

LIFE The Tough Get Going



LIFE 16 ENV/IT/000225 - LIFE TTGG

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Mitigation actions to improve environmental performance in dairy farms

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Introduction: scope and objectives



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Cattolica University is partner of the LIFE TTGG project with the departments of:

- Animal, Nutrition and Food Sciences – DiANA
- Sustainable Food Process – DiSTAS

Project objectives:

- Estimating the environmental impact of milk production at the farm gate
- Identification of environmental hotspots
- Actions proposal to mitigate the environmental performance of dairy farms
- Implementation of the Environmental Decision Support System - EDSS

PEF Product
Environmental
Footprint



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Sampling procedure

PEFCR equation to define the number of sub-populations: $N_{sp} = g * t * c = 60$

✓ **4200** dairy farms -> sub-population of **1320** farms with known characteristics

✓ **65** dairy farms sampled ($\sqrt{\text{number of dairy farms CTFGP}}$)

*g: (n. of geographical positions): Po Valley or Trentino Alto Adige -> **2***

*t: (n. of technologies/farming practices): statistical (percentiles) technology classes obtained on the size of the herd -> **10***

*c: (n. of production classes): average herd production -> **3***

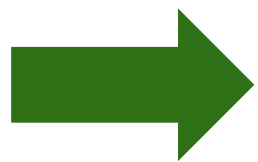
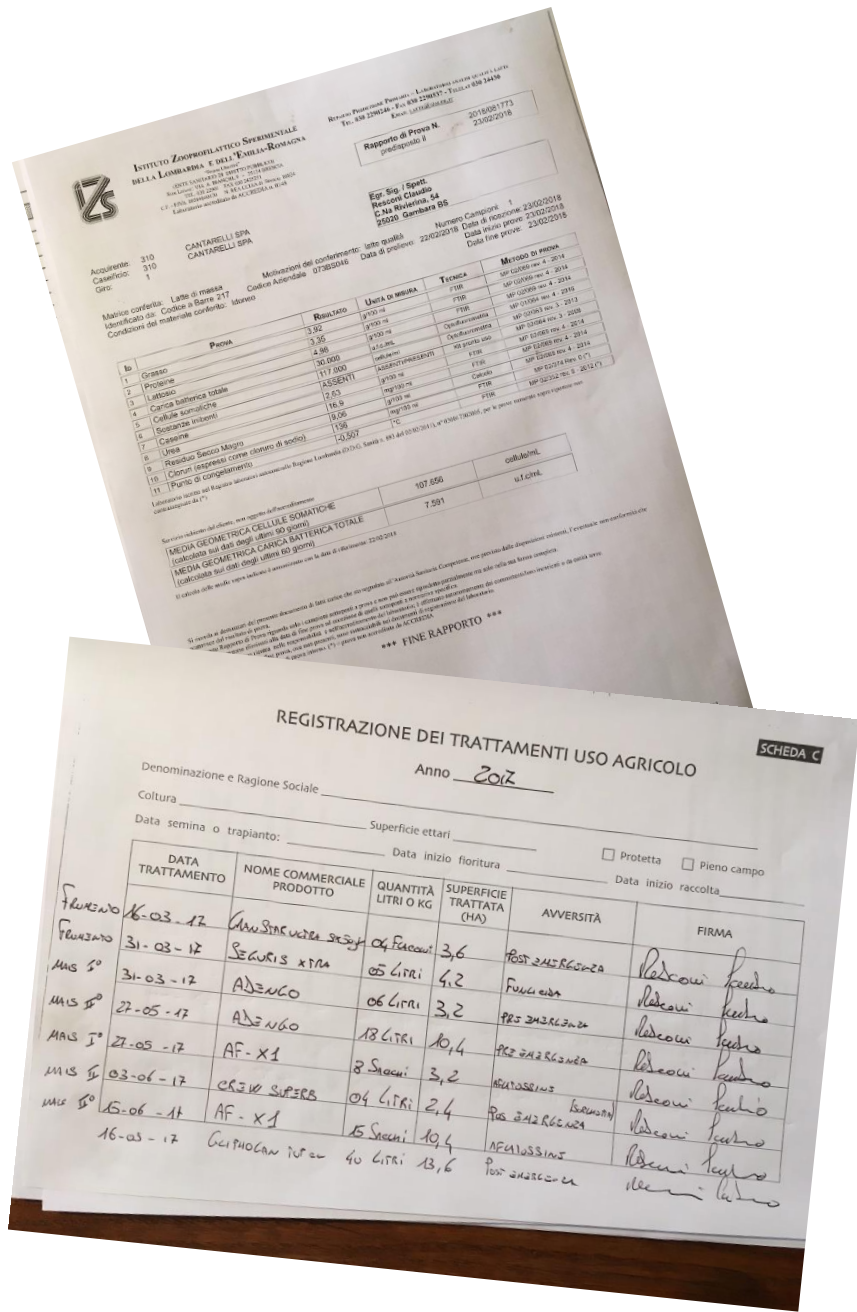
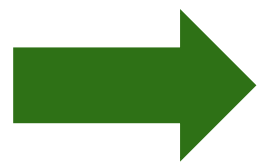


Inventory analysis

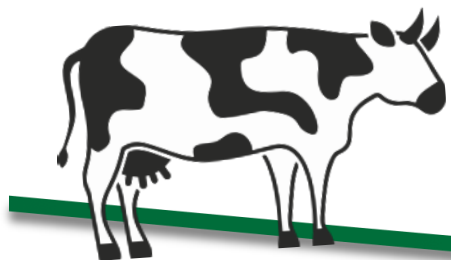
Dairy farms audit

Data collection

Data analysis

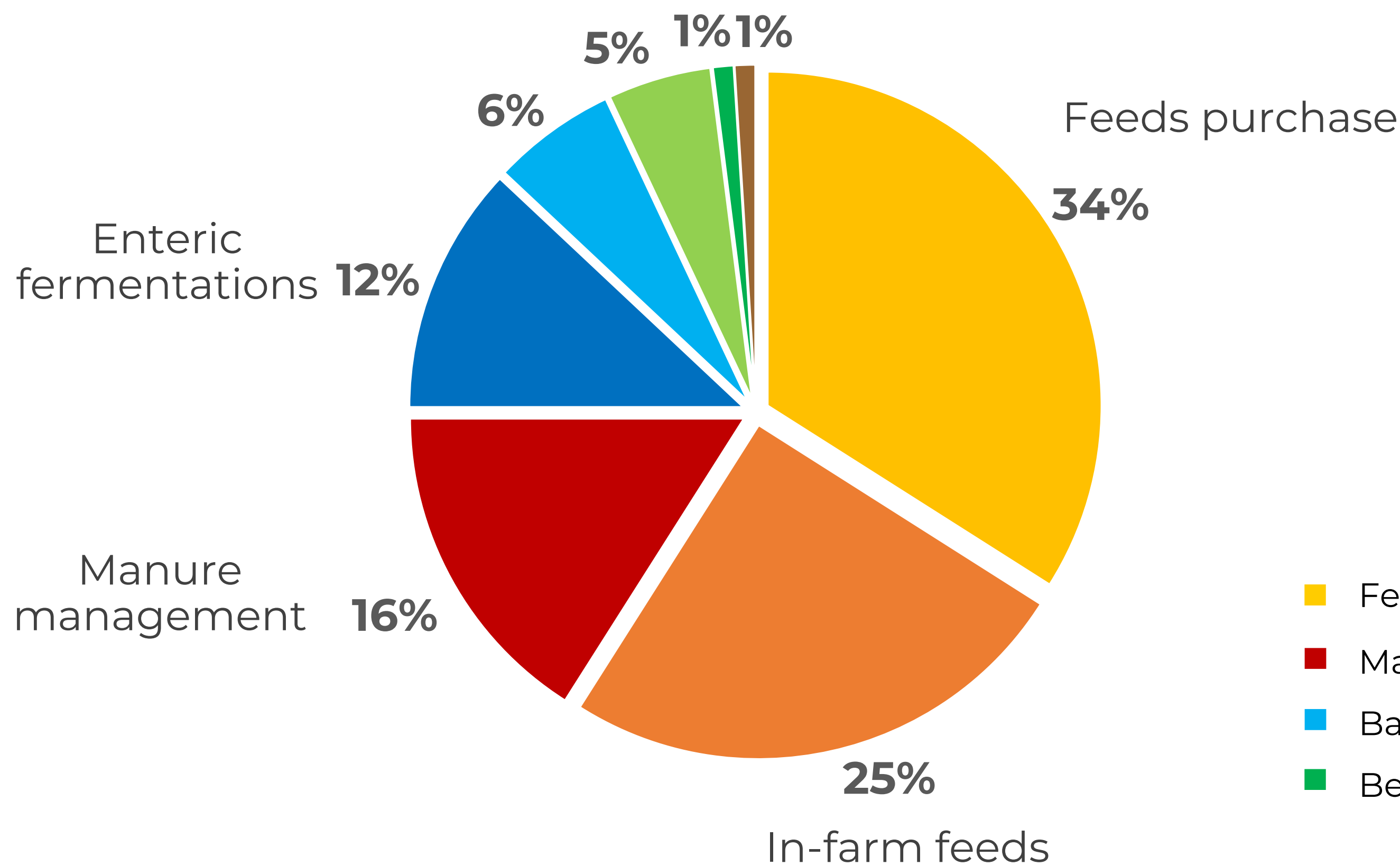


- Feeds purchase
- In-farm feeds
- Bedding materials
- Energy
- In-farm water use
- Emissions -> barn
 - > enteric
 - > manure



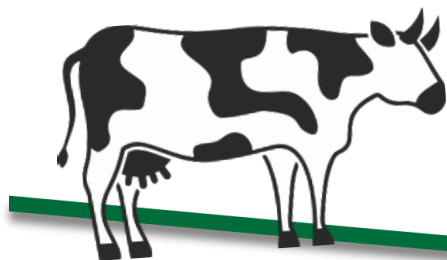
Environmetal impact of milk production

Method EF 2.0 – weighted results without toxicity categories



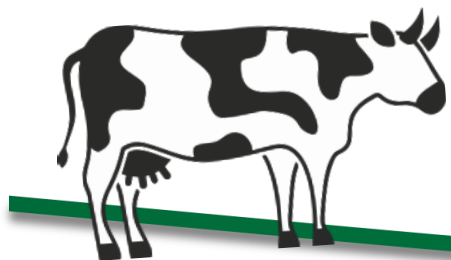
Impact category	1 kg Milk FPCM
Climate change	32%
Water scarcity	25%
Eutrophication terrestrial	11%
Land use	7%
Total	75%

- Feeds purchase
- Manure management
- Barn management
- Bedding materials
- In-farm feeds
- Enteric fermentations
- Energy
- In-farm water use



Selected reduction measures

	Mitigation action	Description
1	Management and distribution of livestock manure and distribution of mineral fertilizers	<ul style="list-style-type: none">- Low emissions manure storage systems- Best agricultural practices for manure spreading- Best agricultural practices for nitrogen fertilizers spreading- Use of slow release fertilizers (urea)
2	Anaerobic treatment	<ul style="list-style-type: none">- Manure valorization through anaerobic digestion
3	Optimization of the herd composition	<ul style="list-style-type: none">- Correct proportion of breeding and productive animals- Reducing the number of unproductive animals- Reduction of inputs (feeds purchase) and outputs (manure and related emissions)
4	Source of feeds	<ul style="list-style-type: none">- Soybean meal origin
5	Quality of feeds	<ul style="list-style-type: none">- Nutritional characteristics of in-farm feeds
6	Heat recovery	<ul style="list-style-type: none">- Heat recovery from milk tank



Driving parameters and normalization strategies

Mitigation action

Driving parameters

Normalization

1

Management and distribution of livestock manure and distribution of mineral fertilizers

- Rigid lid or roof
- Shallow injection manure, closed slot (> 15 cm)
- Injection of fertilizer into the soil
- Kg N from urea

- % reduction of NH₃ emissions
- Rigid lid or roof = 80%
- Closed slot = 85%
- Injection = 90%
- 20% reduction of N from urea
- Purchasing
- Yield increase [ton/ha]

2

Anaerobic treatment

- % digestate management

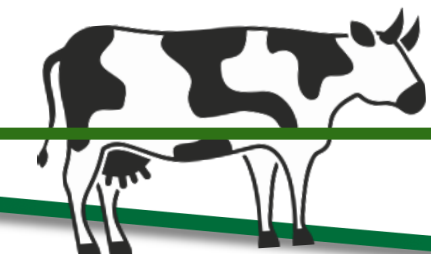
- MCF Anaerobic digester = 1%
- EF3 Anaerobic digester = 0.0006
- FracGasm digested = 7%

3

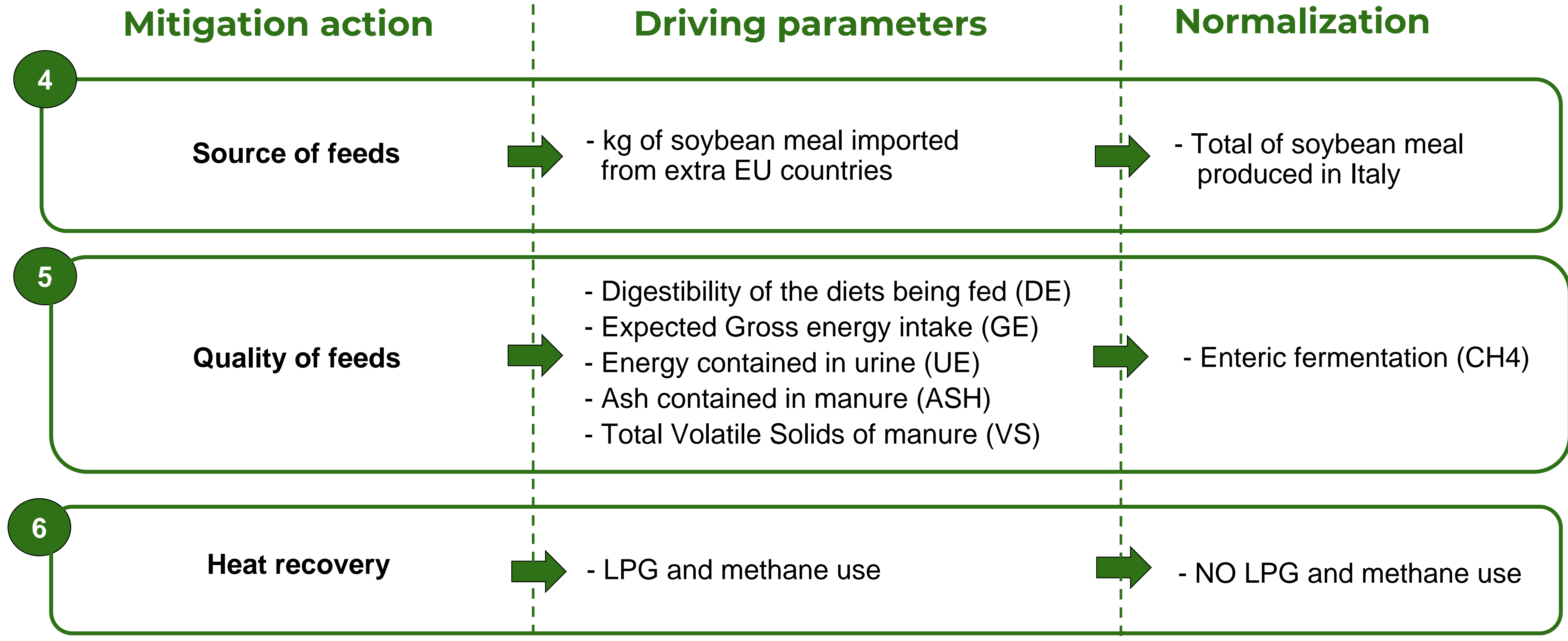
Optimization of the herd composition

- Dry period = 60 days
- Age at first calving = 24 months
- Average number of lactations per cow = 2.8
- Calving interval = 376 days
- Average number of calving per year = 0.97
- % of female calves born per year = 0.5 %

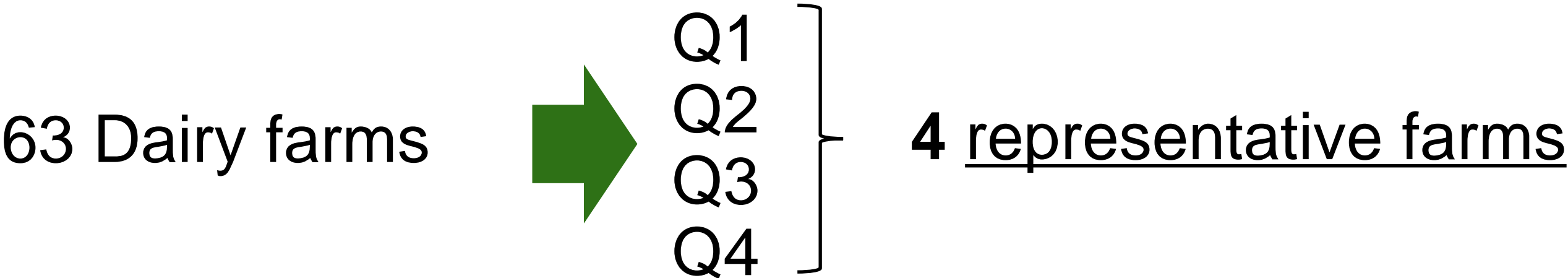
- New herd composition
- Feeds purchase
- Manure production
- Enteric fermentation
- ...



Parametri e strategie di normalizzazione



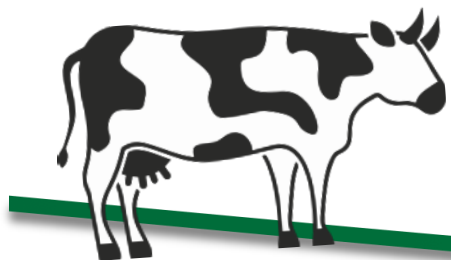
Mitigation measures: % reduction



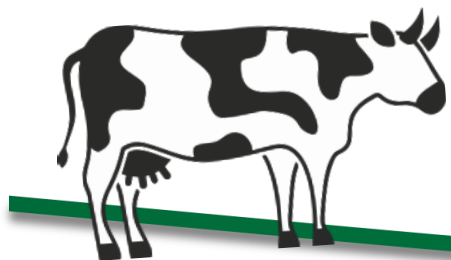
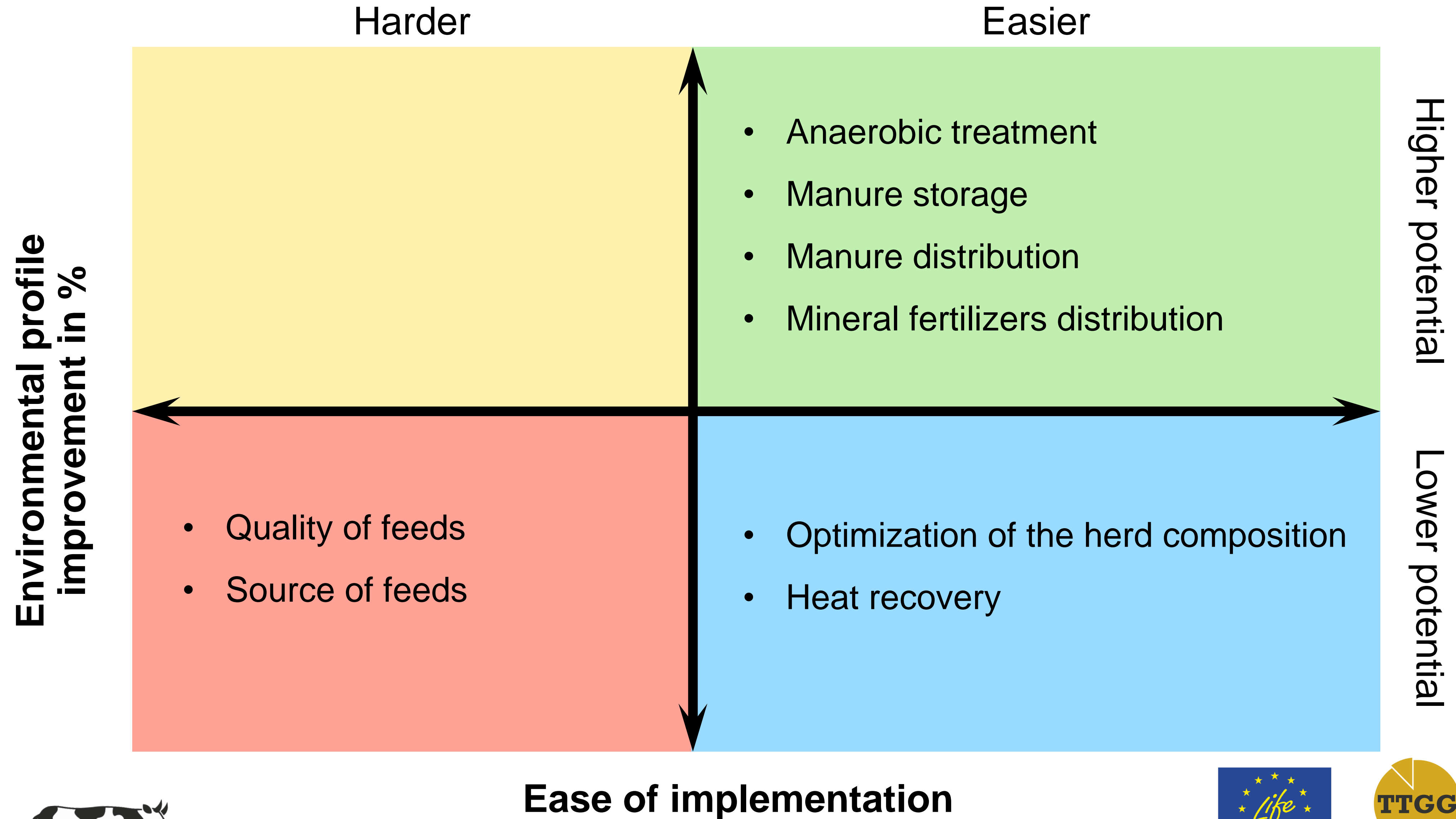
1

2

	Q1	Q2	Q3	Q4	Range reduction
Management and distribution fertilizers	-6%	-6%	-3%	-7%	3÷7
Anaerobic treatment	-7%	-9%	-3%	-7%	3÷9
Optimization of the herd composition	-	-5%	0.09%	-2%	2÷5
Source of feeds	0.22%	1%	0.45%	0.5%	-
Quality of feeds	-2%	-3%	-2%	-1%	1÷3
Heat recovery	-	-3%	-0.01%	-0.01%	0.01÷3



Results: efficiency measures





Thank you for your attention

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