



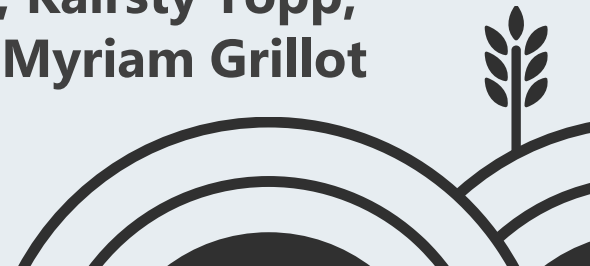
MIXED

EFFICIENT AND RESILIENT
MIXED FARMING & AGROFORESTRY

Analysing farmer biomass, product, labour and land exchanges in a range of European landscapes

Francesco Accatino; Claire Triolet, Tommy Dalgaard, Camelia Gavrilesco, Jacqueline Leonte, Miranda Meuwissen, Carolina Ramos, Asbjørn Mølmer Sahlholdt, Marie Trydeman Knudsen, Kairsty Topp, Monica M. Tudor, Christine Watson, Fergus Younger, Myriam Grillot

INRAE





mixedness



MIXED
FARMING &
AGROFORESTRY SYSTEMS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862357





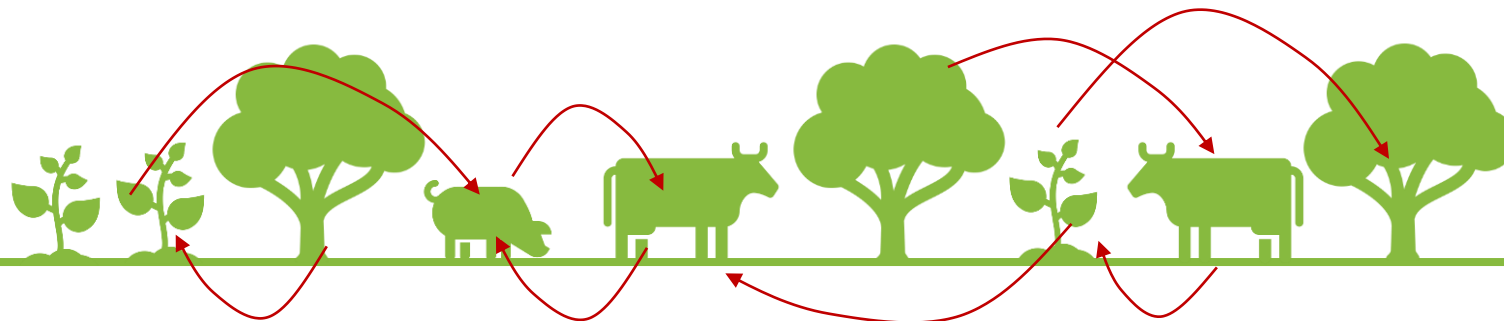
DIVERSITY

(of activities)



mixedness





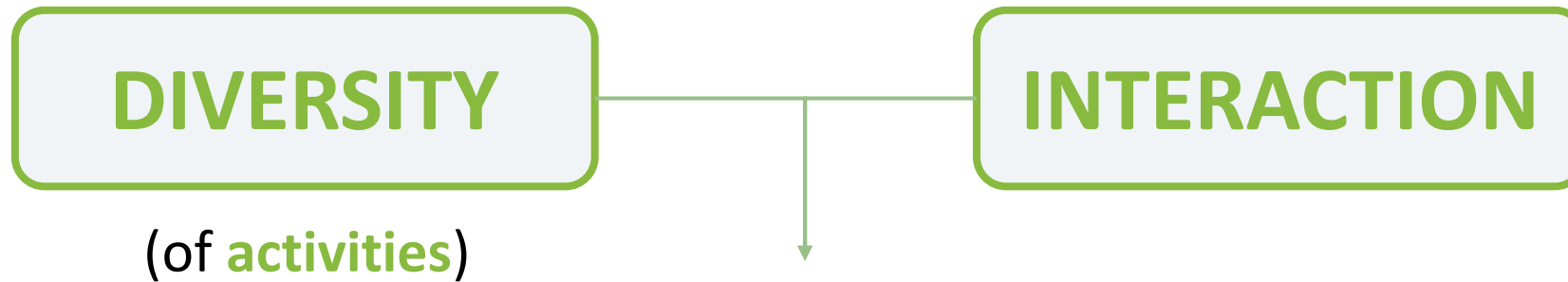
DIVERSITY

(of activities)

INTERACTION

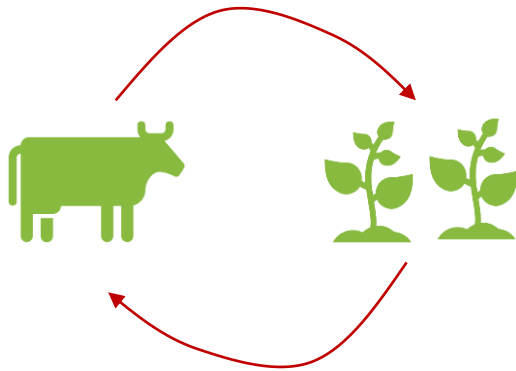
mixedness

- Closing the nutrient cycle (**circularity**)
- Provision of **ecosystem services**



mixedness

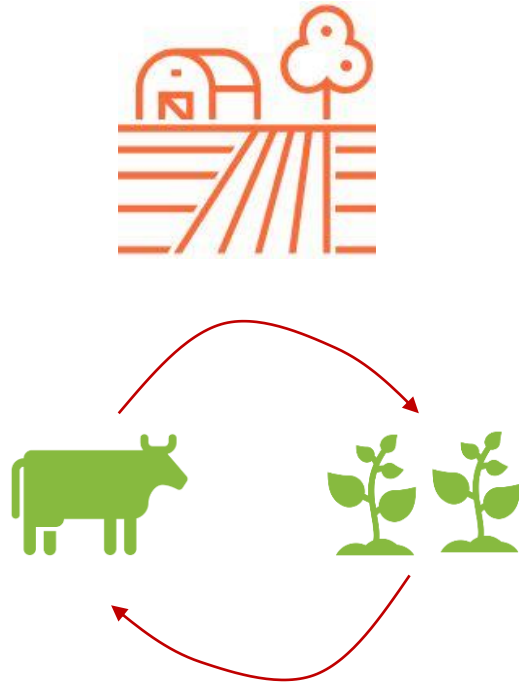
FARM



- Practices
- Mindset

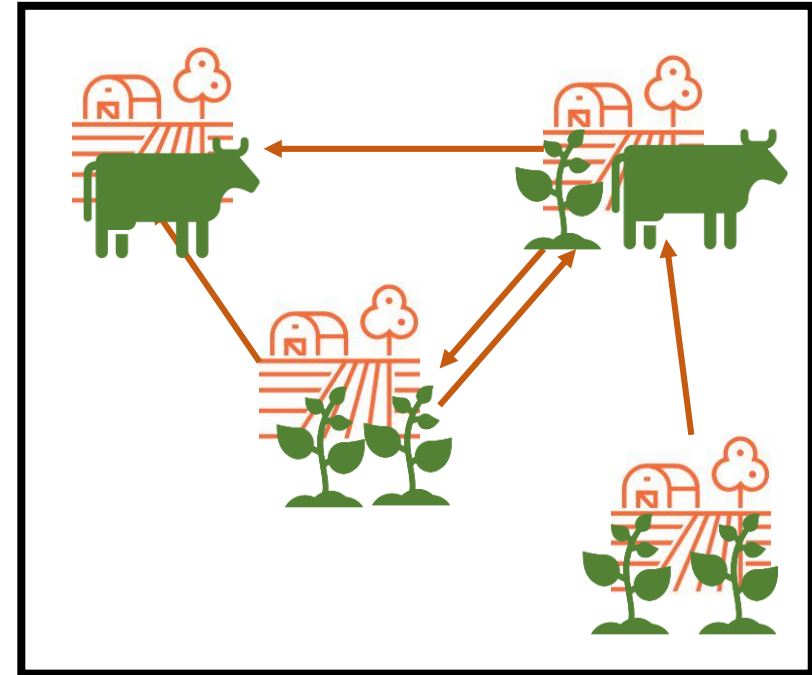
LANDSCAPE

FARM

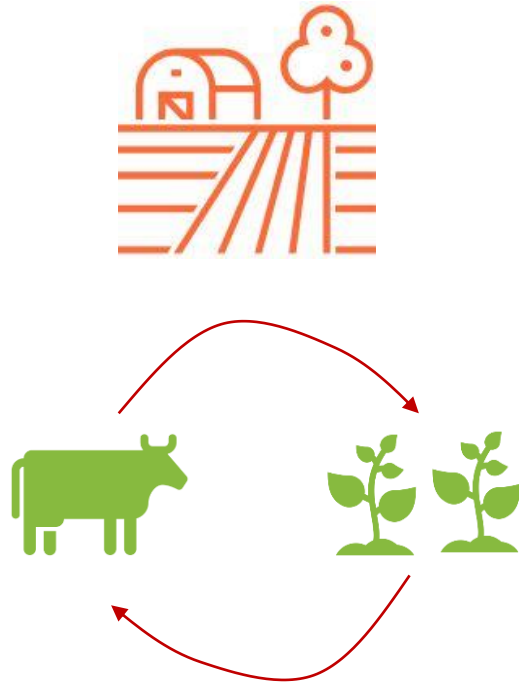


- Practices
- Mindset

LANDSCAPE

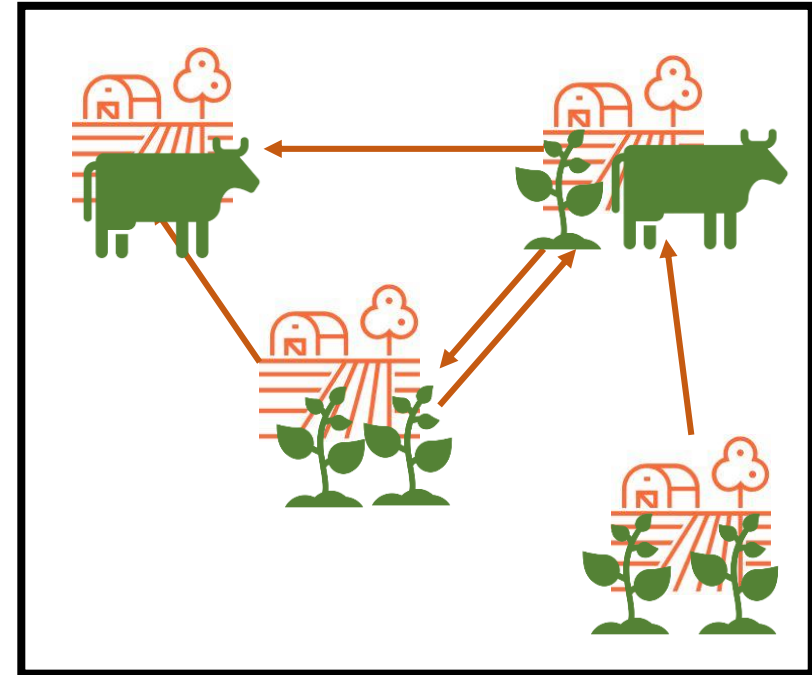


FARM



- Practices
- Mindset

LANDSCAPE

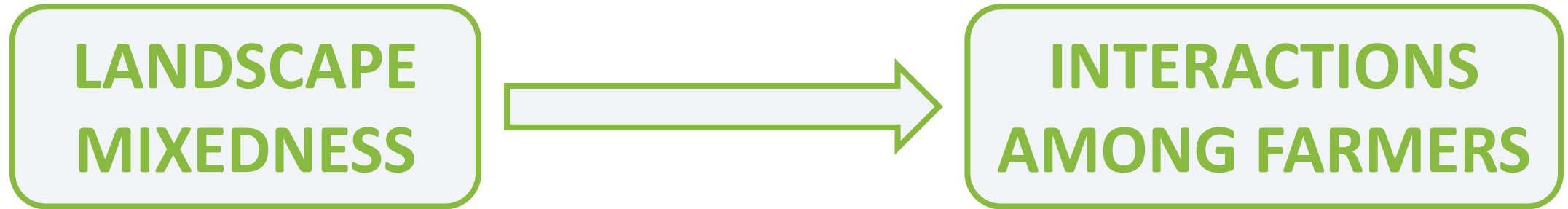


INTERACTIONS

RESEARCH QUESTION(S)

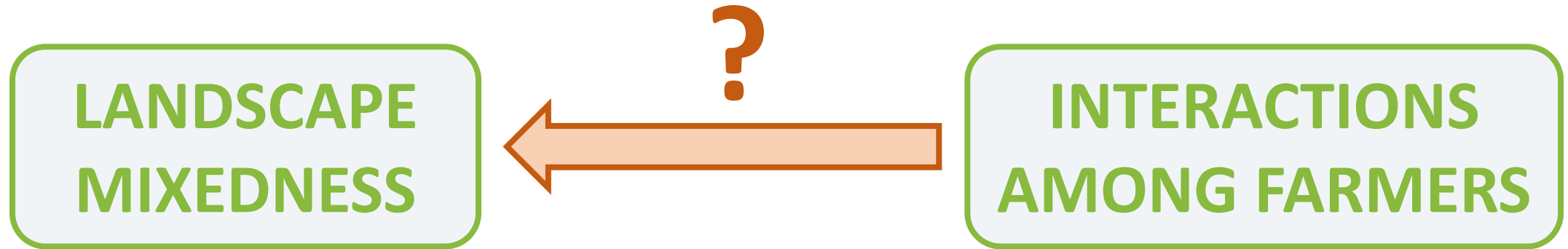


RESEARCH QUESTION(S)



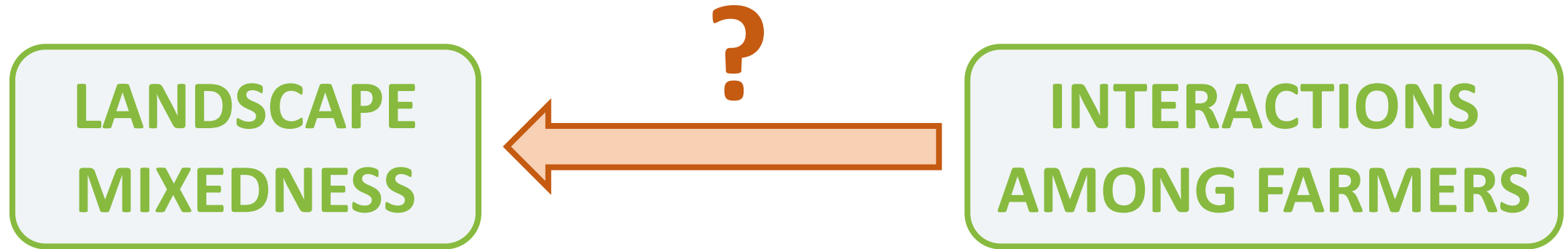
- How to **characterize interactions** among farmers?

RESEARCH QUESTION(S)



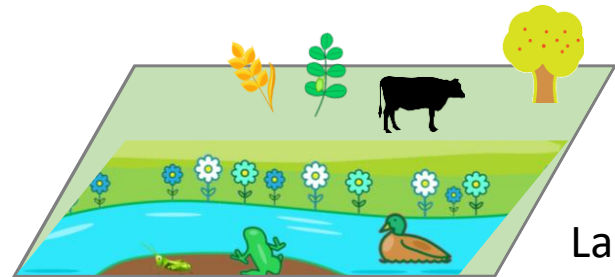
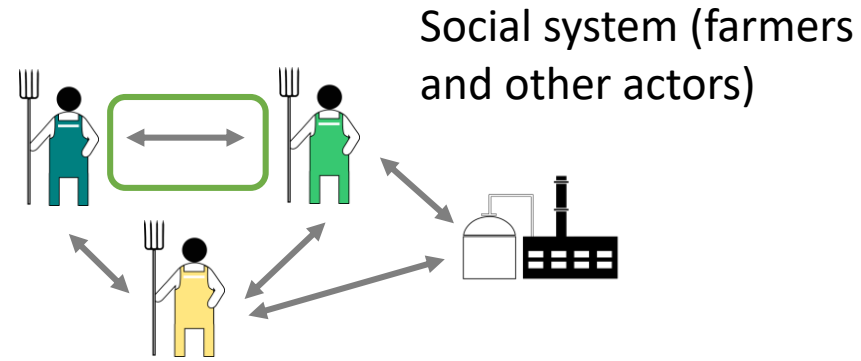
- How to **characterize interactions** among farmers?
- Can we discuss if and how the types of interactions **leading to “mixedness”**?

RESEARCH QUESTION(S)



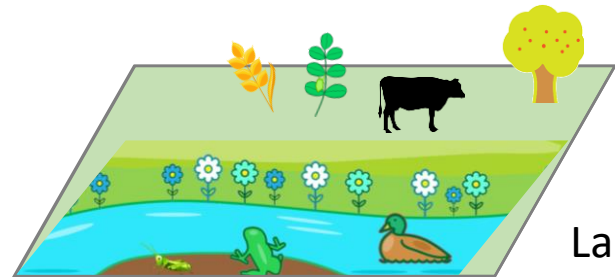
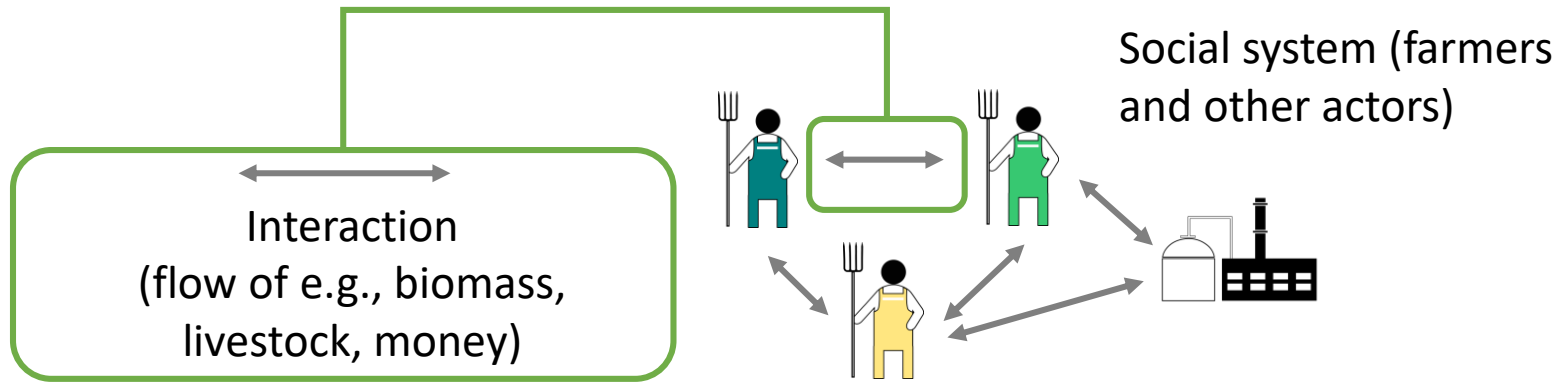
- How to **characterize interactions** among farmers?
- Can we discuss if and how the types of interactions **leading to “mixedness”**?
- **Levers** for facilitating interactions?

LET'S (TRY TO) DEFINE INTERACTIONS FOR MIXEDNESS



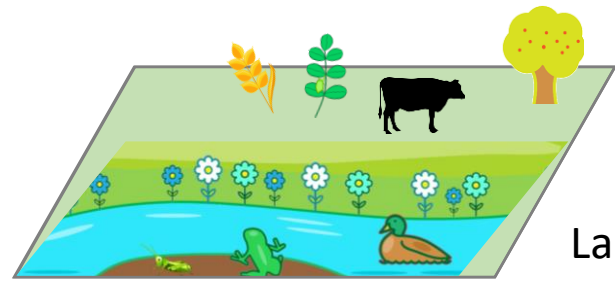
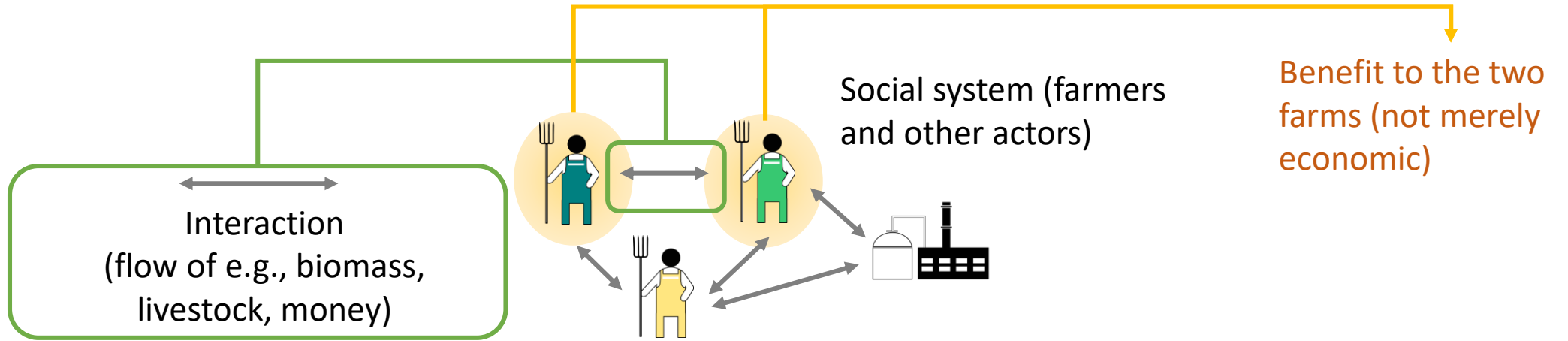
Landscape:
Farmland and ecological system

LET'S (TRY TO) DEFINE INTERACTIONS FOR MIXEDNESS



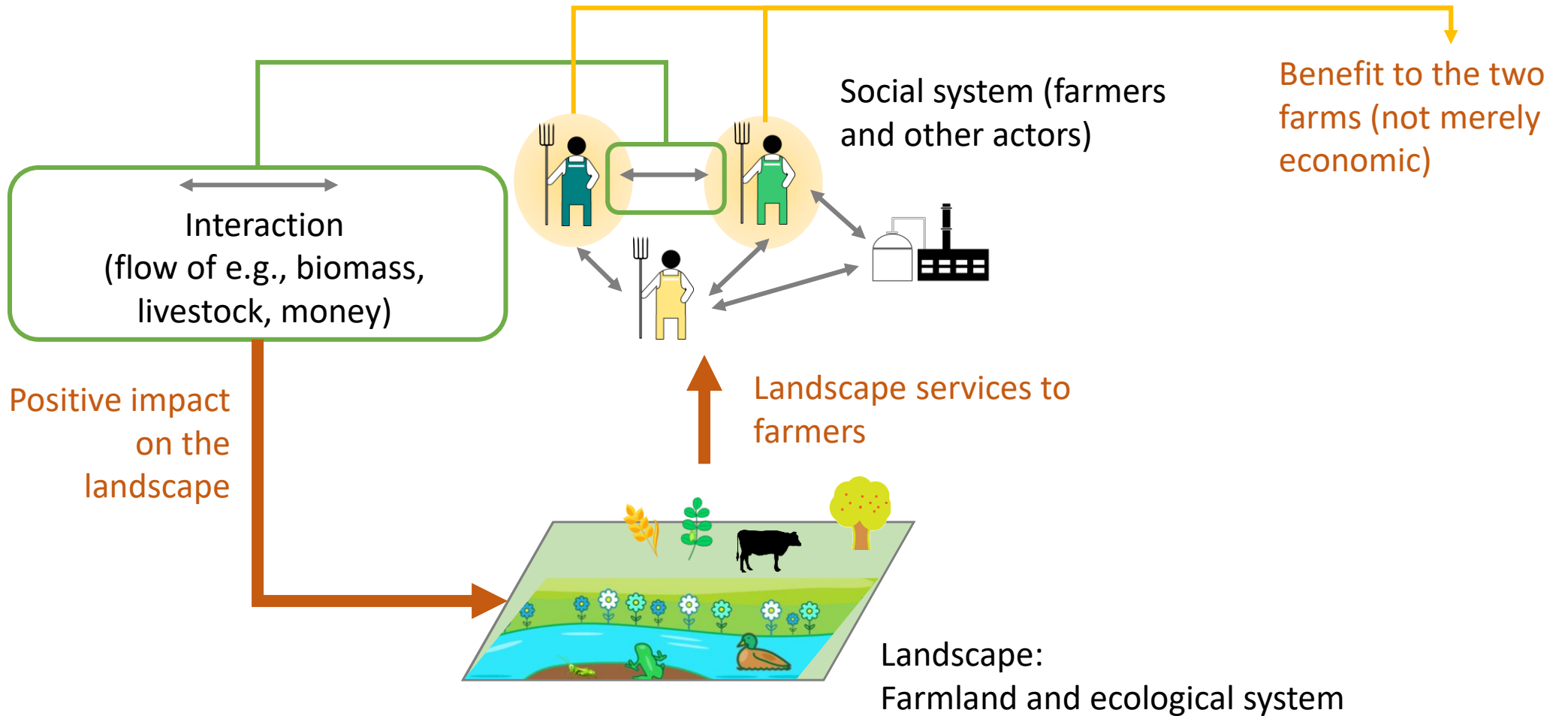
Landscape:
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LET'S (TRY TO) DEFINE INTERACTIONS FOR MIXEDNESS



Landscape:
Farmland and ecological system

LET'S (TRY TO) DEFINE INTERACTIONS FOR MIXEDNESS



CASE STUDIES

UK

- sheep grazing on cover crops
- straw – manure exchanges



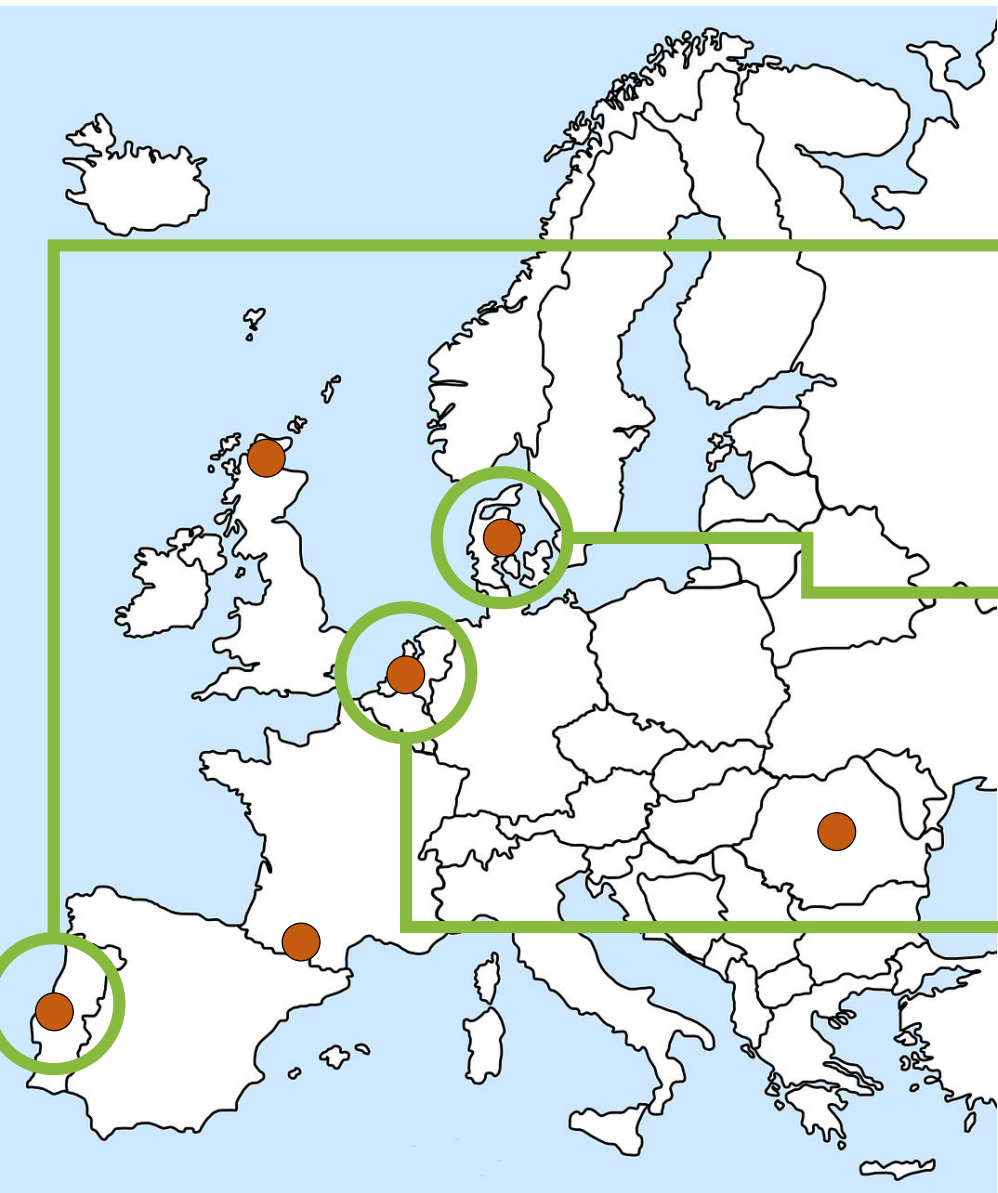
FR

- Feed vs manure exchanges, geographical separation between breeders and cereal farmers

RO

- Mixed farms with agrotourism facilities

CASE STUDIES



PT

- Montado systems (trees + pasture)



DK

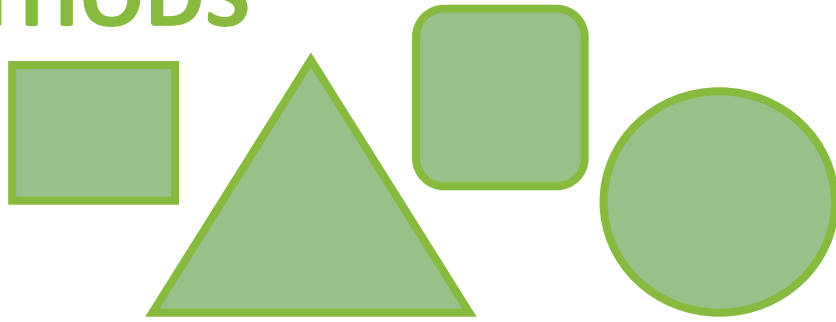
- Specialized farms with a biogas plant

NL

- Dairy and crop farmers
- Land exchanges for optimizing rotations



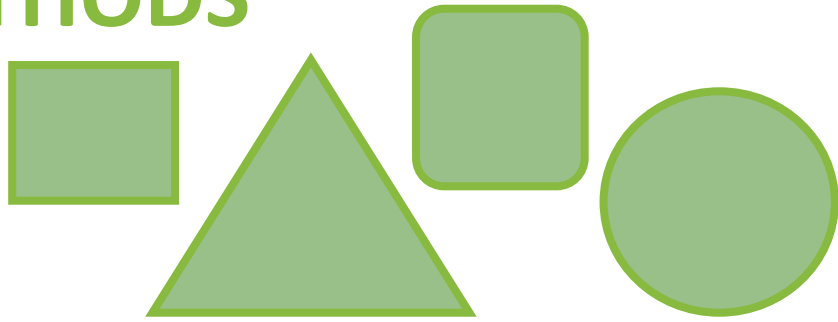
METHODS



Information was collected with **different methodologies** in the different case studies, and then **harmonized**



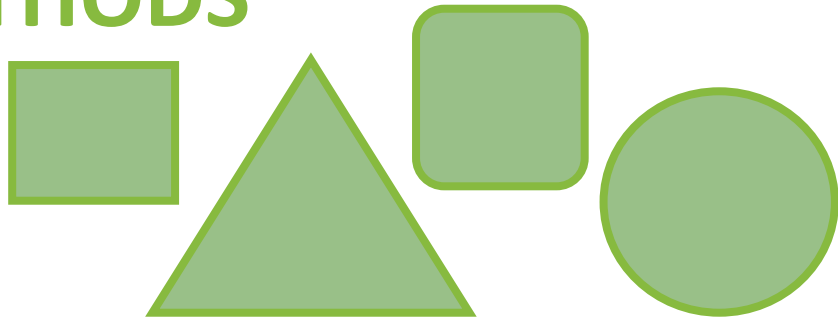
METHODS



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Interaction ID	Actor A	Actor B	Good or service from A to B	Good or service from B to A	Benefit for A	Benefit for B	Landscape benefit
FR_1/1	Ruminant farmer	Cereal farmer					

METHODS

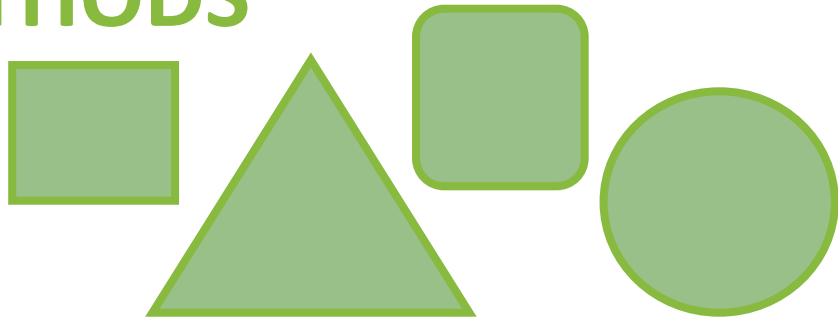


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METHODS

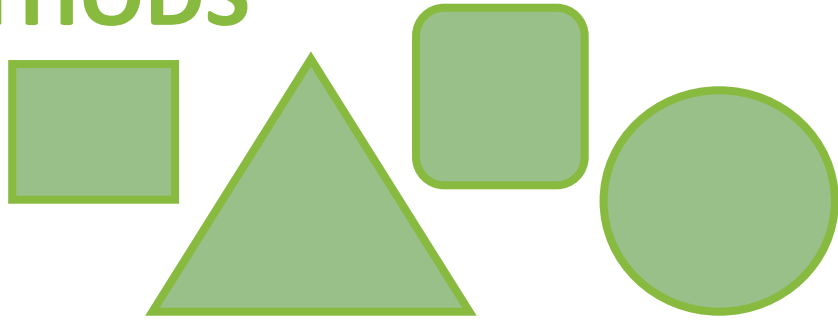


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RESULTS

FEED/STRAW vs MANURE EXCHANGES

FLUXES OF LIVESTOCK

BIOGAS PLANT

LAND EXCHANGES

PRODUCTS EXCHANGES

FEED/STRAW vs MANURE EXCHANGES

Interaction ID	Actor A	Actor B	Good or service from A to B	Good or service from B to A	Benefit for A	Benefit for B	Landscape benefit
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NL_2/1	Dairy farmer	Arable farmer	Manure	Feed			
UK_1/1	Sheep/beef farmer	Arable farmer	Manure	Straw			

FLUXES OF LIVESTOCK

Interaction ID	Actor A	Actor B	Good or service from A to B	Good or service from B to A	Benefit for A	Benefit for B	Landscape benefit
PT_1/1	Montado farmer	Pig farmer (from outside the network)	Acorns, grazing area	Pigs, money	Gross margin, improved pasture conditions, reduced need for fertilizer	Improved animal welfare, feed of better quality	Improved nutrient circularity (?)
PT_1/2	Orchard /vineyard farmer	Sheep farmer (from outside the network)	Grazing area	Sheep, money	Gross margin, weed control	Improved animal welfare, feed of better quality	Improved nutrient circularity (?)
RO_1/1	Sheep farmer	Sheep herder	Money	Specialized work	Animal welfare, improved nutrition for sheep	Gross margin, cheese	Pasture maintainance
UK_1/2	Sheep farmer	Sheep	Ruminants	Winter cereals / cover crops	Animal welfare, reduced need fo buying feed	Pasture maintainance, improved soil fertility	Improved nutrient circularity

BIOGAS PLANT

Interaction ID	Actor A	Actor B	Good or service from A to B	Good or service from B to A	Benefit for A	Benefit for B	Landscape benefit
DK_1/1	Specialized livestock farmer	Biogas plant	Manure, money	Digestate	Reduced synthetic fertilizer, improved soil conditions,	Gross margin	Improved nutrient circularity, higher nutrient efficiency

Some farms pay for receiving more digestate than equivalent to the manure they sent: this leads to **indirect interactions** among farmers mediated by the biogas plant, leading to a **nitrogen re-distribution** in the region.

LAND EXCHANGES

Interaction ID	Actor A	Actor B	Good or service from A to B	Good or service from B to A	Benefit for A	Benefit for B	Landscape benefit
NL_1/1	Arable farmer	Arable farmer	Land	Land	Improved rotation and production of more rentable crops	Improved rotation and production of more rentable crops	Increased production

PRODUCTS EXCHANGES

Interaction ID	Actor A	Actor B	Good or service from A to B	Good or service from B to A	Benefit for A	Benefit for B	Landscape benefit
RO_1/2	Farmer / agrotourism facility	Farmer / agrotourism facility	Dairy products, fruits, manure, calves	Dairy products, fruits, manure, calves	Service diversification, self-sustainment	Service diversification, self-sustainment	Regional development, employment creation

Farms are **already mixed**, exchanges of products are needed to help each other in diversification

CONSIDERATIONS

FEED/STRAW vs MANURE EXCHANGES

FLUXES OF LIVESTOCK

BIOGAS PLANT

LAND EXCHANGES

PRODUCTS EXCHANGES

Theoretically leads to nutrient recycling and internal redistribution.

However, quantification is needed

CONSIDERATIONS

FEED/STRAW vs MANURE EXCHANGES

FLUXES OF LIVESTOCK

BIOGAS PLANT

LAND EXCHANGES

PRODUCTS EXCHANGES

Ecosystem services due to animal grazing in other systems (pastures, vineyards...).

However it depends on the practices and how far livestock are sent.

CONSIDERATIONS

FEED/STRAW vs MANURE EXCHANGES

FLUXES OF LIVESTOCK

BIOGAS PLANT

LAND EXCHANGES

PRODUCTS EXCHANGES

Resilience can be weak as it depends on the prices set by the biogas plant

CONSIDERATIONS

FEED/STRAW vs MANURE EXCHANGES

FLUXES OF LIVESTOCK

BIOGAS PLANT

LAND EXCHANGES

PRODUCTS EXCHANGES

Mostly focused on the **provisioning services and economic**, not necessarily positive for other ecosystem services.

CONSIDERATIONS

FEED/STRAW vs MANURE EXCHANGES

FLUXES OF LIVESTOCK

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LAND EXCHANGES

PRODUCTS EXCHANGES

Mostly focused on
economics...

CONSIDERATIONS

Many interactions are informal and often not accounted for in policies

Cooperatives and advisors can play a role if specialized on interactions and not on individual farmers

In some case studies, **formal agreements** among farmers are desired

For a better classification of interaction, **quantification and modelling** can help



THANKS FOR YOUR ATTENTION

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THANK YOU!



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