Diversity in farm activities layout and contribution of agriculture to the territory performances

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Context / Objectives

At mixed crop-livestock farms level

Performance and sustainabililty of farm depend on both

- the **balance between activities** (livestock vs. crops)
- **AND the diversity of integration schemes** of these activities

(Sneessens et al., 2016)

What happens at territory scale?

How the diversity related to the articulation of livestock and crop activities, intra and inter-farms, orients performance at the territory scale?

Modelling tool building: 'Territory-type'

Space

Provence region

- 611 000 ha of agricultural area
- 2 000 breeders
- 600 000 ewes

DRAF PACA, 2000

Time

To test

Interdependence of crop and livestock activities at farm level

Farms specialization

Decreasing of integration

New alternatives of integration

(Mohamed, 2015; Lasseur et al., 2016)

Modelling tool building: ‘Territory-type’

Methodological choices

Multi-scale

- Farming systems diversity
- ‘territory-type’: set of farms in interactions

No spatially explicit modeling

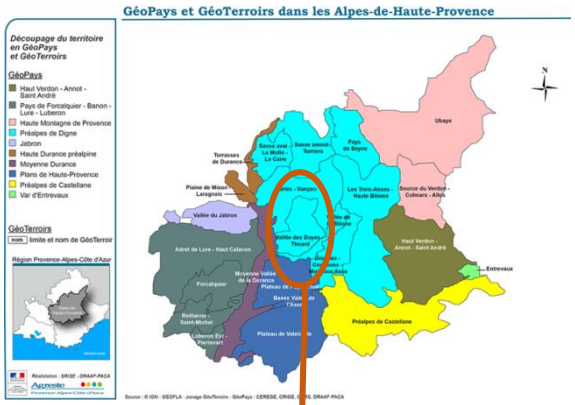
Valuing the data and knowledge already available

- French geographic census of agriculture **(RGA 2010)**
- Reference Pastoral Paddock Benchmark **(RPG 2014)**
- Database depicting diversity of farming systems **(Inosys Network 2016)**

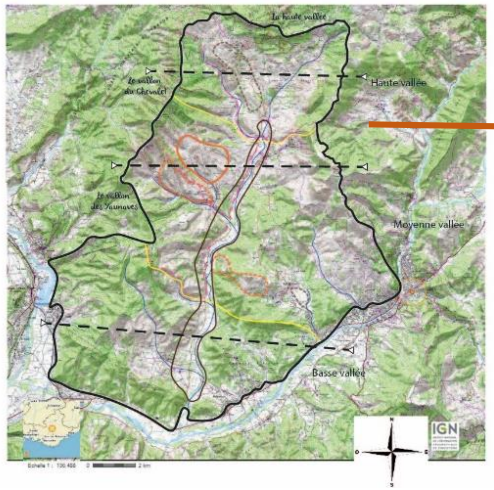
Modelling tool building: 'Territory-type'

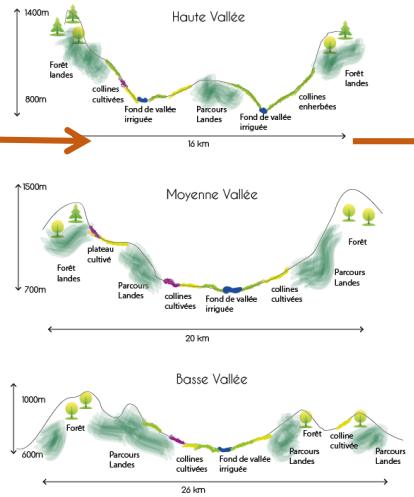
Step of building: surfaces

Geoterritory Vallées des Duyes-Thoard

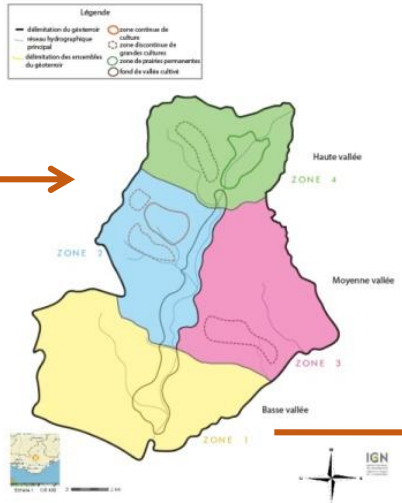


Landscape analysis

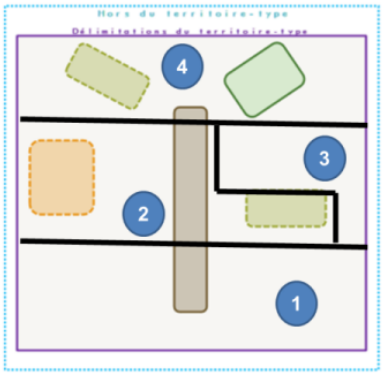




Split into 4 zones



Conceptualisation



Modelling tool building: 'Territory-type'

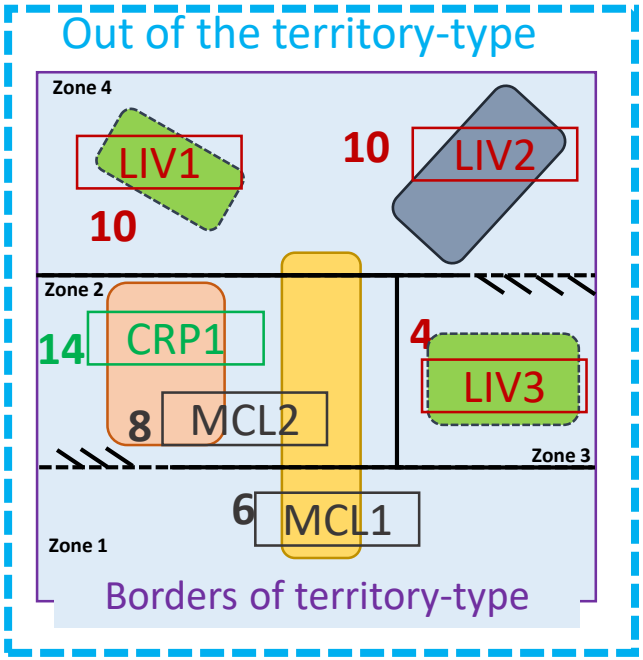
Step of building: farming systems

A – Farming systems diversity

- 3 specialized Ovine farms - LIV
- 2 mixed crop-livestock farms - MCL
- 1 specialized Crop farm - CRP

B – Farming systems operation

- Technical and economic modelling from Inosys database (national follow-up farm net)
- Management of straw and manure, current links between farms **(surveys)**



Modelling tool building: 'Territory-type'

Step of building: 2 scenarios tested

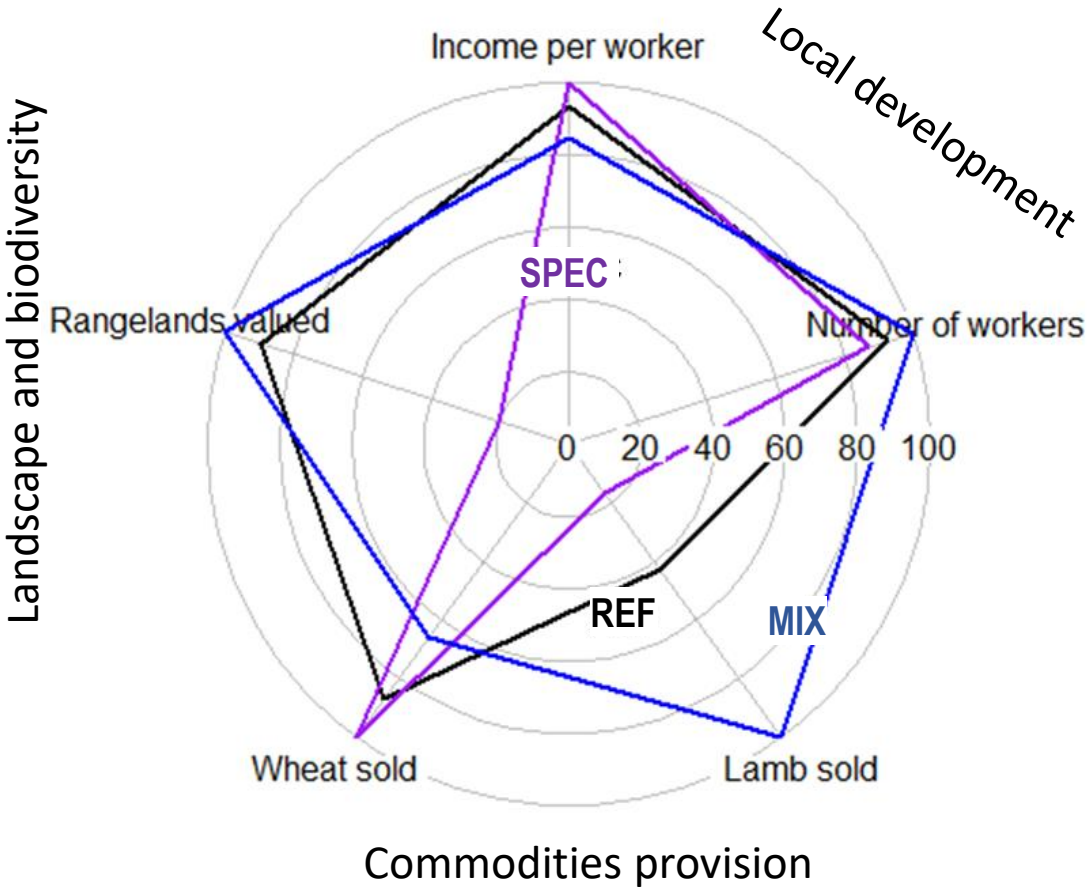
	Modification in farming systems	Impact on surfaces	Rebuilding of the agricultural activities on the territory
Specialized territory - SPEC			
Toward a specialization →	Replacement of mixed farms by specialized farms	Release of rangelands and grasslands by mixed farms	*1 - Introduction of livestock farms* *2 - Use of arable lands by new crop farms*
Reference scenario - REF			
Toward a diversification →	Replacement of specialized farms by mixed farms	Release of arable lands by crop farms	*Use of agricultural surfaces by mixed farming systems less pastoral*
Mixed territory- MIX			

Farming system characteristics

Farms	CRP	MCL1	MCL2	MCL2 Bis	LIV2
Agricultural area (ha)	105	62	111	129	51
Herd size (nb ewes)	n.a.	320	500	520	460
Rangelands (ha)	n.a.	178	526	155	154
Meadows (ha)	n.a.	20	25	34	40
Crops (ha)	105	42	86	95	11
% rangelands in diet	**n.a.**	**17%**	**10%**	**8.60%**	**13%**

The diversity of farming systems is based on both structure and production characteristics

Results : Performances at territory scale



SPEC maximizes the income per worker unit, but less workers are present and very few valued rangelands

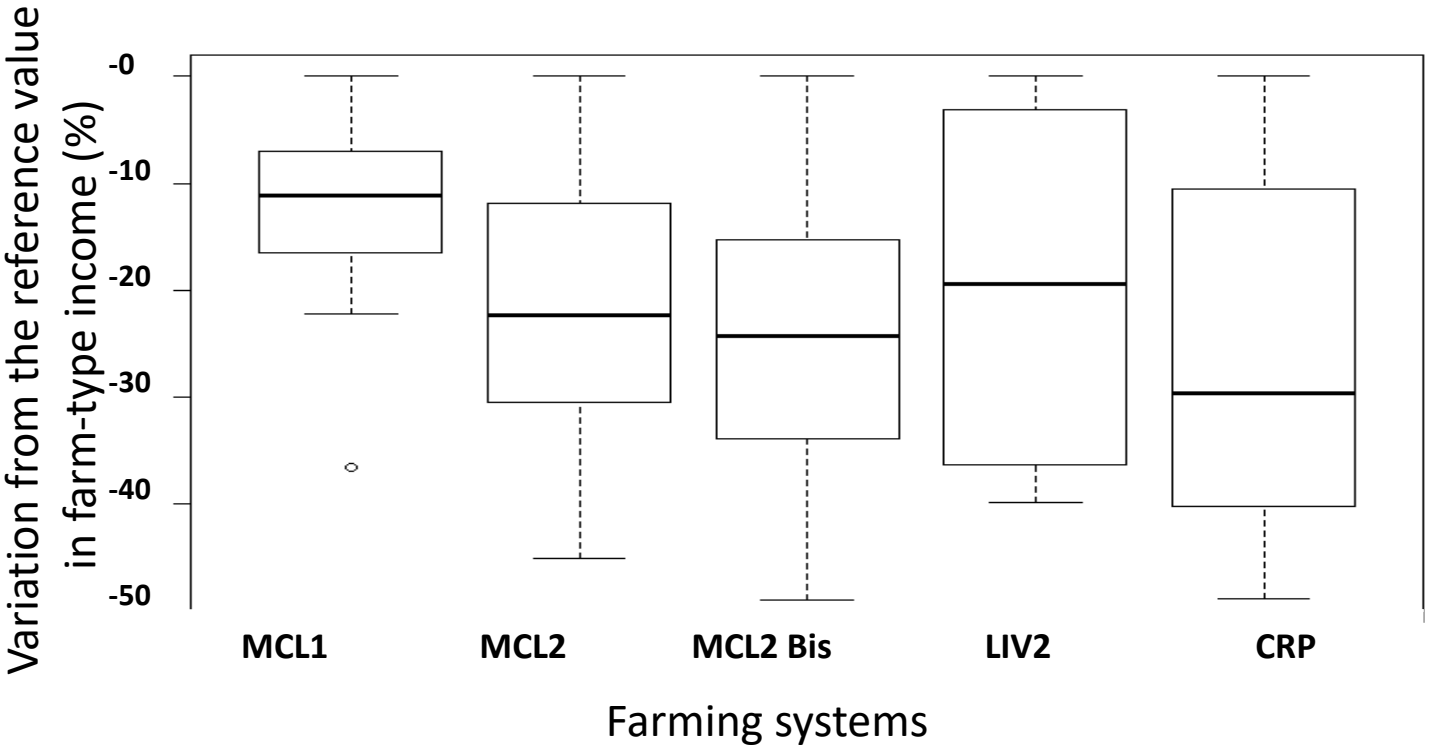
MIX maximizes the range of products, the valued rangelands and the number of workers

REF = intermediate situation

Results : Diversity and robustness

Sensitivity of the income to price volatility

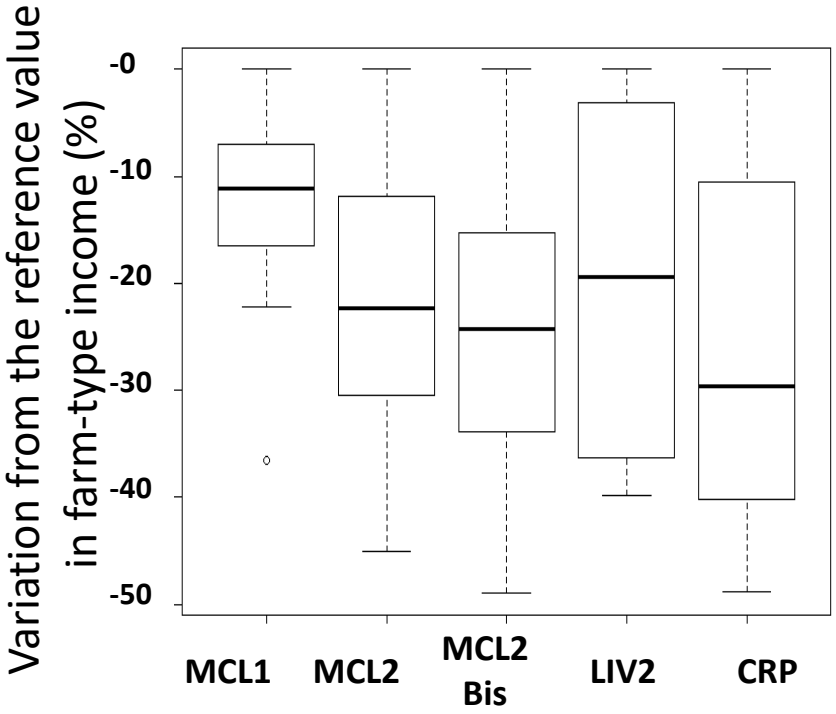
Variability of individual income and global income : a 20%-variation in the price of inputs (fertilizer and concentrates) and/or products (lamb, wheat and lavandin)

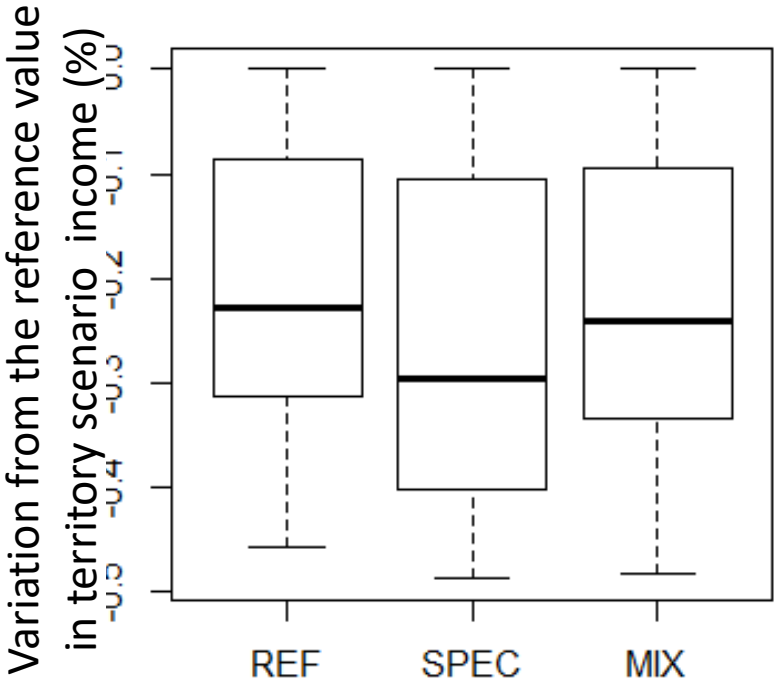


Farms	MCL1	MCL2	MCL2 Bis	LIV2	CRP
% rangelands in diet	17%	10%	8.60%	13%	n.a.

Results : Diversity et robustness

Sensitivity of the income to price volatility





Farming systems → Territory scenarios

Shannon diversity indice for farm-type distribution / Richness of farm-types	1.03 / 3	0.45 / 2	0.99 / 3
Shannon diversity indice for products distribution / Richness of products	0.92 / 19	0.76 / 7	1.15 / 25

Dicussion & Perspectives

At farm scale :
Sensitivity of price volatility is related to the part of rangelands in flock diet

At territory scale :
Combination of specialized farms (livestock and crops) can compensate the individual sensitivity of the farms and reach results obtained by mixed farms

However, divergent results appear between individual farm and landscape performances.

➔ **It raises questions about the way to balance performances at several scales to promote sustainable farming systems in the economic dynamic of a territory**

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Thank you for your attention