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Ecological intensification of livestock farming systems : landscape heterogeneity matters

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‘Ecological Intensification’ of
livestock farming systems :
landscape **heterogeneity** does matter

M. Tichit – R. Sabatier – Teillard F. – L. Doyen

INRA SAD – Sciences for Action and Development Division, PARIS



DIET
AGRICULTURE
ENVIRONMENT

INRA

Stating the problem

What is
'Ecological Intensification' ?

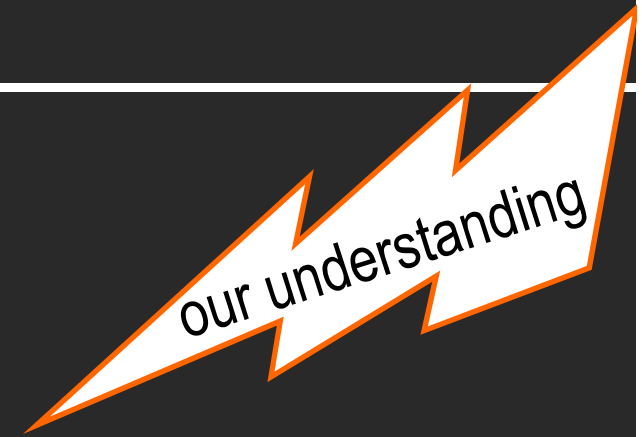
Cassman 1999

Improving nutrient use
efficiency

Griffon 2006

Intensifying the use of the natural
processes to produce food and
"other things" e.g. **ecosystem services**

- biological regulations (*cf Douhard*)
- role of livestock in ecological processes (*cf Magda*)
- diversity in time
- **diversity in space (heterogeneity)**



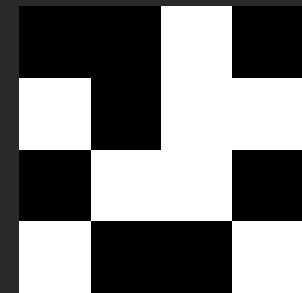
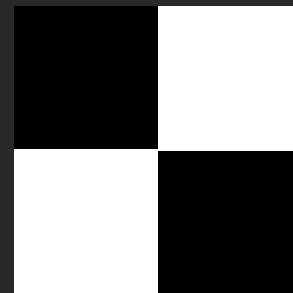
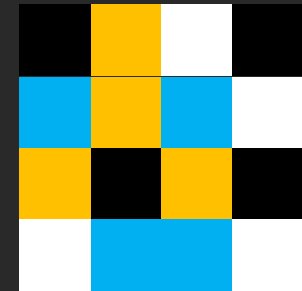
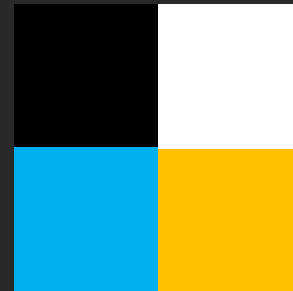
our understanding

Stating the problem

Explaining 'Landscape Heterogeneity'



compositional heterogeneity +++

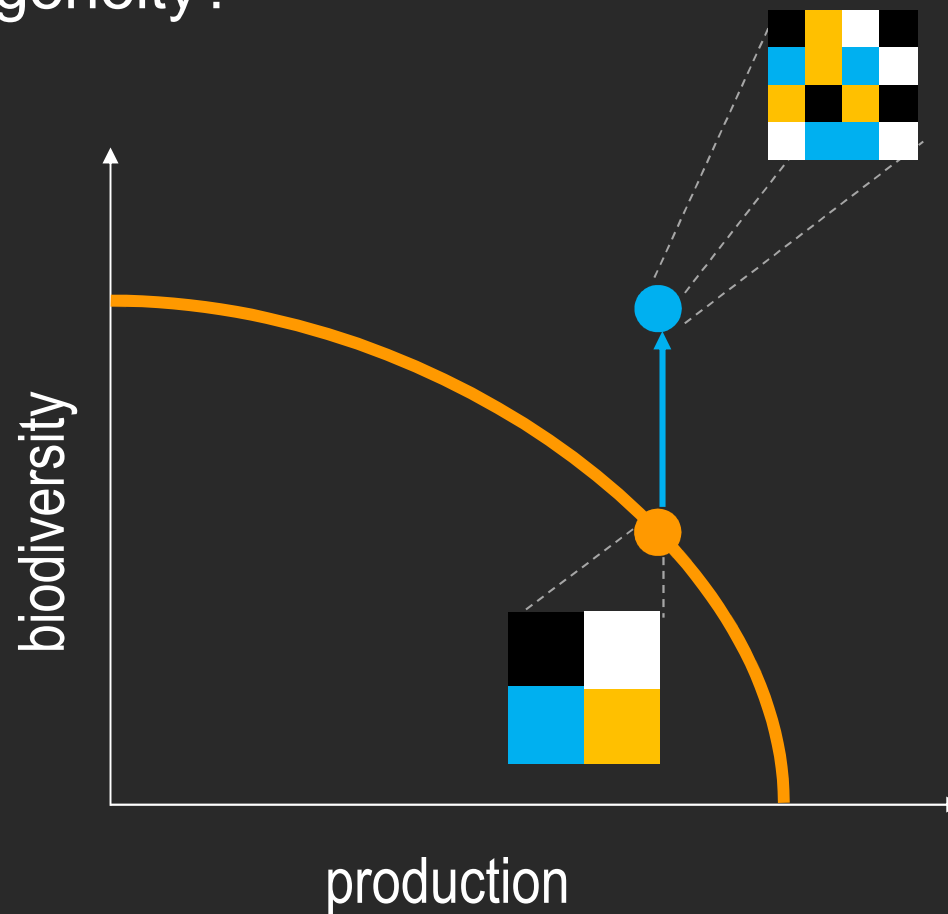


structural heterogeneity +++

after Fahrig 2011

Stating the problem

To what extent can biodiversity be **enhanced** by increasing landscape heterogeneity?



Case study



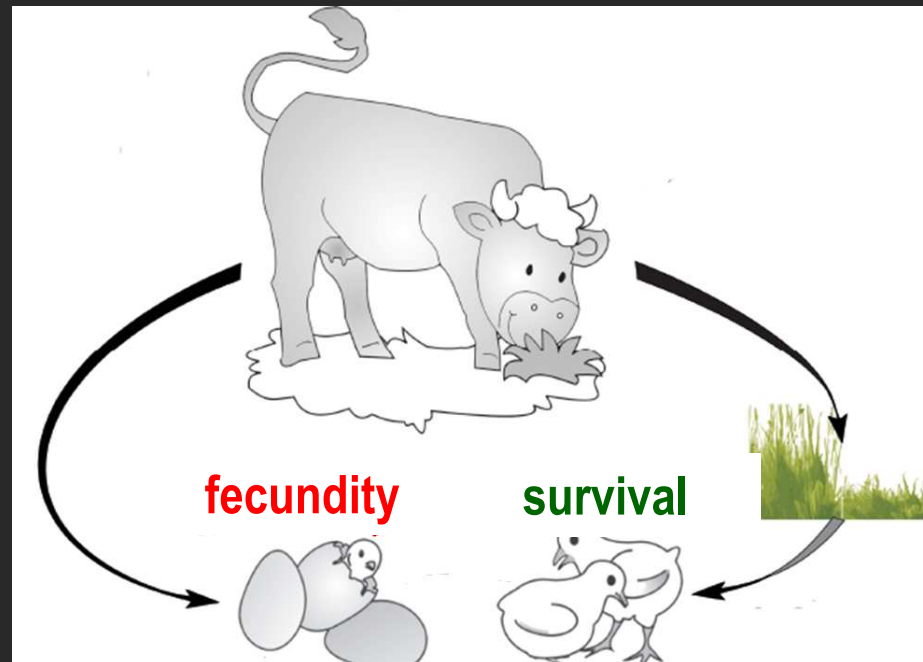
- A grassland landscape (5000 ha) with 50 beef cattle farms



Case study

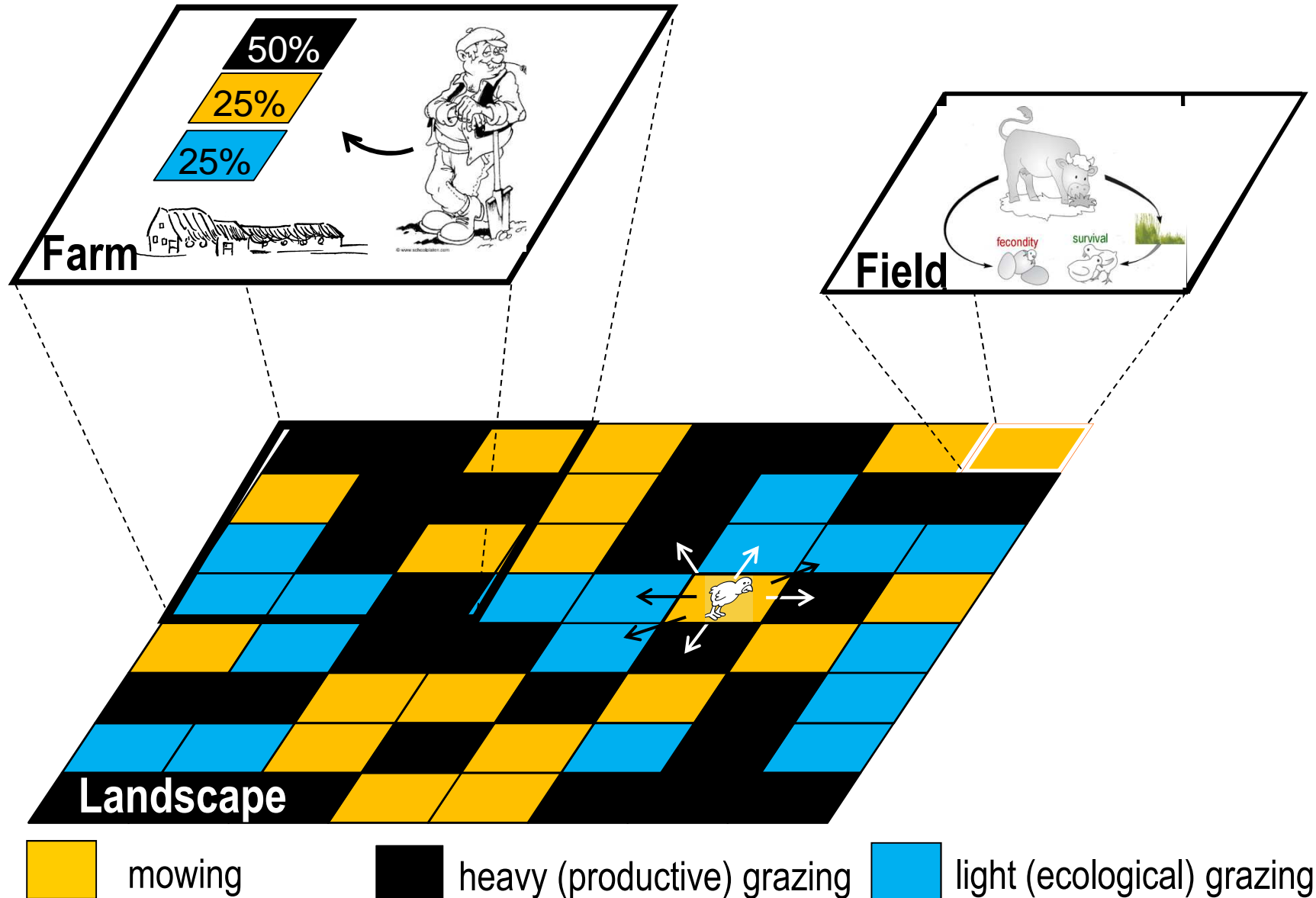


- A grassland landscape (5000 ha) with 50 beef cattle farms
- Bird sp. which life cycle is deeply linked to **management practices**



Spatially explicit dynamic model

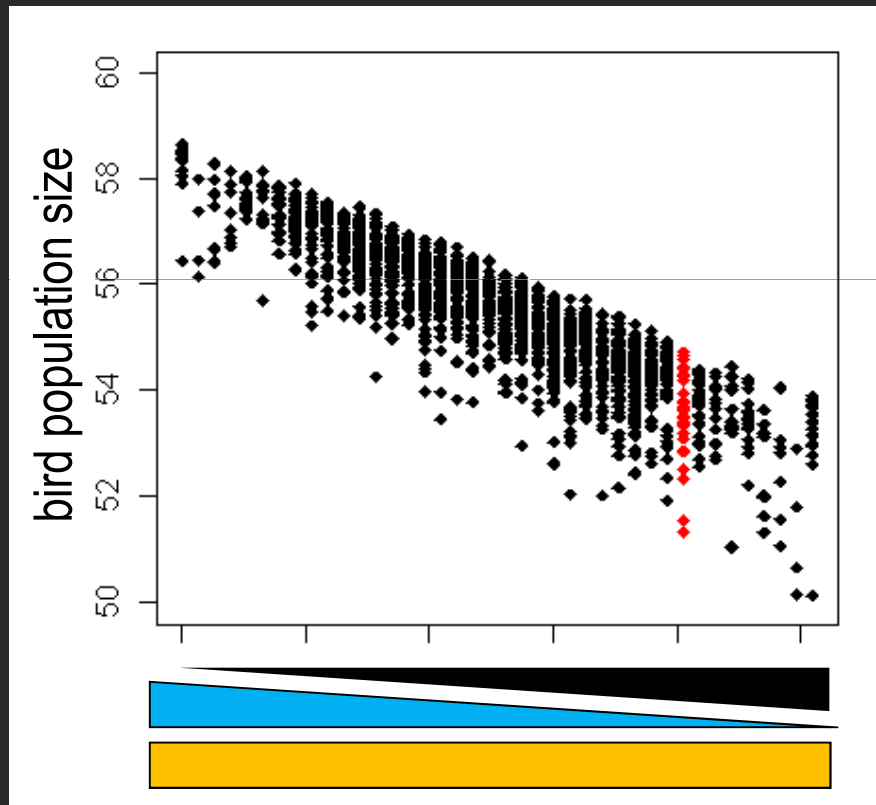
Sabatier 2010
Teillard 2010



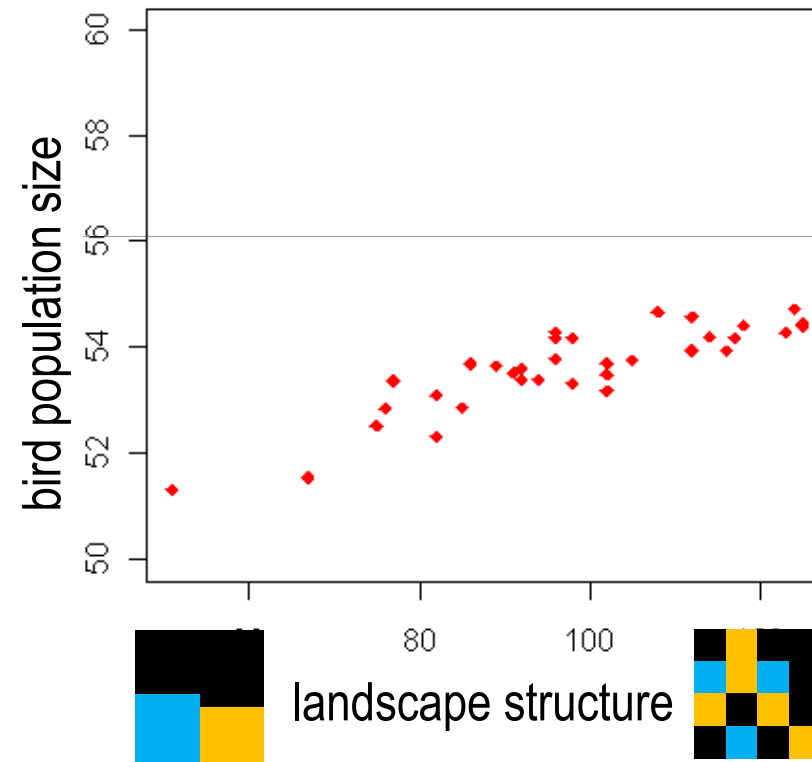
Relative effect of composition and structure

Sabatier 2010

Composition



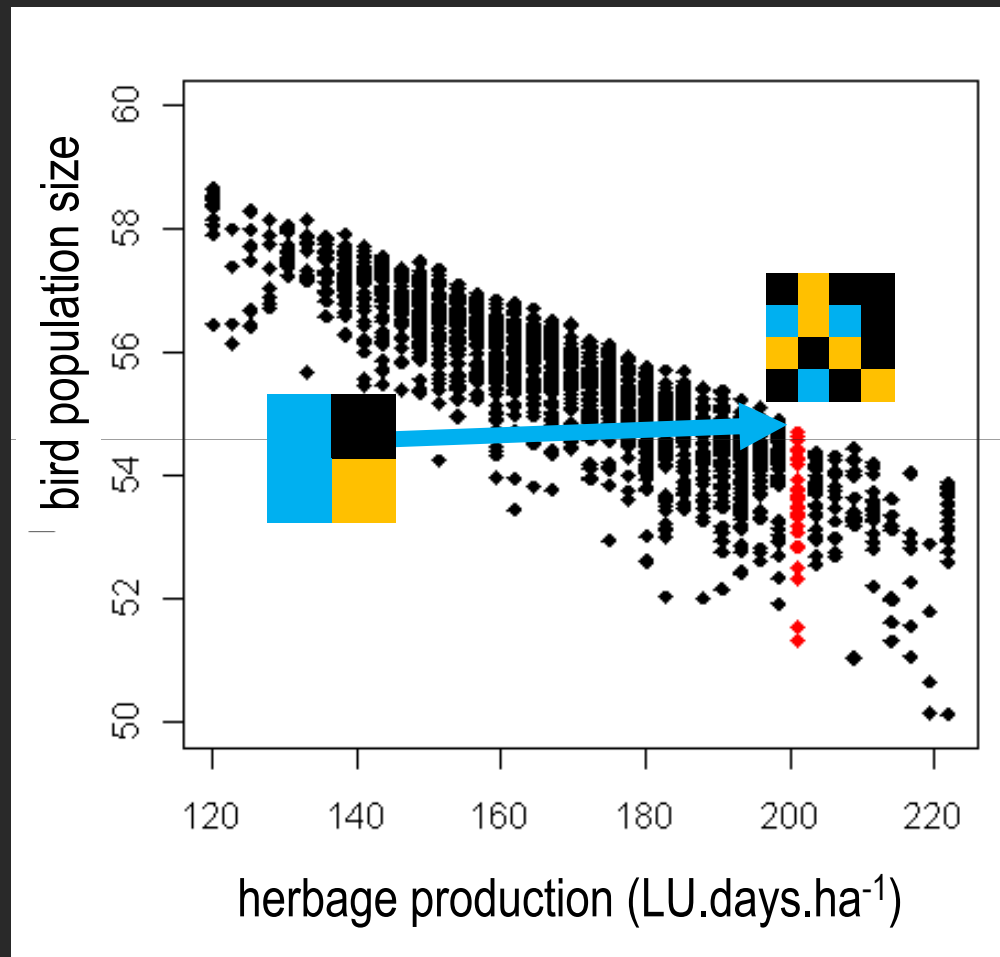
Structure



 mowing 39%  heavy (productive) grazing  light (ecological) grazing

Heterogeneity leverages the trade-off (in production)

Sabatier 2010



mowing



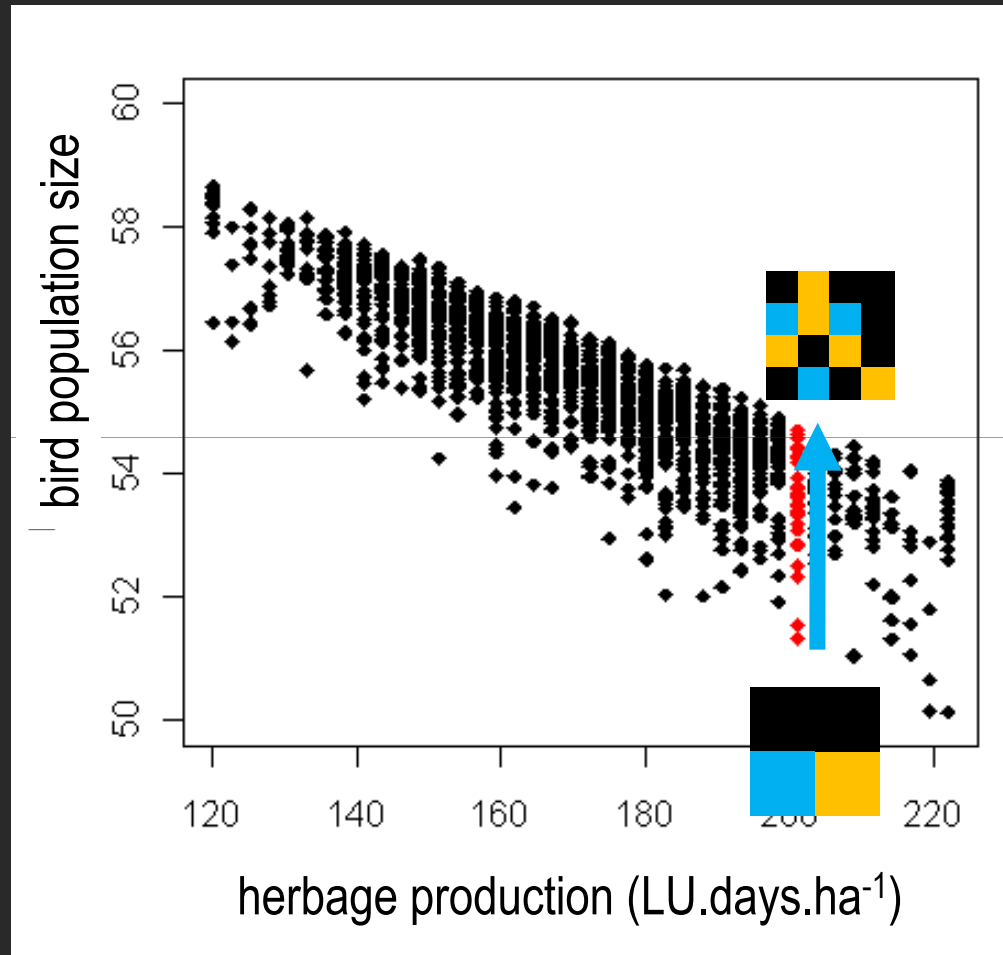
heavy (productive) grazing



light (ecological) grazing

Heterogeneity leverages the trade-off (in biodiversity)

Sabatier 2010



mowing



heavy (productive) grazing



light (ecological) grazing

Conclusion

- Heterogeneity leverages the tradeoff
- From tradeoff to synergies...
- Heterogeneity more important for **mobile** species
- Modulating landscape heterogeneity requires coordination between farmers

Future challenges

From **possible**
landscapes to **feasible**
landscapes



Co-design of **feasible**
landscapes with farmers
and other stakeholders

Thank you for your attention

Fundings 2009-2012

FarmBird project

« Coviability models of FARMing and BIRD biodiversity »



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