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Preservation and management

&gt; HUMAN-INDUCED WATER POLLUTION

# Study of chronic water pollution by pesticides: the case of chlordecone in the French Antilles



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▲ *Banana cultivation in the French West Indies.*

Chlordecone is an organochlorinated insecticide, used from 1971 to 1993 in the banana tree plantations in the French Antilles. Chlordecone residues are still present in the environment, especially in soils. This situation leads to chronic contamination of rivers, underground tables, (including large drinking water resources) and even of certain crops. Little is known either about the dispersion modalities of this pesticide – which is significantly adsorbed in organic matter-rich soils submitted to tropical rainfall – or about the modalities of plant contamination.

The Chlordexco project, supported by the National Chlordecone Plan and the “Contaminants, Ecosystem, Health” programme of ANR, implies the research units *HortSys* and *Systèmes Bananiers* of CIRAD, the LISAH JRU (INRA, IRD, Montpellier SupAgro), the INRA centre of Guadeloupe, the IRD centre of Martinique

and the Agrosphere Institute in Germany. It aims at studying the contamination of water bodies through:

- The identification of the determinants of the molecule release within the soil profile and of its transfer to underground tables: the characteristics of chlordecone adsorption/desorption mechanisms are examined taking into account the type of soil, the quality of the organic matter and the mineral composition. A forecasting model of chlordecone migration is elaborated depending on soils hydrodynamic properties and climatic events.
- The identification of sources and dynamics of river contamination at the catchment scale: several measurement stations have been installed in Guadeloupe to characterise the hydrological behaviour of an elementary basin (20 ha) and of a resource basin (400 ha). Environmental contamination is analysed in soils and water of tables and rivers. The transfer pathways and the dynamics of the pollutants are being modelled.

These research works will allow identifying the main zones that contribute to the pollution and to the evolution of the polluting pressure over time at different scales. They will contribute to diagnose the importance and the short and long terms evolution of underground and surface water contamination. They will help to better understand the chemical stresses suffered by aquatic organisms. Finally, they will end up with recommendations for a better environmental management.

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LBE is one of the world leading laboratories in the field of anaerobic digestion. It promotes excellence in research, thematic plurality, multidisciplinary approaches, innovation and technology transfer (6 patents, 11 licence contracts, *Pollutec* Innovation Awards in 2007, 2009, 2010). Its facilities cover more than 4,700 m<sup>2</sup>, including a 1,900 m<sup>2</sup> experimental hall, high performance scientific and analytical equipment, with more than 50 digesters (from 1 litre to several cubic meters), running on a 24/7 basis.

## Analysis of minerals *in water*

*The Water, Soils and Plants Analyses Internal Service Unit – US Analyses* (CIRAD) is an analyses laboratory with a staff of 19, based in Montpellier. It is specialised in the analysis of mineral constituents, including metal trace elements, in plants, water, soils and other media related to agriculture (harvest residues), environment (waste water treatment plant sludge), or the food industry (table oil). It plays a cross-disciplinary role by serving other research units of CIRAD and other public institutes (INRA, CNRS, IRD, etc.).

The lab is accredited by the Ministry of Agriculture to import and analyse soils from non-European countries. It is well-equipped with analysis devices such as inductive coupling plasma (ICP), inductive coupling plasma mass spectrometry (ICP-MS), continuous flow colorimeters, automatic granulometers, pH-meter automat controller, C, H and N elementary analysers, atomic absorption spectrometer with electrothermal atomisation, polarographic chain.

The lab is also accredited to train students and researchers in analytical techniques. It carries out methodological studies on laboratory and field experiments. It is also destined to train, control and evaluate other analyses laboratories in terms of metrology and quality control. Since 2000, the lab is certified by the French Association for the Improvement and Management of Quality according to the ISO-9001-2008 standards for four types of services (analysis, training, expertise and methodological developments). With regard to water, the lab analyses elements present in natural water (rivers, lakes, underground water tables), or in waste water, including mineral pollutants such as heavy metals. ■