VALBRO species in the rural landscape

Their role for nature and heritage

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06-08.10.2008
Freiburg

• What landscape are we talking about?
• What landscape are we studying?
• What trees have we had in the landscape?
• What trees will we have in the future?
• Why do they matter?
What landscape are we talking about?

- Trás-os-Montes, mountains in the northeast Portugal
- Supramediterranean thermotype and humid or sub-humid ombrotypes
- High geodiversity and complexity
- Native forest by oak woods - *Quercus pyrenaica*
- Chestnut trees - *Castanea sativa* are historically important
- Historical regression of native forests
  - bear and lynx have been extirpated
  - lower wild populations densities are than in the past
  - deer were exterminated at beginning of the 20th century
- Wildlife populations recovering
  - expansion of scrubs
  - less of human pressure
  - better protection laws
  - deer recovering by 1989, via Spanish populations

What landscape are we talking about?

- Nowadays population in small villages of 200/300 inhabitants, each 5 km
- Traditional family livelihood, small and shifting farming and sheep herding
- Agricultural activity has decayed
- Tourism, leisure and recreation have became more and more significant
What landscape are we talking about?

- Endogenous knowledge stimulated “involution” models of rural management.
- Rural landscapes are changing rapidly since the middle last century.
- Depopulation rates is conducting to endogenous knowledge erosion and local regulation loss.
- New economic and technological “progress” threatened the ancient landscape and traditional sustainable scenarios.
- The ecological-productive-economical complex has been deregulated by:
  - rupture in traditional knowledge heritage;
  - absence of local human regulation;
  - introduction of economic scale issues.

What landscape are we studying?

- 9 small villages clustered in 3 municipalities;
- A recurrent pattern: a more or less compact woodland matrix surrounds an agrarian matrix, which in turn surrounds the main homestead’ agglomeration:
  - A first municipality is on a plateau site;
  - A second municipality is on a south exposed hillside;
  - A third municipality with three villages is a hilly site on a mountainous region
What landscape are we studying?

- Remote sensing data
- Neighbouring analysis
- Geostatistics
- Factors: natural and human

What landscape are we studying?

- Duality of agrarian matrix vs. woodland matrix
- Land cover as result of nature and human livelihood processes
- Shaping main factors in creating and maintaining current landscape:
  - building distance,
  - arable rotation fields,
  - and scrubland.
- With complementary factors:
  - elevation,
  - slope,
  - physiography concavities.
- Forest/range/woodland matrix versus agriculture matrix
- Natural process versus rural process
Two trends in agrarian matrix:
- more open and intensified fields near households
- fallow, abandoned, or more wooded areas

Pattern of agrarian matrix stills related to households distance as a functional heritage derived from landuse history of human and animal traction of manure, seeds, and harvests.

Two trends in woodland matrix:
- steepest with woodlands (oak coppice)
- scrublands, sheep and goat pasture and biomass gathering to manure

Remarked lithology and topography, as well as aforesation, reducing traditional use of shrubs create some “disorder” in the original landscape.

Topographical and hydrological gradients enhance land-use sharpness.

Cereals was the main driving crop, two thirds of agrarian matrix, mostly in elevated and remote areas.

Households’ vicinities are cultivated with self-subsistence crops.

In the last half-century, cereal production and rural population were reduced to about one third.
Native trees are broadleaf species, most of them, “valuable” broadleaf species:

Elm
Alder
Ash
Walnut
Cherry

What trees have we had in the landscape?

- Punctual structure types
  - scattered trees
  - single trees
  - stepping stone trees

- Linear structure types
  - hedgerows, hedgerow network
  - fencerows, tree row
  - riparian buffer strips
  - road verges, shelterbelts
  - windbreaks

- Polygonal structure types
  - woods, woodlots, woodlands
  - forest fragments, remnants
  - non crop habitats, midfield islets
  - farmland biotopes
What trees have we had in the landscape?

- Sample unit: 2 ha hexagons:
- Geographical database:
  - tree structures
  - spatial data
  - environmental data

What trees have we had in the landscape?

- Fieldwork:
  - species composition
  - their functional character
What trees have we had in the landscape?

- **High spatial and environmental determination**
- **Two contrasting variation trends**
  - urban proximity
  - topographic situation
- **High diversity in meadows:**
  - cattle and sheep forage
  - stream margins
  - trees and hedgerows of ash, poplar and alder
- **High diversity in households’ areas**
  - human consumption role (walnut, fig tree, chestnut)
  - high valued wood (cherry-tree, walnut), branches (willow)
  - vanishing elm trees (disease and absence of pig to forage)
- **Not so diversified pattern in remote areas and hills**
  - remote scattered and woodlots, oak (and pine)
  - woodlots or scattered cultivated chestnut hills
What trees have we had in the landscape?

- Our knowledge about these “indispensable patterns” considered as key ecological features:
  - trees located on the villages’ environs:
    - walnut
    - cherry-tree
    - chestnut
    - mulberry
  - hedgerows over pastures:
    - ash
    - alder
    - willow
    - oak
    - poplar
  - woodlots over open fields:
    - chestnut
    - oak
  - village proximity reveals the current human use:
    - cherry-tree
    - walnut
    - chestnut
    - and mulberry
  - or vanishing forage practices:
    - elm

- Regular distribution of tree elements provides a basis to assess order and disorder in landscape – patterns on process, and process on pattern.

- Common patterns among 3 different study sites in:
  - distance and topographic gradients
  - half of heterogeneity explained by spatial and environmental process

- Throughout history, the way of reproduction of most trees species has been coppiced or sucked after been felled.

- The integration of the ecological role of these structures with their productive and economic purposes has maintained their complex functions over time.
What trees will we have in the future?

• Orthophots time series retro-interpreted
• Last half-century: time scale refer to each of the last five decades
• Comparisons reveal change and persistence
• Ten hexagons of two hectare:
  – Meadows
  – Hills
  – Homestead vicinities
  – Remote areas
• Focus is on the dynamics

What trees will we have in the future?

• Woody structures variation estimated in:
  – number of punctual structures per hectare (isolated trees)
  – Meters of linear structures per hectare (hedgerows, riparian galleries)
  – square meters of polygonal structures (woodlots) per hectare
• Transitions between structure type
  – from punctual structures to linear and polygonal
  – from linear to polygonal features ones
• Nowadays compared with 50’s:
  – a half of linear structures (particularly last two decades)
  – one third in punctual structures (idem)
  – not significant changes in polygonal structures
What trees will we have in the future?

- Linear structures are a half of 1958 total
- Punctual structures were reduced in one third
- Polygonal structures do not reveal significant changes
- Generalized abrupt reduction in linear structures:
  - Homestead’ vicinities (52.5%)
  - Hills (52.2%)
  - Remote areas (50.4 %)
  - Meadows (42.6%)
- Decrease was important on meadows and on hills:
  - loss of forty meters per hectare of linear structures
- In homestead’ vicinities and remote areas
  - loss of thirty meters per hectare of linear structures

Decline of tree network is higher on old structures than on the recent ones:
- one tree per hectare and decade;
- a dozen of meters of hedgerow per hectare and decade;
- a hundred square meters of woodlot per hectare and decade.

Higher decay values on meadows hedgerows and hills trees and woodlots.

Most of the young trees structures was developed by the 80’s and 90’s.

One way to preserve diversity might be to regulate the management of field’s margins around plots, streams and road verges, among others.

Also a monitoring program in order to recover a stable level that watch over a new sustainable and functional rural landscape is required.
Why do they matter?

• Rural areas have become depopulated as a result of lower incomes proportionate by agrarian activity, and upper attraction, bigger incomes and expected better way of life of urban regions.
• Hedgerows, rows of trees or shrubs enclosing or separating fields have been part of rural landscape heritage and should not be studied without considering the farming systems and the rural society as a whole.
• Their pattern depends on the history of the countryside, as well as current farming practices.

Why do they matter?

• Landscape elements affect and are affected by farming.
• Even managed woodland habitats are stable elements.
• Must play a key role in biodiversity maintenance.
• Dynamics and drivers often poorly known.
• But determinants will be always farming activities.
• Structure and function correlated to adjacent land-use:
  - meadows
  - households' adjacencies
  - hills
  - remote areas
• Historical photos reveal change and persistence in:
  - trees
  - hedgerows
  - woodlots
Why do they matter?

- Deciduous trees structures harbour of biodiversity in both:
  - forested landscapes
  - cultural landscapes
- Natural spatial and temporal patterns from abiotic process
- Humans changed trees amount and distribution
- Associated species, populations have declined/extinct
- But remnants live in the managed landscape
- These areas of natural vegetation can also be one of the solutions used for the preservation of biodiversity in traditional

Why do they matter?

- Wooden structures as an indicator:
  - of ecological stability that they confer to landscape processes;
  - of information value about old productive agricultural processes and current ecological processes;
  - of ecological contrast and ecotones which can promote wildlife richness in humanized ecosystems.
- Studies of contemporary land-cover change require an integrated approach because changes in cover and environmental conditions are primarily caused by land-uses, which, in turn are governed by human driving forces in a specific socio-economic and cultural context
Thank you!