



les dossiers
d'**AGROPOLIS**
INTERNATIONAL

Expertise of the scientific community

Soil
Earth's living skin

Sewage sludge, trace metal elements and sugarcane

The economic and agricultural advantages of recycling waste in agriculture are well documented, but it is essential to manage the environmental impact. Metallic trace elements (MTE) are amongst the potential pollutants involved in such recycling. These elements should be carefully monitored because most of them are toxic to animal and plant communities.

Agricultural spreading of sewage sludge is under strict French regulation so as to ensure, amongst other aspects, protection against the risk of contamination of soils and the environment (ecosystems, agrosystems, inland waters). To reduce risks associated with MTEs, waste spreading is therefore prohibited when sewage sludge has an excessively high MTE content or when the field soils to be treated already have a high level of these elements.

On the island of Réunion, many soils are formed on volcanic materials that naturally have nickel, chrome and copper contents above legally authorized levels. Sludge spreading therefore cannot be authorized on these soils unless the farmer has obtained an official waiver.

Following a large-scale soil and sugarcane sampling campaign, the internal research unit (UPR) Environmental Risks of Recycling (CIRAD) studied MTE mobility, i.e. the ability of these elements to pass into the liquid phase, and also their phytoavailability, i.e. the quantity of MTEs taken up by plants.

The findings revealed that the studied MTEs were not very mobile and that sugarcane plants growing on soils with very high MTE contents did not take up more nickel, chrome or copper than cane plants growing on less MTE-rich soils. These results could potentially be used to request a waiver, which in turn would pave the way to new prospects for utilizing sewage sludge in Réunion. The current setting in which fertilizer costs are sharply rising suggests that these prospects could become reality

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Development of tools for the analysis and prediction of Mediterranean agrohydrosystem function

The joint research unit (UMR) *Environnement Méditerranéen et Modélisation des Agro-Hydrosystèmes* (EMMAH) groups researchers from INRA and physicists and hydrogeologists from the University of Avignon and Pays de Vaucluse (UAPV). The unit's thematic and technical expertise spans the following domains:

- Crop function/agronomy, bioclimatology and remote sensing
- Physics of transfers and biogeochemistry of soils and porous media
- Hydrogeology, hydrochemistry and hydrology.

The aim is to develop tools for analysis and prediction of the physical, biological and biogeochemical functioning of agrohydrosystems, especially Mediterranean, in terms of agricultural production, water flows and pollutant transfers, while considering a setting under possible climate and soil use changes.

The scientific strategy is based partially on experiments carried out on various scales (from a closed laboratory reactor to a catchment, including the column and plot), and also on the development of modelling tools to simulate the function of studied systems.

Concerning soil related activities, research is focused on modelling runoff and quick infiltration phenomena, on mineral or biotic (bacteria) colloidal particle movement, and on monitoring interactions between transport mechanisms (water, heat, solutes, gas) and biogeochemical processes controlling the fate of elements and compounds in solution (nitrates, dissolved organic carbon, trace metal elements). Various simulation tools have been developed: model of transfers in the unsaturated zone, combining transport, geochemistry and biological processes, 3D model of water extraction by root systems, crop development simulation models, 'soil-vegetation-atmosphere' transport (SVAT) models, assimilation of remote sensing data in vegetation models, models for simulating transfers in water tables, etc. ...

Other teams focused on this topic

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