PARAGE PROJECT: ASSESSING AGRI-ENVIRONMENTAL IMPACTS IN THE FRENCH WEST INDIES AND FRENCH GUIANA

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1. INTRODUCTION

The PARAGE project funded by the French ministry of agriculture and fisheries is a two-year pilot study involving private firms (Spot Image and SIGbea) and government agencies (CIRAD and IRD). Under French and European land and resource management regulations (the sustainable agriculture contract, Common Agricultural Policy (CAP) and EU Framework Water Directive), farming institutions need reliable and current spatial information. This information is needed to base decisions on a detailed territorial analysis of utilized agricultural area (UAA), its spatial and temporal dynamics and how it is interacting with urban and natural environments.
Processed satellite imagery in combination with existing data and expertise meets this requirement. Focusing on French Guiana, Martinique and Guadeloupe, the PARAGE project is working with the receiving station operating in French Guiana since February 2006 to build up a large database of SPOT satellite imagery covering the Amazon and Caribbean environments.
The four main phases of the project were: 1) needs analysis, vital to examine the specific features of the study areas (Martinique, Guadeloupe and French Guiana); 2) Specification of agri-environmental geo-indicators and map products derived from processed satellite imagery to meet users' requirements; 3) Specification of a GIS demonstrator integrating different layers of spatial information based on the geo-indicators; 4) Development of the map products and demonstrator.

2. GEO-INDICATORS

As defined by GeoTraceAgri, 2005 [1], and GTIS-CAP, 2005 [2], a geo-indicator is an indicator giving a synthetic vision of a problem in order to better understand it, based on reliable and easily accessible data, responsive to expected changes and understood and accepted by users. It also has to satisfy certain spatial criteria. It must be: explicitly spatial, i.e., underpinned by a model explicitly based on geographic coordinates (x, y) and spatial algorithms; or implicitly spatial, i.e., underpinned by data tied to geographic objects (e.g., a polygon). For the PARAGE project, geo-indicators must also address agri-environmental issues. The original feature of these geo-indicators is that they highlight existing spatial relationships between a field and its environment. They were defined after conducting interviews with users in French Guiana and the French West Indies. They are calculated using spatial data from existing databases on the demonstration sites and by exploiting satellite imagery.

3. METHODOLOGY: 3 THREE REGIONS, THREE ISSUES

Methodologies developed cover three specific study areas: French Guiana, Guadeloupe and Martinique. These French overseas territories are governed by the same laws as mainland France but benefit from special provisions—notably fiscal provisions—applying to the European Union's so-called "ultra-peripheral" regions. In each of the study areas, sites were selected and analyzed from an agri-environmental perspective in line with local requirements.
The PARAGE project adopted an iterative approach in close, permanent contact with decision-makers in the agri-environmental sector. To begin with, meetings were arranged with institutional stakeholders in French Guiana and the French West Indies to identify priority local issues. From the results of this requirements analysis, useful spatial information was inventoried and project phases were planned through to the production of indicators chosen to describe and analyze farming issues: 1) Martinique: assessment of erosion risks on the "Baie du Robert" watershed: 2) Guadeloupe: landscape change; 3) French Guiana: monitoring of land clearance by slash-and-burn farming

Two key geo-indicators were developed to study these issues: 1) Land-use change indicator implemented in French Guiana, Guadeloupe and Martinique; 2) Erosion sensitivity indicator implemented in Martinique

4. DATA

Satellite images used for the PARAGE project are:
- Martinique: SPOT 5 color – 2.5 m resolution, Quick Bird color – 70 cm resolution and Formosat-2 color – 2 m resolution.
- Guadeloupe: SPOT 5 color – 2.5 m resolution and Quick Bird color – 70 cm resolution
- French Guiana: SPOT 1 - 5 color – 2.5 m, 5 m and 10 m resolution.

They were acquired by the SEAS receiving station operating in French Guiana since February 2006.

5. RESULTS

The project results are of 2 types.

5.1. Value added cartographic products

Definition and production of value added cartographic products developed with local issues, and principally based on satellite imagery products:

- Martinique: erosion sensitivity derived from 4 layers of information (land use, slope, run-off accumulation and soil conditions) [3].
- Guadeloupe: calculation of land-cover changes at different dates for several study sites exhibiting different features [4].
- French Guiana: land clearance indicator applied along the corridor of the road being built between Saint-Laurent and Apatou [5].

The map products developed are land-cover maps with a nomenclature matched to users' requirements.

5.2. GIS demonstrator

To implement these geo-indicators, an Open Source Web-based GIS demonstrator was also specified and developed for the PARAGE project. This demonstrator aims to highlight results from processed satellite imagery and shows the dynamic nature of the geo-indicators. It is a data viewing and distribution tool geared toward supporting dialogue and exchange of information between stakeholders

6. CONCLUSION AND OUTLOOK

Working in close partnership with local stakeholders, the PARAGE project has successfully developed map products and geo-indicators to meet their needs, notably for monitoring changing land use - across a range of agri-environmental contexts (mangrove, market gardens, low-density housing, primary forest, etc.) - and soil erosion vulnerability. However, the project was not able to achieve completely standardized products in the time available.

The GIS demonstrator has elicited very positive feedback from the vast majority of users. In particular, they liked the fact that it: is built around lightweight, open-source Web technologies; allows sharing of geospatial information between all users; meets the needs of both engineers and the lay public. It nevertheless remains a demonstration tool, so further work is needed to develop a truly operational Web GIS solution.

7. REFERENCES

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