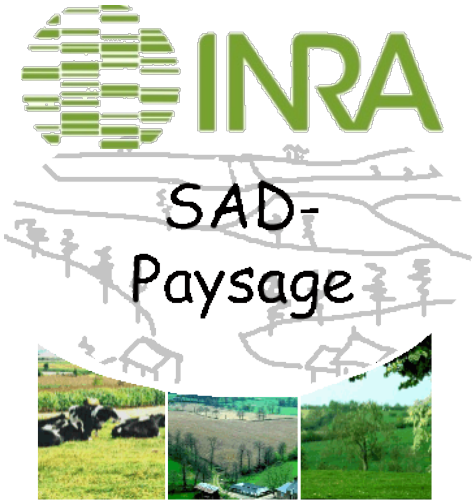
Crop acreage allocation decisions on intensive mixed crop-livestock farms

Bénédicte ROCHE, Amiotte C., Boussard H., Joannon A., Martel G.

INRA SAD Paysage, *Rennes, France*



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Session 31a: Livestock Farming Systems

Introduction

Organization of crop and grassland areas

at the landscape level

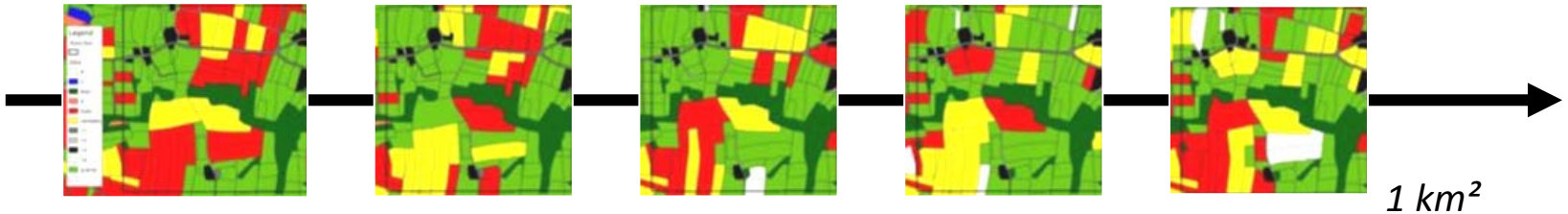
Natural resources

Ecological processes

Individual decisions taken

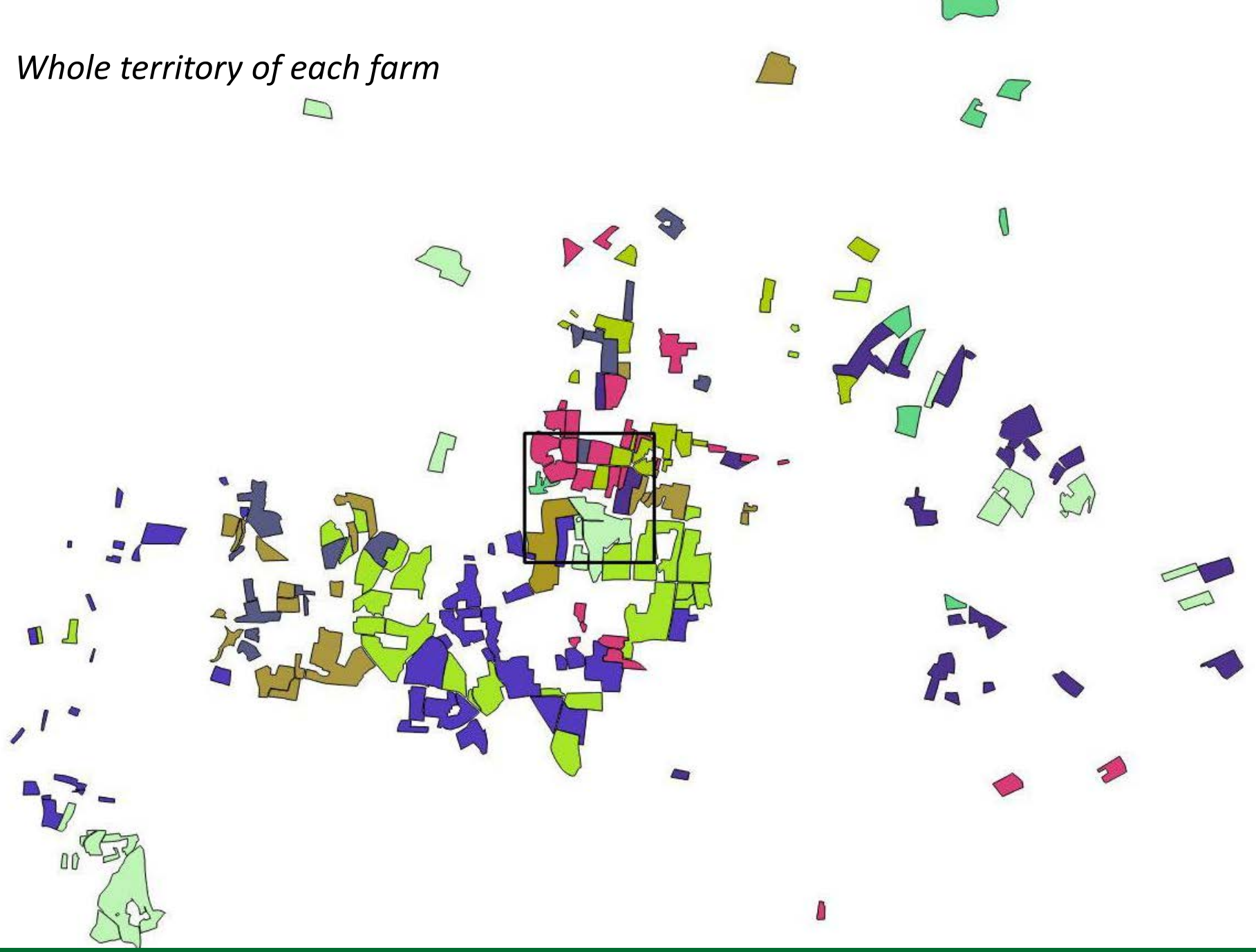
at the farm level

Dynamic of a crop mosaic



Plots of
6 different farms

Whole territory of each farm



Aims of our research

Why understanding farmers' crop area allocation decisions

> simulate realistic agricultural landscapes

> identify in farmers' decisions, key factors affecting landscape dynamics

> some may be levers for action

→ **Building a farm model for multi-year simulations**

Farmers' crop area allocation decisions: available knowledge

. Studied by agronomists, mainly in cash crop farms

Key parameters: - Farm territory characteristics

- Crop management

. Models in dairy farms

. Mixed crop-livestock farms less studied, especially in intensive contexts

- **How livestock management**,

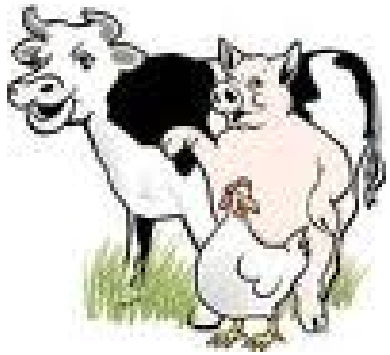
  in combination with farm territory characteristics and crop management,

  influence crop area decision making?

Context: Brittany, France

- Diverse LFS, more or less intensive

  Cattle (milk or beef) x Pig x Poultry



- Land mainly dedicated to animal feeding:

  Temporary grasslands

  Maize

  Wheat

Comprehensive survey in 12 farms

4 different combinations of productions

(nb of farms) Total area	Cattle (nb cows)		Granivores		Cash crops
	Dairy	Suckling	Poultry	Pigs *nb fat/y*	
(n=3) 77-125 ha	*55-85*	*35-85*			
(n=2) 45-57 ha	*30-60*		*800 - 1200 m²*		
(n=4) 71-118 ha	*35-100*		*1850 - 2500 m²*	*1500*	*15-57 ha*
(n=3) 43-74 ha			*4400 m²*	*2500 - 3200*	*20-70 ha*

Results preview. Farmers' crop area decision making : livestock management

- Farmers define priority crops
  > depends on animal raised
- They define minimum areas for these crops
  > diversity
  > depends on feeding strategies of cattle
- *Agronomic decision rules similar among farms*

Results 1/4 Crop grown : priorities

In farms raising cattle

priority = forage production

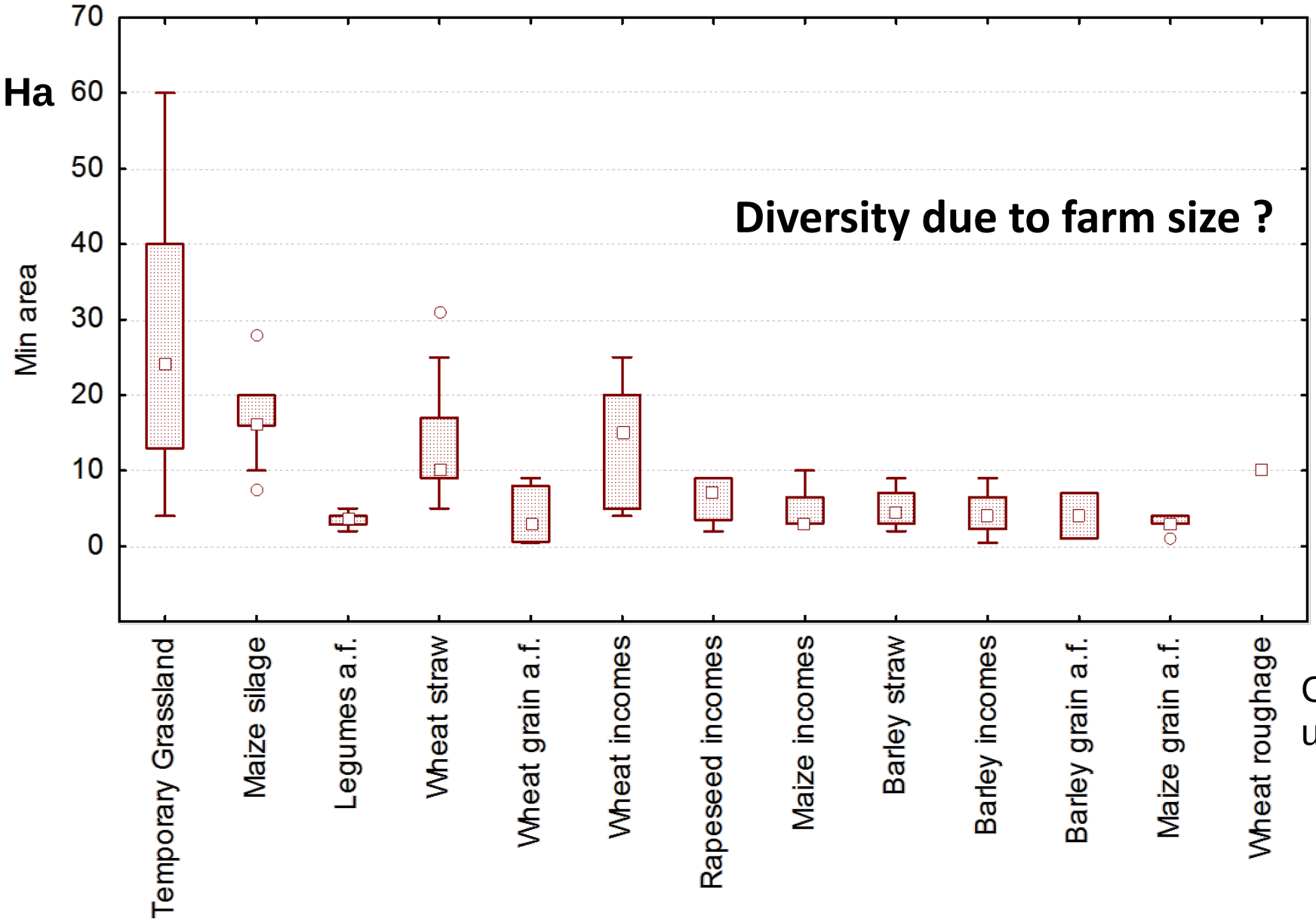
Grassland and/or maize

In farms raising ‘granivores’

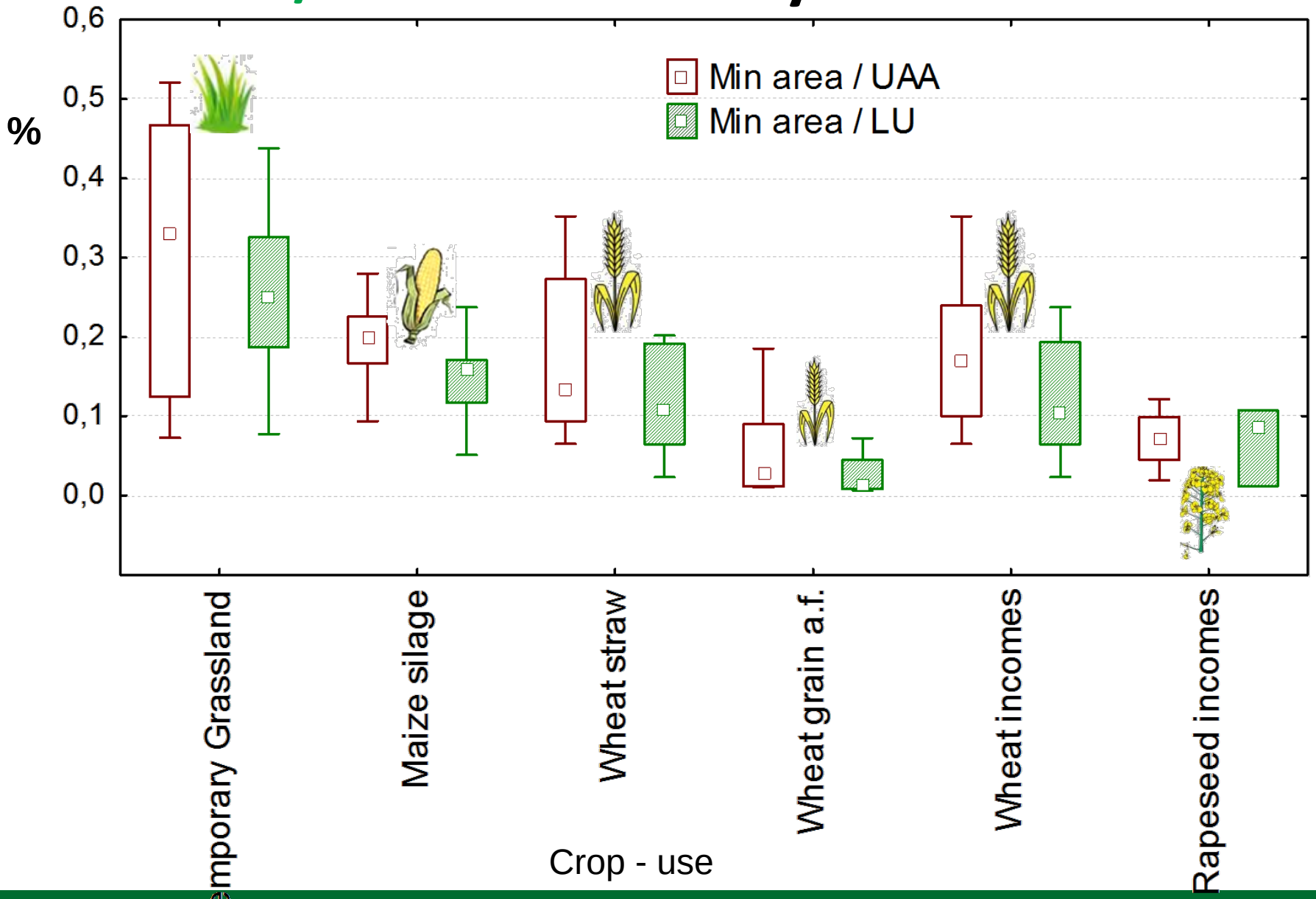
priority = secure incomes,

mainly with wheat, that provides also straw

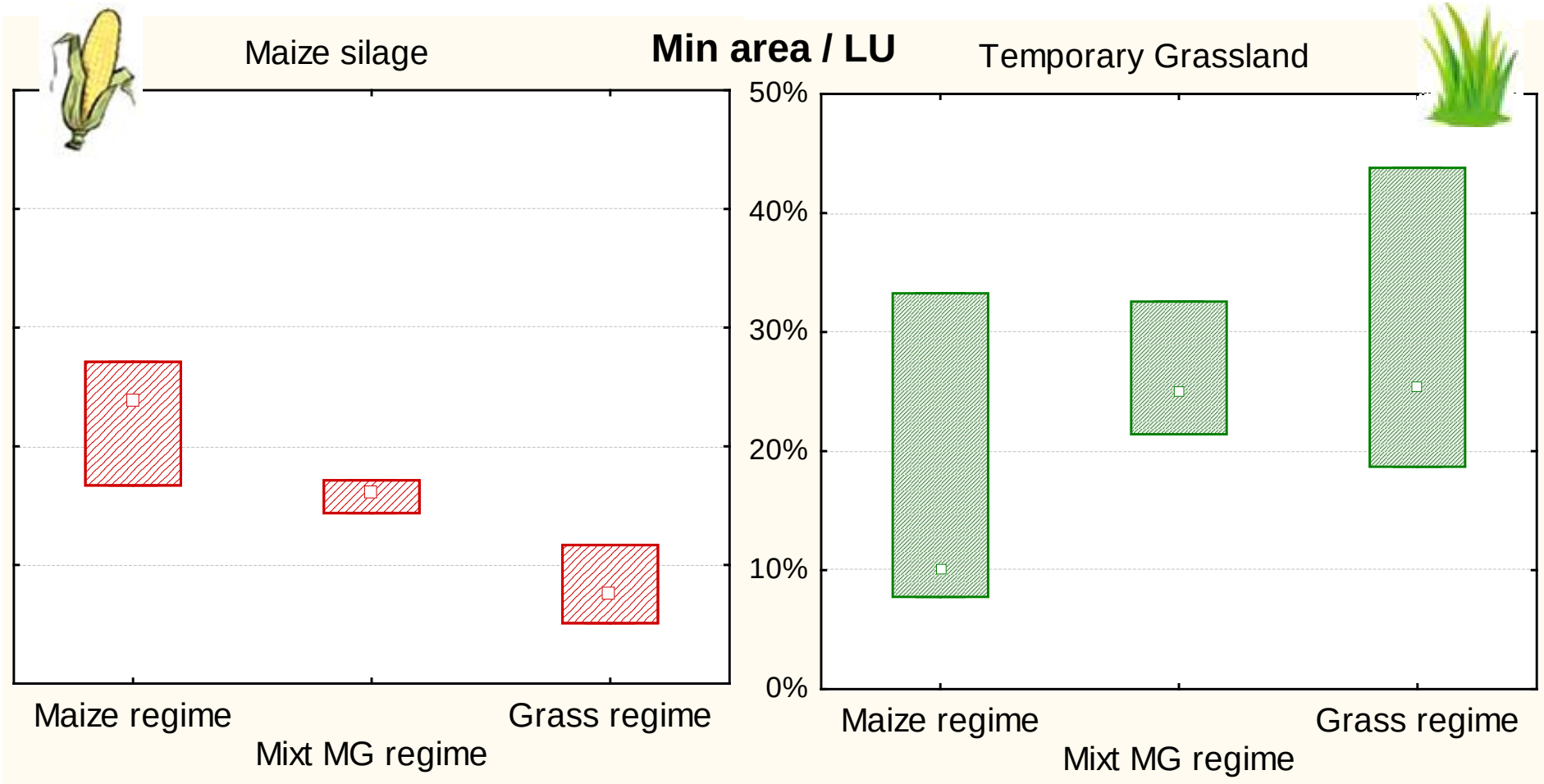
Results 2/4. Minimum area defined for



Results 3/4. More diversity in relatives



Results 4/4. Partly explained by feeding strategies



3 feeding strategies of cattle

Perspectives

- Complete analysis => a spatially explicit simulation of landscape
  - Spatial allocation of crops > connectivity of landscape elements
  - Agronomic decision rules > multi-year simulation, landscape dynamics
- Some complementary surveys

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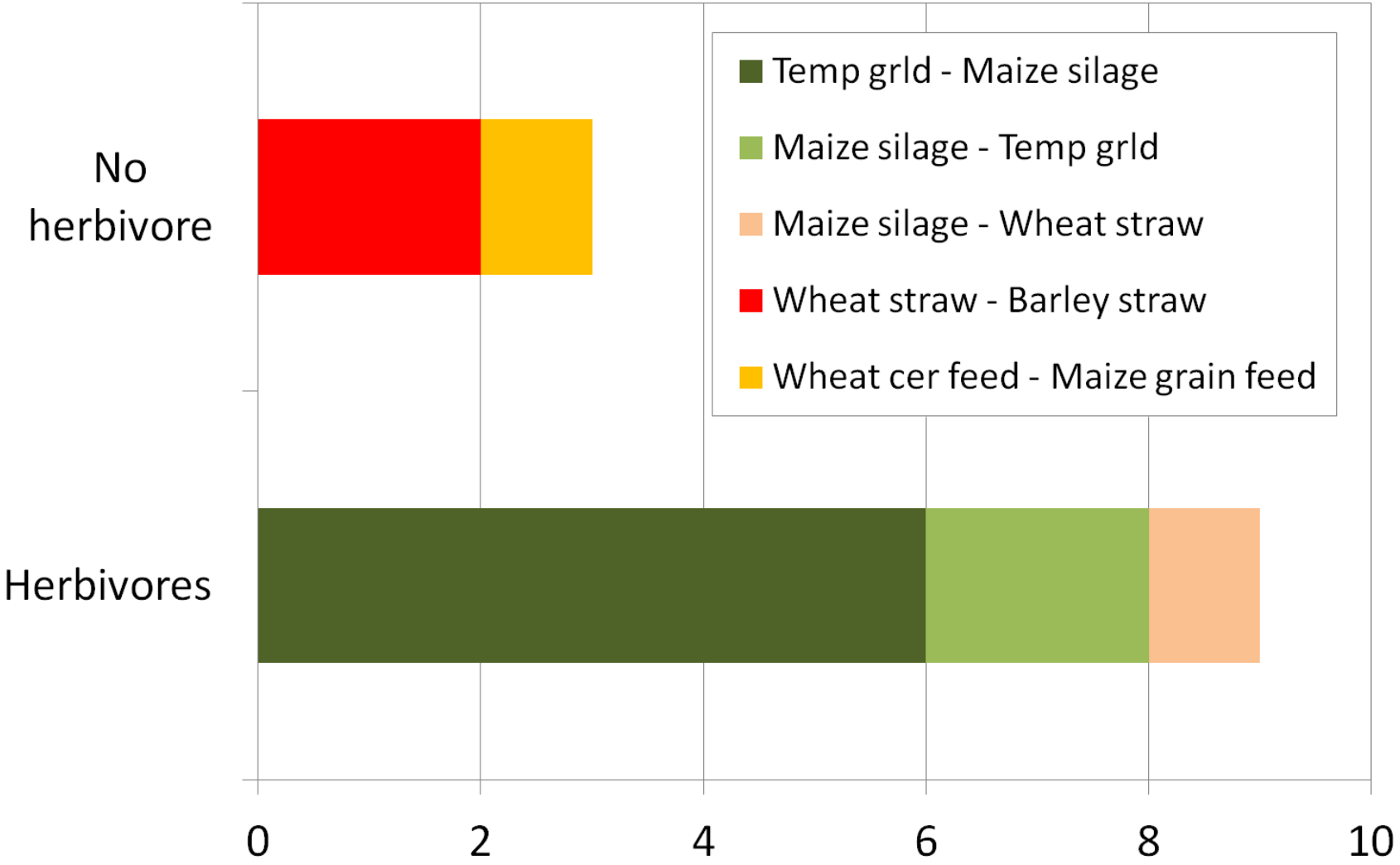
Details Results. Crop grown : priorities



More results. Homogeneity in agronomic decision-making rules

For each crop

- Suitable cultivation area
- Return time
- Acceptable preceding crops
- Maximum number of successive cycles

Perm GL "determinate" on certain plots :
small, wet, distant

On arable land,

. no constraints for maize,

. few for cereals (2 farms)

. distance for grasslands

More frequent sequences M-W-TGL M-W

- If more Wheat
  - W-W or W-TGL possible
- If more Maize
  - M-M or M-TGL possible

More precise perspectives

- Confirm results with other data sets :
  - Specialized dairy farms
  - Pig farms → **Martel *et al.* poster EAAP 2013**

- Complete survey
  - Other LFS types
  - Agronomic rules