# CHARACTERIZING IRISH BEEF AND SHEEP FARMING SYSTEMS TO TAILOR SUSTAINABILITY INTERVENTIONS

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# BACKGROUND

- The Irish beef and sheep sectors are key for Ireland's agriculture
- They also face major challenges:
  - Low farm economic viability and profitability
  - Negative environmental impacts (i.e., GHG emissions)

# POLICIES AND INTERVENTIONS

## HOW TO FACE THE CHALLENGES

Several organizations and policies have addressed these main challenges the beef and sheep sector is facing:

- Common Agricultural Policy (CAP)
- Irish Business and Employers Confederation (IBEC)
- Food Vision Beef Group (FVBG)

## THE ISSUE OF HETEROGENEITY

The high heterogeneity of the sector makes the design and implementation of policies and interventions difficult, as they are not tailored to specific systems

# CHARACTERIZING THE IRISH BEEF AND SHEEP FARMING SECTORS

## GOAL

Gain understanding of the diversity of the Irish beef and sheep sectors, to aid in more tailored approaches for interventions and guide the design of future policies.

## MATERIAL AND METHODS

- National database: National Farm Survey
  - 381 farms
  - 47 variables
- Cluster analysis

## RESULTS

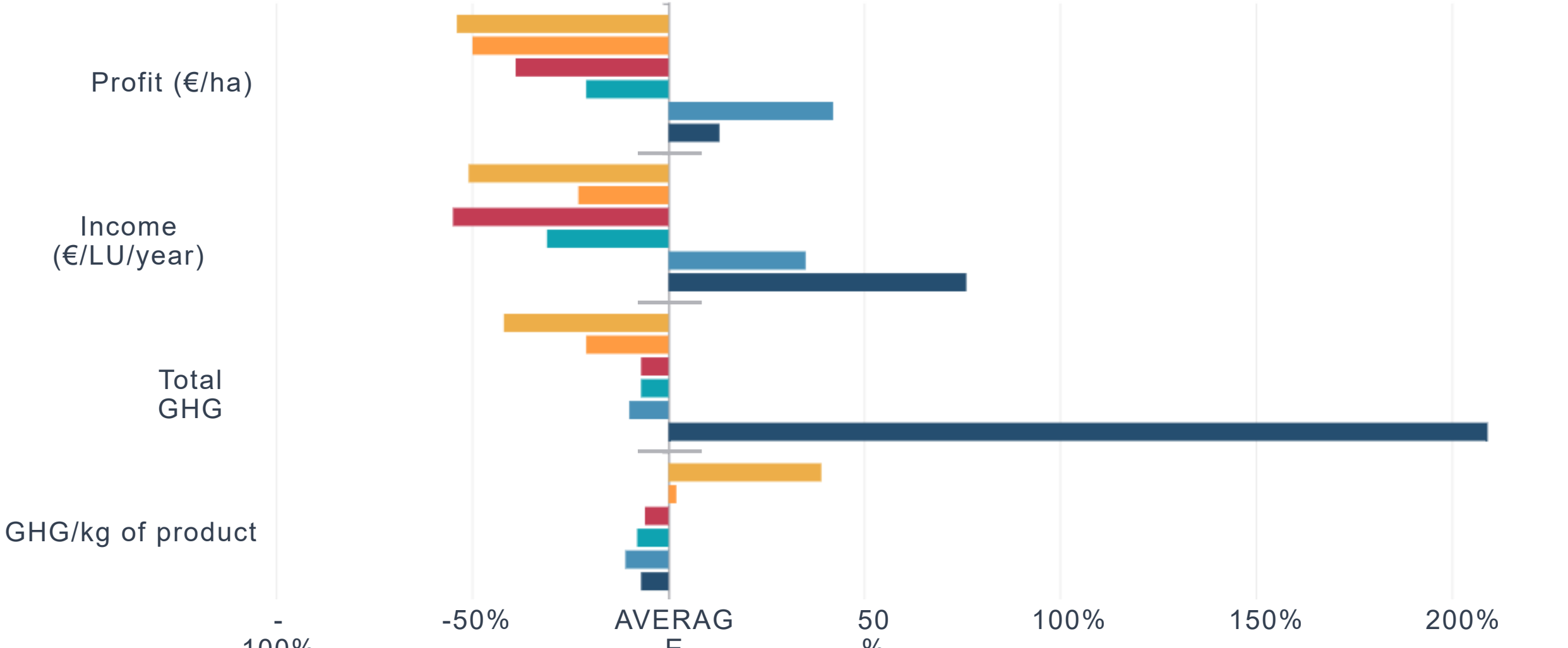
- Six clusters of farms

# CLUSTERS
## Types of farms

| CLUSTER 1 | CLUSTER 2 | CLUSTER 3 | CLUSTER 4 | CLUSTER 5 | CLUSTER 6 |
|---|---|---|---|---|---|
| Small cattle farms | Extensive farms | Medium farms (sheep) | Medium farms (cattle) | Medium mixed farms | Large cattle farms |
| 19% | 5% | 8% | 17% | 44% | 7% |
| • Part-time<br>• Cattle rearing<br>• Low input<br>• Low impact | • Part-time<br>• Sheep or cattle finishing<br>• Large nature areas<br>• Low input<br>• Low impact | • Mixed farms<br>• Mainly sheep<br>• High reliance on external labor | • Mixed farm<br>• Mainly cattle<br>• High reliance on external inputs | • Mixed farms<br>• Balanced sheep to cattle ratio<br>• Most efficient | • Cattle finishing<br>• High intensity |

# CLUSTERS
## Are there average farms?

| CLUSTER 1 | CLUSTER 2 | CLUSTER 3 | CLUSTER 4 | CLUSTER 5 | CLUSTER 6 |
|---|---|---|---|---|---|
| Small cattle | Extensive | Medium (sheep) | Medium (cattle) | Medium mixed | Large cattle |

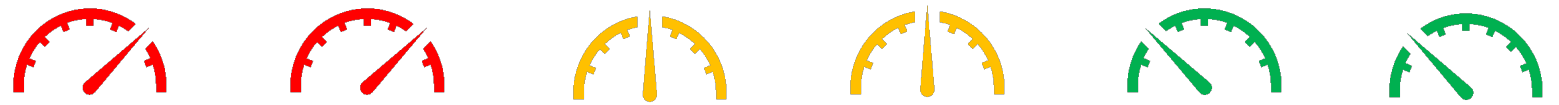


# TAILORING INTERVENTIONS TO SPECIFIC CLUSTERS

## Example: Measures proposed by the FVBG to reduce GHG

| CLUSTER 1 | CLUSTER 2 | CLUSTER 3 | CLUSTER 4 | CLUSTER 5 | CLUSTER 6 |
|---|---|---|---|---|---|
| Small cattle | Extensive | Medium (sheep) | Medium (cattle) | Medium mixed | Large cattle |

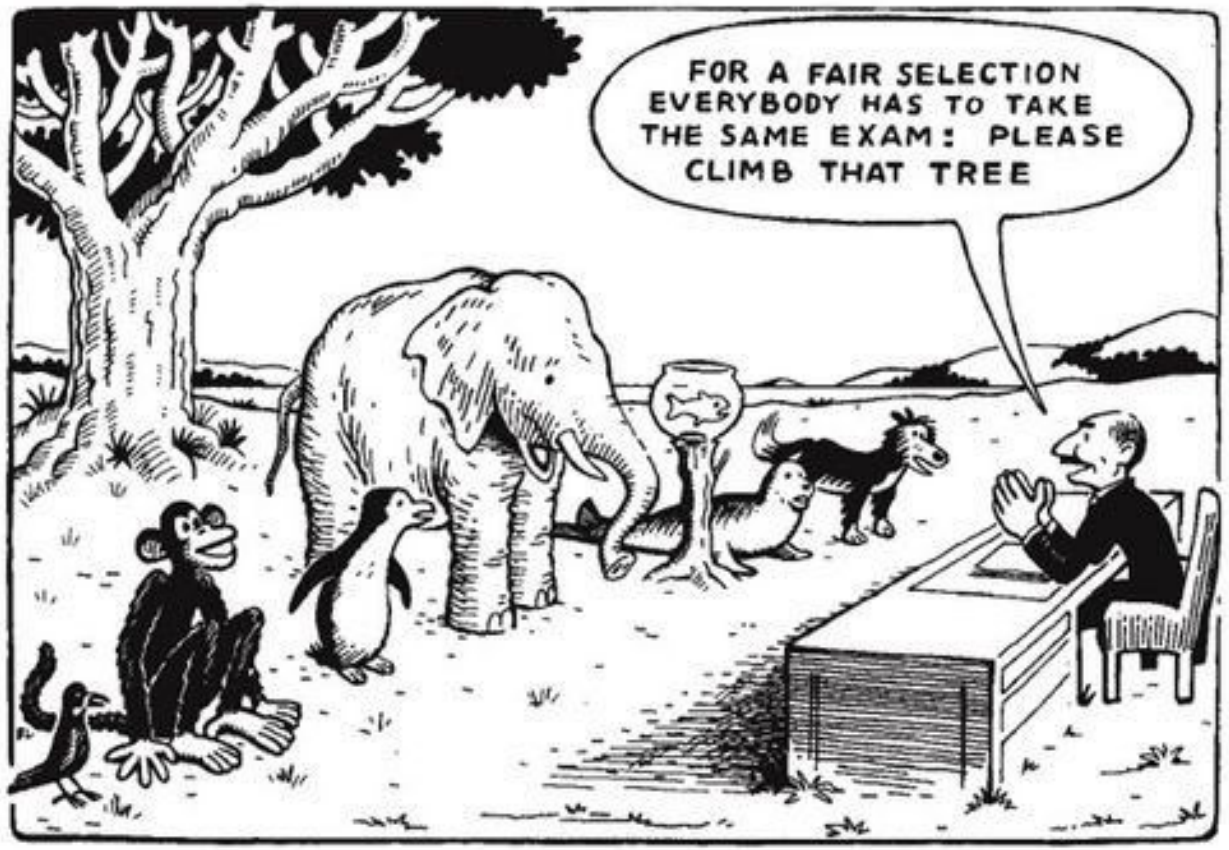
20% OF CLOVER OR MULTISPECIES IN ALL FARMS



INCREASE AREA UNDER ORGANIC PRODUCTION

# THE IMPORTANCE OF TAILORING POLICIES AND INTERVENTIONS

All farms should strive to reduce GHG emissions and be economically viable. However, it is important to consider their differences




# THANK YOU

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Beyond Nutrition

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 814030.

# MATERIALS AND METHODS

## DATA

Teagasc National Farm Survey and Sustainability report

- Random, nationally representative sample
- 870 farms → 381 beef and/or sheep farms
- 47 Variables:
  - O Farm structure
  - O Management
  - O Environmental performance
  - O Economic performance

## ANALYSIS

- SPSS
- Principal component analysis (PCA)
  - O PC were retained if Eigen Value > 1
  - O 9 PC – 79% of variance explained

| Component | % | Variables |
|---|---|---|
| **PC1: Scale** | 25.5 | Greenhouse gas emissions |
| | | Ammonia emissions |
| | | Livestock units |
| | | Total utilised agricultural area |
| | | Subsidies |
| | | Labor requirements |
| | | Direct costs |
| | | Investments |
| **PC2: Phosphorus** | 11.5 | Phosphorus balance |
| | | Phosphorus use efficiency |
| | | Phosphorus application rate |
| **PC3: Feed and efficiency** | 9.7 | Feed costs |
| | | Livestock costs |
| | | Feed |
| | | Beef ammonia efficiency |
| | | Beef emissions efficiency |
| **PC4: Nitrogen and Intensity** | 8.9 | Nitrogen application rate |
| | | Nitrogen balance |
| | | Livestock Intensity |
| | | Nitrogen use efficiency |
| **PC5: Economic performance** | 6.6 | Profitability |
| | | Market return |
| | | Income per labor unit |
| | | Livestock Productivity |
| **PC6: Autonomy** | 5 | Family labor |
| | | Labor costs |
| | | Owned land |
| **PC7: Mixed production and sales** | 4 | Sheep to Cattle ratio |
| | | Livestock sales |
| **PC8: Social vulnerability** | 3.8 | Farm Continuity |
| | | Farmers Training |
| **PC9: Natural landscape** | 3.6 | Pasture area |
| | | Nature area |

# MATERIALS AND METHODS

**ANALYSIS**

- Cluster analysis:
- Hierarchical clustering - Ward's method
- ANOVA test to decide the appropriate number of clusters

1) Small cattle rearing
-Lowest profitability
-Lowest quantity of subsidies per farm
-Lowest Total emissions and highest per kg of beef (GHG and NH3)

2)Extensive
-Lowest Subsidies/ha
-Lowest Farm continuity
-Highest % Nature area per farm (53%)
-Lowest contribution to emissions

3)Medium (sheep)
-Lowest Market return,
-Largest proportion of non-viable farms (91%)
-Lowest Income per labor unit.
-Lowest proportion of farms with High Continuity

4) Medium (cattle)
-Highest Subsidies/ha

5)Medium mixed
-Highest Profitability (484 €/ha)
-Closest to a positive Market Return - 45% of farms with +Market returns
-Lowest NH3 and GHG emissions per kg of beef

6) Large cattle finishing
-Highest Total subsidies (The 2nd highest is less than ½)
-66% of viable farms (highest proportion)
-Highest proportion of farms with high Farm Continuity.
-Highest NH3 and GHG emissions – (22% of total NH3 and GHG emissions, while being just 7% of the farms)

| Component | Variables | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| PC1: Scale | Greenhouse gas emissions | -0.50362 | 0.00096 | -0.09953 | -0.17176 | -0.07861 | 2.34131 |
| | Ammonia emissions | | | | | | |
| | Livestock units | | | | | | |
| | Total utilised agricultural area | | | | | | |
| | Subsidies | | | | | | |
| | Labor requirements | | | | | | |
| | Direct costs | | | | | | |
| | Investments | | | | | | |
| PC2: Phosphorus | Phosphorus balance | -0.18088 | -0.62166 | 0.33516 | -0.83525 | 0.45955 | -0.31573 |
| | Phosphorus use efficiency | | | | | | |
| | Phosphorus application rate | | | | | | |
| PC3: Feed and efficiency | Feed costs | -0.62843 | 0.30545 | 0.23789 | 0.41143 | 0.00267 | 0.14862 |
| | Livestock costs | | | | | | |
| | Feed | | | | | | |
| | Beef ammonia efficiency | | | | | | |
| | Beef emissions efficiency | | | | | | |
| PC4: Nitrogen and Intensity | Nitrogen application rate | -0.23407 | -0.32926 | 0.0266 | 0.64743 | -0.28411 | 1.01433 |
| | Nitrogen balance | | | | | | |
| | Livestock Intensity | | | | | | |
| | Nitrogen use efficiency | | | | | | |
| PC5: Economic performance | Profitability | -0.56561 | -0.49239 | -0.55042 | -0.22039 | 0.49639 | -0.05354 |
| | Market return | | | | | | |
| | Income per labor unit | | | | | | |
| | Livestock Productivity | | | | | | |
| PC6: Autonomy | Family labor | -0.38576 | 0.09817 | 2.14207 | -0.28275 | -0.19691 | 0.30518 |
| | Labor costs | | | | | | |
| | Owned land | | | | | | |
| PC7: Mixed production and sales | Sheep to Cattle ratio | -0.[illegible] | 0.15311 | 0.36021 | -0.[illegible] | 0.35551 | 0.19071 |
| | Livestock sales | | | | | | |
| PC8: Social vulnerability | Farm Continuity | | | | | | |
| | Farmers Training | | | | | | |
| PC9: Natural landscape | Pasture area | | | | | | |
| | Nature area | | | | | | |