field days, events and during farm visits. The simulator can be transported in a pick-up care, so it can be used as a demonstration tool at different locations. The sample trays with soil can be prepared in advance with crops and different soil covers if needed.

Components of a rainfall simulator

Frame

Table support

Main support holding three nozzles

Secondary support: a beam for the balanced nozzle

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Sample Tray

The soil is collected using a sample tray, which consists of a sieve which allows water, soluble and small particles to infiltrate and hold the remaining soil.

Pump

The pressure for the rain simulator should be between 1 bar and maximum 5 bars to have desired reasonable drops and not mist droplets.

Nozzles support

Electric circuit

Pressure adjustment valve

Infiltration and sediment containers

Setup guide

There are different types of rainfall simulators, each varying in material and structure. To use the one as displayed in figure 1, the following instruction may be used:

1. Sample trays should be filled with soil that has been treated differently. To collect the soil sample, a rectangular frame the size of the tray is inserted into the soil up to a height of approximately 60 mm (Figure 2). The surrounding soil is removed, and the block of soil is carefully cut with a metal plate. It is important to take the soil sample in one piece and to take care when placing it in the sample tray, as we need to leave the soil structure undisturbed. This is particularly important for no-till soils.

Figure 2. A frame used to collect the soil

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2. No-till soils need to be watered up to saturation and left until the water is soaked and completely infiltrated into the soil profile. This would take maximum 6 to 24 hours, depending on the soil textures (sandy or heavy clays).
3. The tilled soils are filled into the containers at the height of runoff collection. However, the soil, once watered, will reduce its volume. Therefore, to observe the surface runoff and erosion effect, the containers need to be refilled up to the rim with more soil.
4. Place the trays on the frame.
5. Connect the motor-pump to the water reservoir with the appropriate hose and the return hose from the pressure regulating valve with screw clamps. The other hoses are provided with quick-links to simplify the switch from the three-nozzles to the balancing-nozzle spraying application. The hoses are labelled with different numbers that need to be matched when switching from one spraying mode to the other. The support of the balancing nozzle is placed and linked to hydraulic and electric circuit when it is needed.
6. Attach the infiltration and the sediment containers.
7. Fill the water tank with clean water and elevate it to properly feed the pump.
8. Fill the pump with fuel.
9. Start the simulator. The intensity of the rain can be adjusted by the pressure valve (regulator). Also, the intensity could be adjusted by changing the nozzles (from orange for low-rate flow to the black nozzles that give the highest flow rates).

About this practice abstract and ConServeTerra

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