

Earth observation as a support to assess pressures caused by pesticides on soils and waters

A case study in French Guiana agricultural areas (Cacao, Javouhey)

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Context and objectives

In French Guiana, as in most parts of the world, one of the most important users of phytosanitary products is agriculture. Their use can have negative impacts on ecosystems and public health, especially when surface and groundwater is used to supply drinking water. In French Guiana where the development of a local agriculture has been starting in the 70's, no state of the art on pesticides in the environment has been conducted by now. This is the reason why BRGM, with the support of the DEAL¹, has been carrying out a project aiming at 1/ establishing a first start of the art of soils and water contamination in French Guiana 2/ characterizing the sorption and degradation mechanisms in the main types of Guianese soils. The project focuses on the two major and historical agricultural zones of the department (Cacao and Javouhey) which offer a large a variety of pedological and climatic contexts.

The first step of the project was to gather under a GIS database all existing data and information useful for later interpretations². Getting a better idea of the pressure on the environment and of its evolution in time was one of this information. For this purpose, satellite images and aerial photographs interpretation showing how the parcel plan and the agricultural sectors have evolved in time have been used.

Methods

The satellite images used are Landsat images (downloaded for free on Global Land Cover Facility) and SPOT images (obtained thanks to the SEAS station managed by the IRD). The images were first processed with Multispec. Then a visual interpretation was done with a colored composition 4-3-2. Finally, with a spectral analysis and the vegetation index analysis the limits of the agricultural zones could be defined.

Results and limits

The results are outlined here for the Javouhey area. It appears that the agricultural zones have been extended since the 1980's (Fig.1). This extension also corresponds to an increase of the deforested areas.

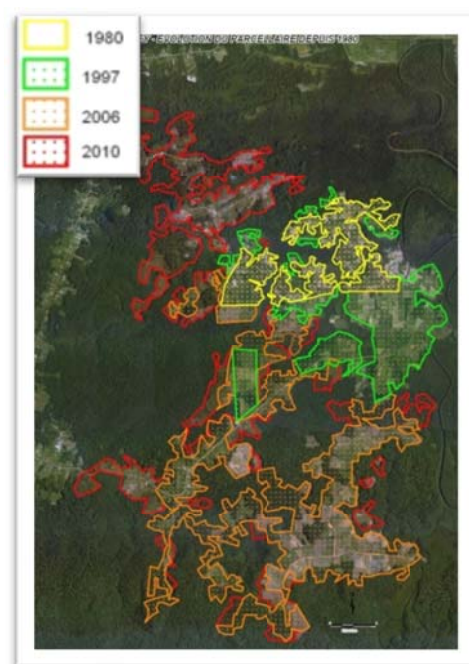
Pressure is supposed to be the highest on oldest cultivated parcels.

Soil, sediment and water (groundwater and surface water) analysis are under progress to confirm these hypothesis.

The evolution of farmer's practices and of the products used will also be considered. Nevertheless, the use of satellite images is constrained by several elements, especially clouds which make the interpretation difficult and the bank angle of the sensors.

Conclusions and perspectives

As a conclusion, satellite images give relevant observations of the state and the evolution of agricultural activities. They can be used as indicators of an important change in anthropogenic activities that could be leading to water contamination and public health issues. Earth observation is therefore an important perspective in water management.



Year	1980	1997	2006	2010
Area	370 ha	960 ha	2260 ha	3260 ha

!s in
2010

¹ Regional Authority for Environment, Planning and Habitat

² Nontanovanh M., Perbet P. - Projet « phytosanitaires en Guyane » phase I : Etude historique du parcellaire et mise en place d'un système d'information géographique sur les secteurs de Javouhey et Cacao, rapport BRGM/RP-60394-FR