PhD defense
Anton Riera

2nd March 2026

Unpacking food system transitions across multiple scales

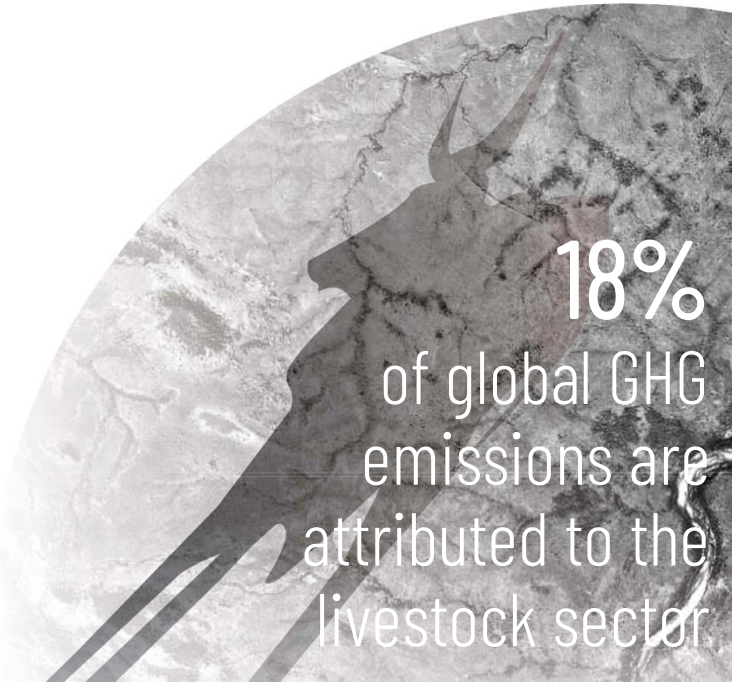
The Belgian livestock sector

SYTRA

UCLouvain

livestock's long shadow
environmental issues and options

From the United Nations...



Steinfeld et al. 2006

... to supermarkets...

...to EU policymaking...

Unpacking food system transitions across multiple scales

The Belgian livestock sector

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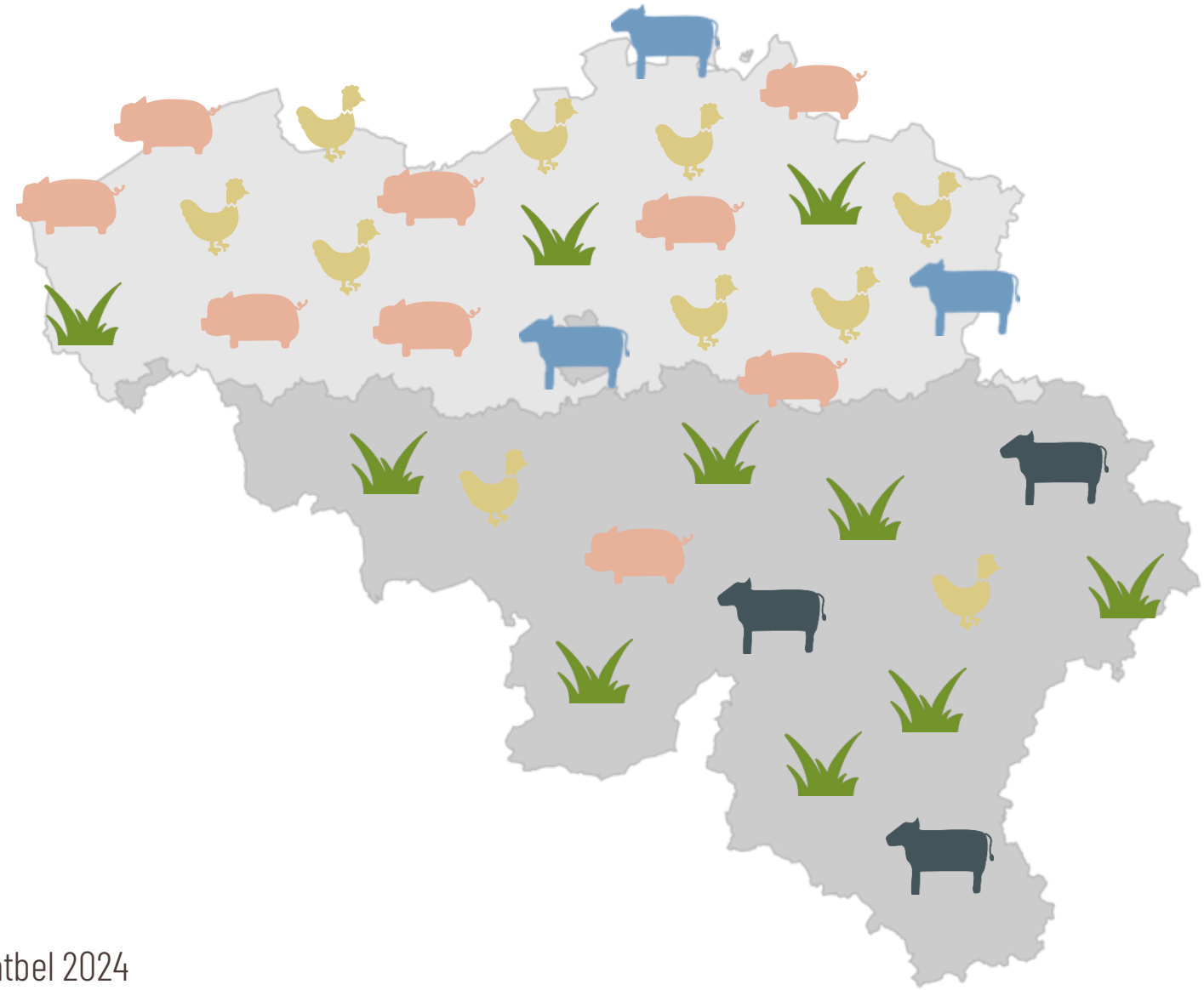
Unpacking food system transitions across multiple scales
The Belgian livestock sector

Flanders - Wallonia: spot the differences



Flanders hosts

94% of pigs

85% of chickens

65% of dairy cows

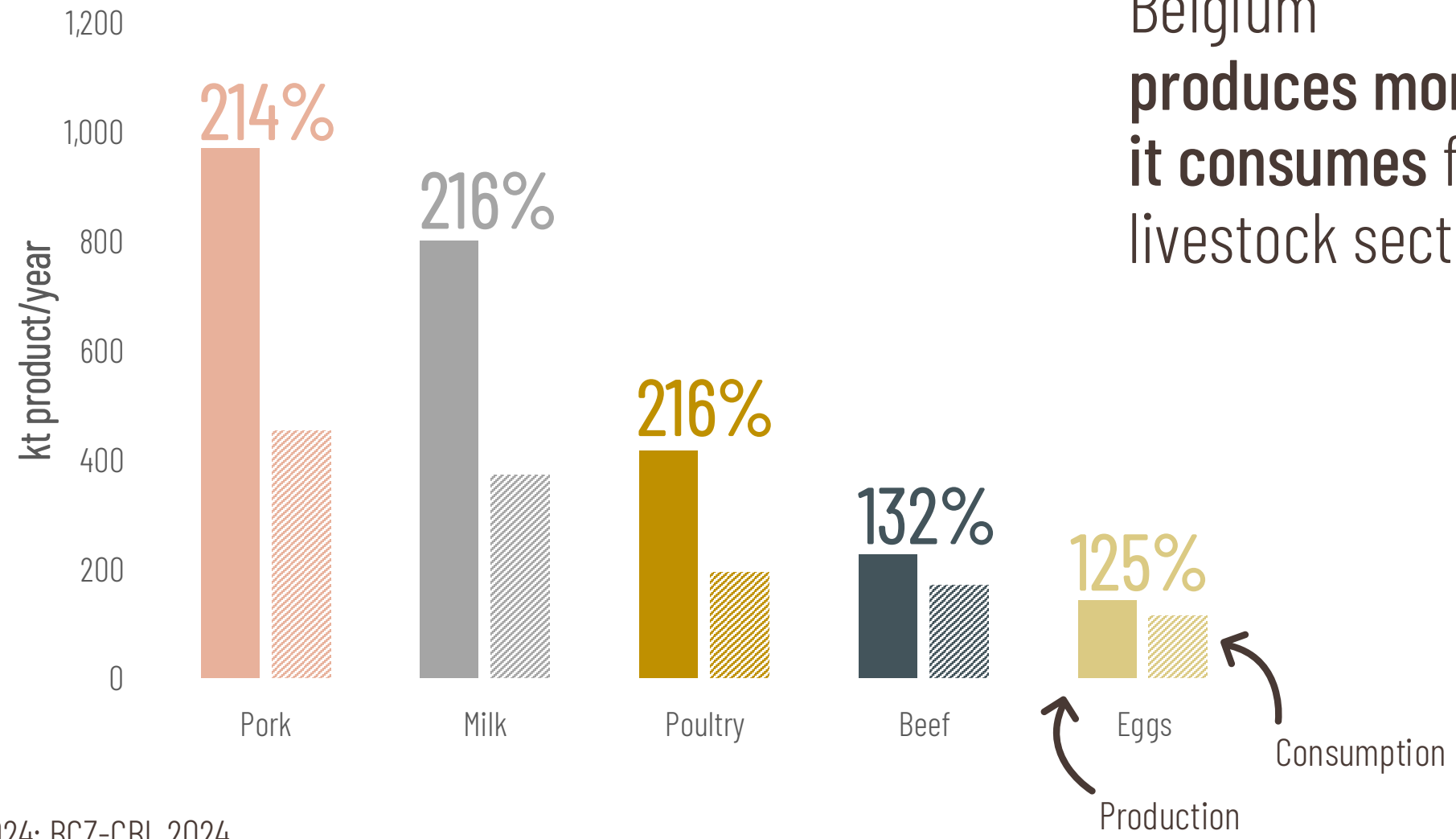
Wallonia hosts

60% of suckler cows

65% of grasslands

Statbel 2024

Belgium is an exporting country



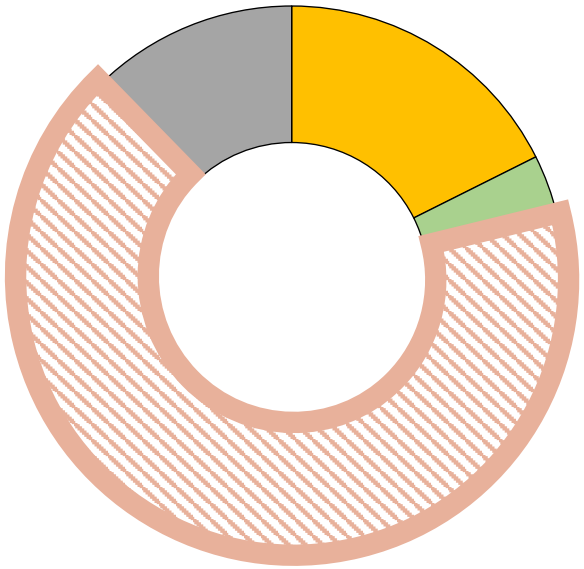
Belgium
produces more than it consumes for all livestock sectors

Statbel 2014, 2024; BCZ-CBL 2024

Consumption of animal products

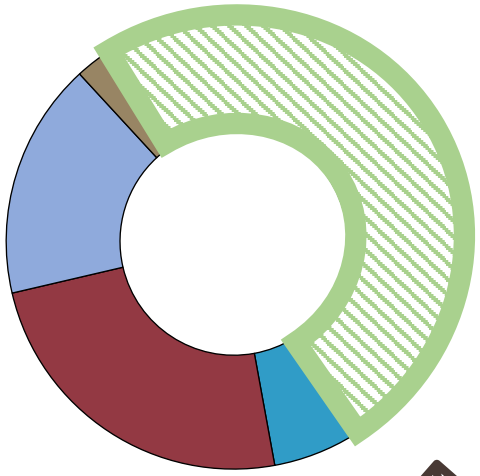
Current diets show an **overconsumption of total and animal** protein

Average Belgian diet



From 60:40 ...

Belgian nutritional recommendations



to 50:50

g protein/cap/day

- Cereals
- Fruits & vegetables
- Legumes
- Fish
- Meat
- Dairy
- Eggs
- Other plant-based products

Sciensano 2016 ; CSS 2019

The Belgian livestock sector faces sustainability challenges

GHG emissions : 74% of Belgium's agricultural GHG emissions are attributed to livestock sectors.

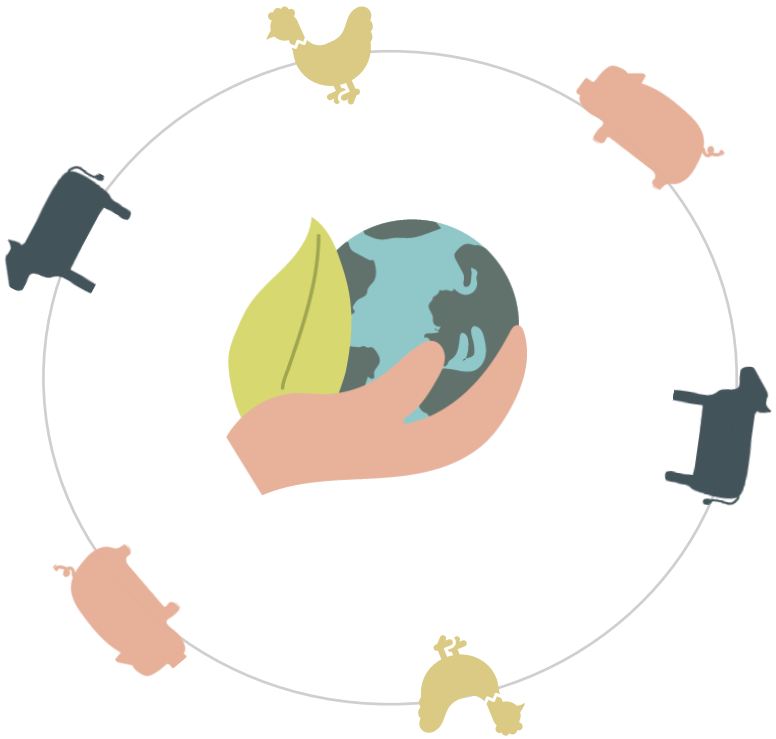
Nitrogen emissions : Overproduction of animal manure impacts water resources and biodiversity, especially in high animal density areas *(Flanders)*.

The Belgian livestock sector faces sustainability challenges

Landscape preservation : Grasslands are important for agricultural biodiversity but are decreasing *(Wallonia)*.

Socio-economic challenges : Health and nutrition ; low farmer incomes & subsidy dependence ; export-orientation vs. world market competition …

The Belgian livestock sector : conclusion



The Belgian livestock sector faces multiple challenges...

A **transition** towards more sustainability is needed.

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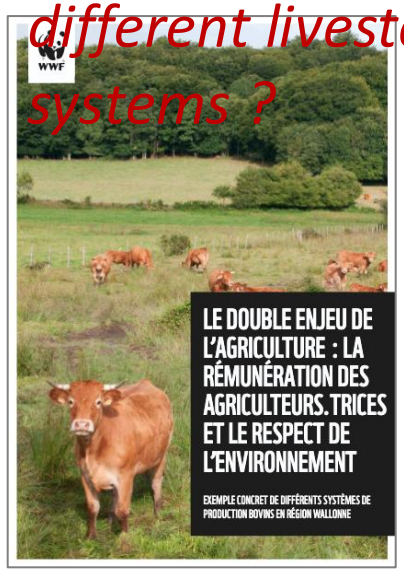
Unpacking food system transitions across multiple scales The Belgian livestock sector

Research questions

Analysing the the Belgian livestock transition … across multiple scales

What are the sustainability performances of different livestock systems ?



2020

What are possible options for the livestock transition and how do they compare ?

2019

How can we progress towards an implementation of the transition ?

2024

Sustainability of livestock systems in Wallonia

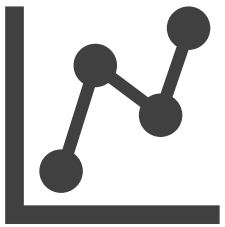
Scope of the case study

Dairy systems

Beef breeding systems

Wallonia
(Southern Belgium)

Dairy sector : 290 farm observations
Beef breeding sector : 216 farm observations

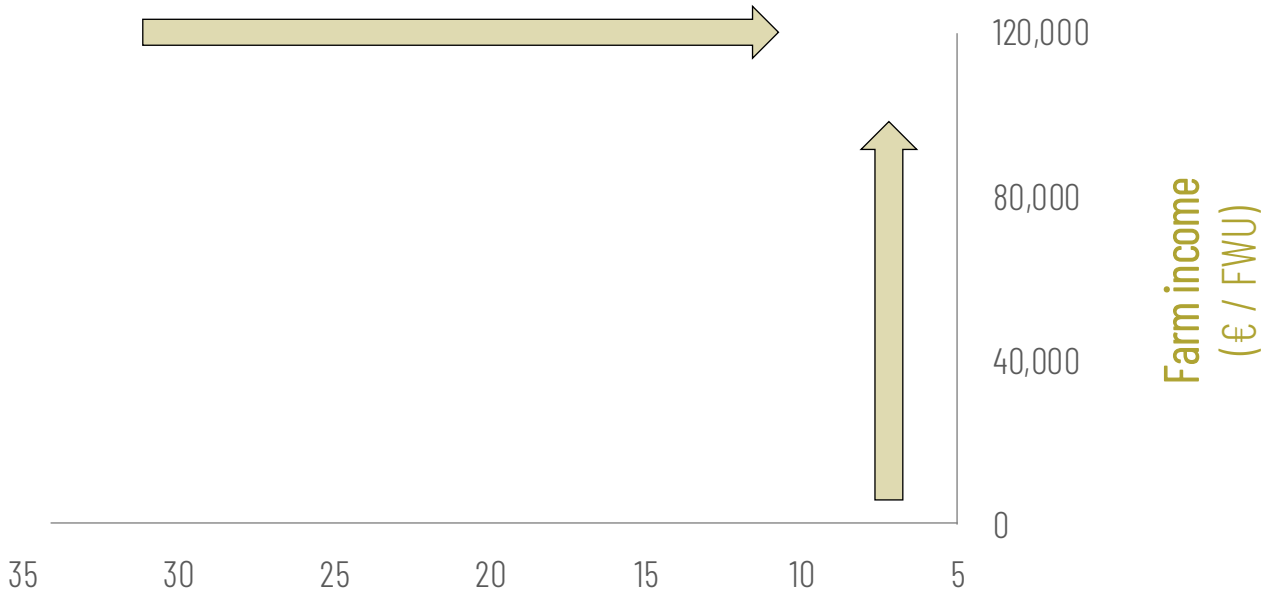


FADN data
4 years (2014 – 2017)

Note: Data provided by *Direction d'Analyse Economique Agricole* (DAEA/FADN).

Two indicators to assess sustainability

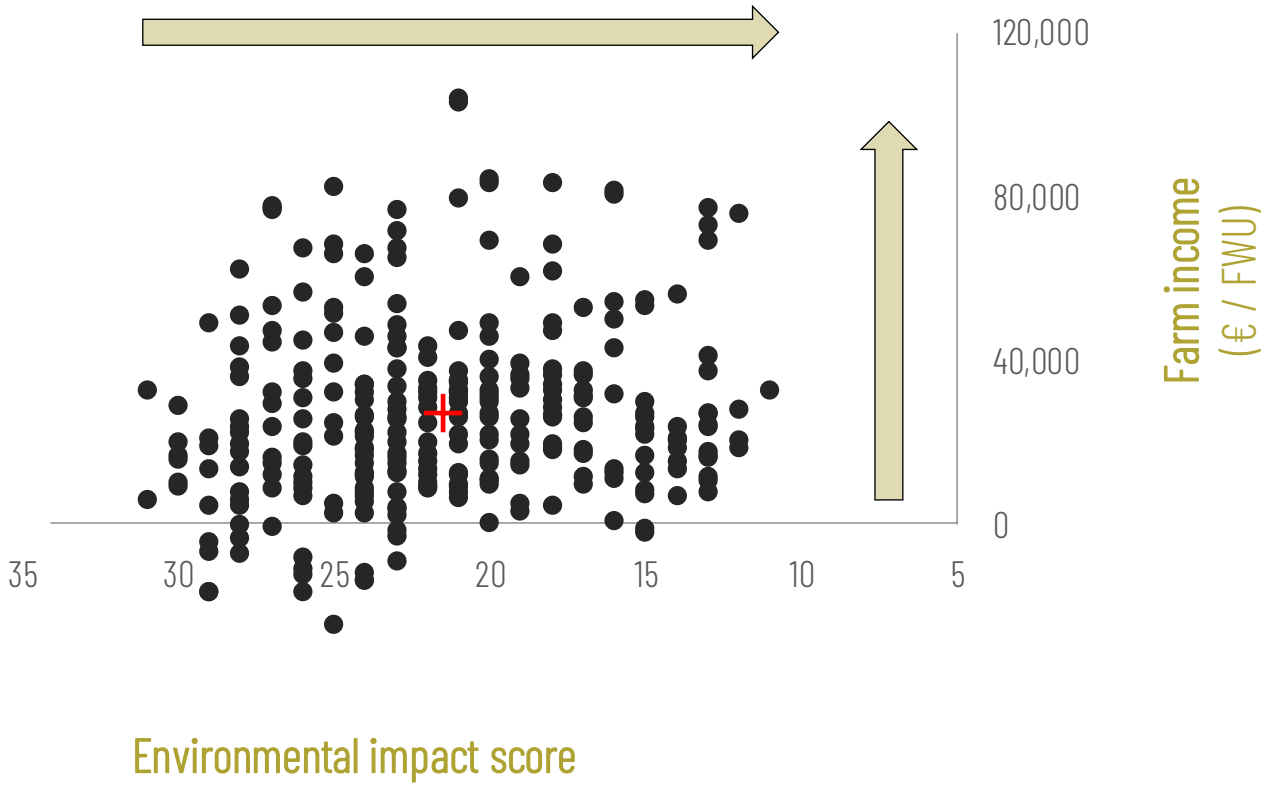
Dairy systems



Environmental impact score : aggregate indicator accounting for pesticide use, N emissions, Biodiversity impact, use of soybean meal and GHG emissions

A diversity of outcomes coexist

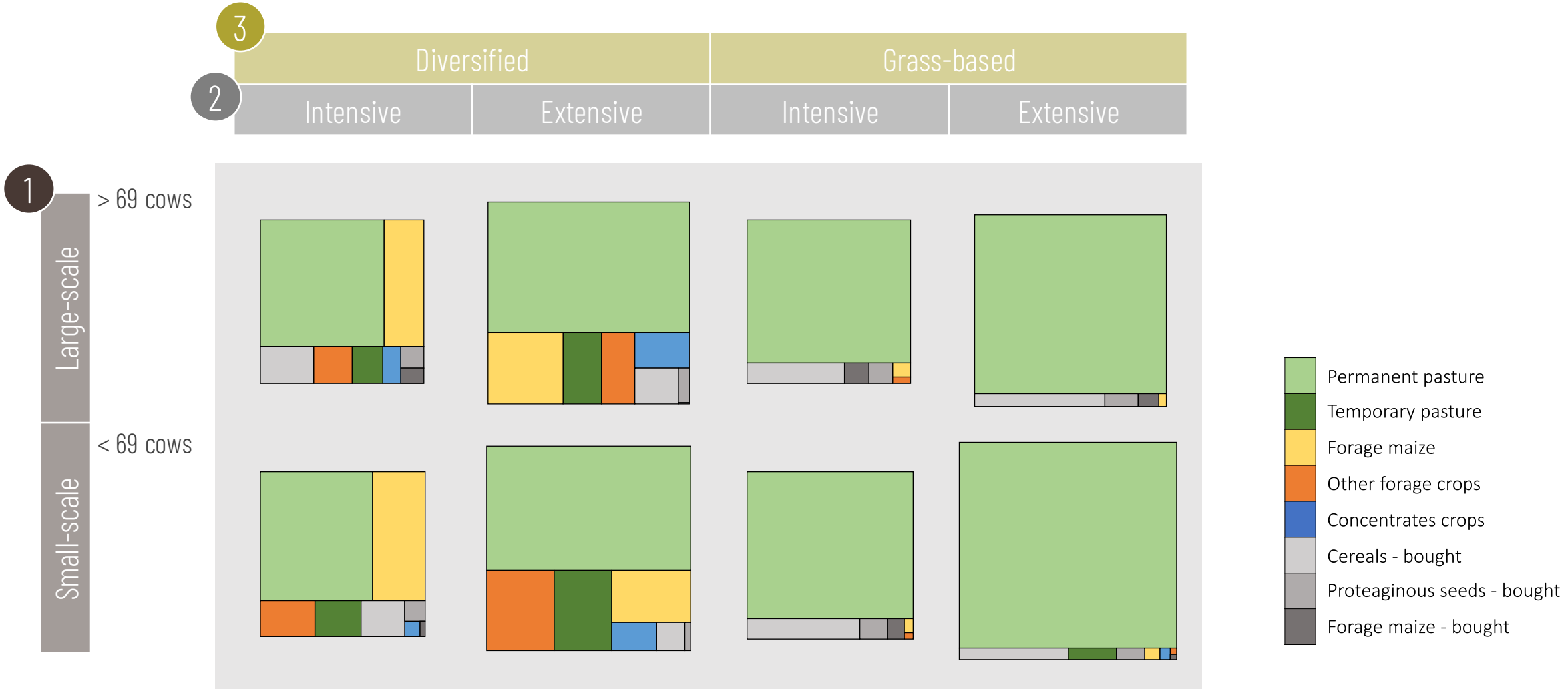
Dairy systems



The red cross indicates the sample average.

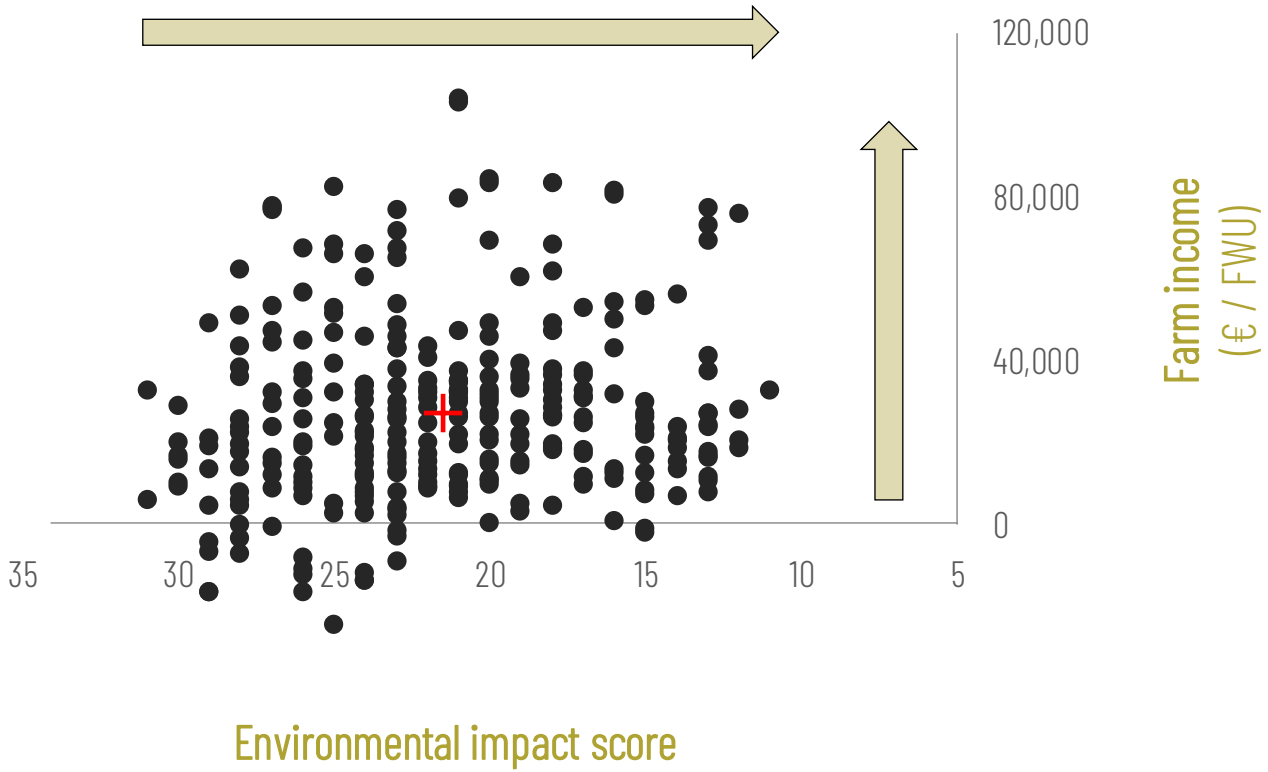
A diversity of systems coexist

Dairy systems



Diversity is key to grasp sustainability challenges

Dairy systems



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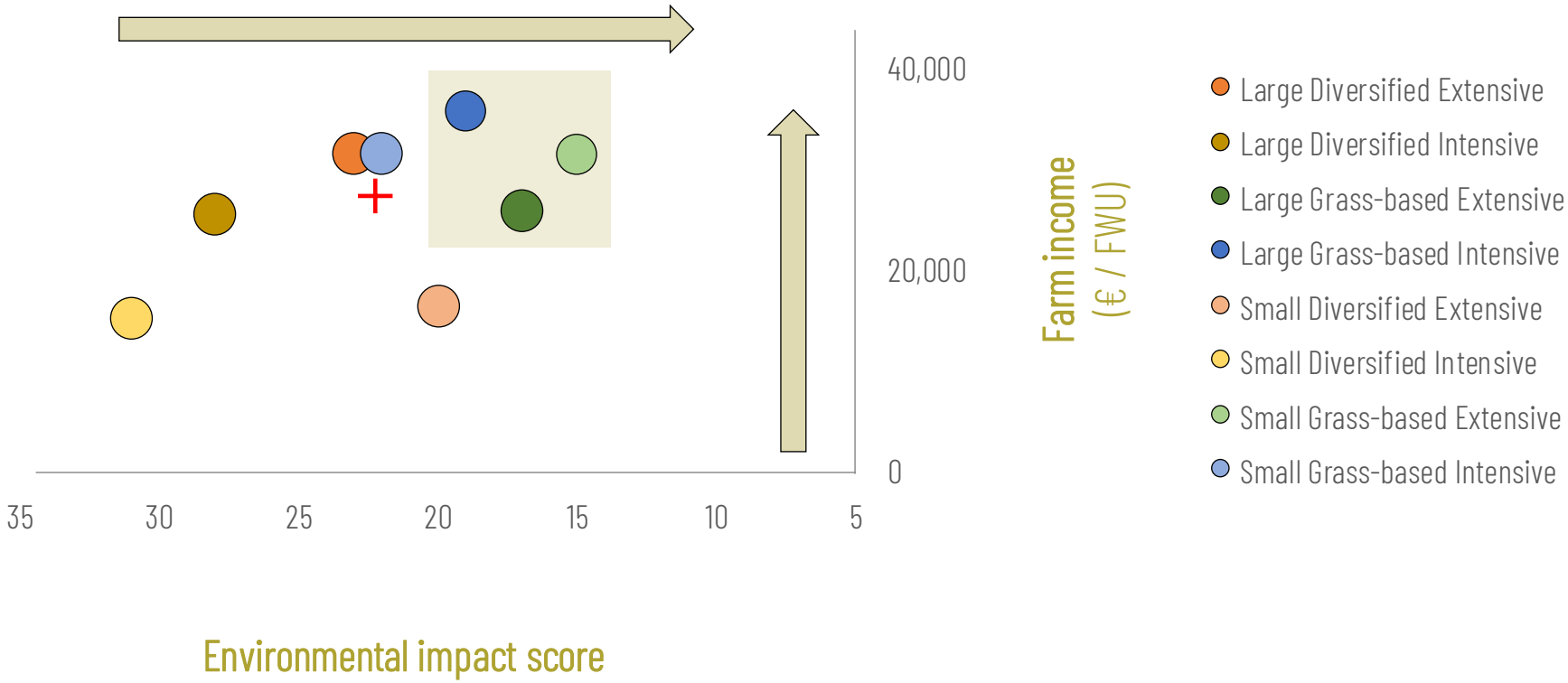
Diversity is key to grasp sustainability challenges

Dairy systems



The red cross indicates the sample average.

From question 1 to question 2

What are the sustainability performances of different livestock systems ?

2020

What are possible options for the livestock transition and how do they compare ?

2019

How can we progress towards an implementation of the transition ?

2024

GREENPEACE

Scenarios for the livestock transition in Belgium

Scope of the case study

Territorial

Belgium

(Flanders & Wallonia)

Sectoral & diversity

Five sectors &

Farming systems*

Dairy

Beef

Pork

Eggs

Poultry

Multidimensional

Agronomic &

Sustainability indicators

Productivity

Feeding practices

GHG emissions

Nitrogen emissions

Biodiversity

Employment

Value of production

* E.g. for the eggs sector :

Cage – Indoors – Free-range – Organic

Testing dominant visions and narratives towards 2050

T3

Radical & low-cost

Fully organic, with no feed-food competition.

T2

Land sharing & no soy

Combines nature conservation and (extensive) agricultural production.

T1

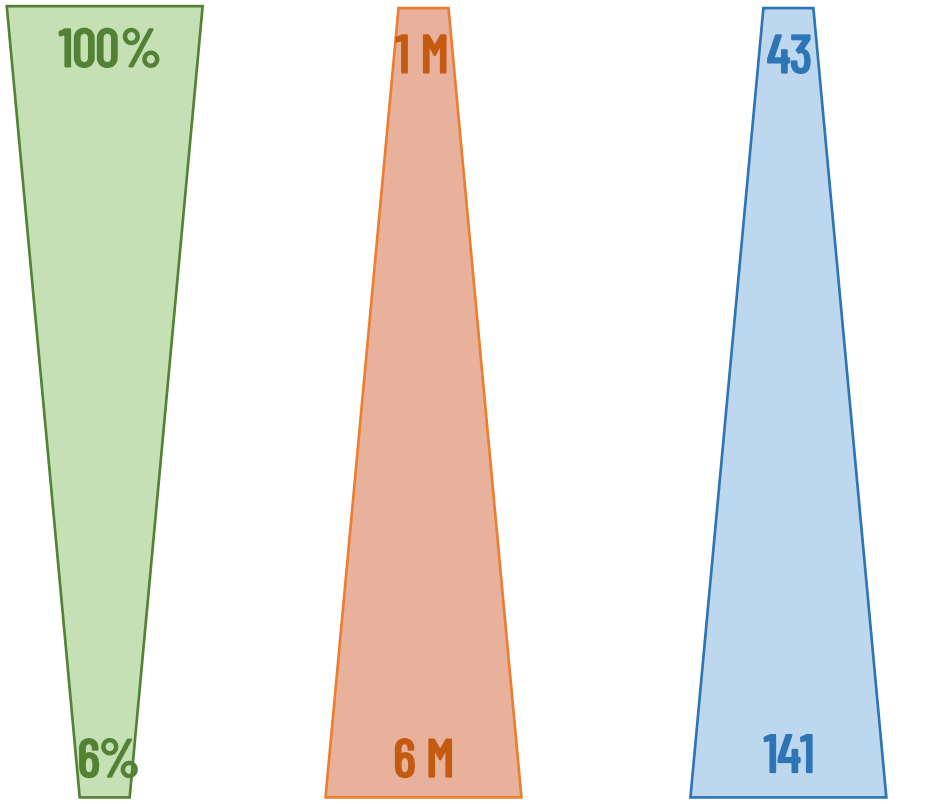
Land sparing

Separates nature conservation from (intensive) agricultural production.

BAU

Trends

Continues the trends from the past 10 years.

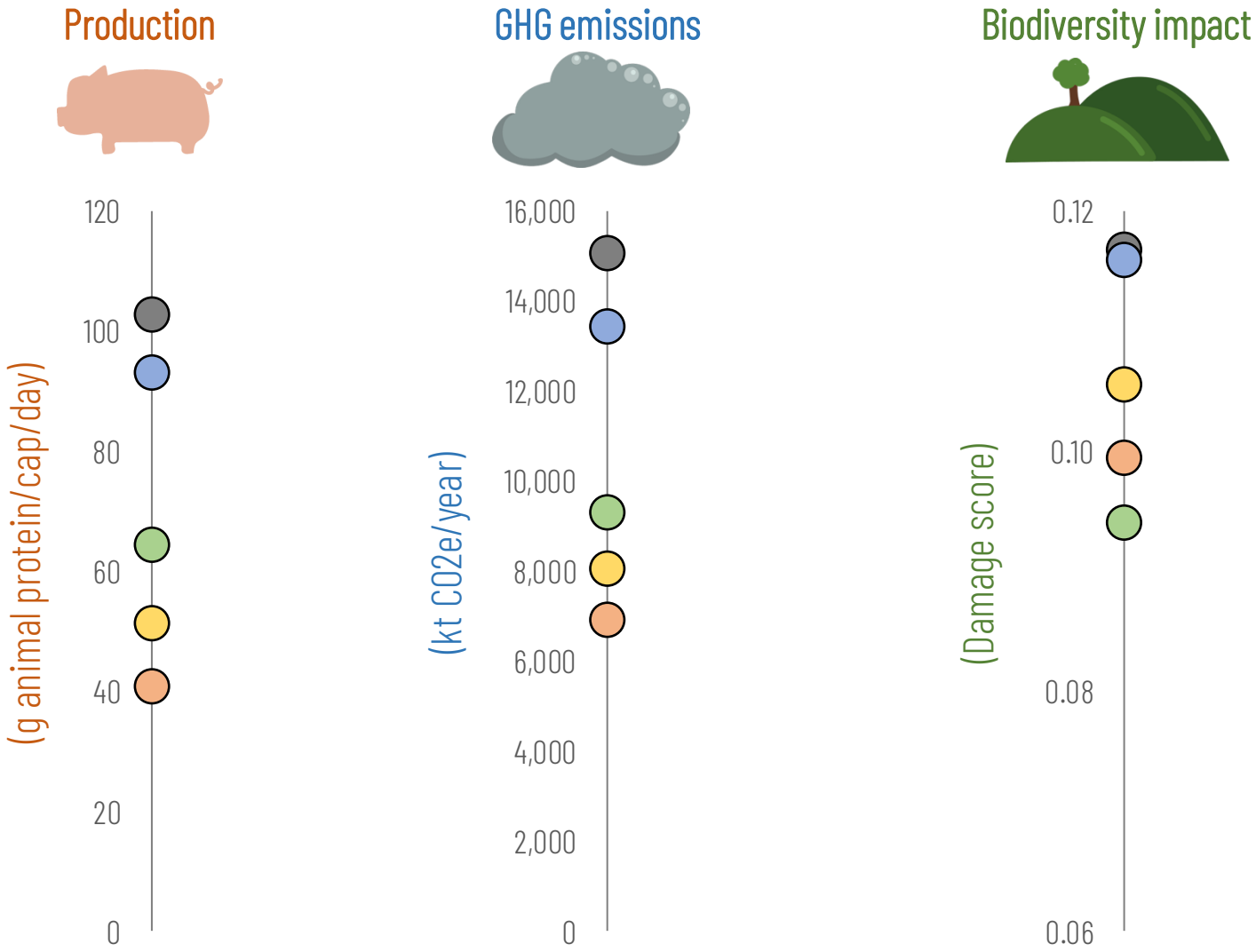


Farming Systems
% organic

Livestock populations
nb animals (LSU)

Consumption of animal products
g meat/cap/day

Scenarios highlight sustainability trade-offs and choices



Downsizing livestock populations is necessary to reduce impacts...

... but **trade-offs** appear between environmental dimensions

From question 1 to question 2

What are the sustainability performances of different livestock systems ?

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AGENTSCHAP
LANDBOUW &
ZEEVISSERIJ

Towards a protein transition in Flanders

From the livestock transition to the protein transition

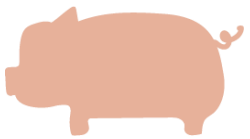
Two sides of the same coin :

"A shift from a diet rich in animal proteins to one richer in alternative protein intake, including a reduction in total protein intake and a reduction in animal-based production"

Four dimensions

Production

Consumption

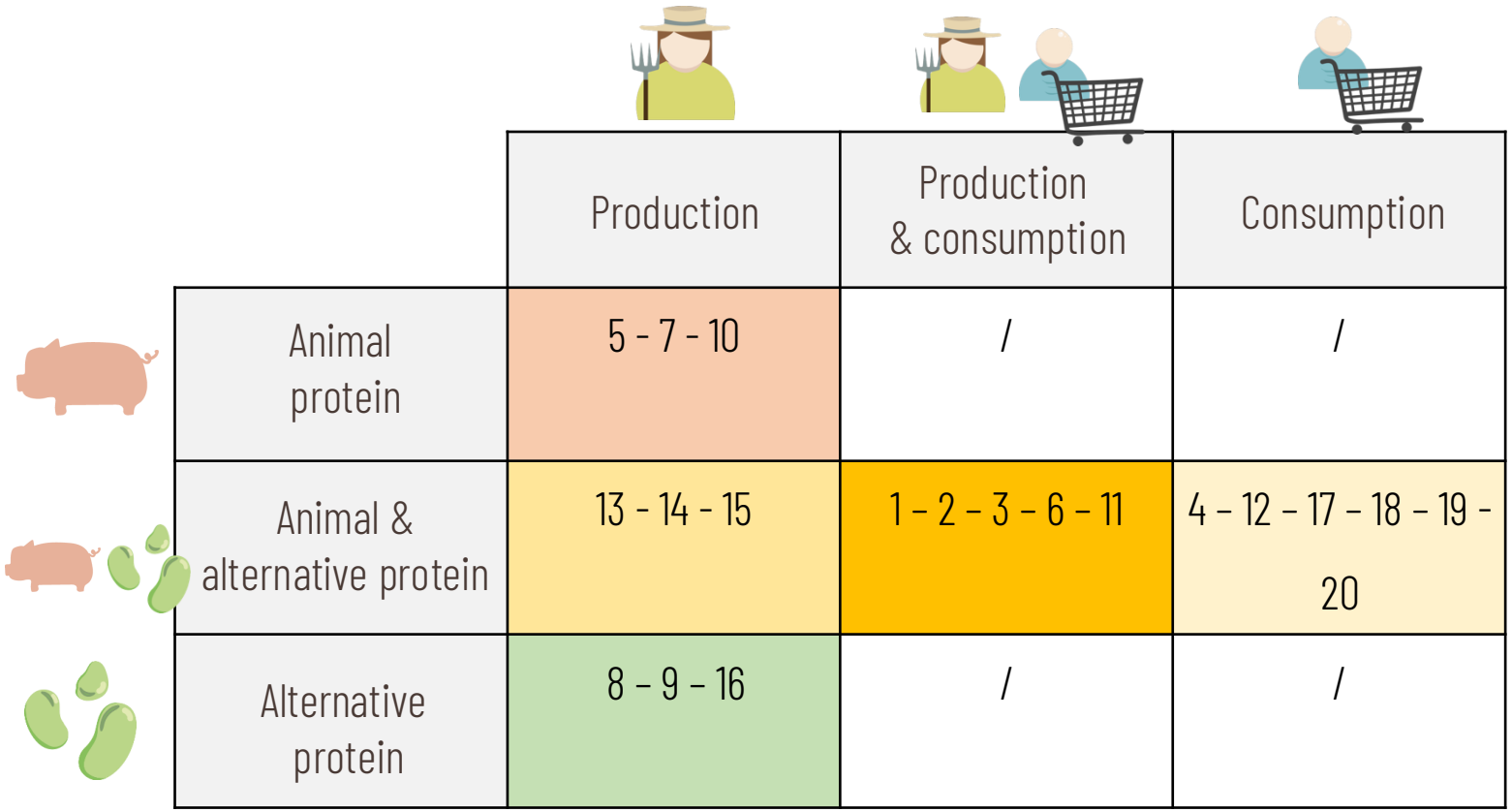


Animal protein

Alternative protein

Duluins & Baret 2024

An analysis of policy landscape



	Production	Production & consumption	Consumption
Animal protein	5 - 7 - 10	/	/
Animal & alternative protein	13 - 14 - 15	1 – 2 – 3 – 6 – 11	4 – 12 – 17 – 18 – 19 - 20
Alternative protein	8 – 9 – 16	/	/

1. Flemish food strategy
2. Flemish protein strategy
3. Research fund for protein strategy
4. Green Deal protein shift on our plates
5. Energy and Climate plan and Covenant bovine enteric emissions
6. Circular food chain agenda
7. Nitrogen decree
8. Manure decree
9. CAP Eco-scheme on protein crops
10. CAP coupled income support for cattle
11. Public support for *VLAM*
12. Public support for *Gezond Leven*
13. Public support for *Flanders Food*
14. Flemish platform for Agrifood research
15. Public support for *ILVO*
16. Public support for *Food Pilot* plant
17. Public support for *ProVeg Belgium*
18. Public support for *GoodPlanet*
19. Public support for *MOS*
20. Sustainable public procurement criteria

An analysis of a value chain : LoCoSoy

Economic actors

PRODUCTION	PROCESSING	RETAIL
 Soy growers - Biograno	LA VIE est BELLE	COLRUYT GROUP

Research questions

Agronomic parameters ?	Production costs ?	Processing options ?	Consumer interest ?	Value chain approach & model ?

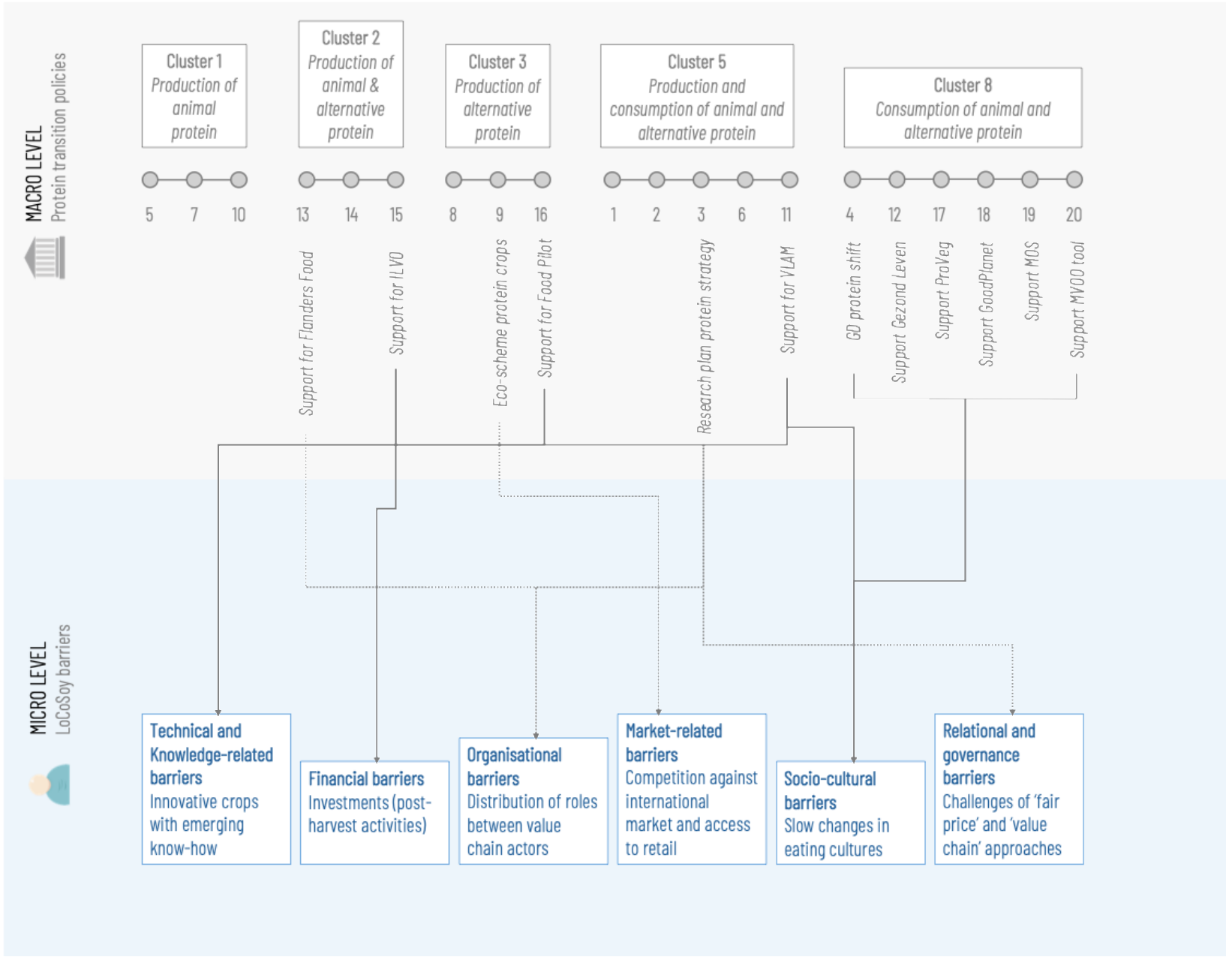
LoCoSoy challenges

Barriers appear throughout the chain

From micro to macro

12 policy measures can help relieve LoCoSoy barriers

... but **policy fragmentation** & **incoherences** remain



Unpacking food system transitions across multiple scales

The Belgian livestock sector

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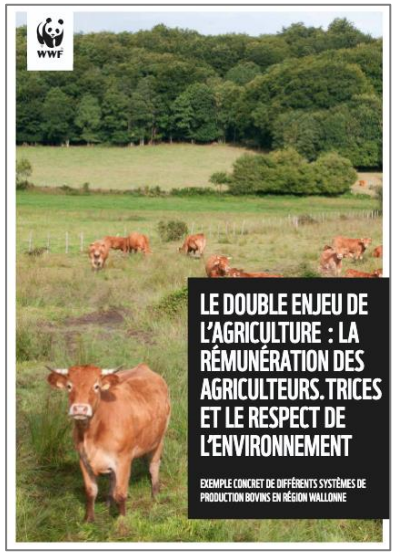
Unpacking food system transitions across multiple scales

The Belgian livestock sector

Research projects and scales of analysis

The three research projects each have their own **scale of analysis**



Cattle production in Wallonia

Livestock scenarios in Belgium

Protein transition in Flanders

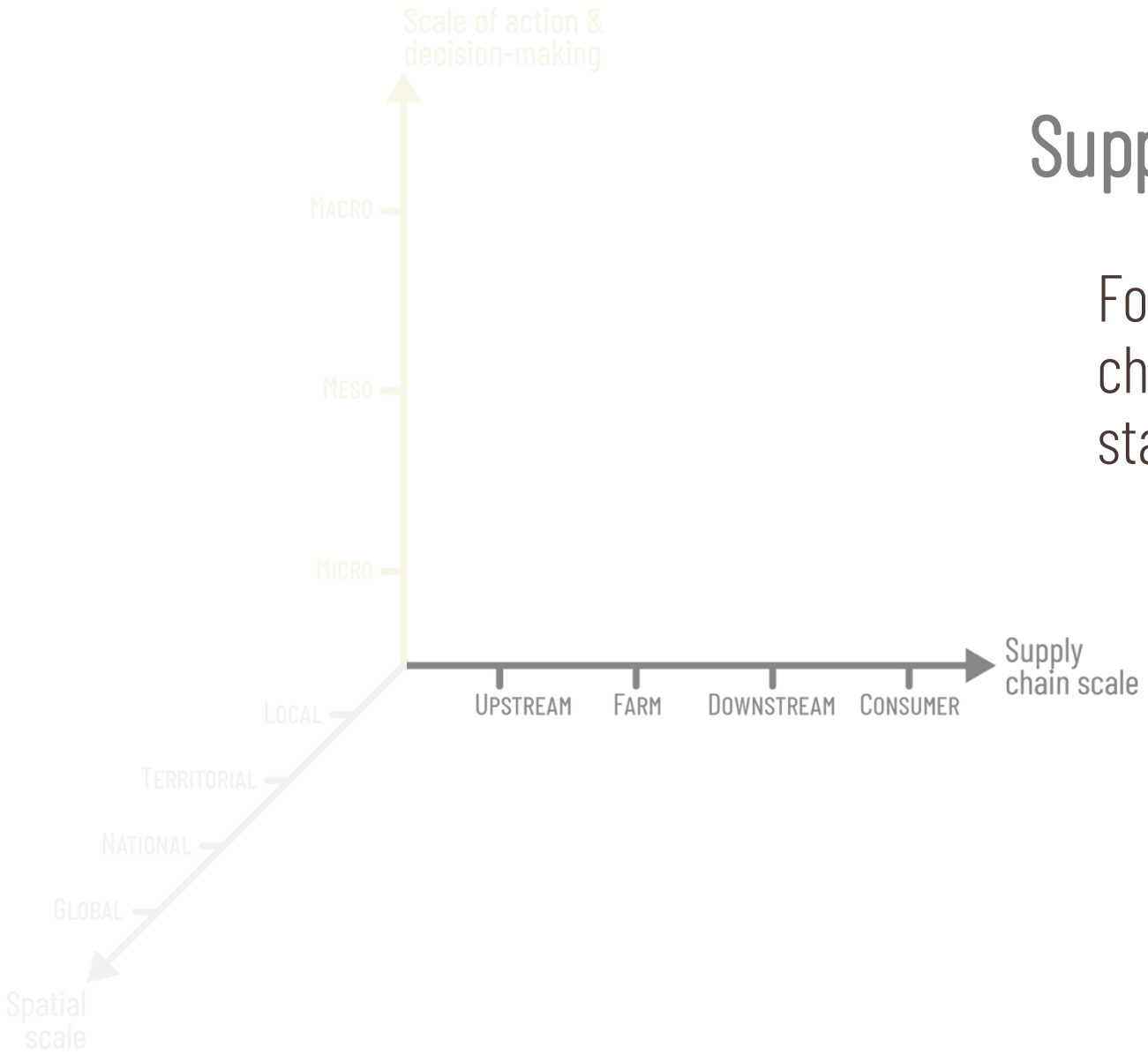
➡ Different

Actors

Spatial scales

Value chain stages

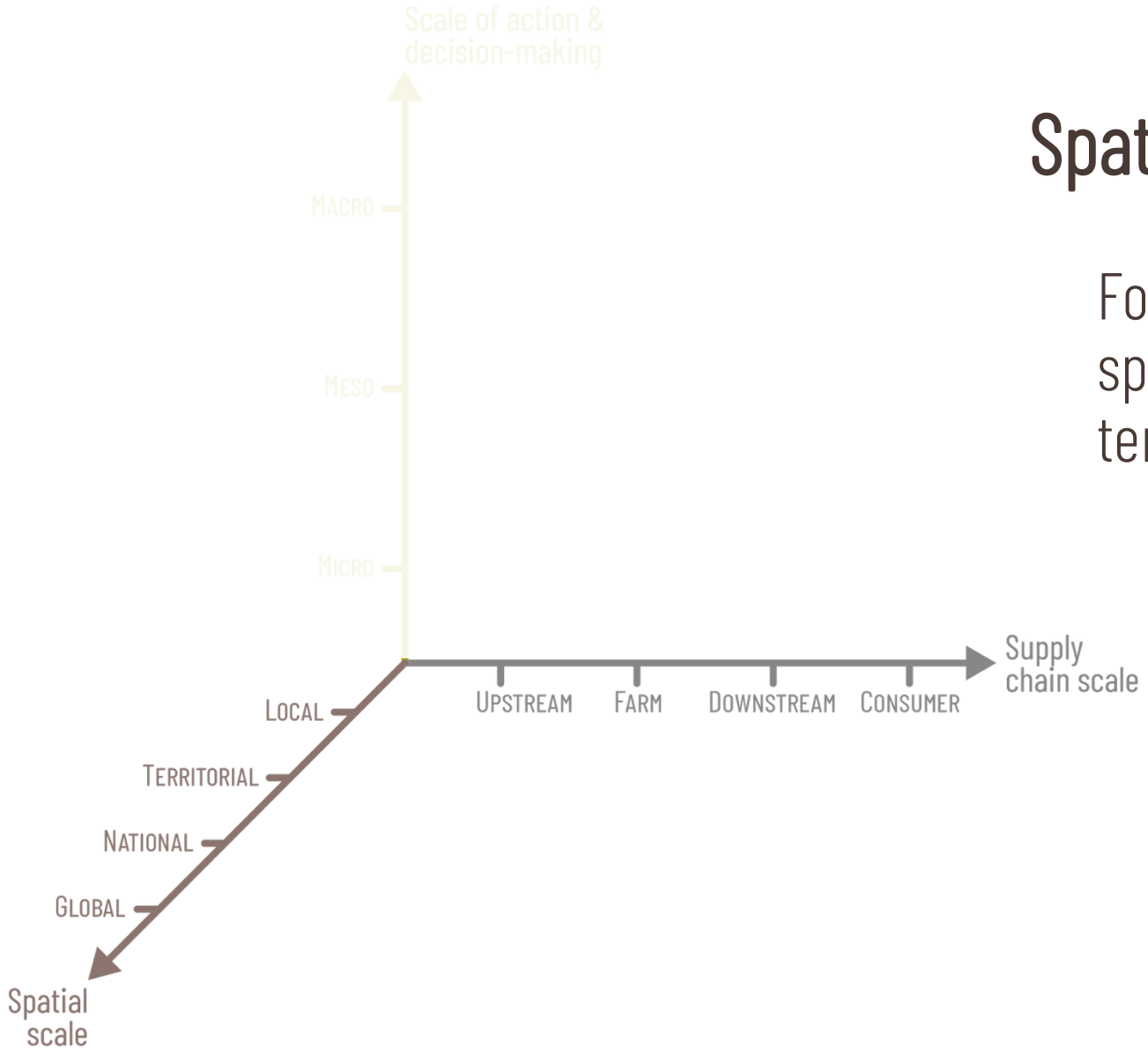
Conceptualising food system transitions at multiple scales



Supply chain scale

Food system transitions involve various supply chain actors and activities beyond the farm stage, from production to consumption.

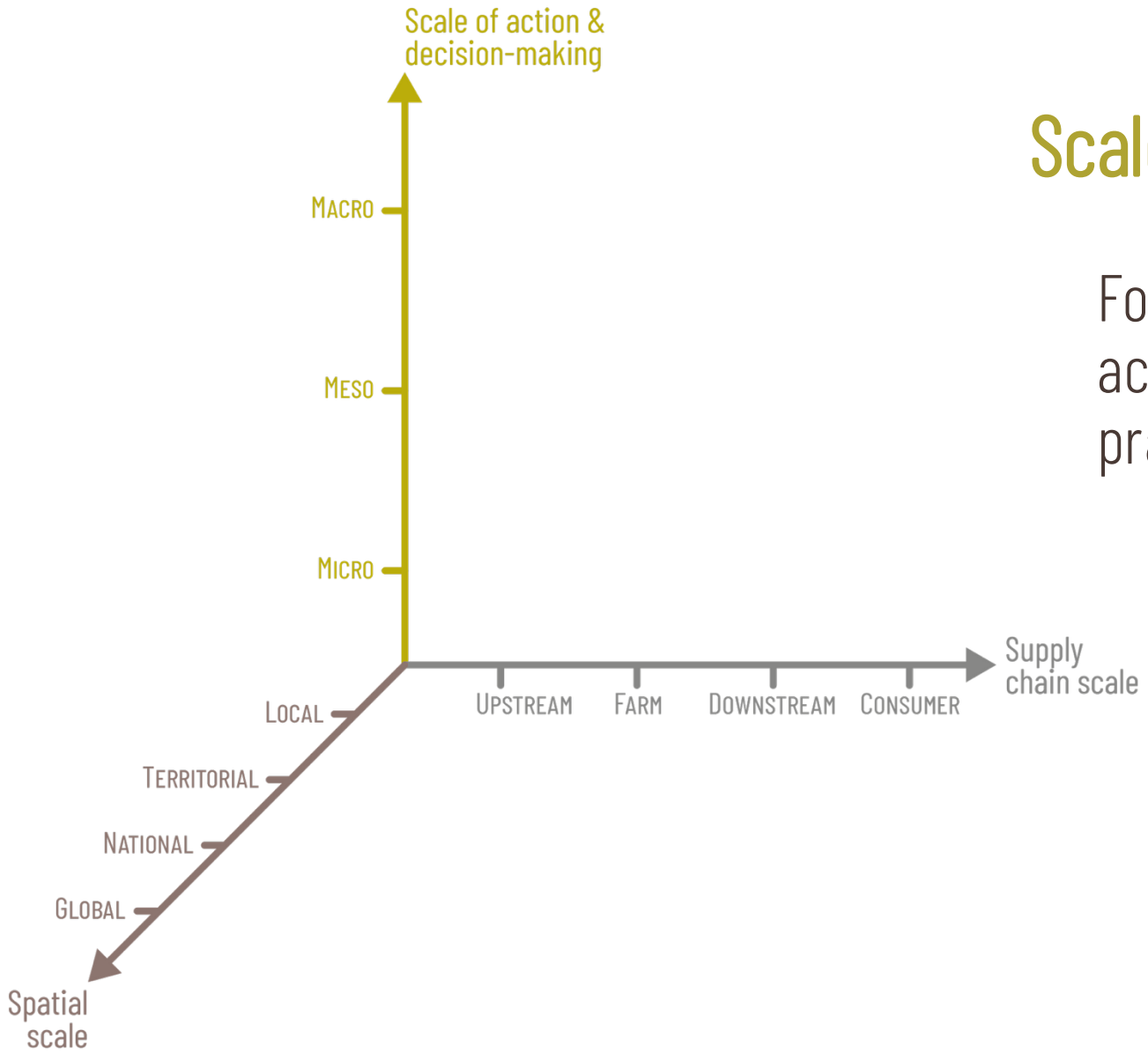
Conceptualising food system transitions at multiple scales



Spatial scale

Food system transitions include multiple spatial scales from local, to landscape and territorial to global.

Conceptualising food system transitions at multiple scales



Scale of action and decision making

Food system transitions imply various levels of action, ranging from individual actions and practices to policymaking.

Diversity as an entry point to the meso level

Macro

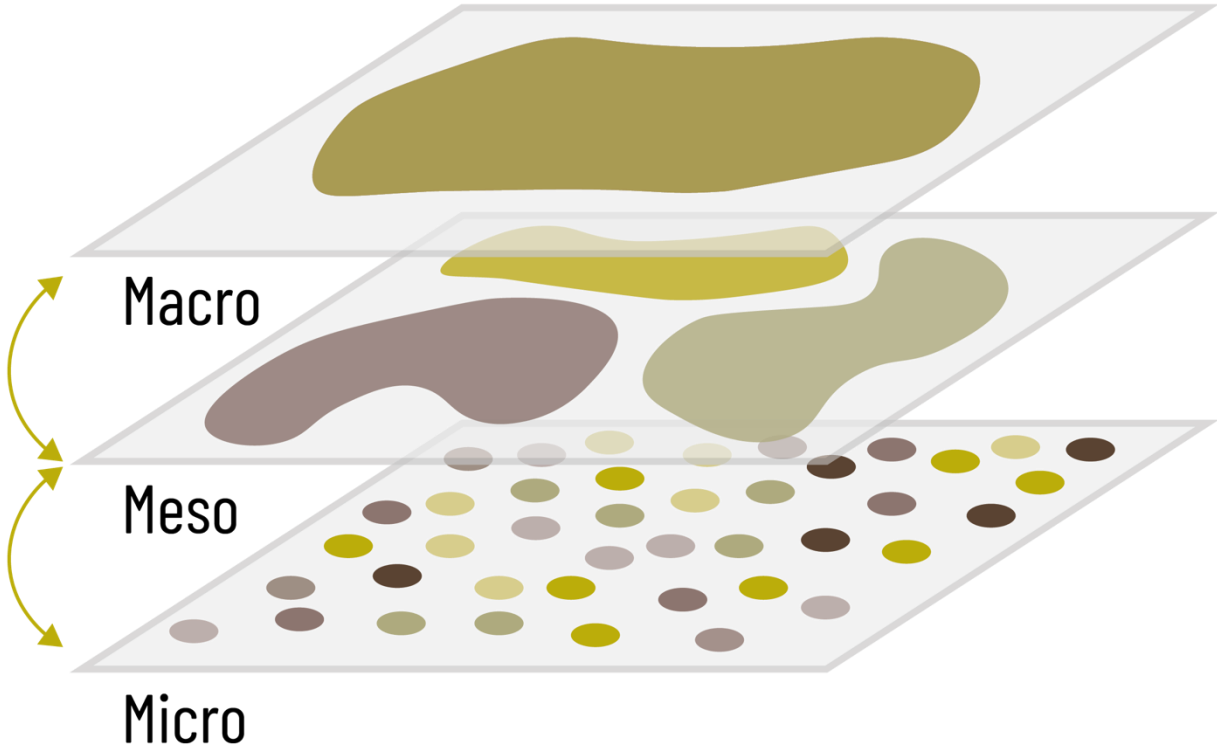
High aggregation - low diversity
Useful for policymakers

Meso

Intermediate diversity & aggregation
Useful for both farmers & policymakers ?

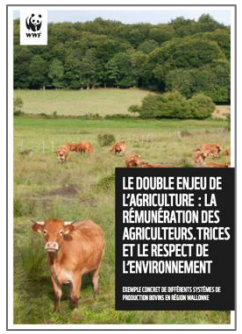
Micro

High diversity - Low aggregation
Useful for farmers



Conclusions

The Belgian livestock transition



What are the sustainability performances of livestock systems ?

- A diversity of systems coexist.
- Environmental and socio-economic sustainability can be compatible.

What are possible options for the livestock transition ?

- A diversity of options coexist.
- Downsizing livestock production and consumption is inevitable to reduces impacts.

How can we progress towards an implementation of the transition ?

- Several barriers complicate micro-level implementation, including policy coherence .
- Sustainability transitions are complex and can benefit from multiple scale analyses.

Thank you for your attention !

SYTRA

transition of food systems

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