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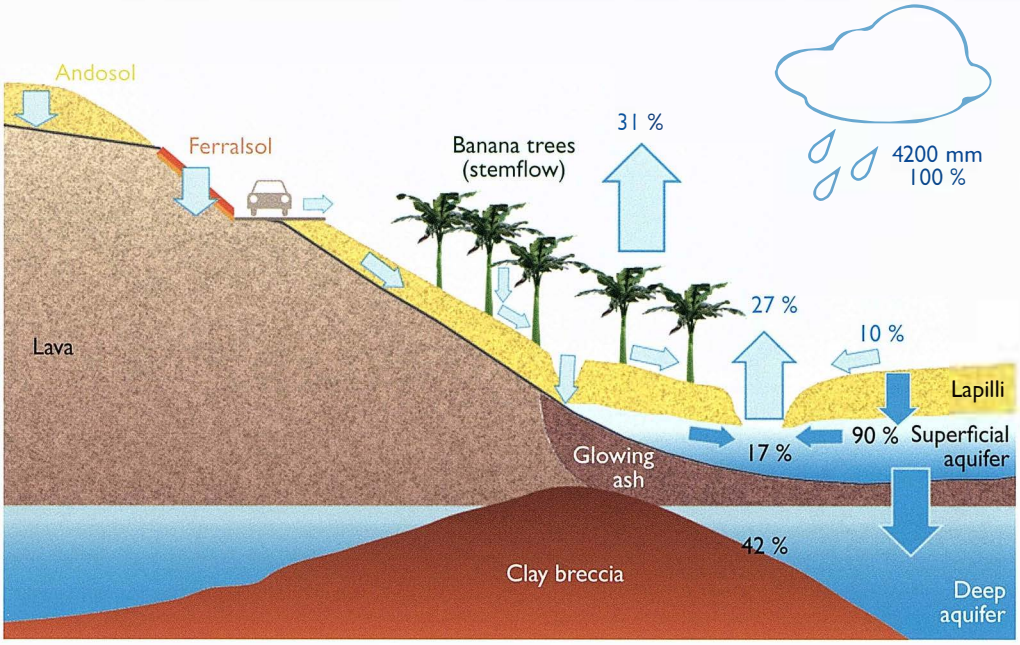
Expertise of the scientific community

Agronomy
Crops and cropping systems

Number 12



◀ *Features of the hydrological balance in the elementary catchment of Féfé (20 ha).*

Hydrological discontinuities between lapilli, lava and glowing ash, and finally breccia, led to separation of the two overlapping aquifers. The main terms of the balance are:
Evaporation = 31% of the rainfall;
River flow (27%) = surface runoff (Rs=10%) + superficial aquifer drainage (Ds=17%);
Infiltration (90%) = Evaporation + Ds + Deep aquifer drainage (42%).

Hydrological functioning on plot and catchment scales
in tropical environments–a case study of banana

Ignorance of the main mechanisms controlling the fate of pesticides used in tropical environments is partly responsible for environmental problems in the West Indies and most banana-growing areas worldwide. As part of a study to assess the fate of pesticides in volcanic tropical environmental conditions, environmental degradation which could be potentially induced by banana cropping was a special focus of attention.

The research (in collaboration with the INRA *Unité Agropédoclimatique de la zone Caraïbe*) was conducted in two phases:
- Understanding how pesticides are mobilized from their application site (plot). The main runoff and drainage water flows were quantified along with changes in pesticide concentrations in different water and soil compartments.
- Study of water resource pollution mechanisms in catchments, i.e. an environmental impact assessment scale. The hydrological functioning of a small banana growing area (20 ha) was characterized, while also determining water and soil contamination patterns.

Hydrological modelling was conducted on two scales using the MHYDAS model developed by LISAH.

On a plot scale, banana trees highly redistribute incident rainfall, mainly via stemflow. This results in a heterogeneous rainfall intensity distribution on the ground, which in turn promotes runoff, increases drainage flows at the foot of banana trees and fosters pesticide export. On a catchment scale, water circulation routes are mainly underground. The spatial hydrological model developed can be used to assess the impact of the landscape spatial organization on water flows.

A study of nematicide dispersion revealed two successive water contamination phases: event-based contamination with peaks lasting less than 30 days, associated with transport via surface runoff during rainstorms; and quantitatively greater chronic contamination associated with drainage of the contaminated surface water.

▲ *Device for measuring the rainfall redistribution by banana leaves.*

A collar allows for recovery (in cans) of water flowing down the stem (stemflow). Basins used to assess the distribution of water flowing through the foliage (throughfall).

Pesticide inputs in banana plantations lead to soil and water pollution on different agricultural spatial scales. This warrants research to develop alternatives to pesticide treatments. The findings of this study provide a reference base on pesticide contamination and mobilization processes in tropical volcanic environments, especially with respect to the management of the chlodecone problem in the West Indies, as this persistent organochlorine pollutes water and soils for very long durations.

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