The rainfall simulation laboratory of the INRA (Orléans, France)

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Facing the lack of knowledge about transfer processes in the environment, the INRA (Institut National de la Recherche Agronomique - French institute for agronomic research) decided to build its own rainfall simulation laboratory. The project was funded by INRA and by the "Conseil Général de la région Centre" (General Council of the region Centre). The facility is primarily designed to be used by INRA scientists but is accessible to the scientific community through collaboration agreements.

The laboratory was recently built in Orléans (France, 100 km south of Paris). The facility is part of the Soil Science Unit and should be fully operational in April 2002. It is divided into three main areas:

- The rainfall simulation tower (8 m high).
- The soil storage (cold room) and box preparation area.
- The sample processing area.

The tower is equipped with two kinds of rainfall simulators:

- ne small-area (< 1 m^2) rainfall simulator – ORSTOM type, with a single oscillating nozzle.
- Two large-area (up to 10 m^2) rainfall simulators, built after the rainfall simulator design of the National Soil Erosion Research Laboratory (USDA-ARS, West Lafayette, IN). Each simulator has five sweeping nozzles. They can be run separately or simultaneously.

For both simulator types, rainfall characteristics can be modified through changes in nozzle type, water pressure and sweep frequency. The water is supplied from a tank collecting natural rainfall or from a de-ionized water production unit.

Two kinds of soil boxes are in use:

- Three small boxes (0.5 m by 0.5 m) with a 10-cm wide buffer zone around the study area to limit side effects due to splash. Soil depth up to 10 cm. These boxes are designed to study local changes in soil characteristics.
- Two large soil boxes (5 m-long by 2 m wide). Designed to compare surface treatments, they are divided in two 1-m-wide areas. Soil depth goes up to 30 cm.

For both box types, slope can be adjusted.

Data collection and processing includes:

- Infiltration and runoff flows. Measurements are done by collecting flows in bottles and then weighting and drying the samples.
- Splash collectors that can be attached to both box types.
- Aggregate and primary particle size distribution of the samples (runoff, splash, etc...) using a laser diffractometer.
- Tensiometric measurements with micro-tensiometers (4 mm in diameter) connected to a Campbell data acquisition unit.
- Soil surface micro-topography using a instantaneous-profile laser scanner.

Other soil characterizations can be done in the soil physics laboratory of the Soil Science Unit (e.g. aggregate stability, hydrodynamic properties).