Assessing land cover changes in the French Pyrenees since the 1940s A semi-automatic GEOBIA approach using aerial photographs

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To cite this version:


HAL Id: hal-01197132
https://univ-tlse2.hal.science/hal-01197132
Submitted on 11 Sep 2015

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Assessing land cover changes in the French Pyrenees since the 1940s

A semi-automatic GEOBIA approach using aerial photographs

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Introduction

As in many mountain areas in Europe, agro-pastoral landscapes of the Pyrenees are subject to fast spontaneous reforestation. Encroachment is mainly related to the abandonment of farmland in combination with rural depopulation and agriculture modernization.

Observed changes of land abandonment or land-use extention can be similar at the regional scale but the dynamics at the local scale do not occur homogeneously, as it is determined by specific conditions (environmental, climatic, socio-economic, anthropogenic).

The objective of this work (part of the MODE-RESPYR project) is to assess the spatial patterns of land cover changes during the last 70 years in three study sites of the Pyrenees, and to compare the local dynamics in order to observe and to explain similarities and disparities.

Material and Method

Data

Historical panchromatic aerial photographs with recent true color digital images

1. Davantaygue
   - Number of photographs: 67
   - 6 dates: from 1948 to 2001
   - Scale: 1:15000-1:30000
   - Spatial resolution: 0.5m
   - TIFF (B or 24 bits)

2. Haut-Vicdessos
   - Number of photographs: 286
   - 7 dates: from 1942 to 2003
   - Scale: 1:25000-1:30000
   - Spatial resolution: 0.5m
   - TIFF (B or 24 bits)

3. Garrottes
   - Number of photographs: 104
   - 5 dates: from 1942 to 2000
   - Scale: 1:25000-1:30000
   - Spatial resolution: 0.5m
   - TIFF (B or 24 bits)

Methodological approach

Dependently-generated land cover maps from a Geographic Object-Based Image Analysis

Study sites

Three Human-Environment Observatories

1. Davantaygue (76 km²)
   - In the Peripheral area of the Pyrenees National Park
   - 6 municipalities

2. Haut-Vicdessos (244 km²)
   - In the Regional Natural Park of Ariège
   - 7 municipalities

3. Garrottes (85 km²)
   - In the Regional Natural Park of the Catalan Pyrenees
   - 5 municipalities

Results

1. Davantaygue

<table>
<thead>
<tr>
<th>Year</th>
<th>Cropland</th>
<th>Forest</th>
<th>Scrub/Grass</th>
<th>Pasture/Grassland</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2001</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- Woody area: (+15%)
- Urban area: (+1%)
- Scrub/Grass in valley upper slopes: (-9.5%)
- Pasture and hayfields in valley upper slopes: (+4%)
- Cropland and grassland in valley bottom: (-2.5%)

2. Haut-Vicdessos

<table>
<thead>
<tr>
<th>Year</th>
<th>Cropland</th>
<th>Forest</th>
<th>Scrub/Grass</th>
<th>Pasture/Grassland</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>1942</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2003</td>
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</tr>
</tbody>
</table>

- Woody area: (+20.5%)
- Urban area: (+0.2%)
- Scrub/Grass: (-28%)
- Pasture and hayfields: (+1%)
- Cropland in valley bottom: (-3.3%)

3. Garrottes

<table>
<thead>
<tr>
<th>Year</th>
<th>Cropland</th>
<th>Forest</th>
<th>Scrub/Grass</th>
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- Woody area: (+20.5%)
- Urban area: (+0.2%)
- Scrub/Grass: (-28%)
- Pasture and hayfields: (+1%)
- Cropland in valley bottom: (-3.3%)

Conclusions

- A similar spatial pattern of land cover changes for the 3 study sites (encroachment at low and medium altitudes) but with different rates and extents, and occurring at different periods.
- A spatial pattern highly related to pattern of farmland abandonment and depopulation.
- A generic method useful for various mountain areas.
- Perspectives: developing an automatic classification procedure using very high resolution remotely sensed images for monitoring annual land use and cover changes.