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Daniele Magda, Cyril Agreil, Laurent Hazard, Muriel Tichit, Daphné Durant, Anne Lauvie, Elisabeth Lécivain, Gilles Martel, Bénédicte Roche, Rodolphe Sabatier, et al.

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# Livestock farming systems and biodiversity : from trade-offs to synergies

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**SAD – Sciences  
for Action and Development Division**



ALIMENTATION  
AGRICULTURE  
ENVIRONNEMENT

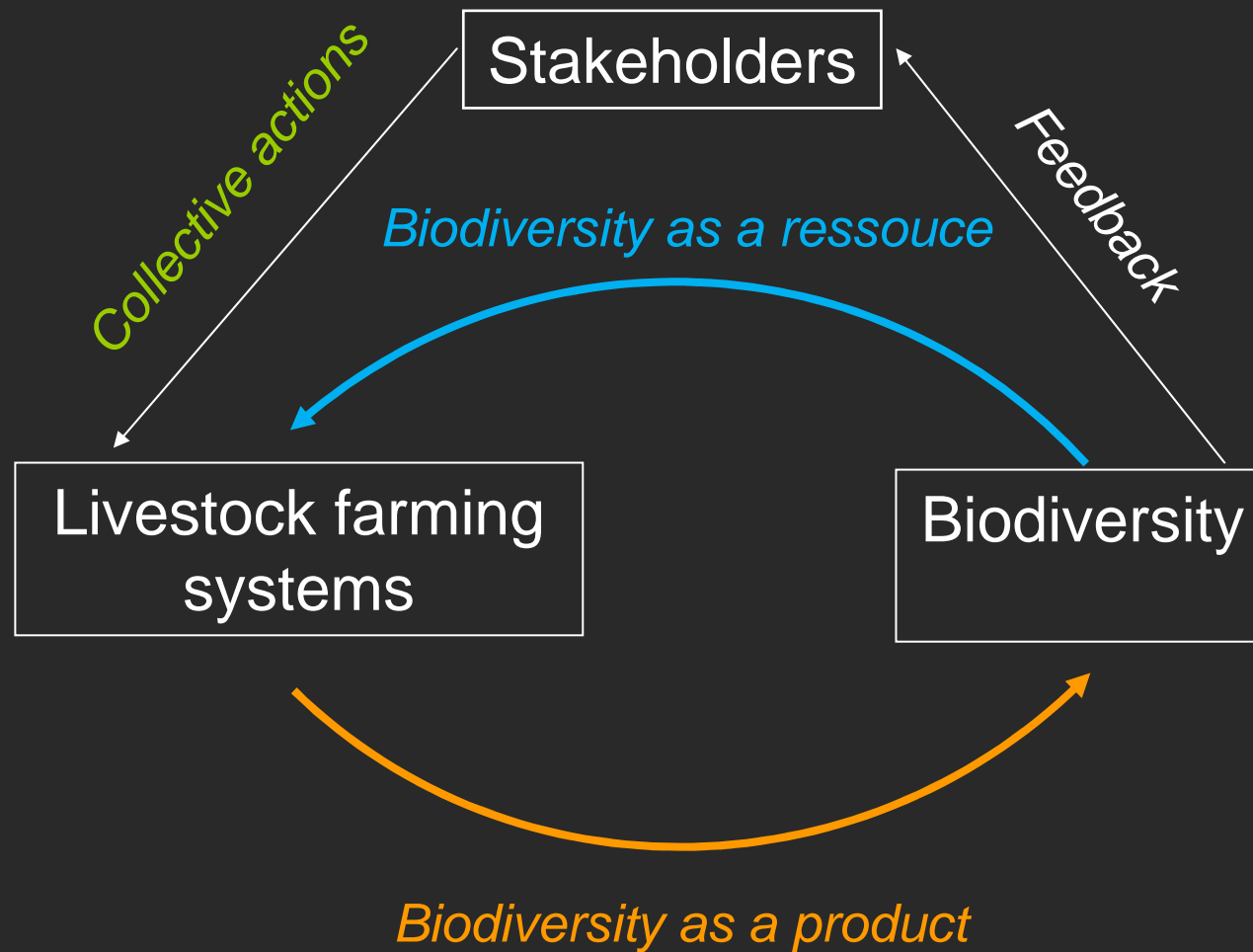
**INRA**

# Introduction

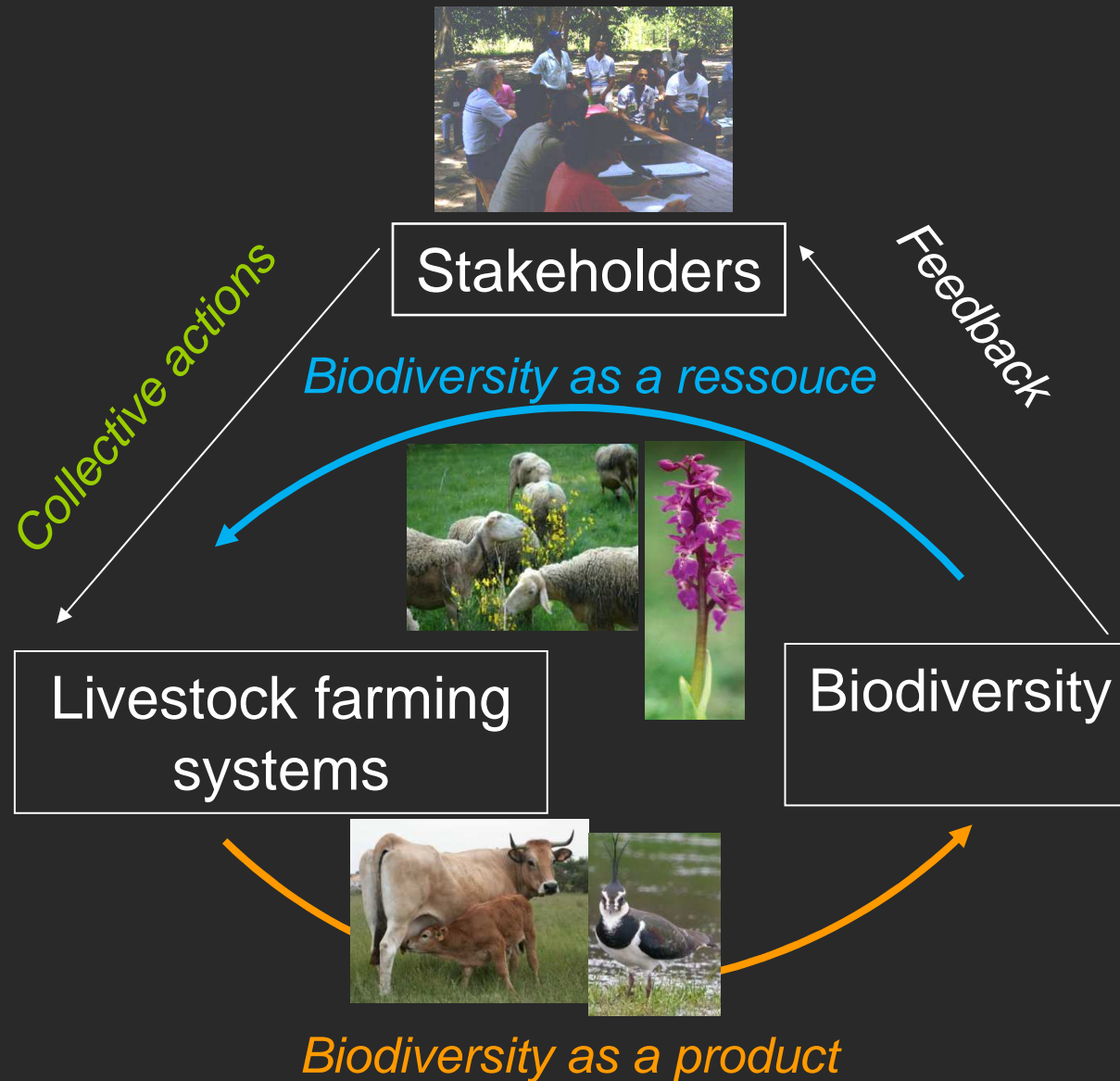
- Biodiversity back in productive systems (*Altieri & Nicholls 2005*)
- Farmers involved in the management of high nature value areas through agri-environment schemes (AES)
- Effectiveness of AES **still under debate** (*Kleijn 2006; Butler 2007*)
- A novelty : result-oriented schemes (*Klimek 2008; Verhulst 2007*)
  - managing **agroecological states**
  - necessity of **closer links** between production and ecological systems
  - but lack of knowledge to do so



# A new view to construct **functional** links between livestock production and biodiversity



# A new view to construct **functional** links between livestock production and biodiversity



# Case study 1–Tradeoffs between livestock production and bird biodiversity in grasslands

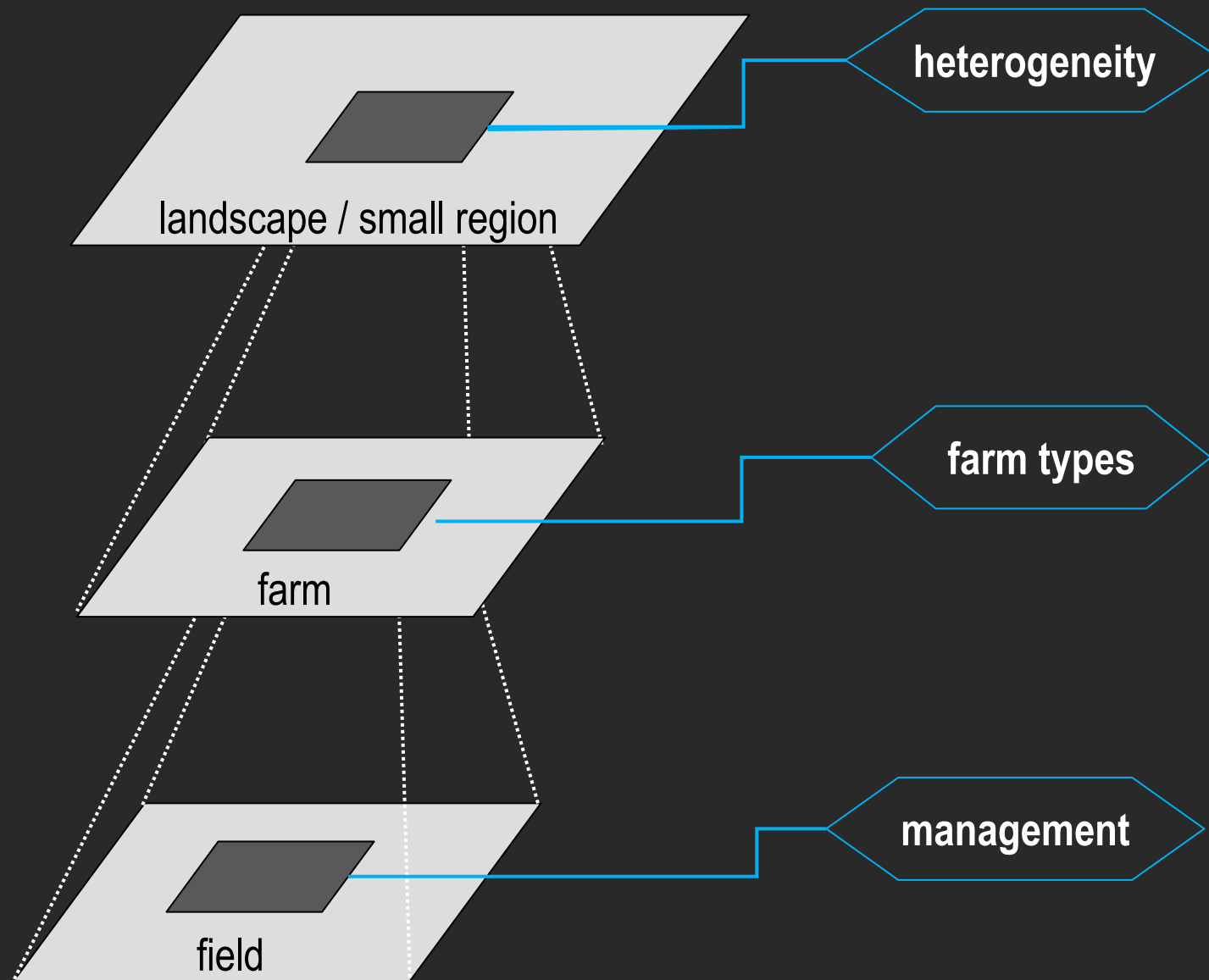


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# CS 1 - Multi-scale tradeoffs between livestock production and bird biodiversity in grasslands

Each level  
= a specific  
**driver** for  
tradeoffs



*Sabatier 2011*  
*Sabatier et al. 2010*  
*Tichit et al. 2007*

# CS1 – Diversity in management regimes plays an important role in tradeoffs



**Diversity =  
central  
mechanism**

Diversity  
**within  
farm**

*Martin et al. 2009*

Diversity  
**between  
fields**

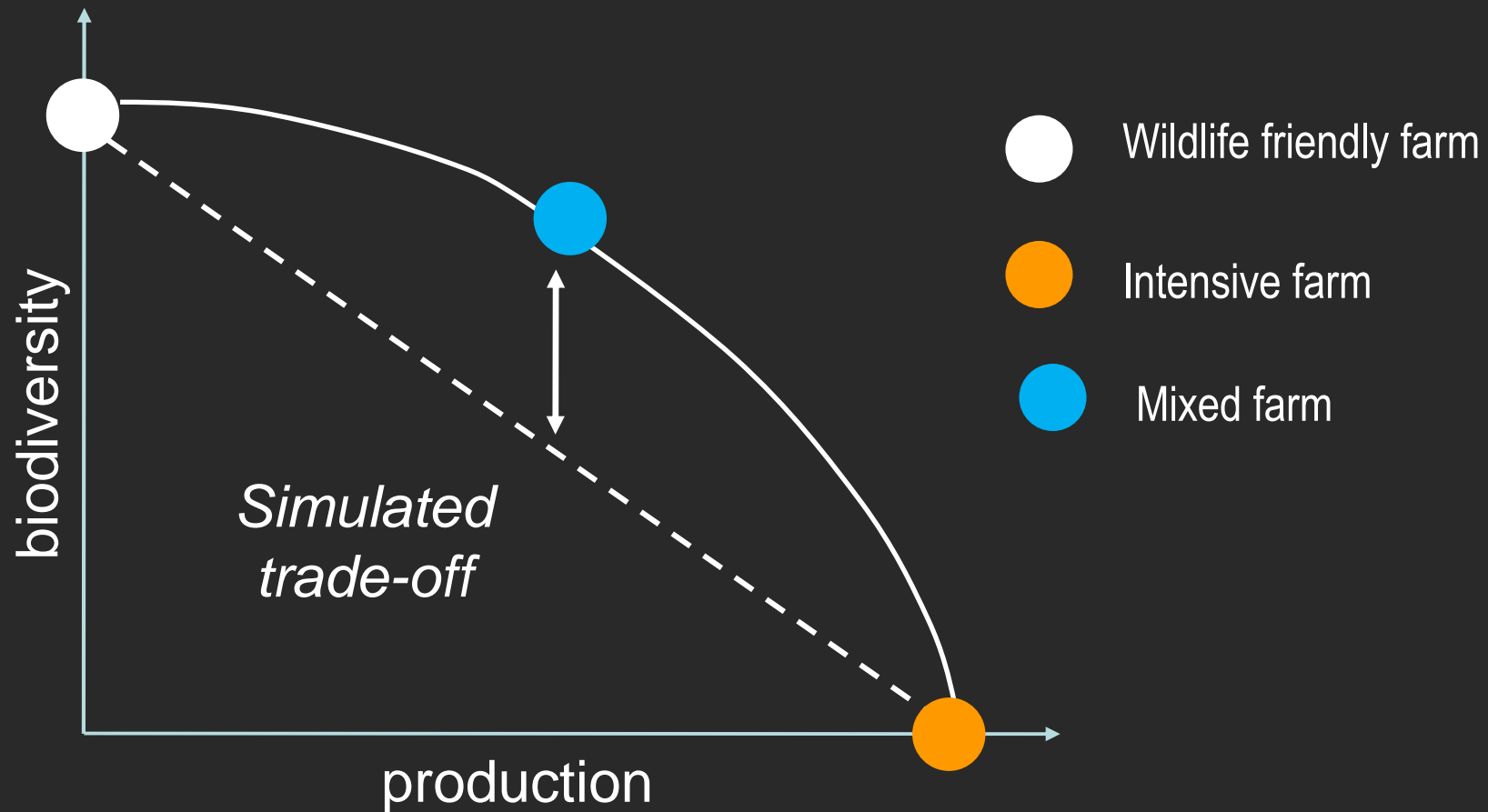
*Durant et al. 2008*

*Tichit et al. 2005*

Diversity  
**in time**

*Sabatier et al. 2010*

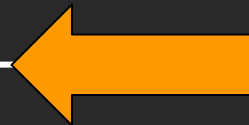
# CS1 – At farm level : importance of interactions among management regimes



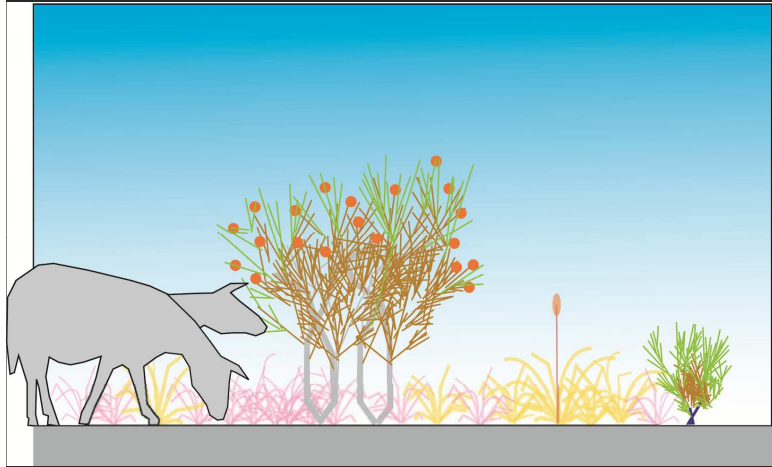
# Case study 2 – Rangeland biodiversity as a resource for animal production



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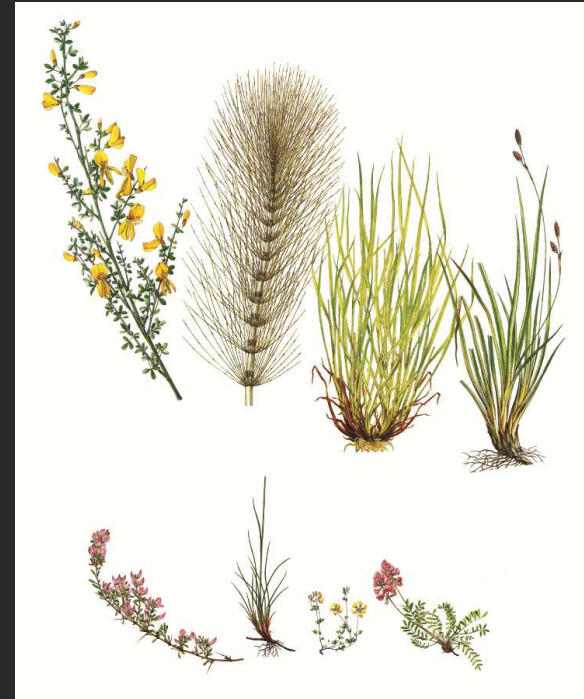
# CS 2 – Defining functional biodiversity from feeding behaviour



Animal **valorises** the diversity !

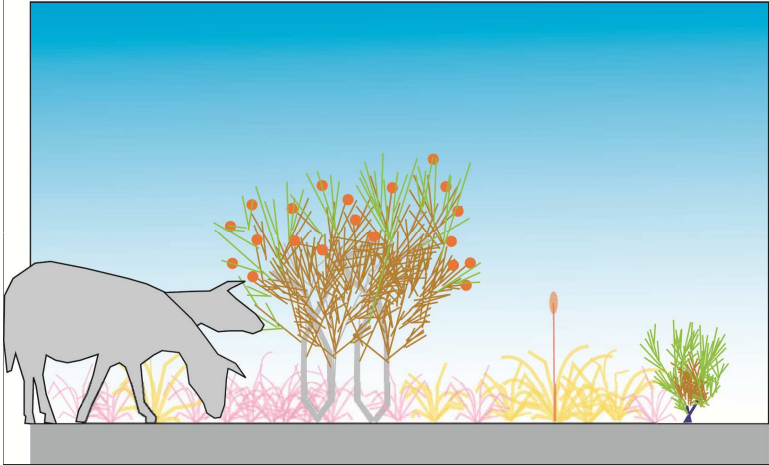
*Agreil et al. 2005*

Resource = diversity of **feed items**



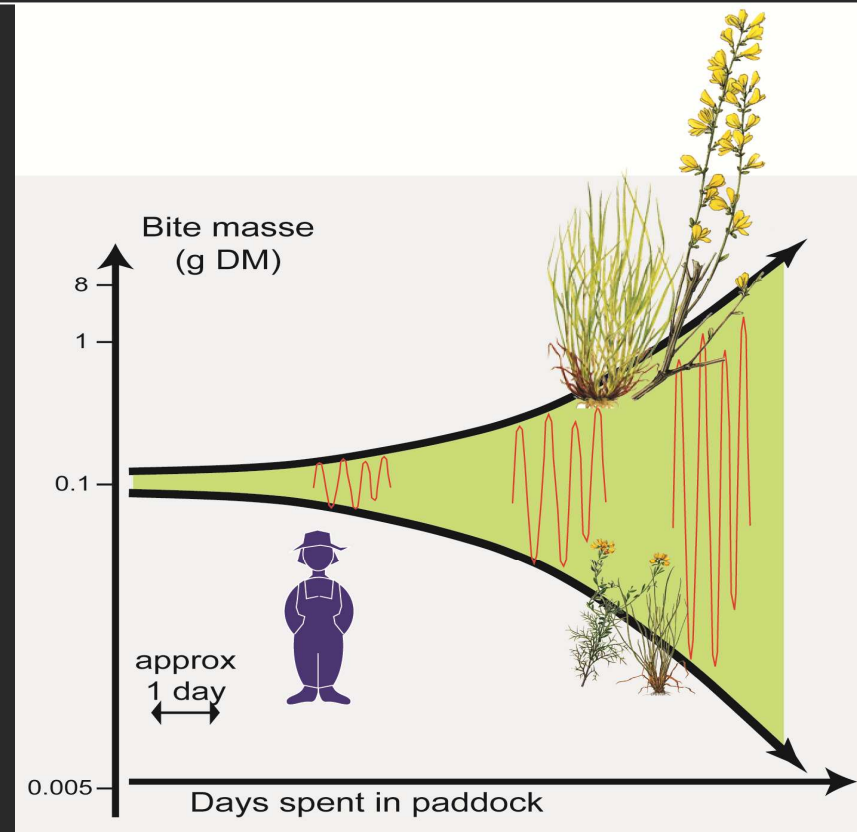
**Functional** diversity  $\neq$  specific diversity

# CS 2 – Defining functional biodiversity from feeding behaviour



Feeding behaviour is  
**adaptive**

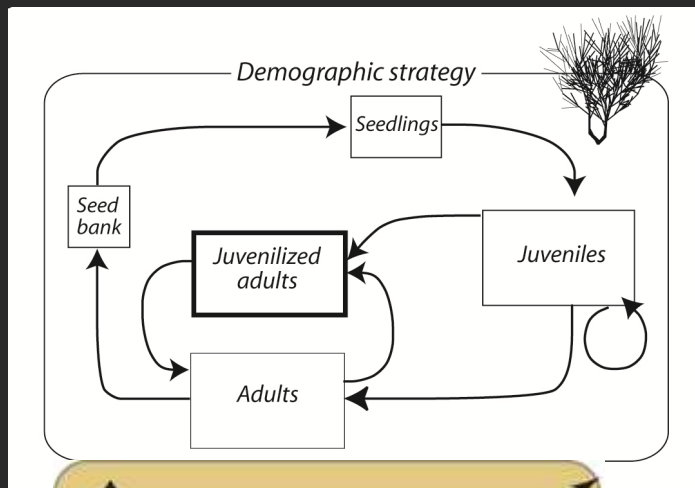
*Agreil et al. 2008*



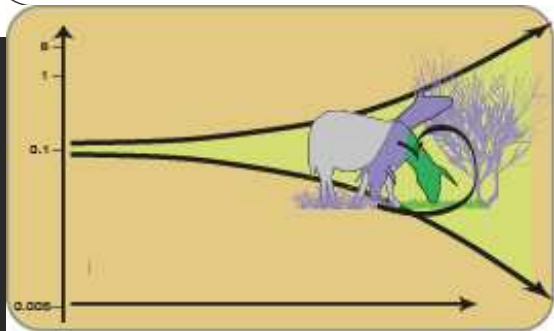
The feeding choice of the  
animal **changes over time**

# CS 2 – Understand the role of grazing on dominant shrub to manage biodiversity

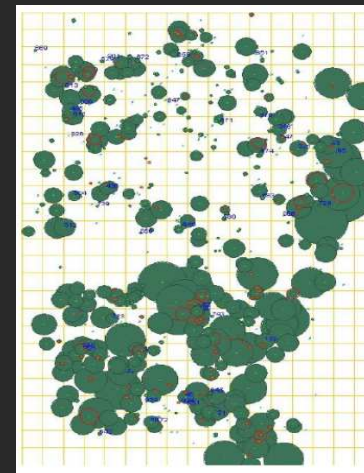
Demographic strategy of shrub gives the **target** stage to be grazed



Regulation of population dominance by managing **links** between feeding behaviour and population **process**



*Magda et al., 2010*  
*Pontes et al., 2010*



# Case study 3 – Domestic biodiversity as product and resource for livestock production

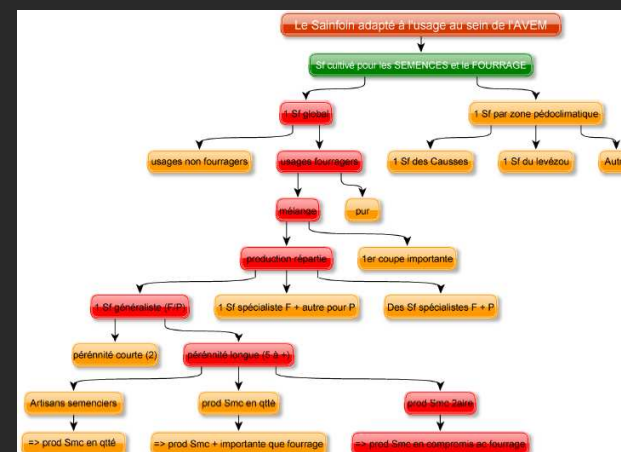
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# Case study 3 – Domestic biodiversity as product and resource for livestock production

Creation of «**houses of seeds**» for **local** genetic resources conservation:

- seed exchanges and quality control,
- participatory plant breeding,
- social learning network.



Design workshop  
to create forage ideotypes



# Perspectives and Challenges

- Back to **complexity** and **uncertainty**
- Adaptative management as a relevant framework to design agroecological production schemes :
  - Production with ecological dynamics as **a learning process**
  - local definition of technical references
- New scientific challenges
  - understand **interactions** between production and ecological **processes**
  - provide **innovative** tools to support stakeholders actions
  - articulate scientific and **empirical knowledge**

*THANKS FOR YOUR ATTENTION*

