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► **To cite this version:**

Fabien Stark, Julie Ryschawy, Romane Mettauer, Myriam Grillot, Imad Shaqura, et al.. Sheep integration into cropping systems for agroecological transition of farming systems in France. 74. Annual Meeting of the European Federation of Animal Science, EAAP, Aug 2023, Lyon, France. pp.443, 10.3920/978-90-8686-936-7. hal-04196545

HAL Id: hal-04196545

<https://hal.inrae.fr/hal-04196545v1>

Submitted on 17 Jun 2024

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F. Stark, J. Ryschawy, R. Mettauer, M. Grillot, I. Shaqura & M. Moraine



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Context and problematic

► Context

- Negative impacts of specialization and concentration of agricultural systems
- Specialization of both farms and regions
- Integrated crop-livestock systems (ICLS) at territorial level as a relevant lever for agroecological transition (*Garrett et al., 2020*)

Objective

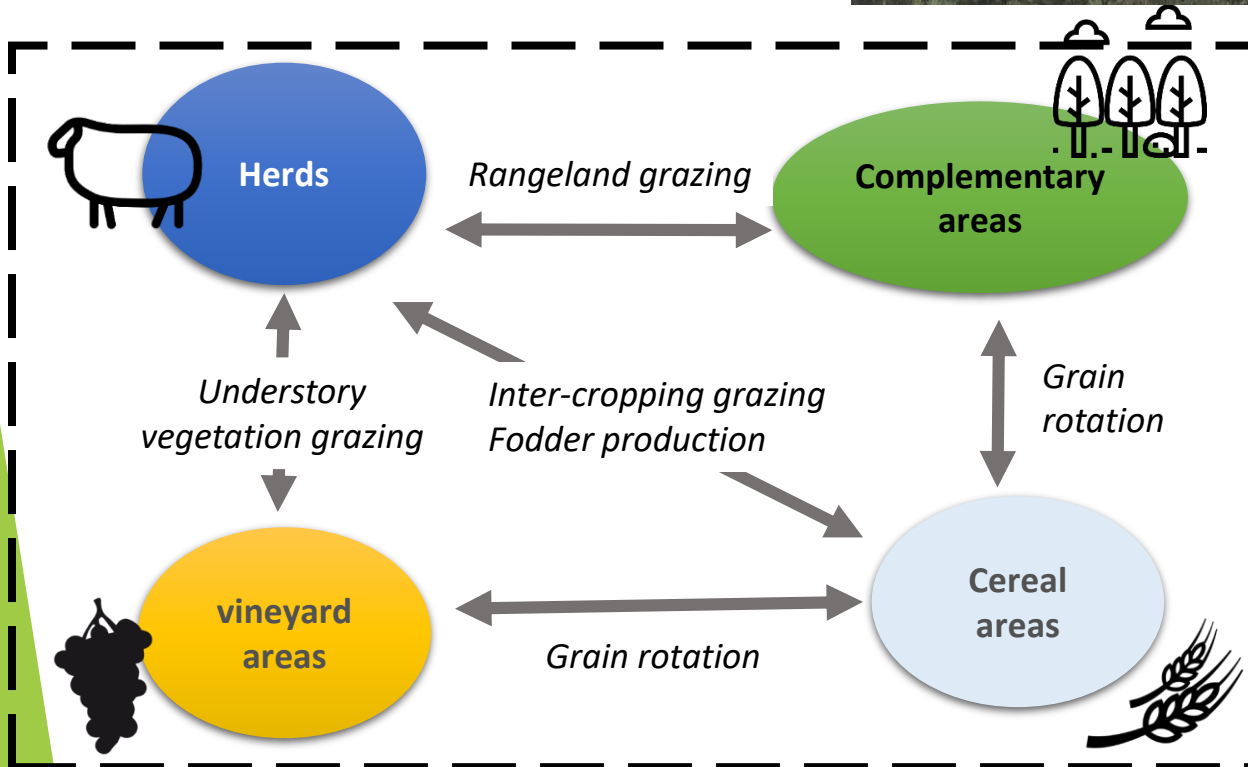
Explore different forms of ICLS in a given region to evaluate their possible benefits and perspectives



Material

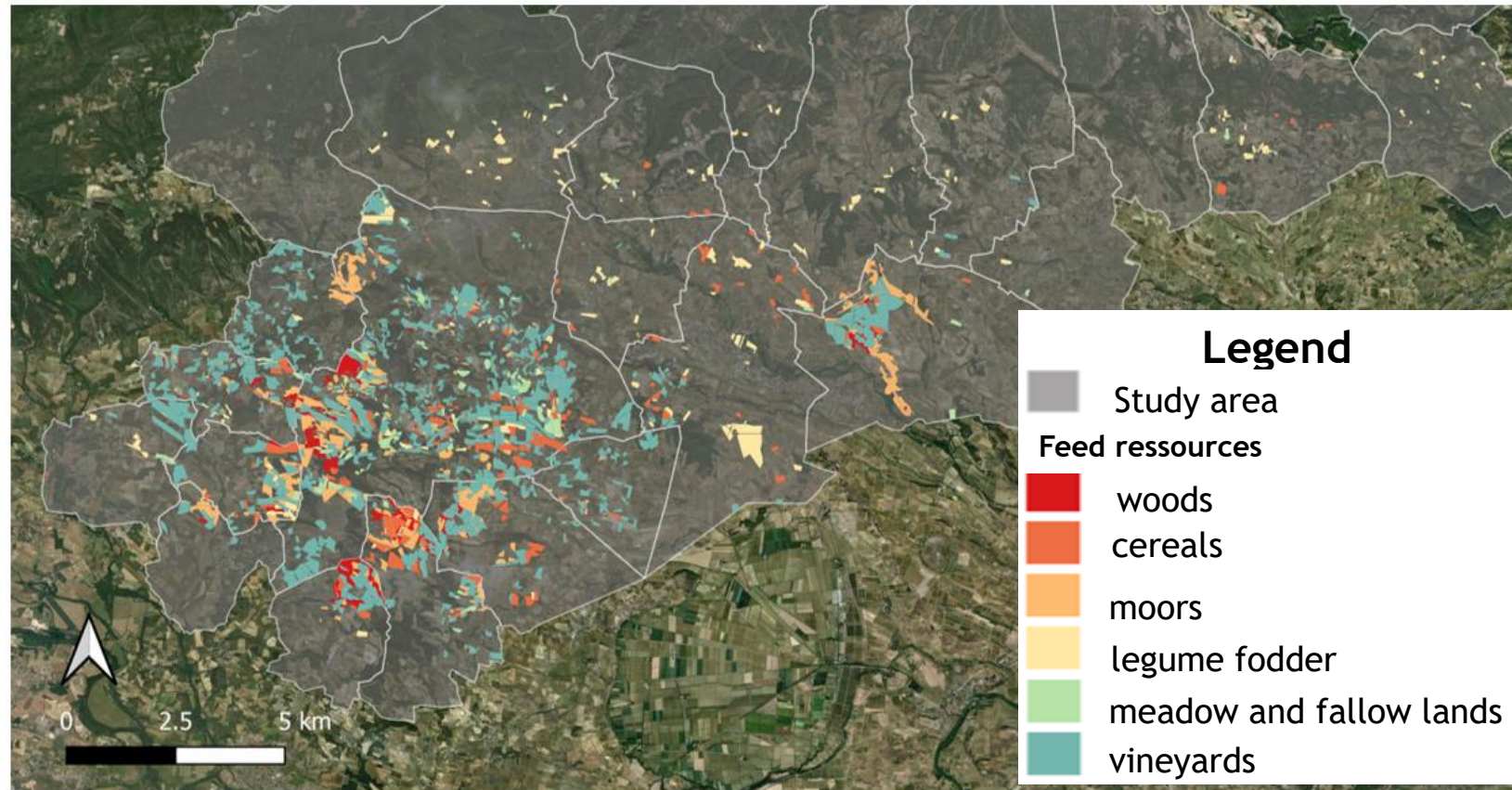
- ▶ Minervois region (South France)
- ▶ Mediterranean climate
- ▶ A plain zone/Causse zone

- ▶ Various forms of ICLS



Methodology: modelling

- ▶ Spatialized and temporalized regional supply-demand model
- ▶ Farming systems and CLI practices calibration: semi-structured interviews (n=22)
- ▶ Spatial distribution of surfaces already involving ICLS (3,000 ha - 20 % of the territory's agricultural surface)
- ▶ Feed resources estimation (legume fodder, moors, inter-row vineyard, ...) (Farrié et al., 2015)



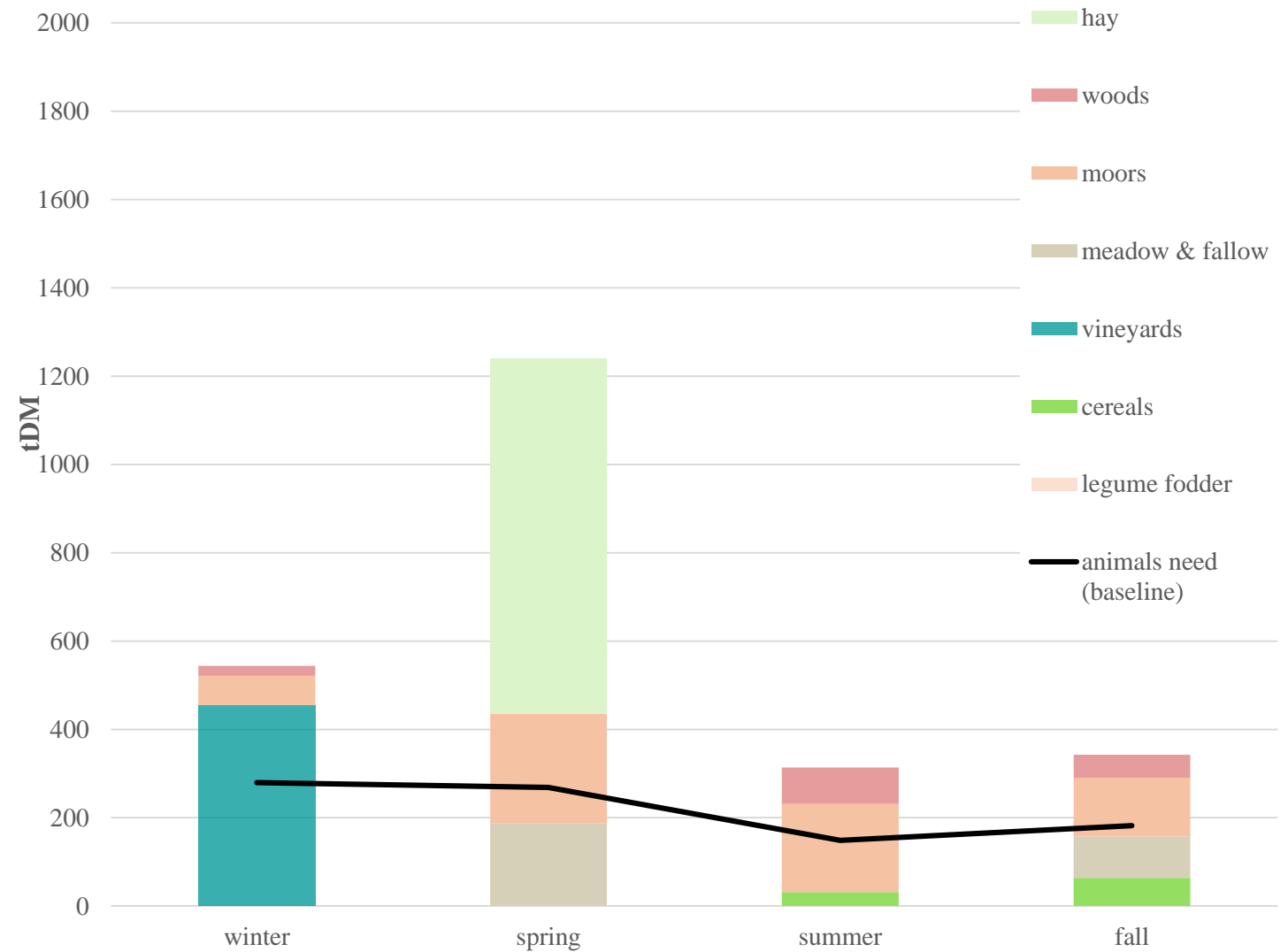
Methodology: simulation

	Scenarios	CC impacts	Increase resources supply	Decrease herd demand	
Setting					
Crops		Change in yields	Change in land use		
Livestock		-		Herd mobility (transhumance)	Batching and lambing period

- ▶ simulation plan elaborate with local actors
- ▶ settings consistent with farming system structures and functioning

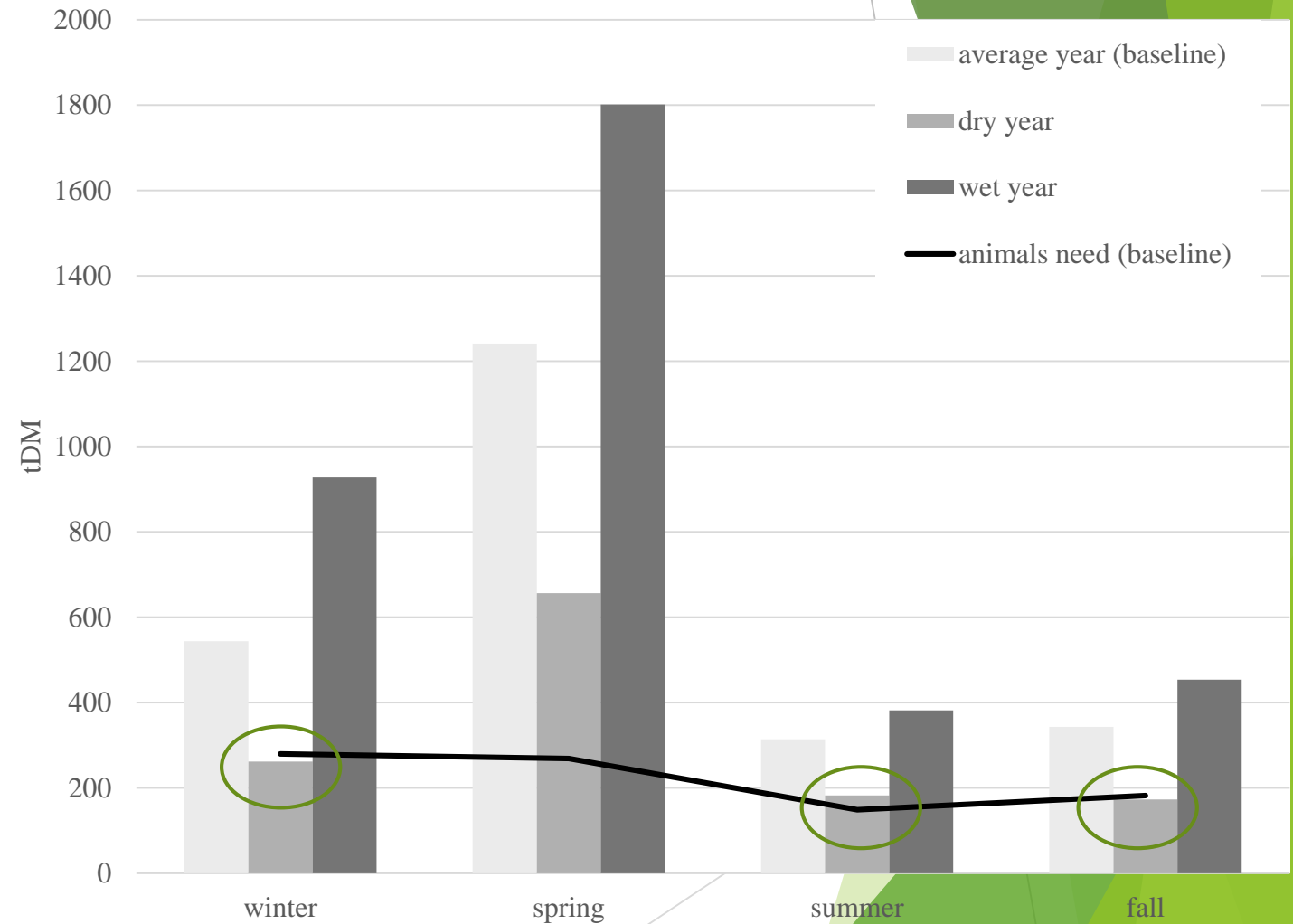
Results: Baseline scenario

- ▶ Herd of 1,000 ewes feed on the territory (shepherd)
- ▶ Diversity of feed resources
- ▶ Complementarity of resources between seasons

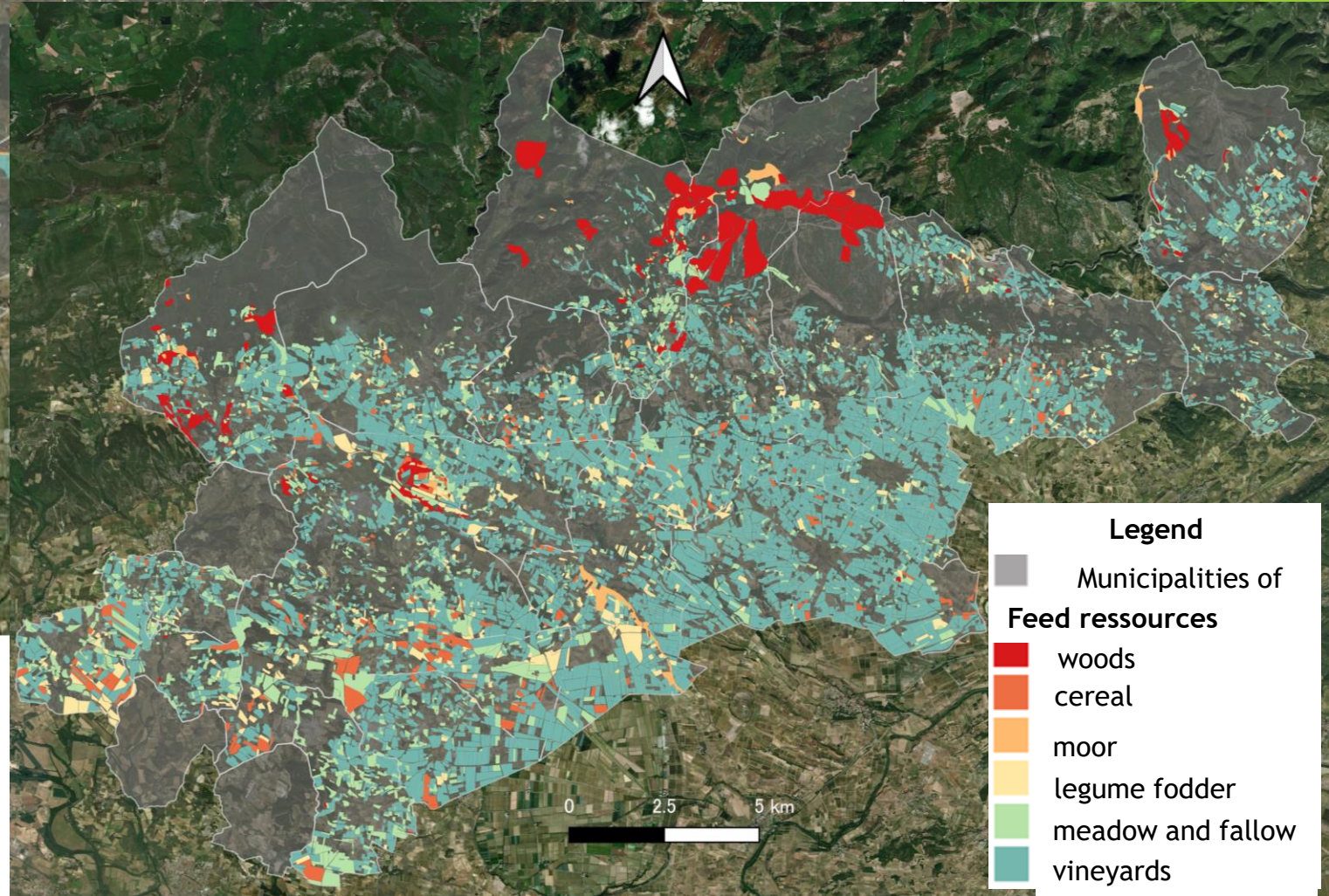
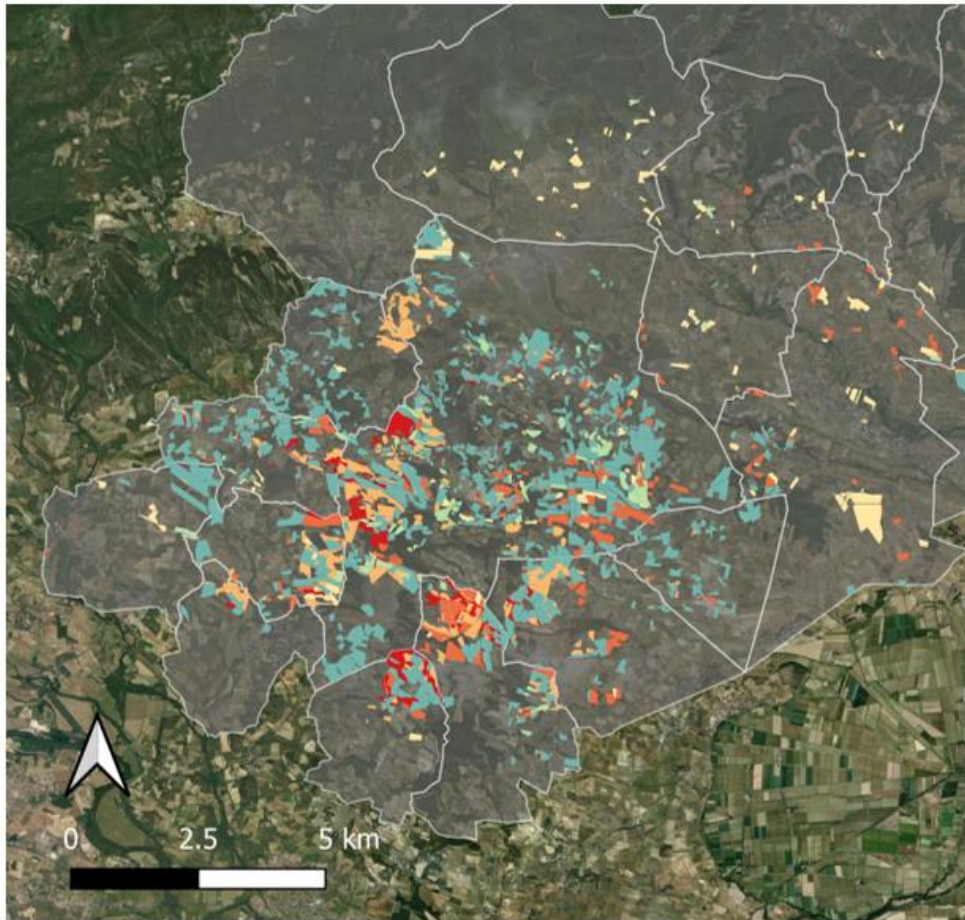


Results: Climatic change impact

- ▶ Setting: Change in yields
- ▶ Fall and winter become also limiting in dry years
- ▶ Not enough resources to feed the actual herd



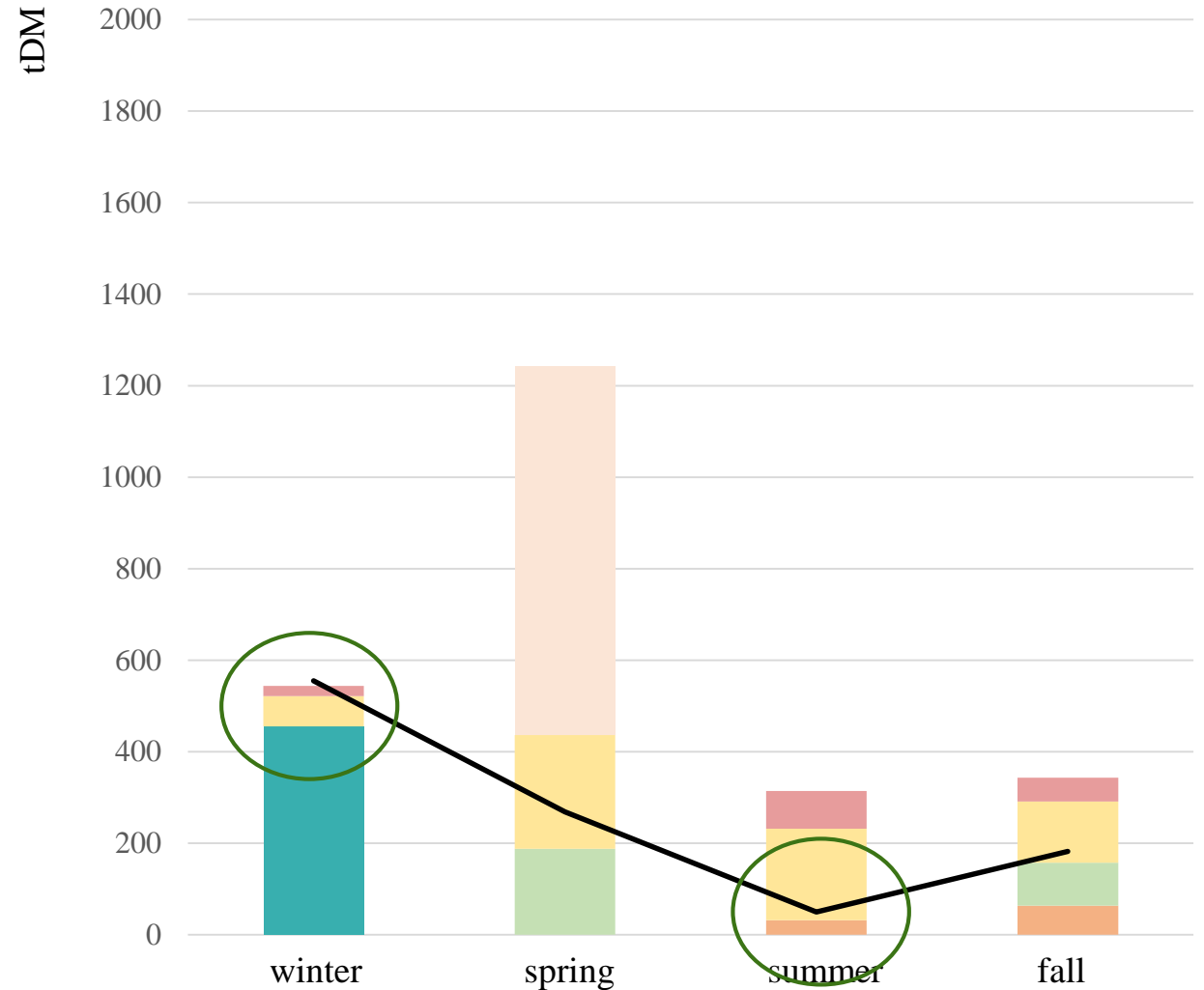
Results: Increase resources supply



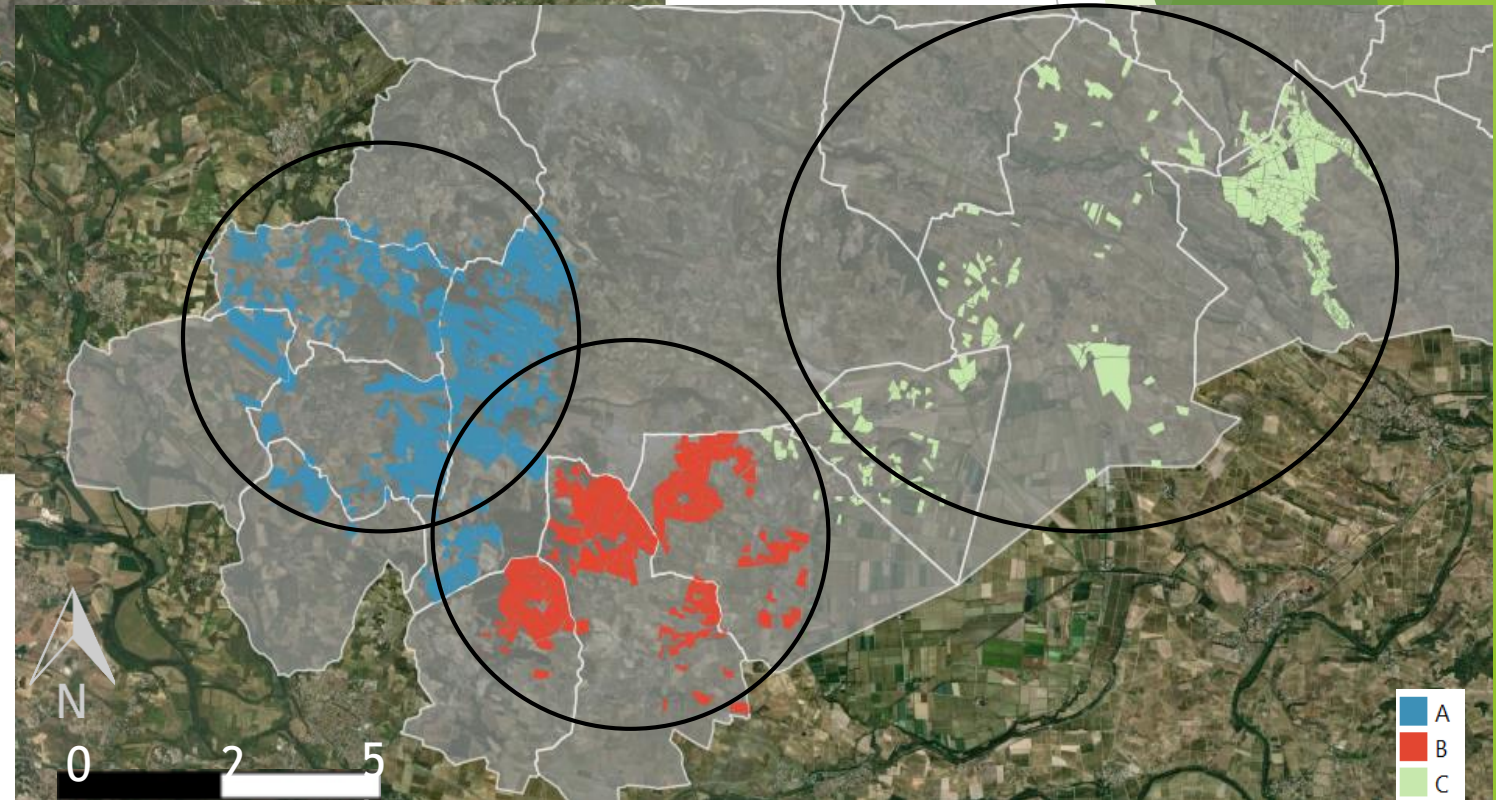
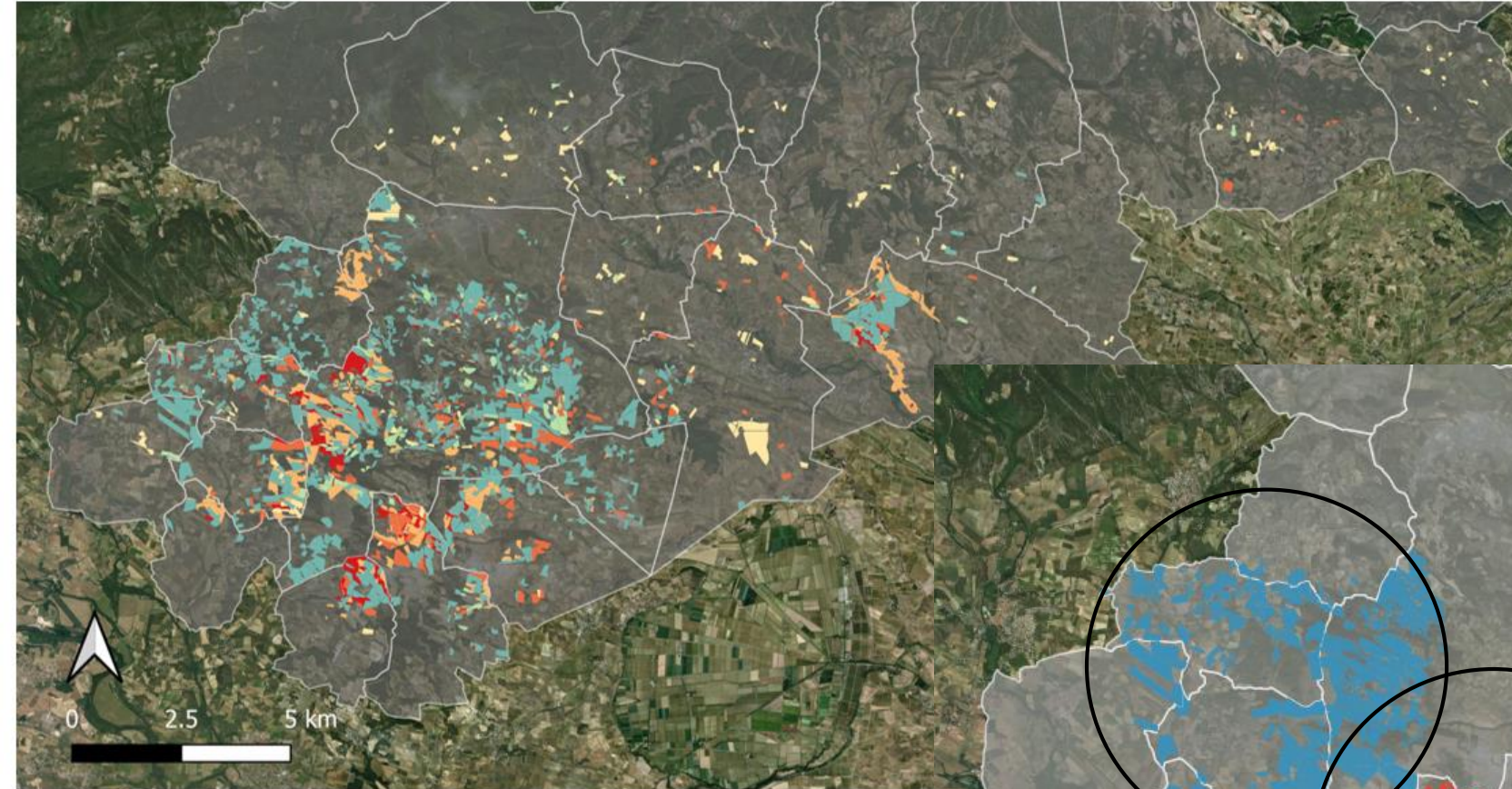
- ▶ Consider ICLS all over the territory
- ▶ Increase number of ewes (> 8,000)

Results: Herd mobility

- ▶ Setting: Change in grazing periods
- ▶ Summer transhumance (estive) to reduce pressure on resources
- ▶ Inverse transhumance to optimize the use of available resources in winter



Results: Batching



- ▶ separate the herd into 3 batches
- ▶ decrease animal density
- ▶ facilitate management

Discussion & Perspectives

- ▶ « **simple** » territorial simulations based on real CLI practices involving **local actors** (participatory research project)
- ▶ Interest in combining **dynamic analysis** (seasonality) and **spatial analysis** (heterogeneity of land use) to **design future landscapes**
- ▶ Social & Environmental « **concerns** » on cropping systems are an **opportunity to reintroduce livestock systems** and provide **additional services** to territories
- ▶ **Brakes and levers** to adoption of ICLS & **multicriteria assesment** of associated benefits in addition





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