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Landscape Agroecology and ecosystem services

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Daniele Magda

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Landscape Agroecology and ecosystem services

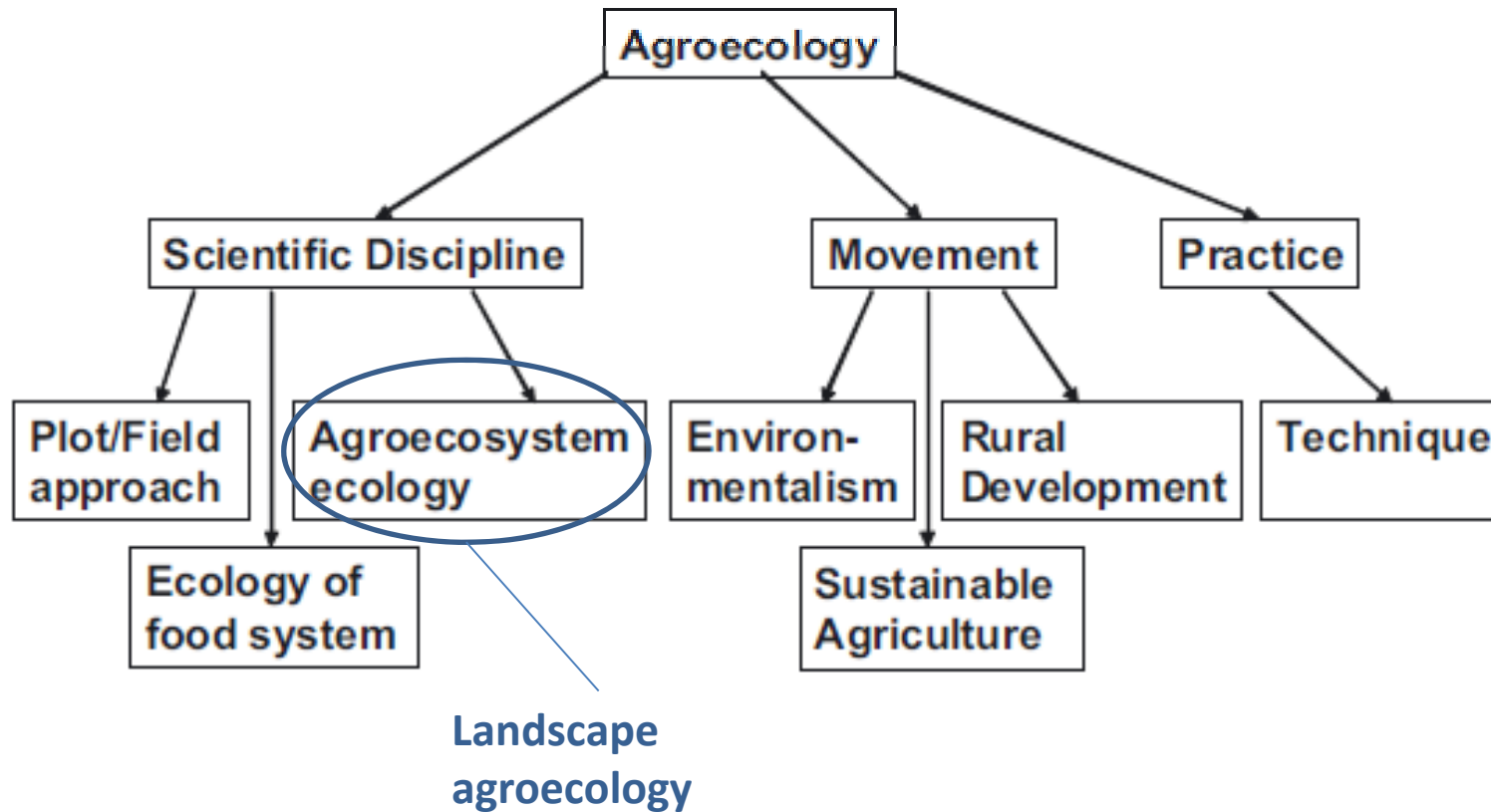
Deconchat M.; Thenail C. Baudry J.;
Aviron S.; Magda D.



Seminar with Dr. Miguel Altieri, Professor of Agroecology at UC Berkeley organized by the Agroecology group of the SAD division. February 1st 10h00 - 17h00 ENGREF, 19 avenue du Maine PARIS XVIème



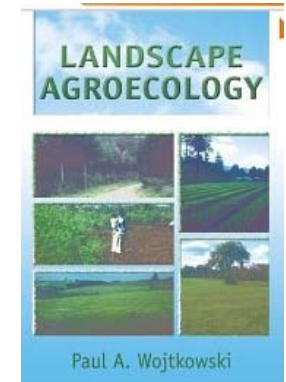
Landscape agroecology



From Agroecology as a science, a movement and a practice. A review
A. Wezel, S. Bellon, T. Dore, C. Francis, D.Vallod, C.David

« Landscape agroecology: ecology of a productive countryside »

- **Interaction** between human-derived, -managed, and/or –influenced ecosystems
- **Interaction** between those that yield useful output and neighboring natural and nonproducing ecosystems



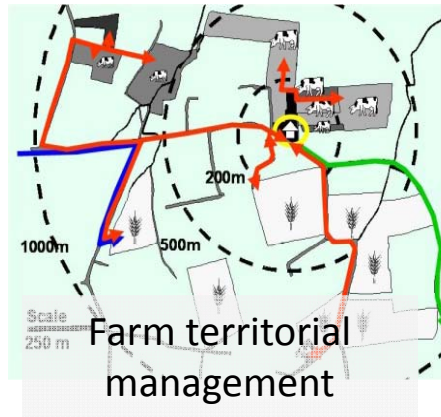
2004

See also Dalgaard 2009

Links with landscape ecology

- 1) the understanding of how the functioning of farming systems within a landscape drive spatiotemporal landscape patterns, hence part of ecological processes **AND**
- 2) how the design of farming systems at individual farms and sets of farms can foster the management of ecological processes, hence of natural resources.
- Landscape: spatial organization produced by a society to manage natural resources

Farming systems :
Decisions, practices,
transformations



Contribution of farming practices to landscape organization, impact on biodiversity...

Landscape as a resource
(stock and changes)



Delivered service: biological corridor, biodiversity conservation...



Biodiversity as a resource
(stock and changes)

Delivered service: patrimonial service
Local communities

Synergies, antagonisms ?

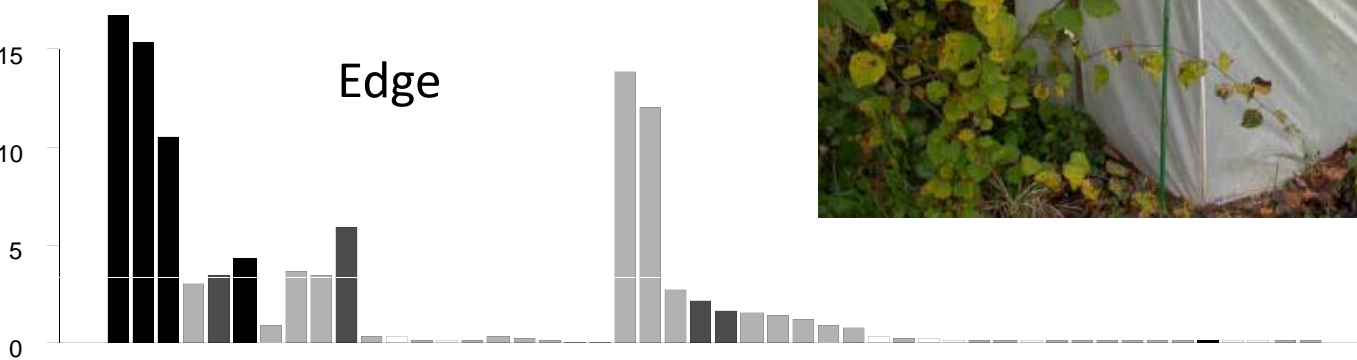
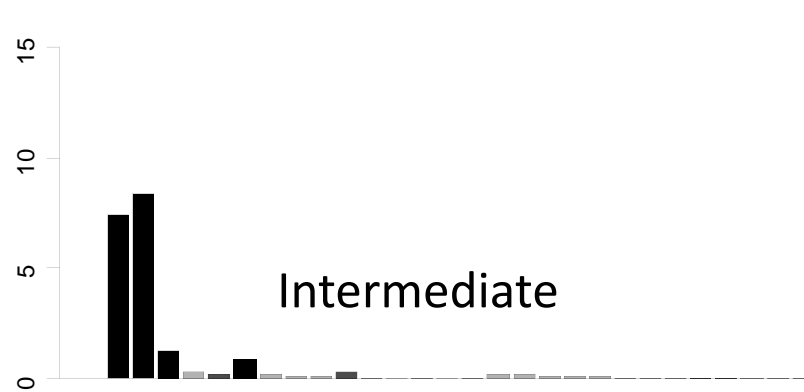
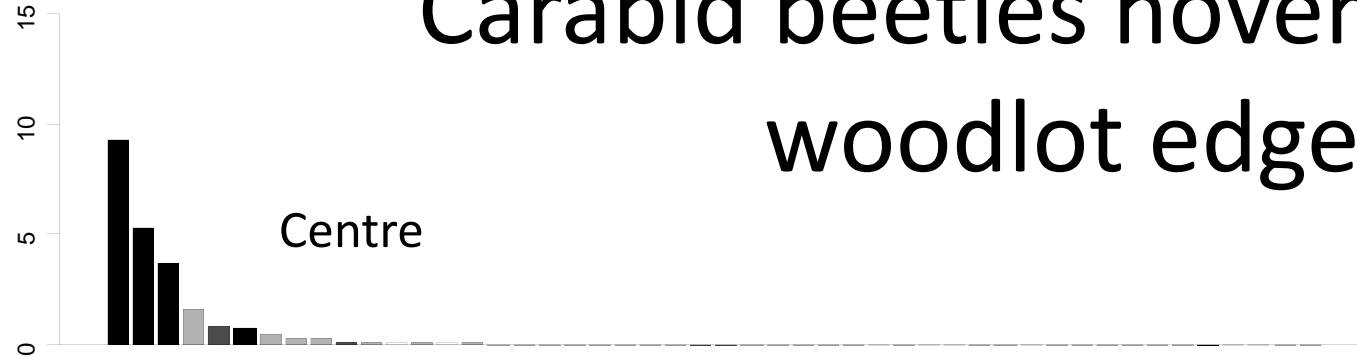
Hot issues

- Plant & animal movements between habitats. Where do they come from?
- Ecological vs management levels of organization: which is the best level for agroecology?
- Multiple services/multiple managers: how to get a compromise for landscape agroecological engineering?

Carabid beetles hoverwinter in woodlot edges



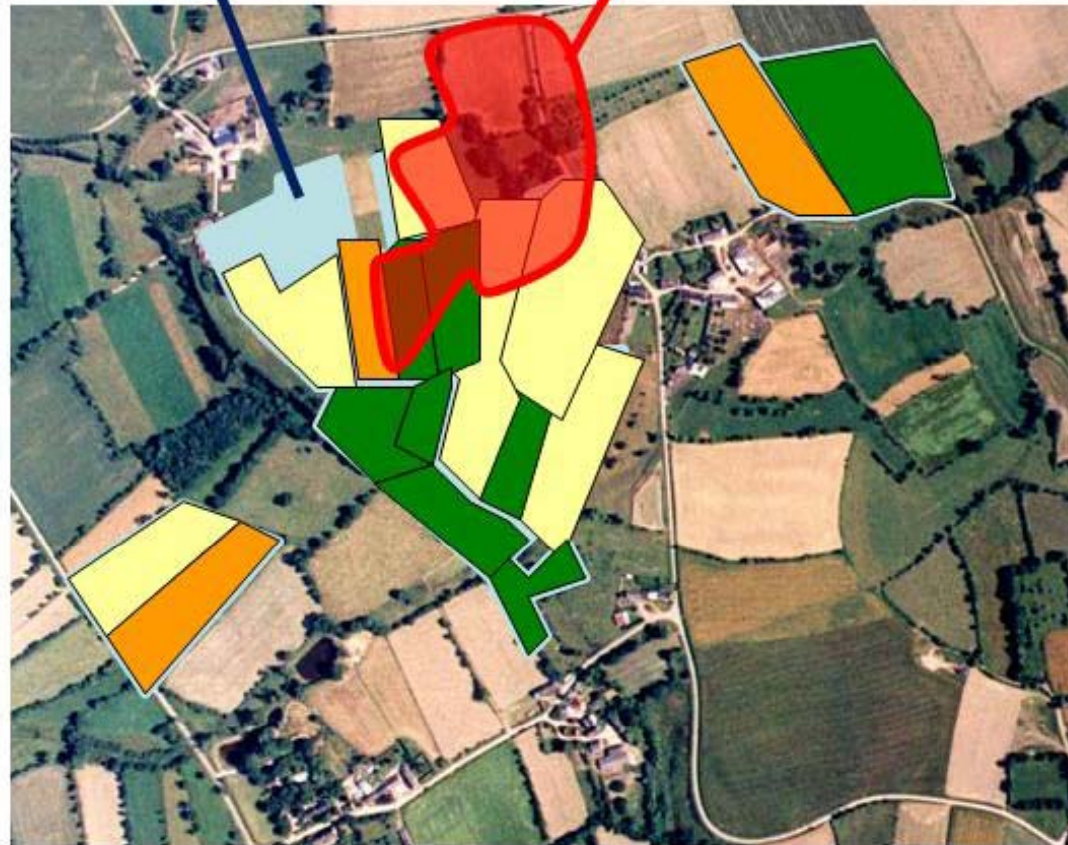
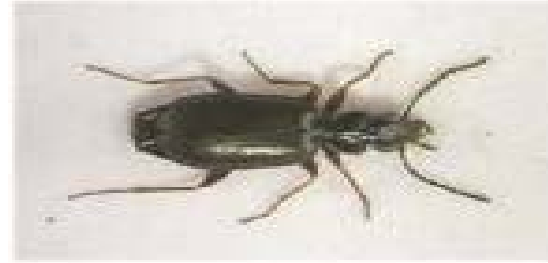
Mean Density (nb carabids/m²)



Species

abapar ptemad caraur diager carpur carnem amasim dermatr carcan trequa poecup steteu gynetr acubru amaluc braver amaova calbif acumer agornue synobs ancdor micluc nebbre parmen hardim pseruf braele brascl bracre notqua amaifam nebsal ambnig braexp ophysab phyobt acipic amaeur calfus clifos metlam micneg notruf olistu poicon stopum zupole

(Roume *et al.*, 2011)



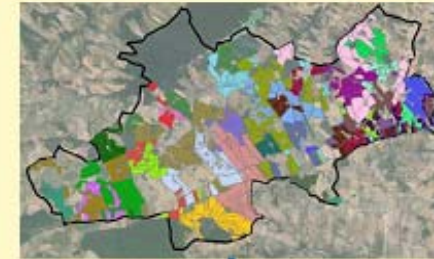
See also
=>

Pelosi, C., Goulard, M. and Balent, G. 2010. The spatial scale mismatch between ecological processes and agricultural management: Do difficulties come from underlying theoretical frameworks? *Agriculture Ecosystems & Environment* **139(4)**: 455-462

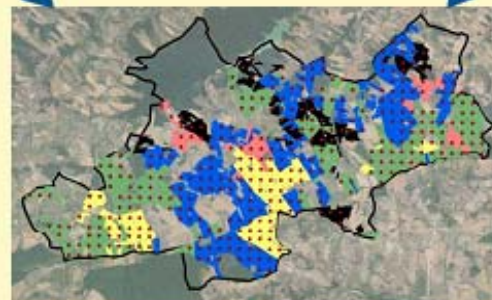
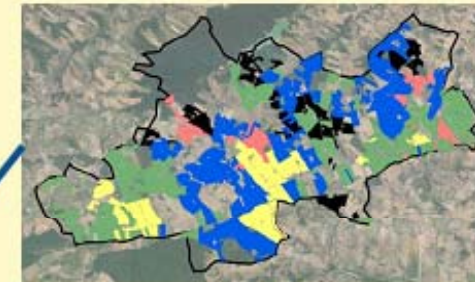
Birds and farming systems

Agronomical data
34 interviewed farms

Ecological data
A grid of point counts to record birds



A typology of farming systems
in 5 modalities



Few links between Farming systems and bird populations

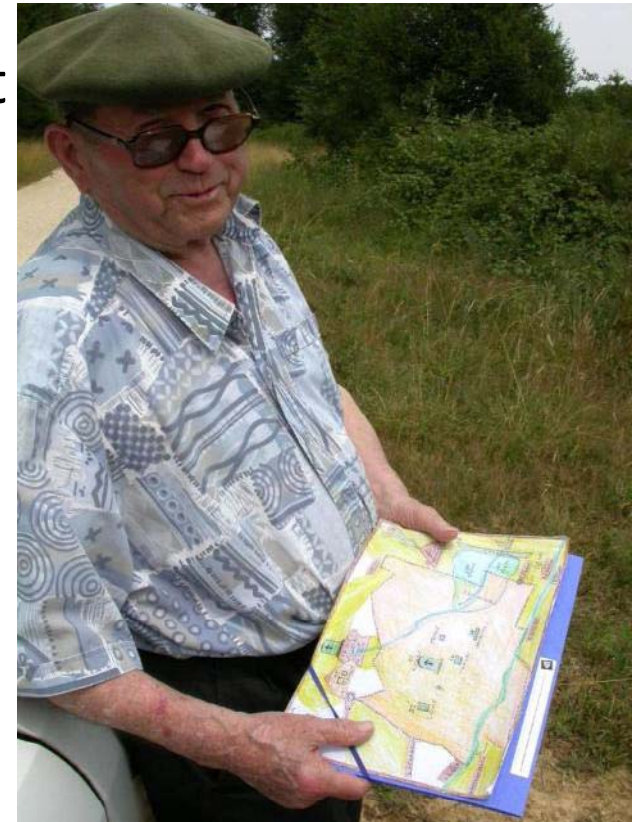
Bonthoux S. et al.

Landscapes: levels and scales

- Modifications in farms have consequences at landscape level:
 - can be difficult to deduce consequences at landscape level from modifications at the farm level
- Availability of spatial data needs careful methods
- Uncertainty of (spatial) ecological models

Landscape agroecological engineering

- How to use and modify landscape structures to improve ecosystem services?
- Policy & regulation of land management
- Must consider the social & technical limits and opportunities
 - Local cultural rules
- Involve people (farmers, foresters, land managers...) :
 - As producers of patterns that influence biodiversity at different scales
 - As managers who adapt their practices according to landscape structure



Landscapes change

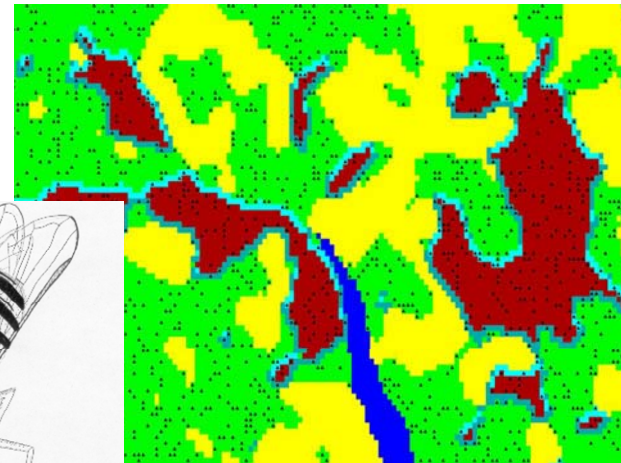
- Slowly for their structure and global pattern
- Rapidly for their land covers (rotation of crops)
- They have (small) components that play key roles
- How to identify them?



Models : tools to study landscapes as complex changing ecological systems

- Realistic models (ex: Multi agent models)
- Spatially explicit/ availability of spatial data
- --> In silico landscape

- Companion modeling (Commod)
- RECORD
- Modelisad
- Payote



HoverWinter model
(Arrignon *et al.*, 2007)

Long term and integrated socio-ecological studies (LTER)

- Detailed analysis of processes
- History
- Scenario
- Participative research
- Interdisciplinarity
- Comparative studies:
 - Networks: LTER-Europe, ILTER, ZA, ...

