



# The potential of landscape management in IPM

C. Lavigne, S. Petit, INRA  
A. Ferguson, D. Bohan, RRes  
C. Moonen, SSSUP  
A. Veres, SZIE  
O. Alomar, IRTA  
B. Golla, JKI  
L. Eggenschwiler, Agroscope  
S. Otto, CNR  
P. Tixier, CIRAD

FOOD  
QUALITY  
AND  
SAFETY



Integrated Pest Management in Europe

Paris, November 2010



## > Why is there a potential for landscape management?

- Traditionally, pest control is focused in farmers' fields where the insect, weed and pathogen pests do their damage

BUT

- Pests/pest enemies move outside fields
  - Between fields (e.g. codling moth)
  - To alternative hosts (e.g. aphids)
  - To overwintering sites (e.g. pollen beetles/ syrphids)
- Crops move around the landscape from year to year
- -> some pest/pest enemies make use of resources at larger scale

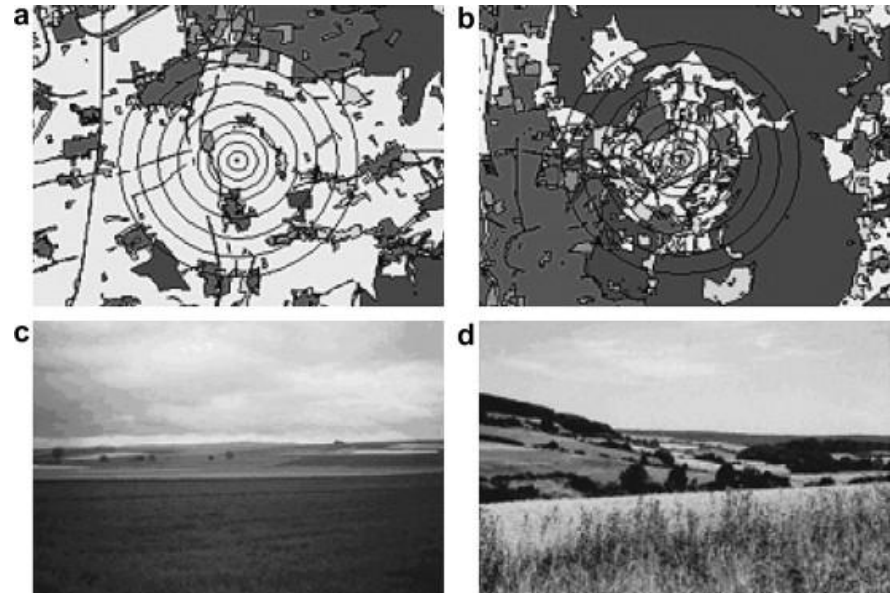
## >Questions asked within ENDURE ?

- What landscape characteristics lead to suppression of insect pests and weeds? Analysis of existing data.
- What is the expert opinion of the potential for landscape management to suppress insect pests by encouraging natural enemies?
- What future approaches are needed to achieve pest-suppressive landscapes?

## >What is “landscape” in landscape and pest/pest enemies studies?

- The ‘pest’ landscape is a spatial and temporal representation of resources used by the organism in a mosaic of crops and uncultivated areas.
- However, authors usually attempt to relate pest abundance to general landscape variables most readily available or observed.
  - Composition.
  - Configuration

- The extent of the landscape depends on study organisms and...authors! from field margins to 10x10km<sup>2</sup> areas



simple

complex

From Tscharntke et al. 2004, 2005

# > Exploitation of Landscape and Community Ecology

Understanding the spatial strategies in simplified pest/pest enemies systems:

« mecanistic » approach



predators



parasitoids

Assessing a link between landscape characteristics and pest abundance or predation/parasitism

« correlative » approach

Resources

Alimentary, Overwintering...  
Quantity, quality,  
Availability in space and time

pests



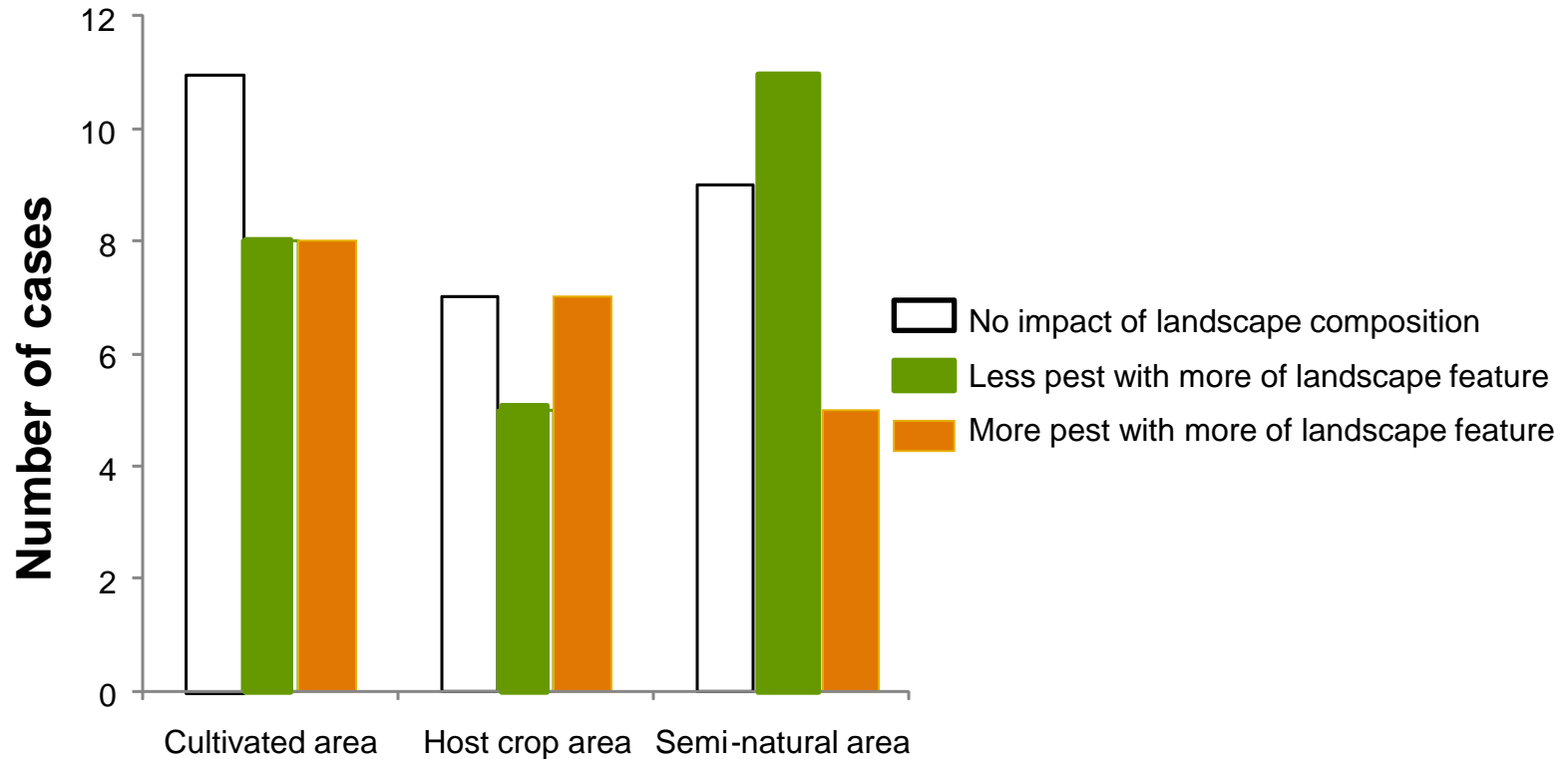
crop

Agricultural practices

## > Impact of landscape composition on in-field pest abundance

- Litterature review (1998-2008)

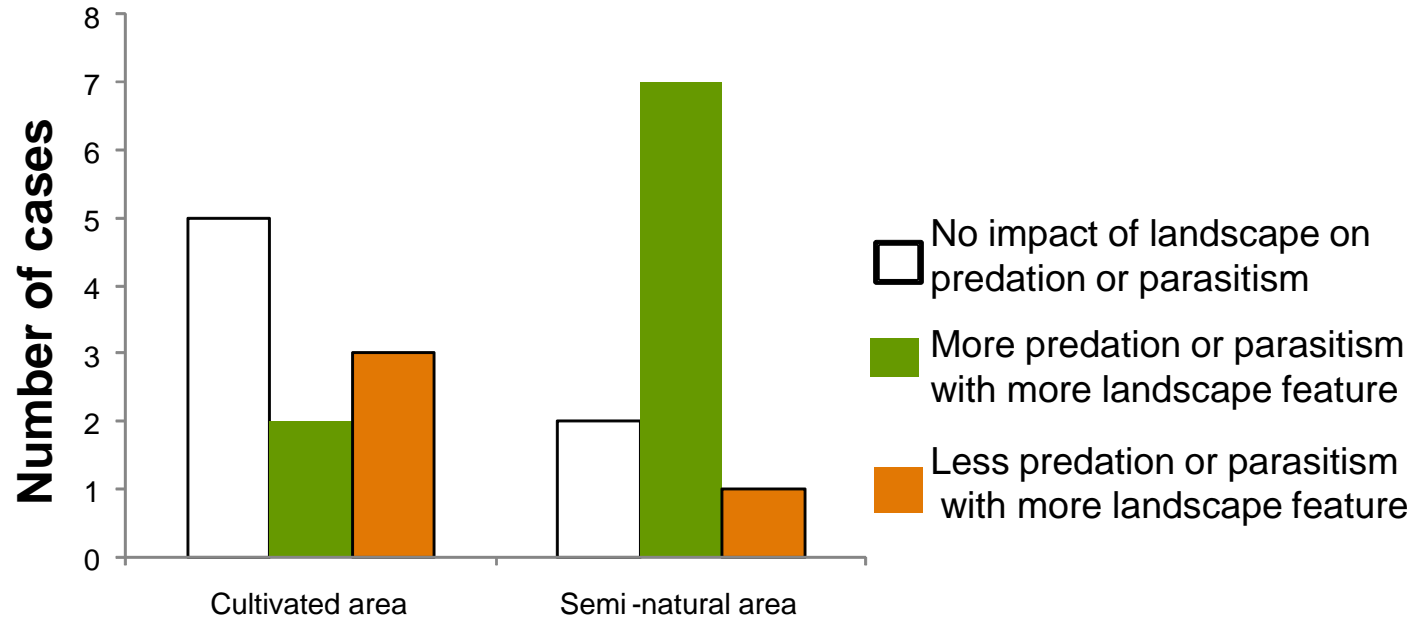
52 study cases, at least area over 100m from field margin



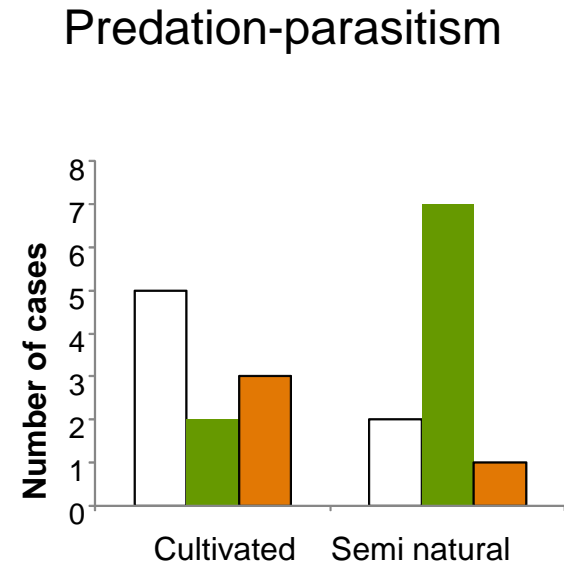
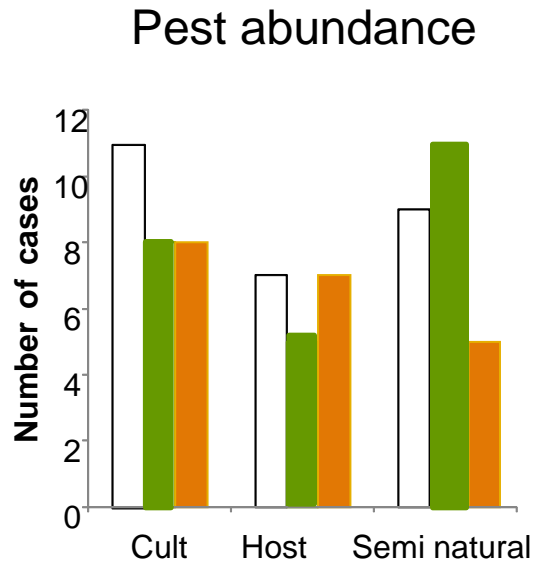
- Positive or negative relationships between acreage of a crop over a landscape and pest abundance in that specific crop.
- Marginal positive effect of semi-natural areas .

A Veres et al.

## > Impact of landscape composition on in-field pest parasitism or predation



- Semi natural areas in the landscape favour lower pest abundance and in-field attacks against pests by natural enemies.



- Semi natural areas in the landscape favour lower pest abundance and in-field attacks against pests by natural enemies.

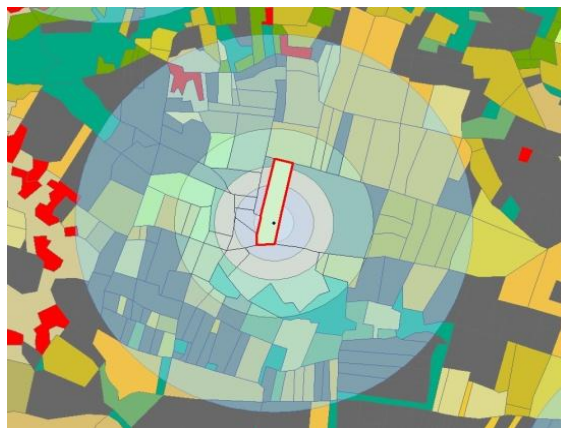


## > Review landscape and weeds.

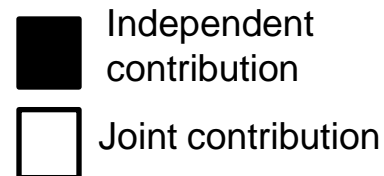
Re- analysis of experiments from SSSUP, AGROS, CNR, JKI, INRA, Rres  
=>Both small-scale landscape elements such as field margins, and larger scale landscape *configuration* affect weed community composition.

### Example: Weed diversity in 126 wheat fields

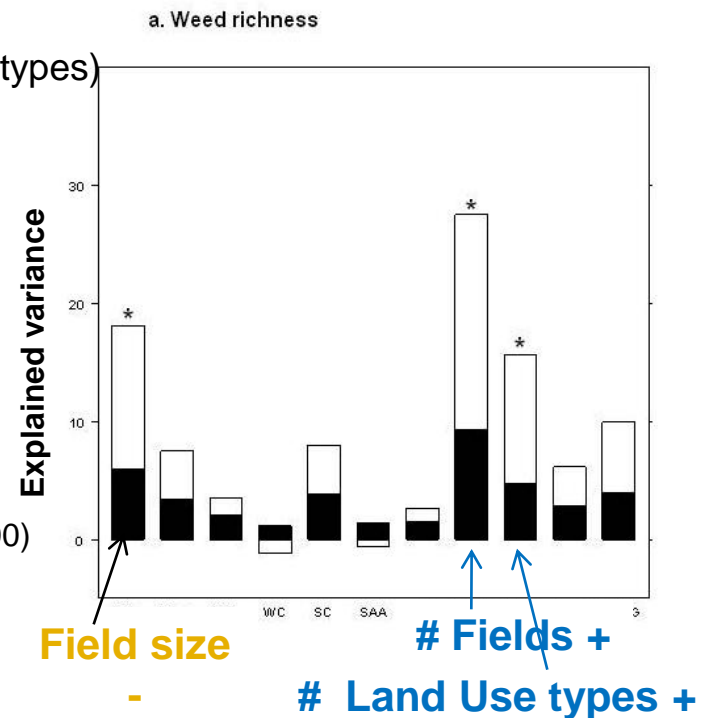
1. Field properties (parcel size, preceding crop)
2. Landscape composition (% cover 5 aggregated land use types)
3. Landscape structure (n°of fields and n°of land use types)



Best=200m radius



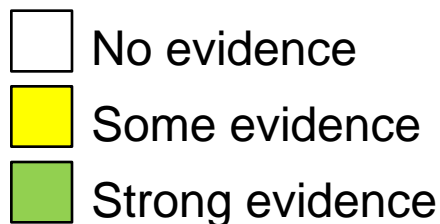
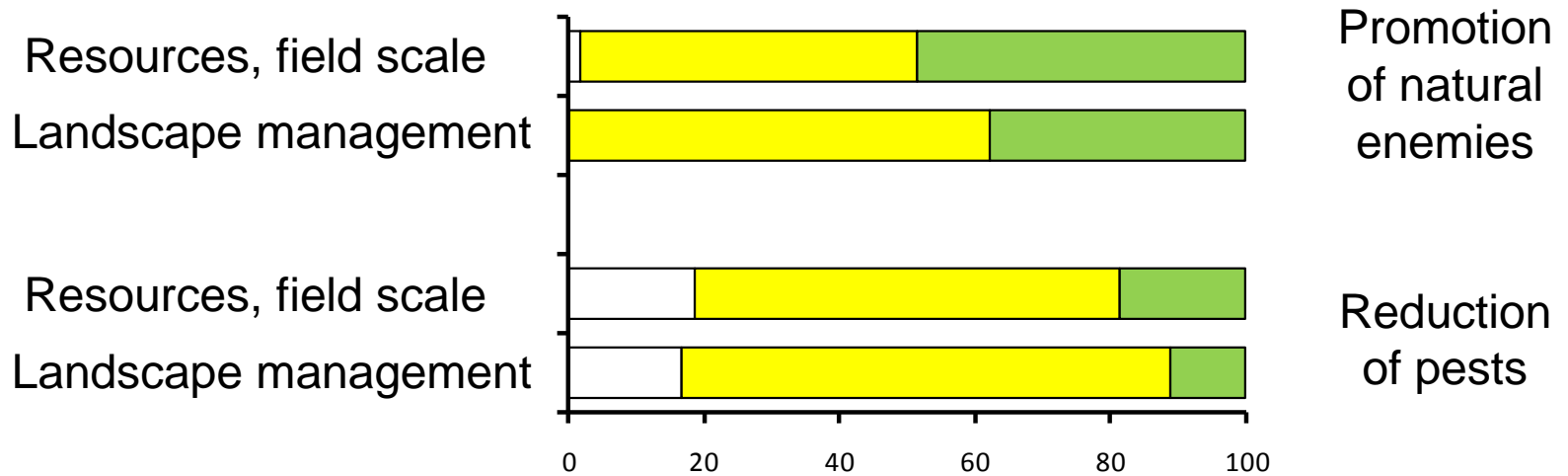
\* Significant Z score after randomisation (n= 100)



Gaba et al., 2010 INRA Dijon

## >Review on expert opinion

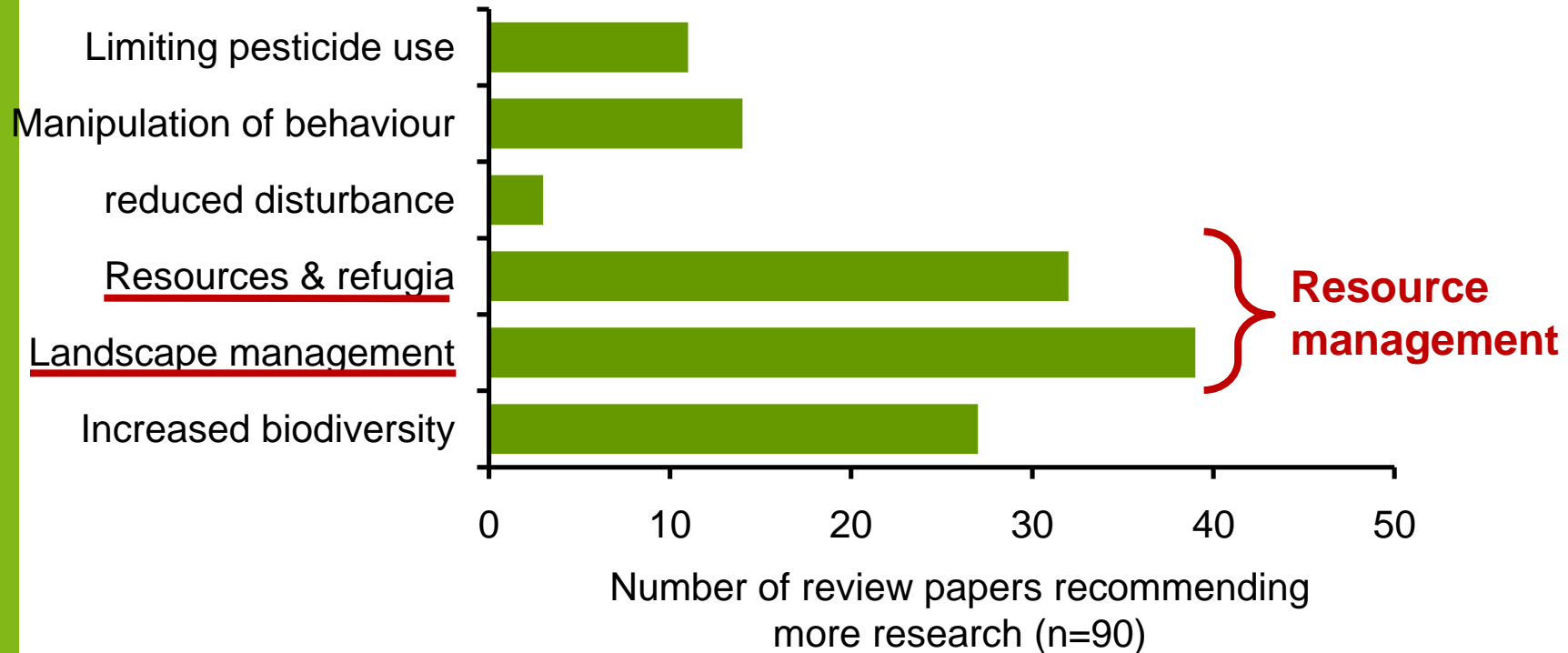
- What is expert opinion of the potential for landscape management to suppress insect pests by encouraging natural enemies? =Increasing their resources in the landscape



Ferguson and Alomar

## >Reviews on landscape and conservation biological control: Gaps in research

Numbers of reviews advocating more research to support different CBC techniques.



Ferguson and Alomar

### General trend:

#### Positive effect :

- of semi-natural areas / diversification in landscape
- of management of resources for pest and pest enemies

### Need for research:

- Large-scale/ mid-term studies and combined analysis of data from multiple research groups; agreed, common approaches and methodologies.
- More consideration (i) for measurements of landscape structure and (ii) for knowledge and recording of farmer practices at a landscape scale.
- Modelling of pest and natural enemy behaviour in virtual landscapes to enable the testing of landscape arrangements.
- The spatial scale at which the landscape functions requires the coordination of farmers and non-farmers activities if the type and intensity of land-use is to be modified->Biodiversity friendly farming?