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Assessing sustainability on European dairy farms based on case study data

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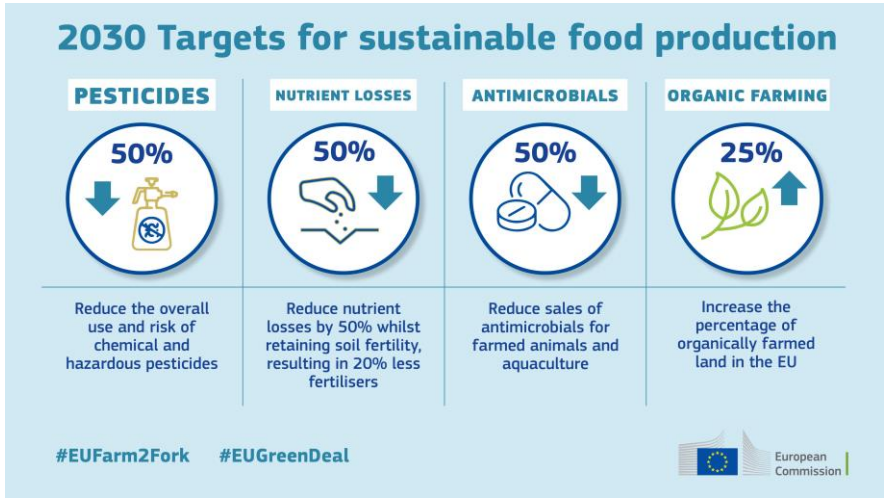
Presentation outline

1. Motivation
2. Objectives
3. Farm data
4. Exploring individual sustainability metrics
5. Integrating the 3 sustainability dimensions into a single framework
6. Conclusions

Why assess farm sustainability?

The EU will:

Become climate-neutral by 2050



Policy reason

Track sustainability trends and allocate resources to achieve desired goals

Farmer and advisory reasons

Identify areas of improvements and tailor solutions for specific farm conditions

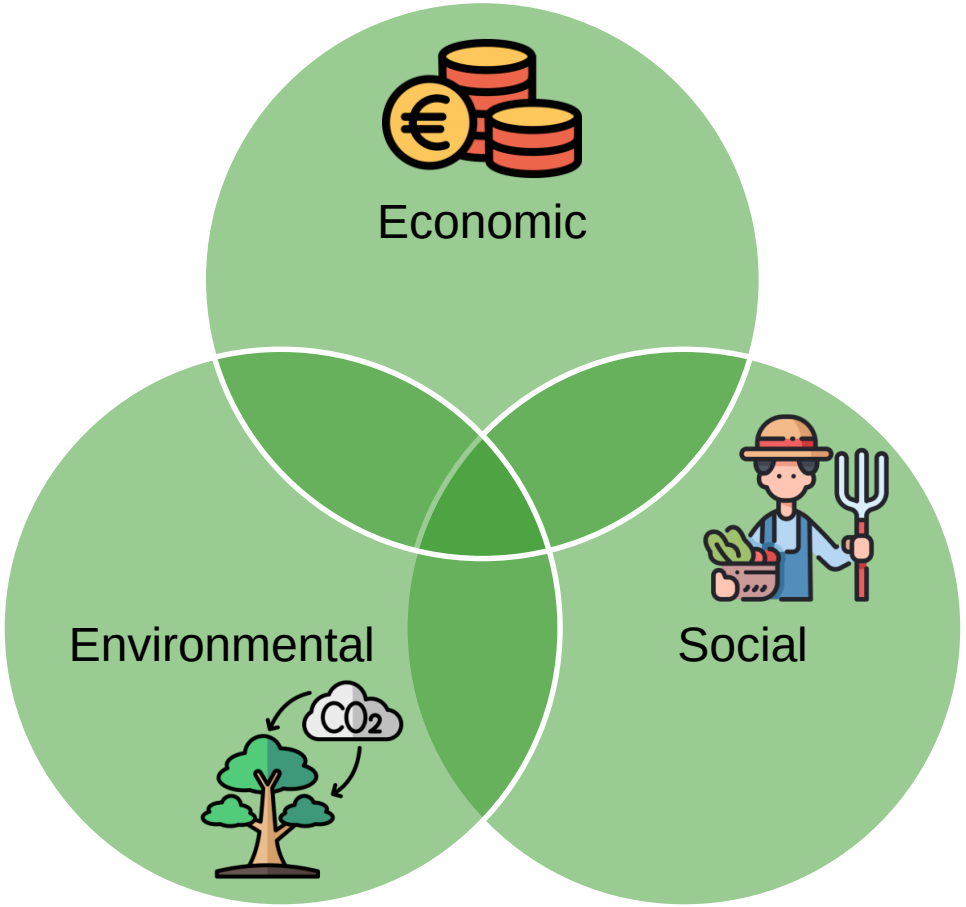
"What do you recommend for greenhouse gas?"

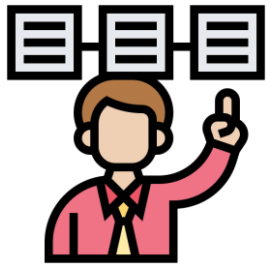
Marketing reason

Demonstrate sustainability credentials to get a better price

Why is this a complex task?

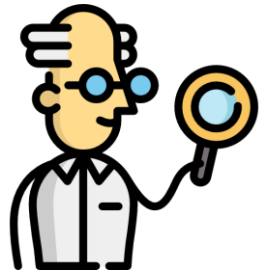
Multidimensional concept





Quantitative and qualitative aspects

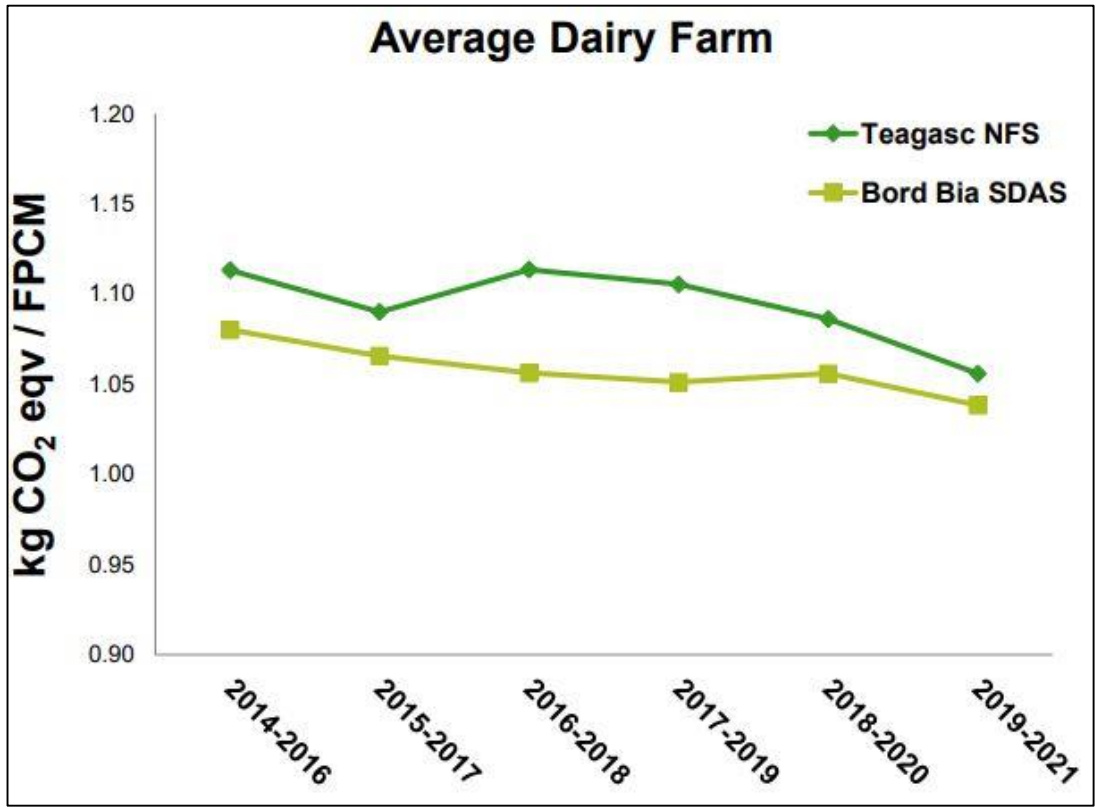
Not always easy to observe or measure



With synergies and trade-offs

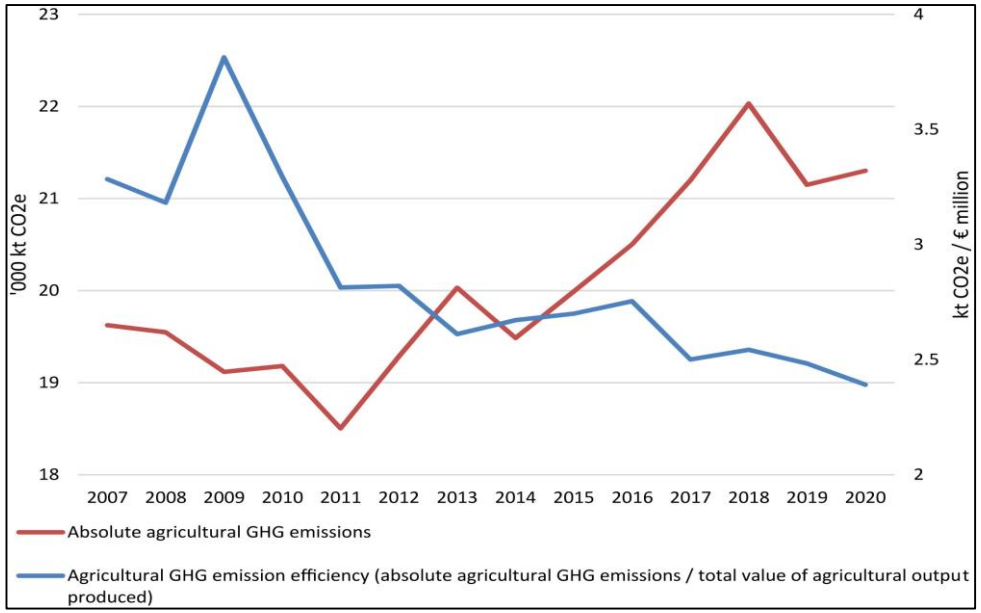
… and to add to this complexity!

Wide variety of methods to measure the same sustainability aspects…



Source: 2021 Teagasc Sustainability Report

Wide variety of ways to report the results…



Irish agricultural GHG emissions, 2007-2020

Source: EuroChoices, Volume: 21, Issue: 2, Pages: 52-57, 2022, DOI: (10.1111/1746-692X.12364). Based on EPA and CSO data.

Teagasc
Agriculture and Food Development Authority

Provide an overview of the MILKEY journey

- Individual metrics:
  - Can individual metrics tell us the sustainability story of the farm?
  - How can we choose which method and functional unit to use?
  - The forgotten dimension: How about social sustainability?
- Integrated metrics:
  - How can we integrate multiple sustainability aspects and dimensions into a single methodological framework ?

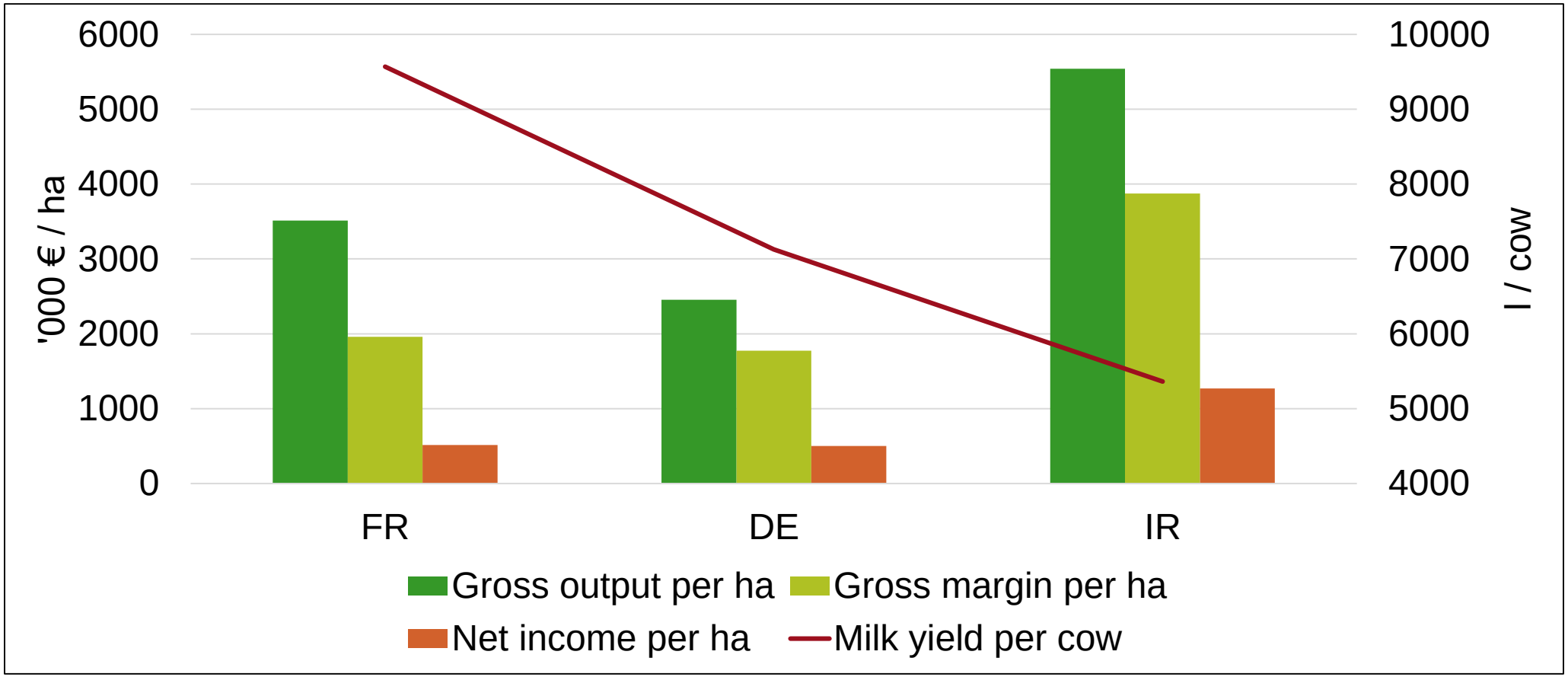
First, a word about the data collection

- About 2 case studies per country, with a wide range of profiles
- Specialised dairy farms
- Face to face and phone interviews in the winter of 2021
- 2020 data

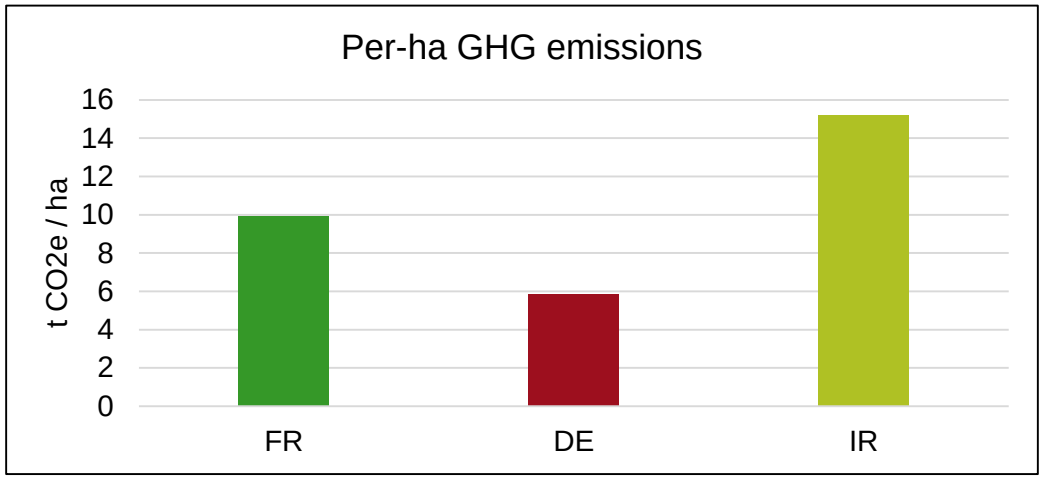
Characteristics of selected case study farms

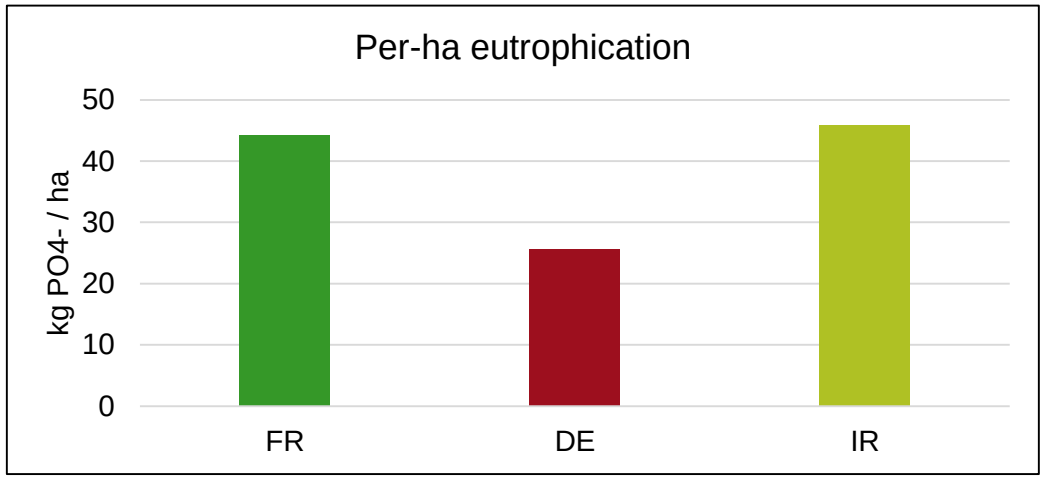
Characteristics	FR (conventional)	DE (organic)	IR (conventional)
UAA (ha)	103.5	230	87
Dairy herd size (cows)	75	110	185
Farm stocking rate (LU/ha)	1.26	0.55	2.70
Calving season (weeks)	40	52	11
Grazing season (days)	61	43	259
% grassland to UAA (%)	38.8	71.7	100
% dairy sales to total farm sales (%)	81.1	99.2	98.9

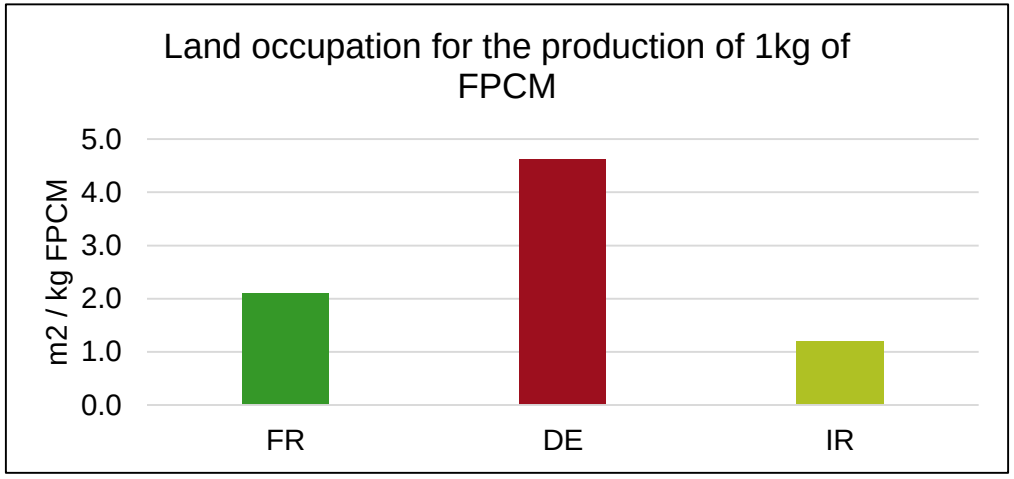
Describing farm sustainability through individual metrics: Economic dimension



Describing farm sustainability through individual metrics: Environmental dimension

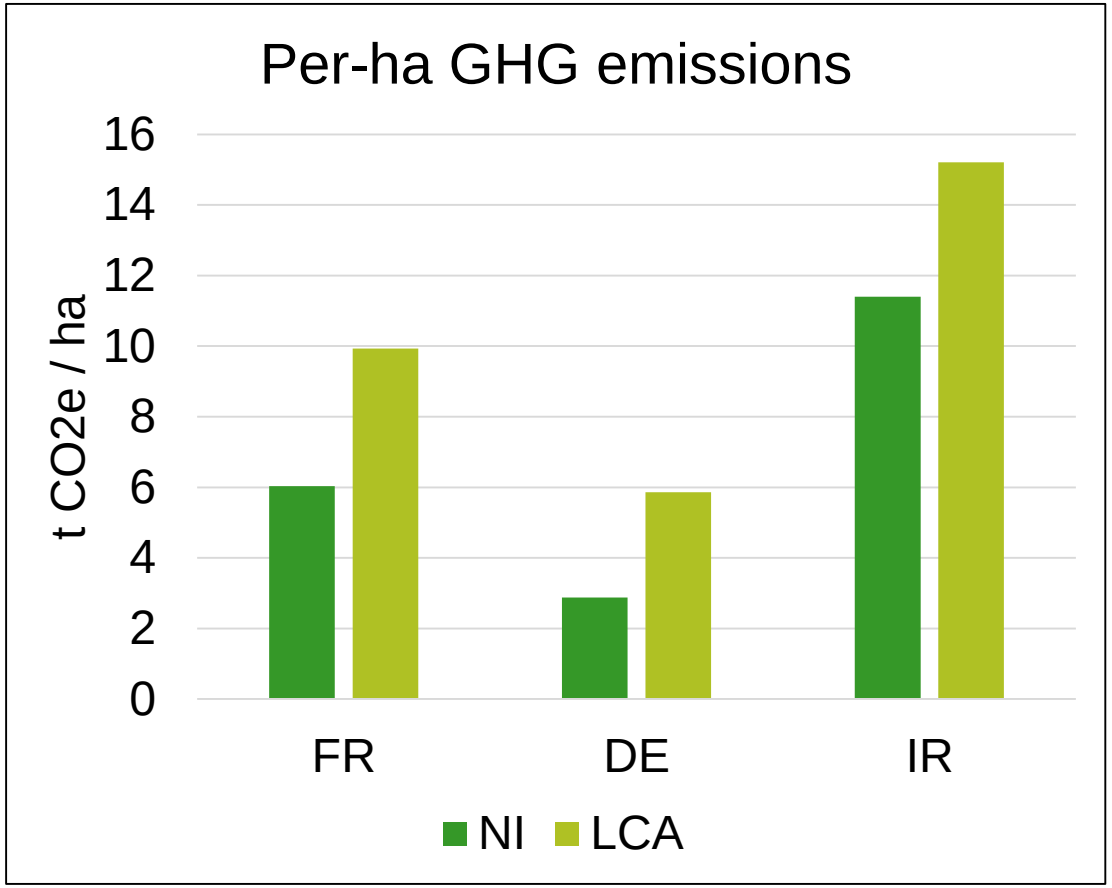






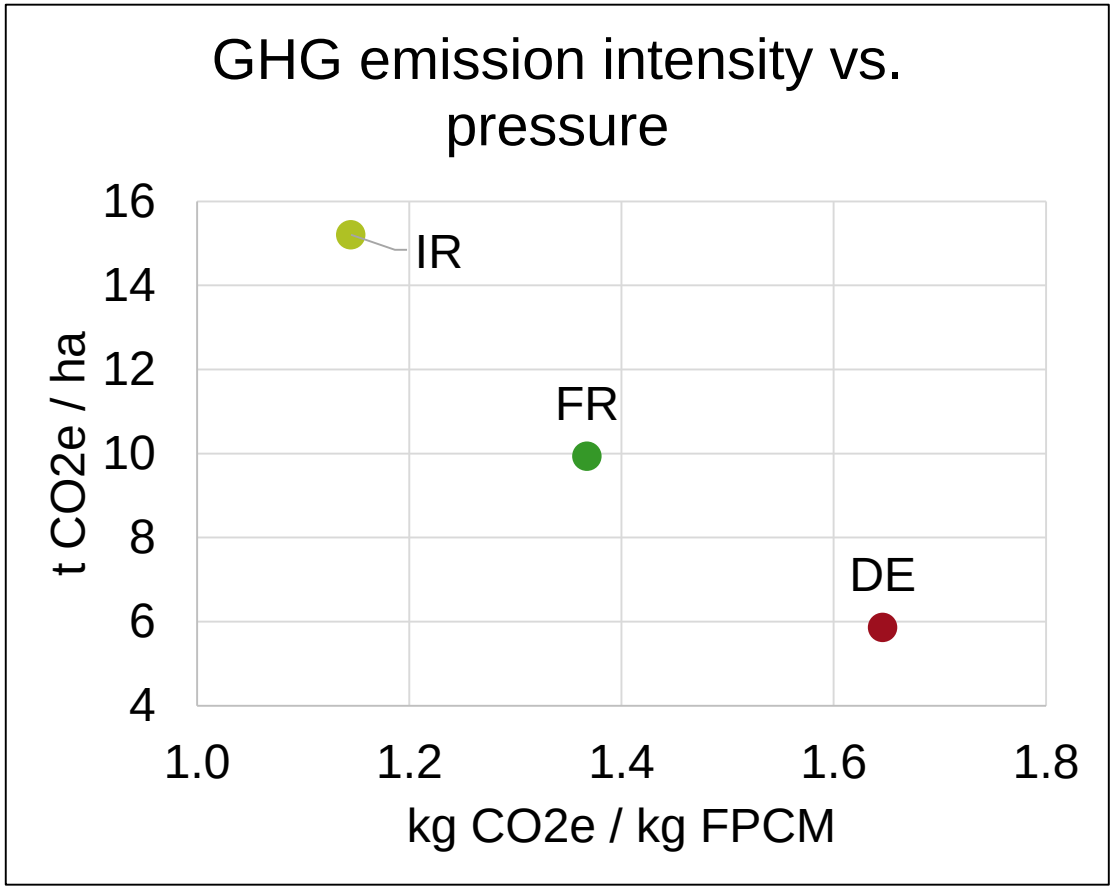
Where different methods can lead to different results…

- Different system boundaries
  - +/- data necessary
- Different applications
  - Inventory vs. Life cycle approach
  - What implications?



And different functional units can tell different stories…

- Related to farm characteristics
- Different applications
  - Environmental efficiency vs. pressure
  - What implications?



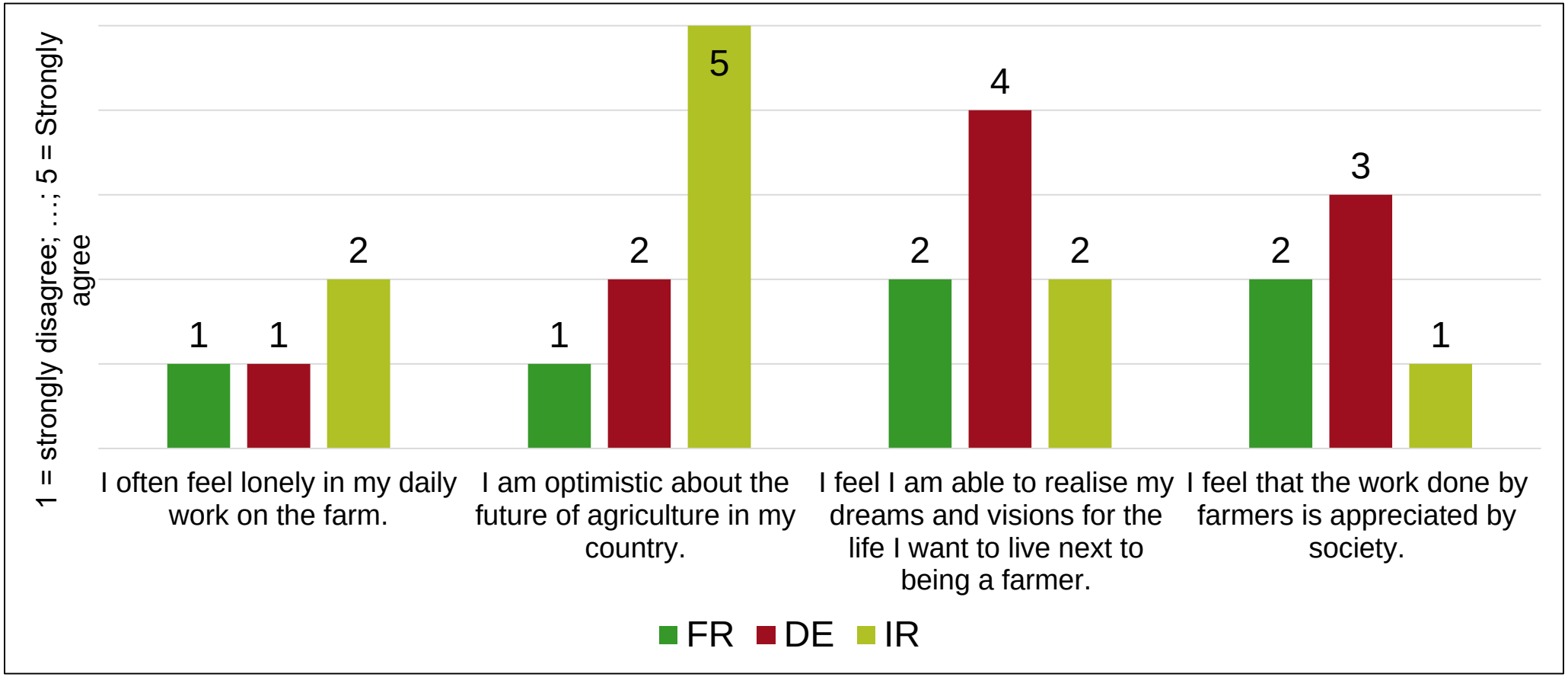
Mid-presentation lessons

- Sustainability story sensitive to:
  - Metric
  - Method
  - Functional unit
- Selection criteria??
  - Adapted to objectives and relevant to users
  - Feasible (data-dependent)
  - Important to recognise limitations (and be upfront about them)!!!

The forgotten social dimension

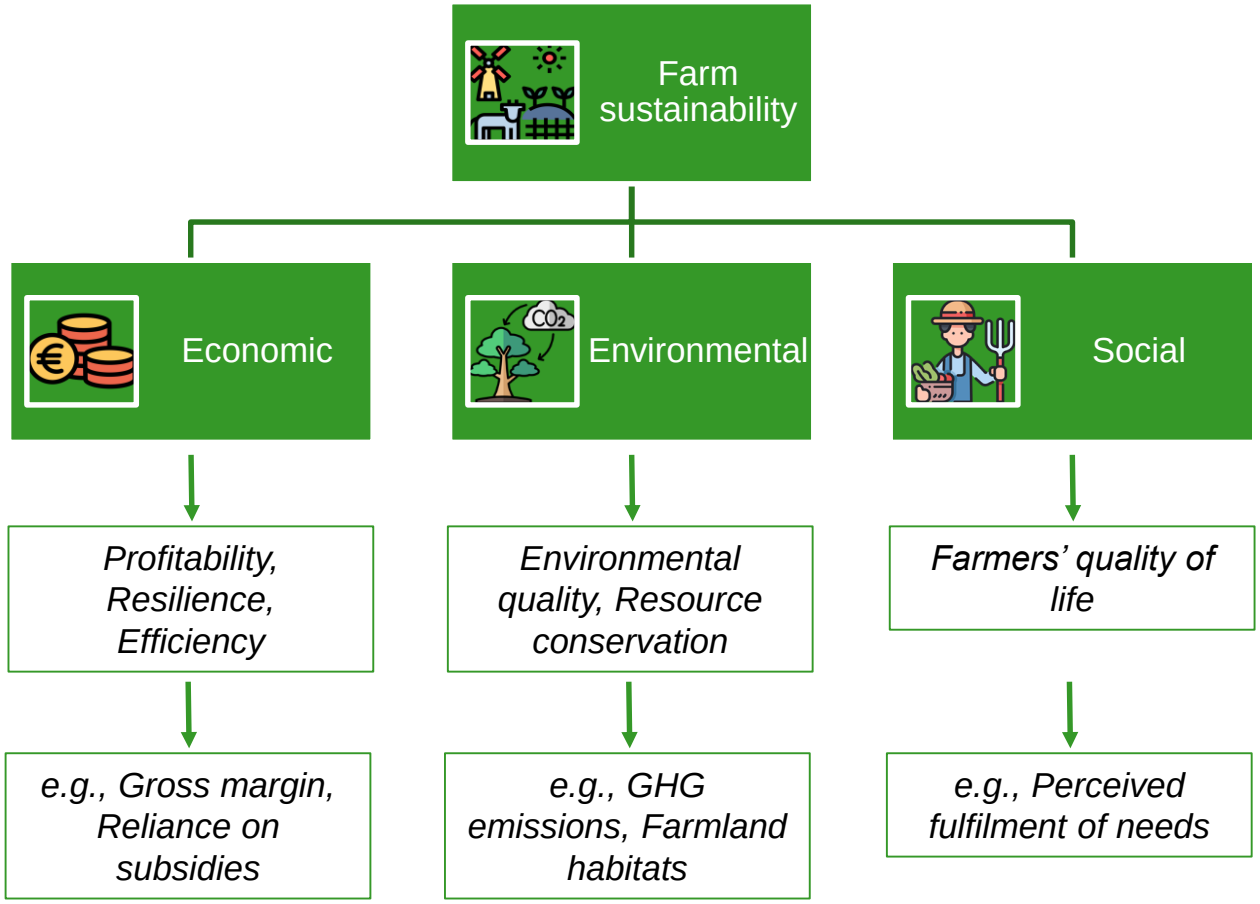
- Difficult to define and thus measure
- Broadly divided into 2 subsets:
  - Internal: Well-being of farmer and his/her family
  - External: Society's expectations of agriculture (beyond productive function)
- 'Pragmatic' indicators, easily tracked over time
  - e.g., labour hours, animal health, product quality
- How about embracing the subjective nature of social sustainability?

Gauging farmers' perceptions in the project



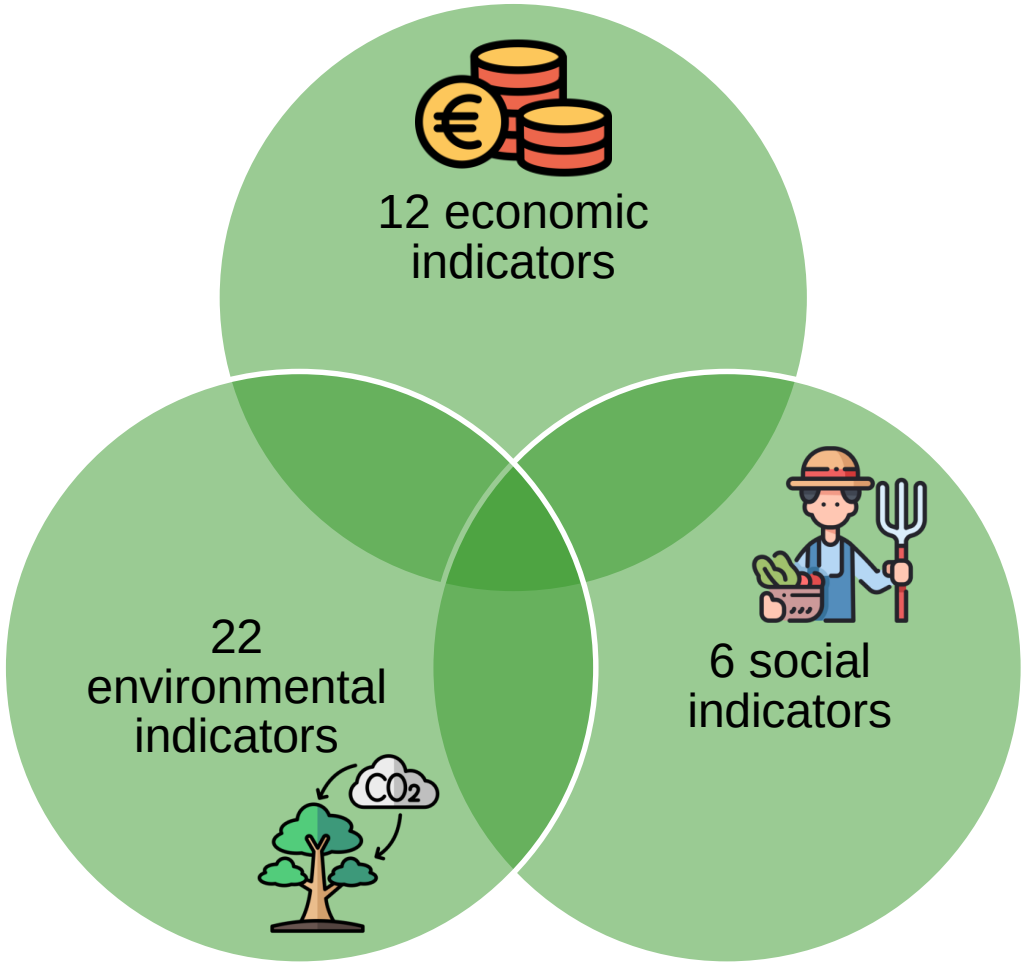
Developing an integrated methodological tool to assess farm sustainability

- Multi-criteria decision modelling method (Decision Expert, DEX)
- Hierarchical
  - Disaggregates problems into sub-problems until obtaining quantifiable indicators
  - Follows a tree structure, where answers to problems are aggregated at different levels

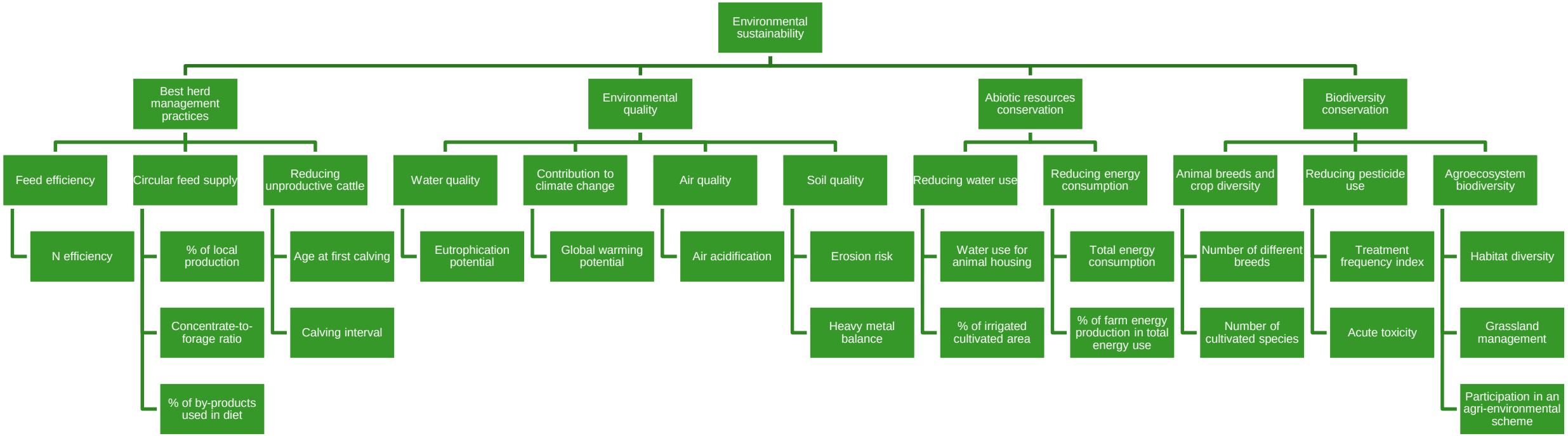


Steps to construct the DEXi-Dairy's sustainability tree

1. We chose the tree structure and sustainability indicators.
2. We weighted sustainability aspects based on their relative importance.
3. For each sustainability indicator, we built a qualitative scale from low to high sustainability performance, based on reference values.
4. We populated the model with farm data.
5. We aggregated indicator scores to obtain farm sustainability scores.



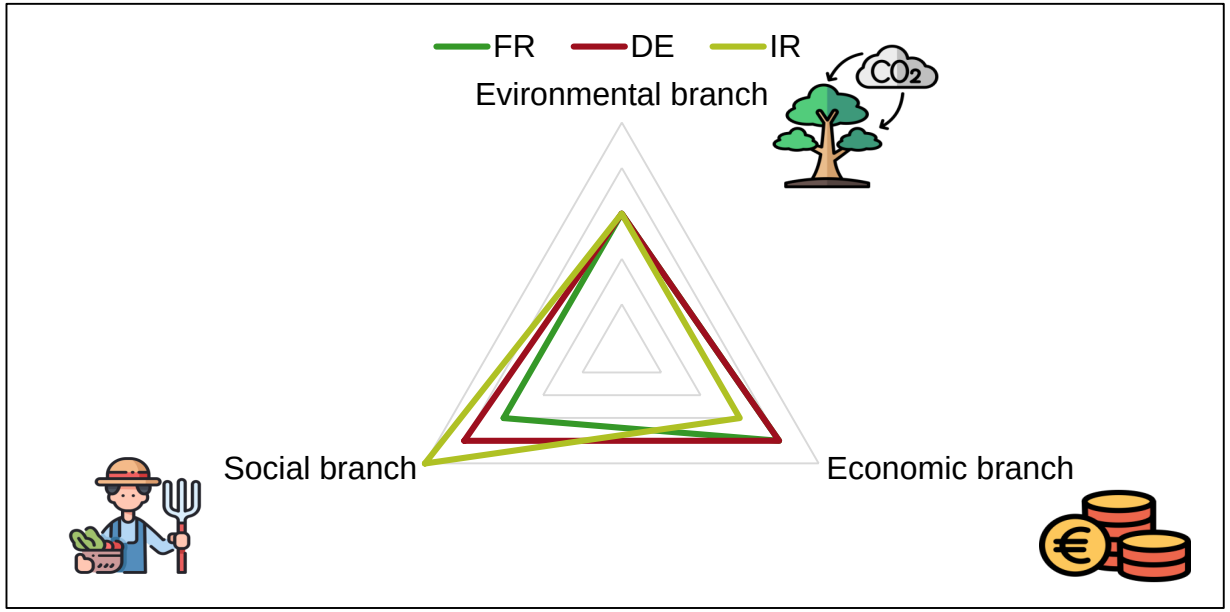
Example: DEXi-Dairy's environmental branch



Sustainability scores of 3 selected farms

Environmental branch	FR	IR	DE
Best dairy herd management practices			
Feed efficiency			
Circular feed supply			
Unproductive cattle			
Environmental quality			
Water quality			
Climate change			
Air quality			
Soil quality			
Biodiversity conservation			
Animal breeds and crop biodiversity			
Reducing pesticide use			
Agroecosystem Biodiversity			

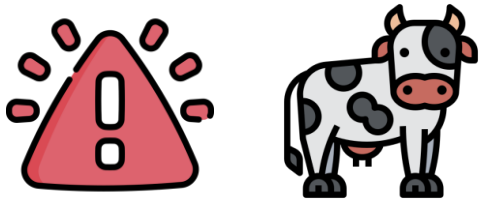
By sustainability dimension



Overall sustainability score

FR	IR	DE

Conclusions



- Individual metrics can provide information about farm sustainability, but it is important to be as comprehensive as possible.
- Integrating sustainability metrics into a multi-criteria assessment can be a way of adopting this holistic view.
- Assessments are sensitive to metric selection, method, and functional unit, so it is important to be careful when interpreting results.
- No national sustainability conclusions can be inferred from case study results!

Thank you for your attention!

Project partners

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