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Circularity in re-integrated crop-livestock systems at territory level: pathways and limits for transitions

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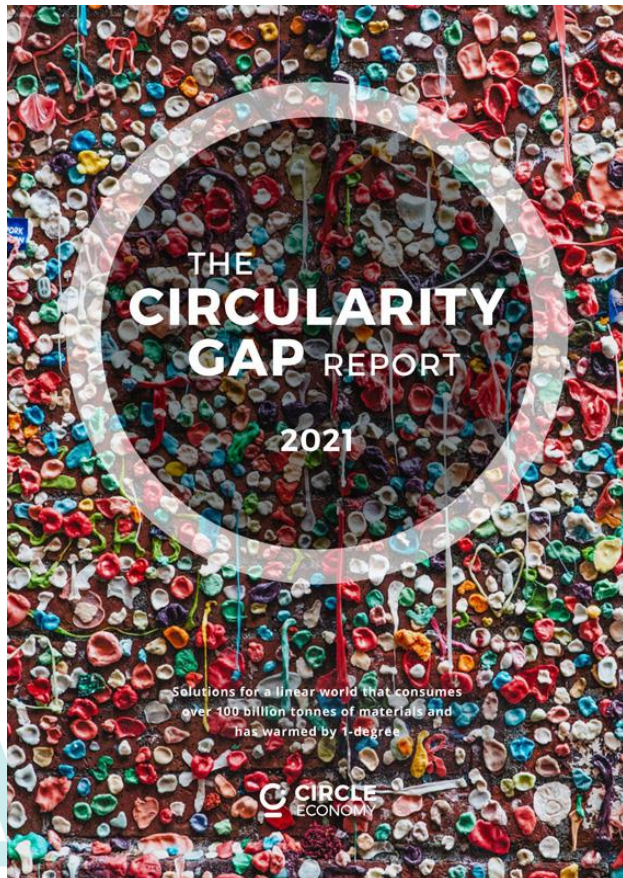
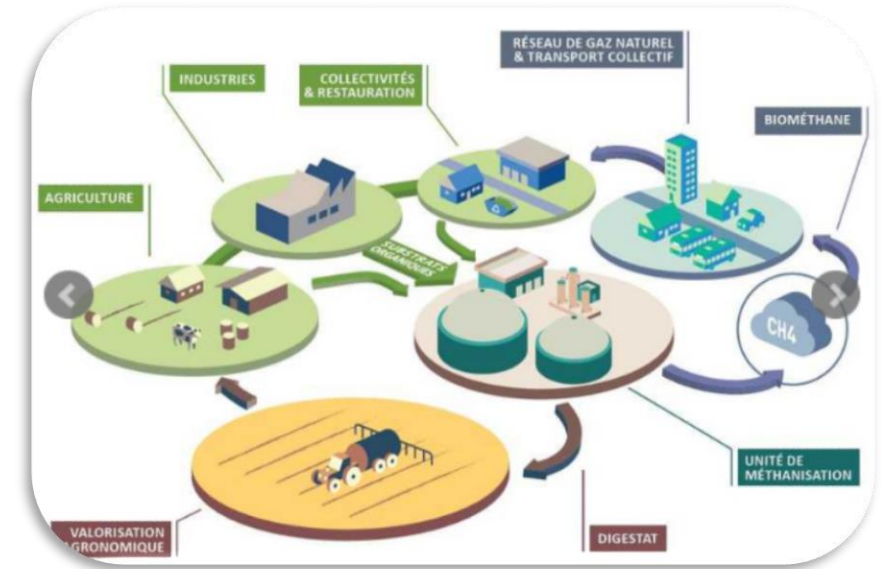
➤ Circularity in re-integrated crop-livestock systems at territory level: pathways and limits for transitions



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Guillaume Martin, Myriam Grillot, Julie Ryschawy, Fabien Stark

➤ Circularity, crops, livestock... People?

1. Why should we close cycles?
2. Who close which cycles?
3. How to make it better and why isn't it so simple?



➤ Looking back

- XIXth Century: production belts for milk and vegetables around cities with functional complementarities
« ...because vines feed the goats and goats' manure fatten the vines » *Monts d'Or, XIXème siècle*
- Green Revolution – 60's:
 - Specialization
 - Substitution by chemical inputs
 - Supply chains
 - Farm growth
- ...until sustainability crises:
C, N, P, etc.



➤ A sector embedded in international trade

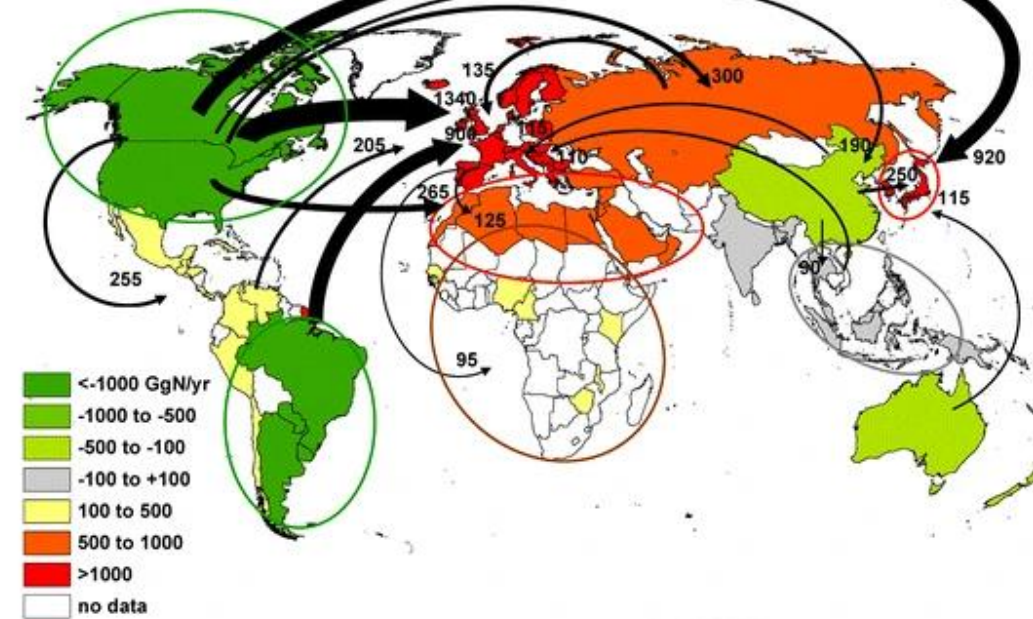
- A small number of countries (USA, Argentina and Brazil) exporting feed to the rest of the world
- At the global scale, disconnection between crop and livestock production across specialized regions, increasing environmental impacts.

Biogeochemistry (2014) 118:225–241
DOI 10.1007/s10533-013-9923-4

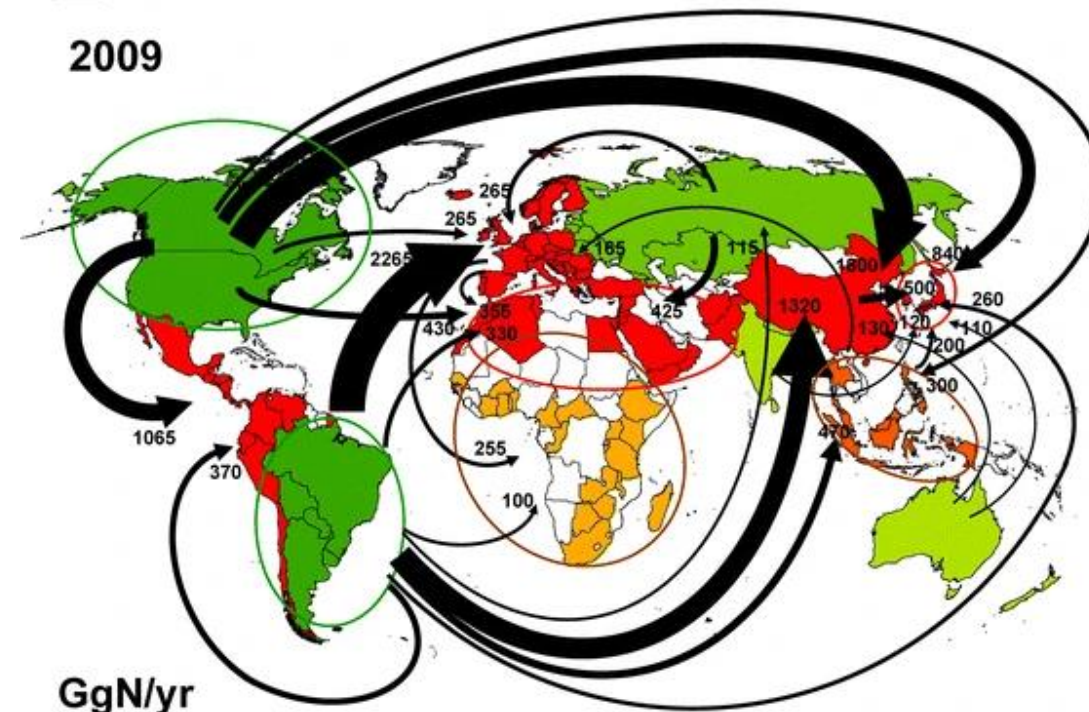
Food and feed trade as a driver in the global nitrogen cycle: 50-year trends

Luis Lassaletta · Gilles Billen · Bruna Grizzetti ·
Josette Garnier · Allison M. Leach ·
James N. Galloway

1986

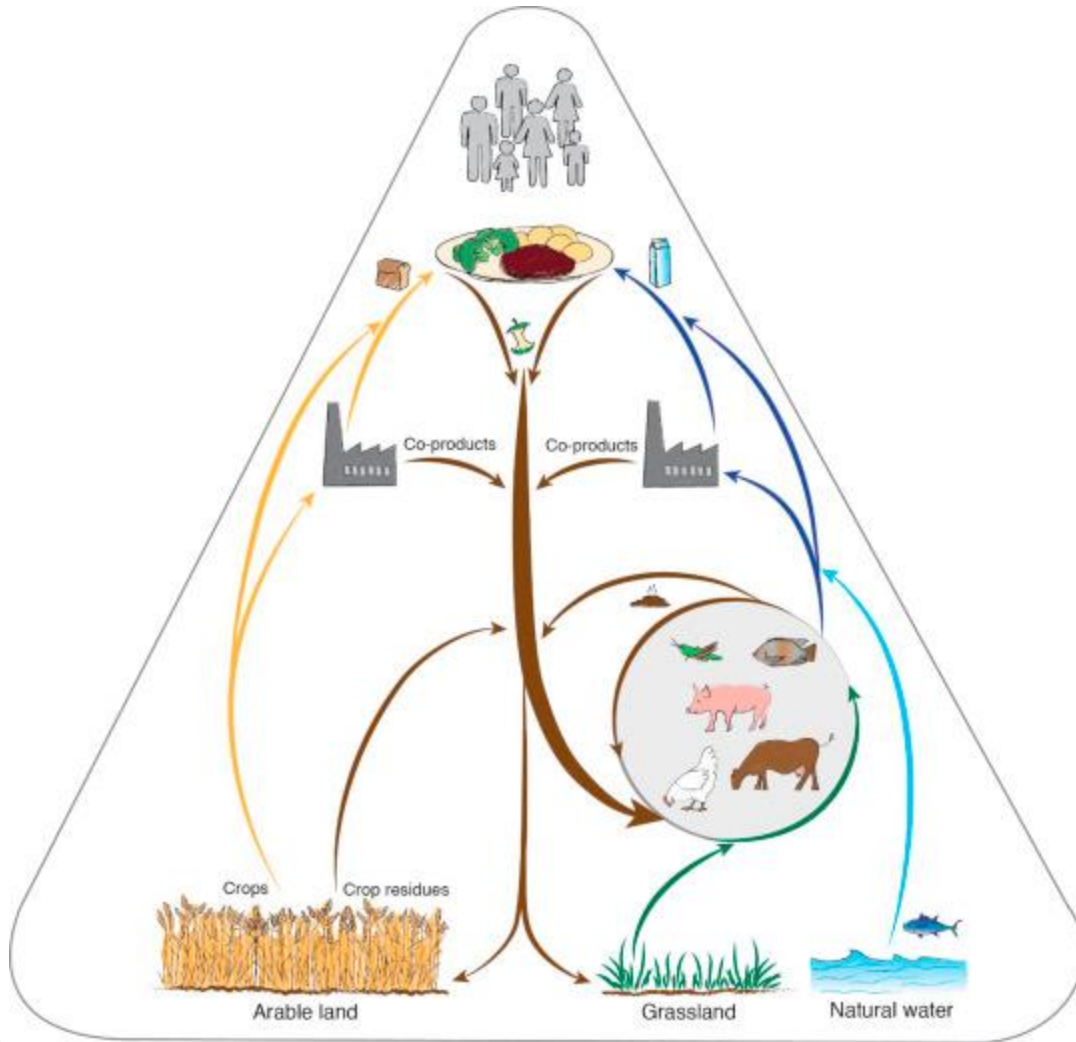


2009



GgN/yr

➤ Local and low-opportunity cost feed in more circular systems as a start



Local?

By analogy with local food systems: *“a food system in which foods are produced, processed and retailed within a defined geographical area (within a 20 to 100 km radius approximately)”*

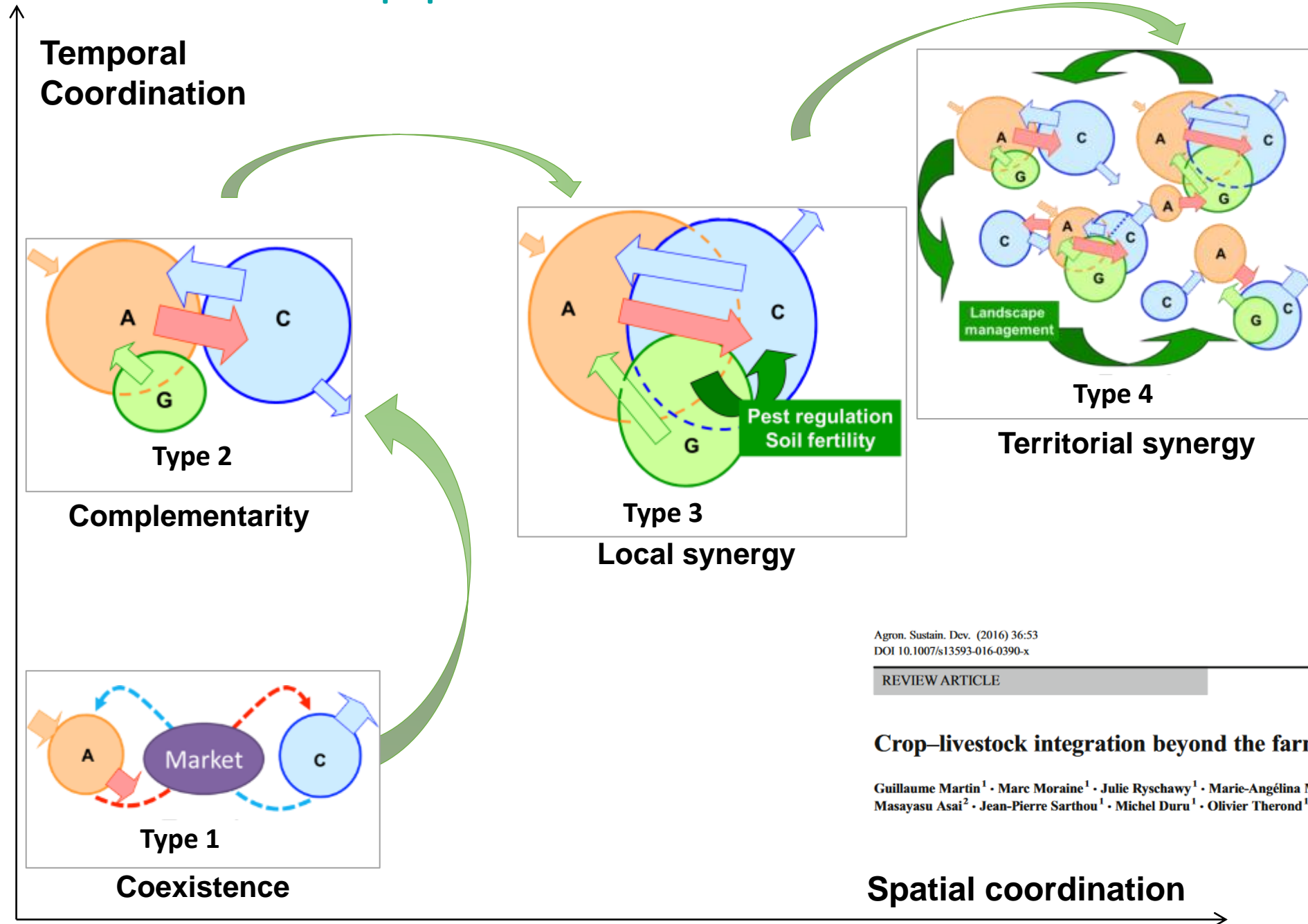
Kneafsey et al., 2013

Low-opportunity cost?

Arable land is primarily used for food production; biomass unsuited for direct human consumption is recycled as animal feed; by-products and manure are used to maintain soil fertility.

van Zanten et al., 2019

➤ Crop-pasture-livestock reconnection



Agron. Sustain. Dev. (2016) 36:53
DOI 10.1007/s13593-016-0390-x

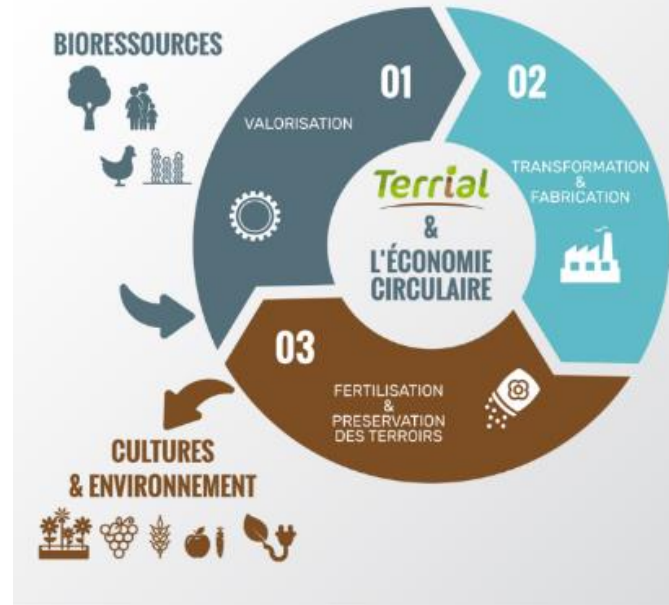
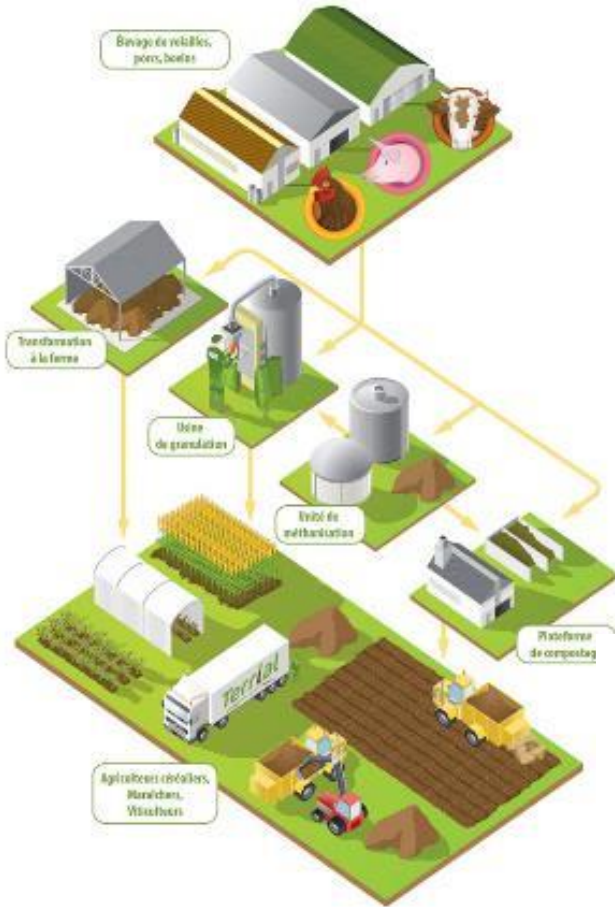
REVIEW ARTICLE

Crop–livestock integration beyond the farm level: a review

Guillaume Martin¹ · Marc Moraine¹ · Julie Ryschawy¹ · Marie-Angéline Magne¹ · Masayasu Asai² · Jean-Pierre Sarthou¹ · Michel Duru¹ · Olivier Therond^{1,3}

Spatial coordination

➤ Who and how? Industrials & trucks?



➤ Who and how? Alternatives & Shepherds?

Sheep
grazing in
cereal
farms



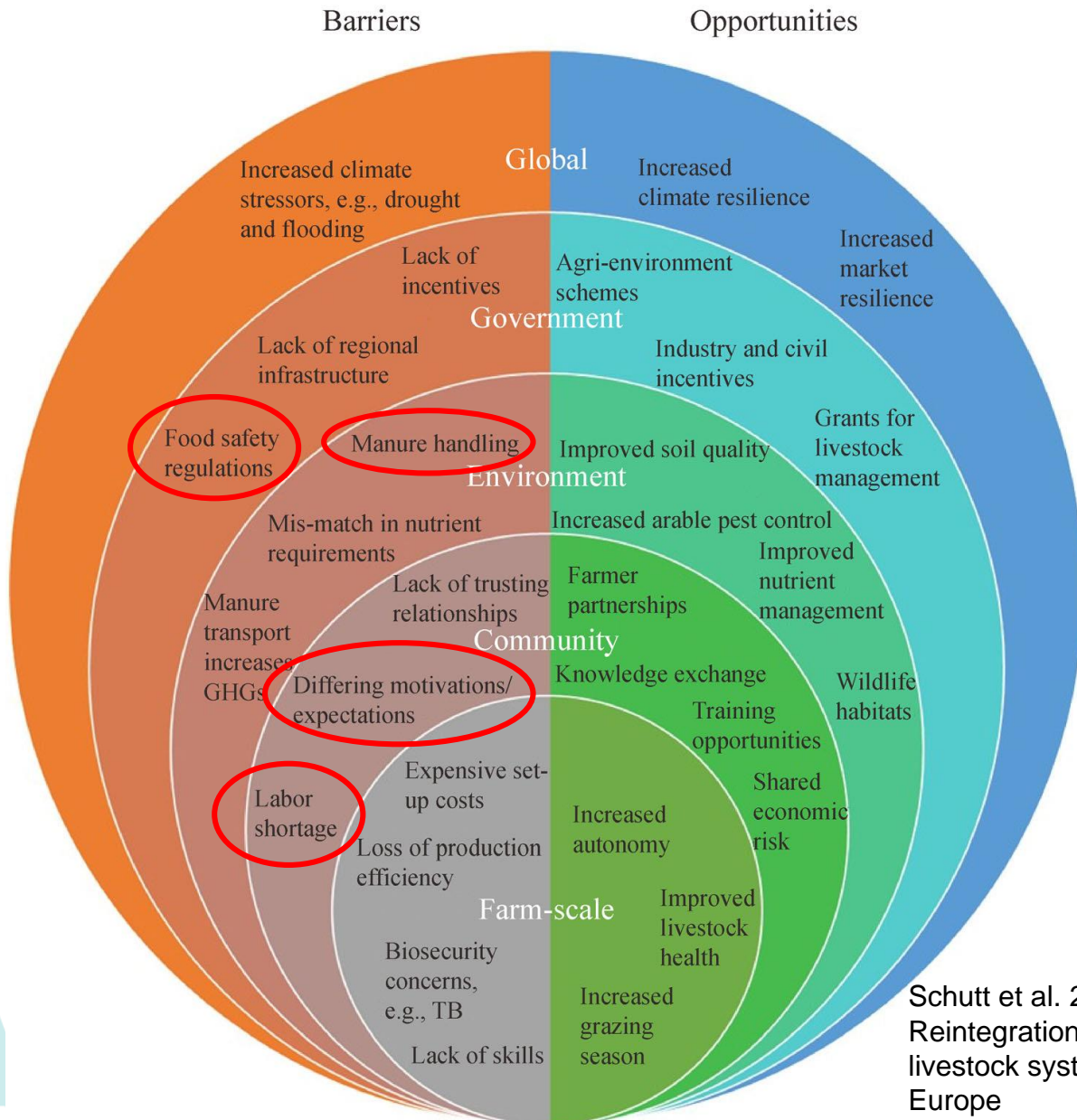
agrof'île
Soils vivants et agroforesterie en Ile-de-France

Living soils & agroforestry

Middle-scale
1 farm
7 enterprises
6 WU
In Ferme d'Arcy (77)
Source Terre-net.fr



➤ Sociotechnical lock-ins to using local feed resources



- Multiple types of transaction costs for information gathering, collective decision-making, implementation and monitoring
- Reducing these costs remains a challenge
- A first set of factors identified e.g.
 - Coordination by third-party entities
 - Presence of social networks
 - Spatial proximity of farms



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol



Schutt et al. 2021.
Reintegration of crop-livestock systems in Europe

Critical factors for crop-livestock integration beyond the farm level: A cross-analysis of worldwide case studies

Masayasu Asai^{a,*}, Marc Moraine^b, Julie Ryschawy^c, Jan de Wit^d, Aaron K. Hoshide^e, Guillaume Martin^c



➤ Sociotechnical lock-ins

Quand l'hiver arrive
chez l'éleveur



et chez le céréalier



Bonne fête du travail
à tous les éleveurs



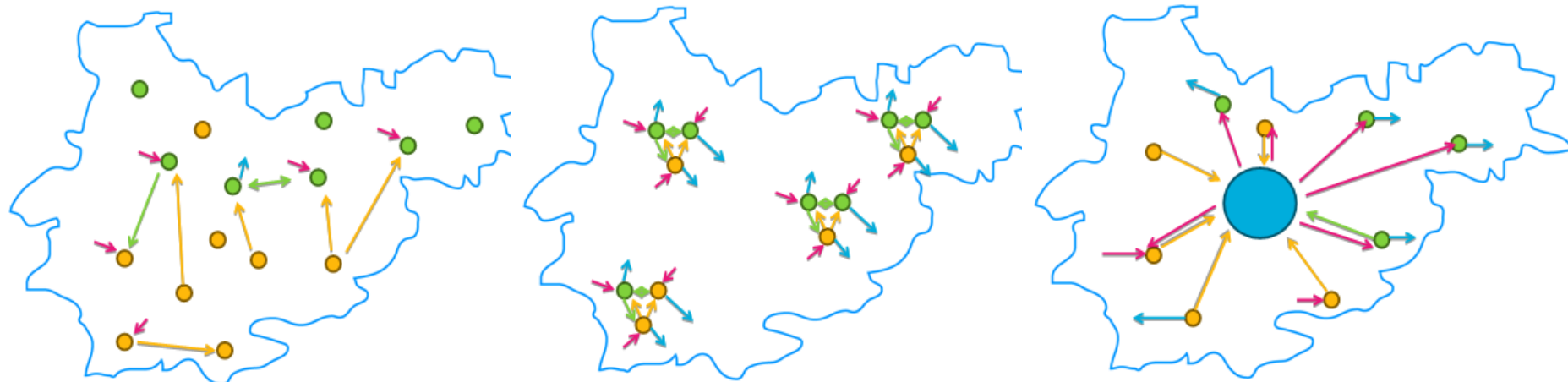
et céréaliers de France



➤ Which innovations to unlock crop-livestock integration at territory level?



Thierry et al. (2017)



Ryschawy et al. 2017



➤ Which innovations to unlock crop-livestock integration at territory level?



AGROÉCOPOLE
FABRÈGUES - MIRABEAU



Vigne
de
Cocagne



➤ Which innovations to unlock crop-livestock integration at territory level?



Minervois (South W)

- Mediterranean
- A plain area / a rangeland area

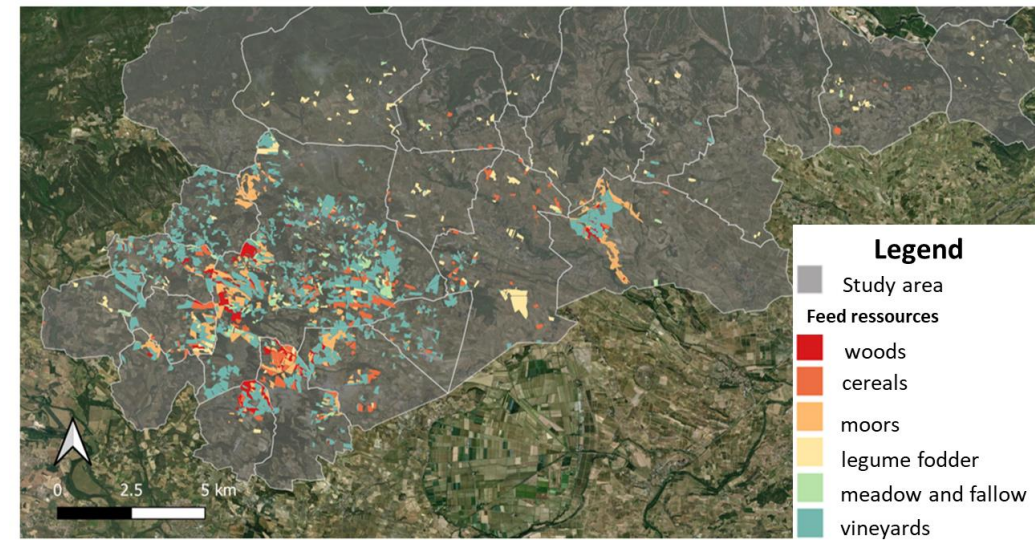
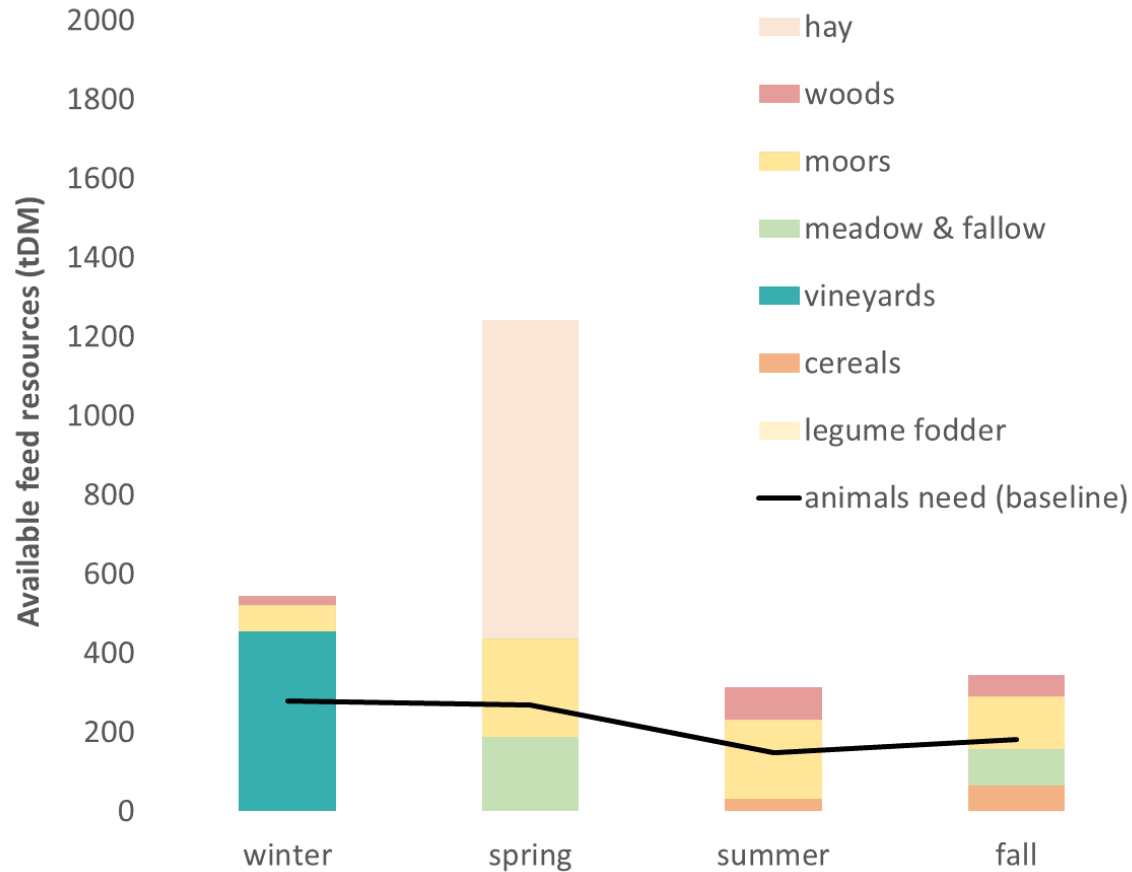


Grazing in vines and crop fields : arrangements between shepherds, wine-makers and arable farmers

Hay-making in crops fields: arrangements between breeders and arable farmers

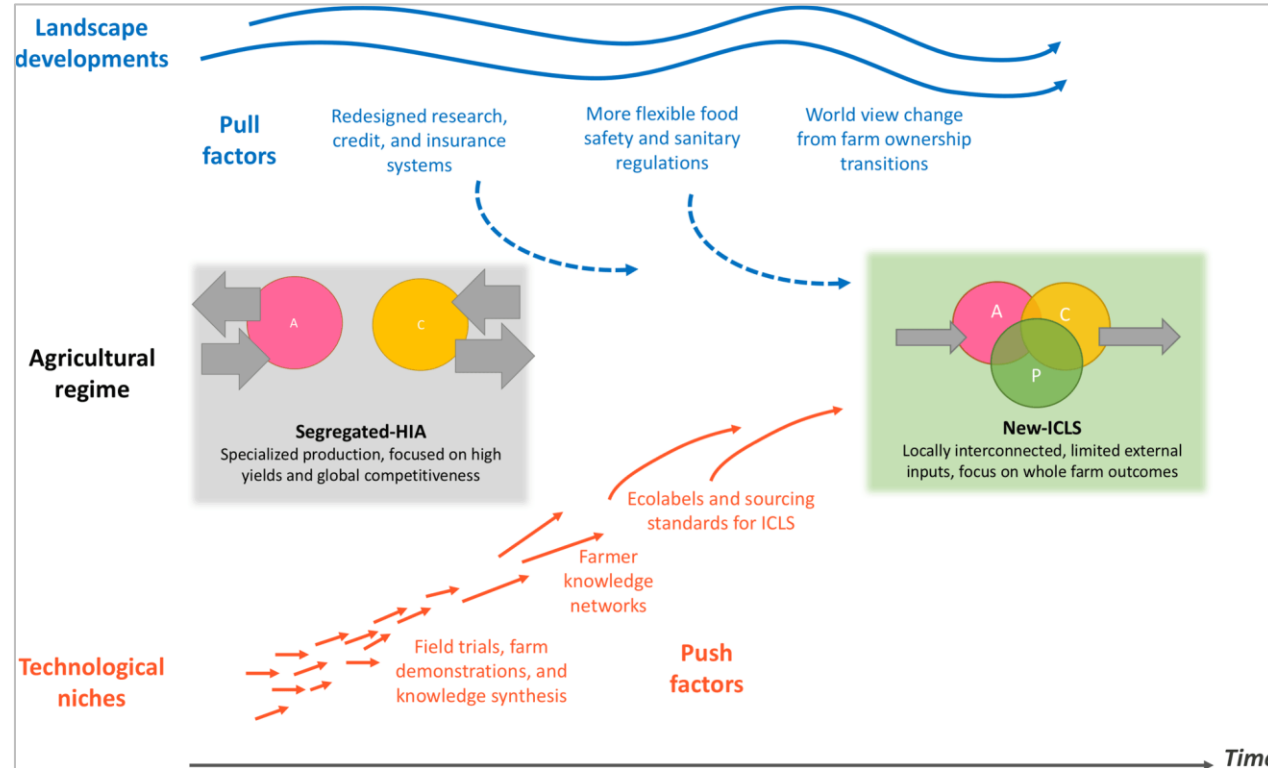


➤ An underestimated potential



- 3000 ha (20 % of the local agricultural area)
- A flock of 1000 ewes
- Availability of feed well beyond the flock requirements
- Diversity of feed resources → resilience to climate hazards
- Feed resources vary across seasons
- Successful implementation requires communication among farmers throughout the year and with other land users (hunters, open-air sport practitioners).

➤ Challenges linked to crop-pasture-livestock reconnection



Garrett et al., 2020

- Which combinations of crop-pasture-livestock according to local conditions?
- How to maximize low-opportunity cost feed in crop-pasture-livestock systems?
- Are there antagonisms among ecosystem services and with feed/food competition?
- Which prices and governance rules for farm-to-farm exchanges?
- How to best support this reconnection?

➤ Research avenues to using local feed resources

- Using local feed resources for livestock farming → real promises...
- ...and allowing the necessary diversification of cropping systems.
- Further research is needed to understand the interplay between biophysical, economic, legal, and organizational issues
- Interdisciplinary, participatory and multi-level research is needed to integrate the different sources and types of knowledge
- Policy measures are urgently needed to set the ground for these more circular systems



➤ Thank you for your attention



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