

Any questions ?

https://attend.wordly.ai/join/GGQM-5068

LIFE GREEN SHEEP FINAL SEMINAR · 17 & 18 NOVEMBER 2026

Mitigation Strategies to Reduce the Carbon Footprint of European Sheep Production

Laeticia Riaguas (Oviaragon)

Sindy Throude (Idele) · Cathal Buckley (Teagasc) · Gabriella Serra (Agris) · Uxue Sarriegi (Lurgintza) · Cristian Ilisiu (IBNA)

LIFE Green Sheep : Reducing GHG Emissions by 5 to 12% whilst Maintaining Farms' Sustainability

-5 % **Demonstrative farms**
1 284 farms in Europe

-12 % **Innovative farms**
261 farms in Europe

Whilst maintaining sustainability performance

Only innovative farms

1 **Initial Assessment (2021)**
Environment et Sustainability performances

2 **Carbon Action Plan**
Mitigation practices identified, estimated gains based on simulation

3 **Implementation of Mitigation Practices**
Farms monitoring

4 **Final Assessment (2024)**
Assessment of impacts of mitigation practices

LIFE Green Sheep : Reducing GHG Emissions by 5 to 12% whilst Maintaining Farms' Sustainability

-5 % **Demonstrative farms**
1 284 farms in Europe

-12 % **Innovative farms**
261 farms in Europe

Whilst maintaining sustainability performance

Only innovative farms

1 — Initial Assessment (2021)
Environment et Sustainability performances

2 — Carbon Action Plan
Mitigation practices identified, estimated gains based on simulation

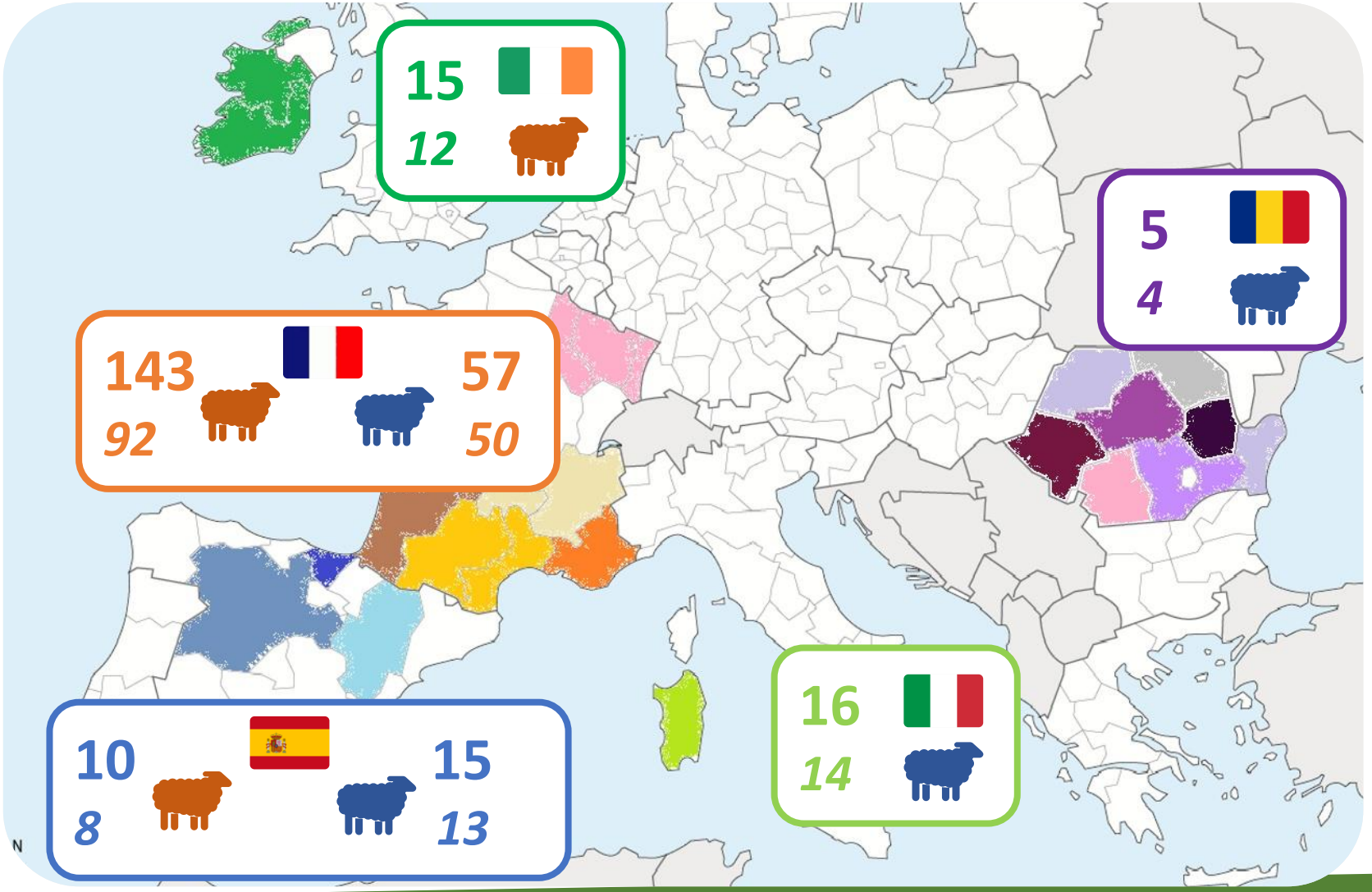
3 — Implementation of Mitigation Practices
Farms monitoring

4 — Final Assessment (2024)
Assessment of impacts of mitigation practices

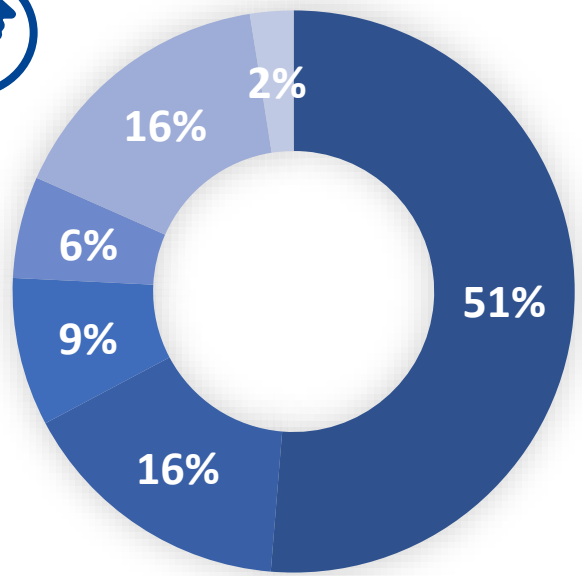
Monitoring of 261 Innovative Sheep Farms

(168 meat farms + 93 dairy farms)

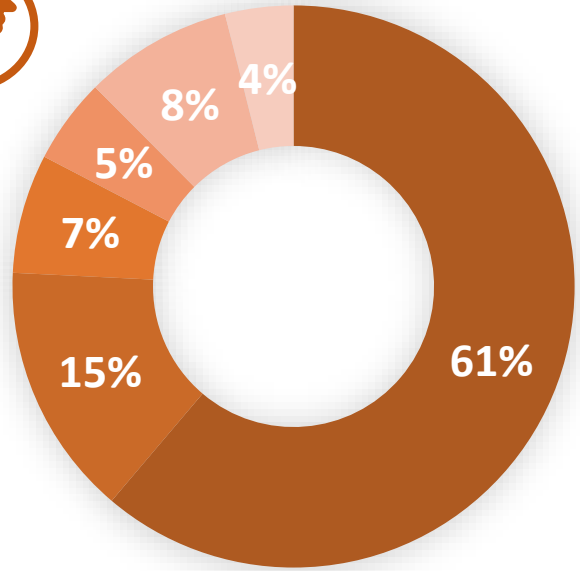
The analysis of mitigation practices is based on **193** *(112+81)* action plans *(identified in italics, without outliers)*



What Mitigation Practices Have Been Put in Place in Sheep Farms ?



- Enteric fermentation
- Manure management
- Nitrogen fertilization
- Fuel & Electricity
- Food purchased
- N fertilizers purchased and other inputs



- Enteric fermentation
- Manure management
- Nitrogen fertilization
- Fuel & Electricity
- Food purchased
- N fertilizers purchased and other inputs

<u>For reminder</u>, main source of GHG emissions : Enteric fermentation (51%, 61%) for both sectors (Dairy, Meat)

For <u>Dairy sector</u> : food purchased is important (16%)

→ **Impact on the type of mitigation practices put in place**

Mitigation Practices Implemented by Sheep Farms

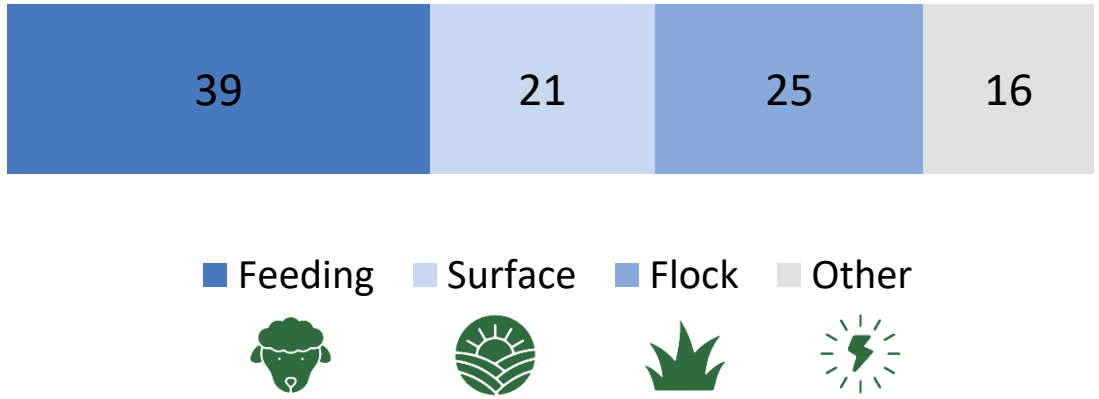
198 / 2,4

Mitigation practices implemented / Practices per farm (max 6)

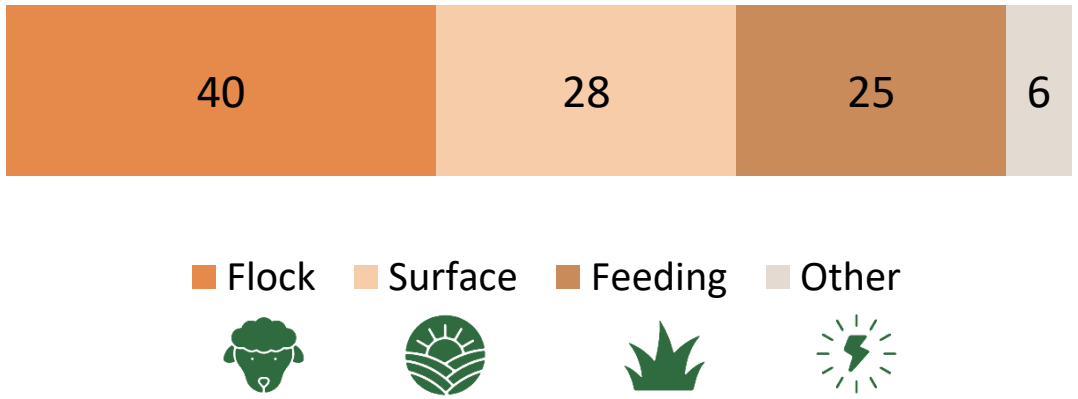
305 / 2,8

Mitigation practices implemented / Practices per farm (max 8)

Share of practices by topic (%)

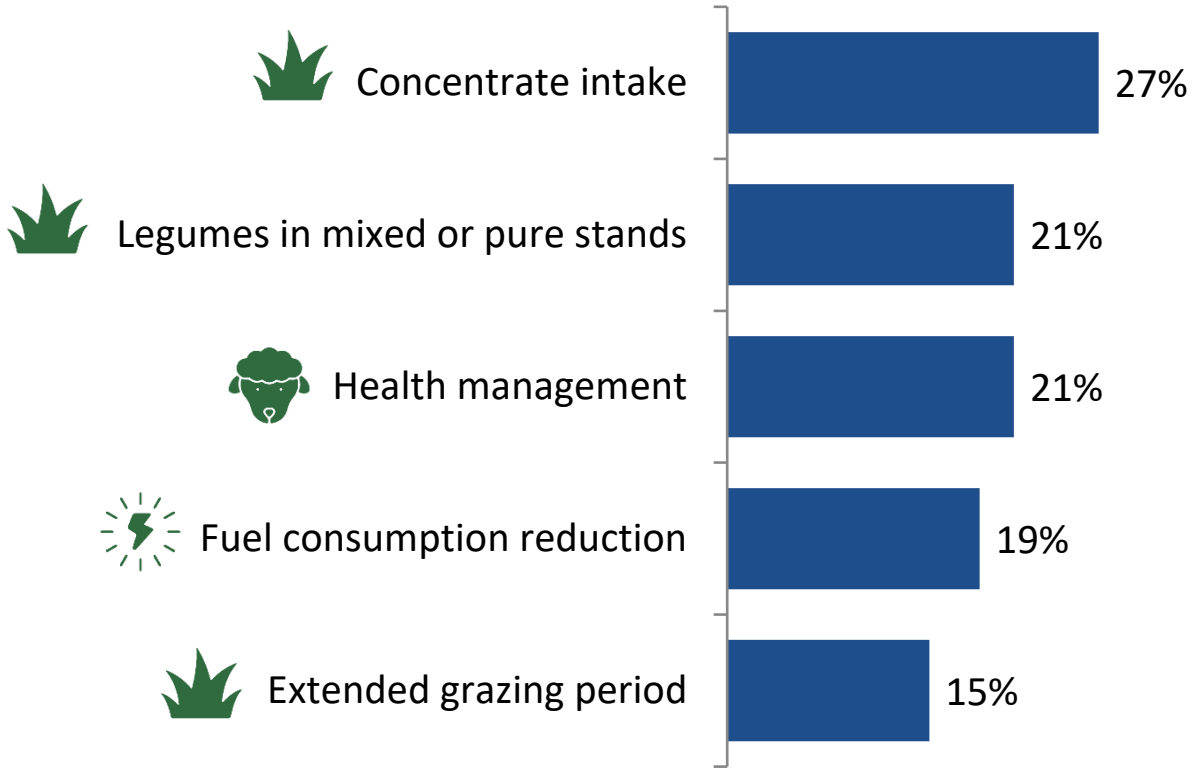


Share of practices by topic (%)



Mitigation Practices Implemented by Dairy Farms

Top 5 mitigation practices (% of farms implementing)



Top mitigation practices by country

France: Concentrate intake (44% of farms)

Italy: Fuel consumption reduction (85%)

Spain : Electricity production (62%)

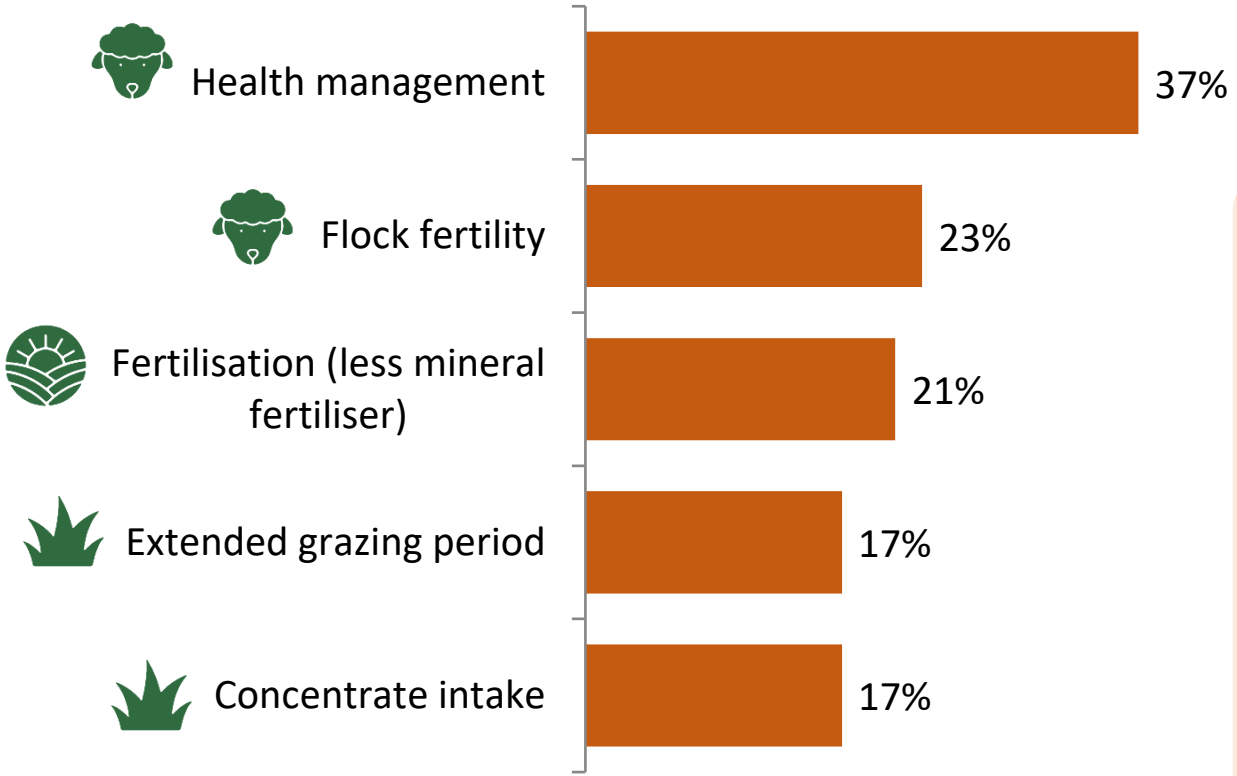
Romania: Feeding management (40%)

KEY MESSAGES

- **Feeding management** is the main topic of mitigation practices implemented (but the profile varies by country) : **the core of the technical profession with a direct economic benefit !**
- **Optimizing concentrates** is the first mitigation practice
- Top 5 is almost the same for each system

Mitigation Practices Implemented by Meat Farms

Top 5 mitigation practices (% of farms implementing)



Top mitigation practices by country

France: Health management (46% of farms)

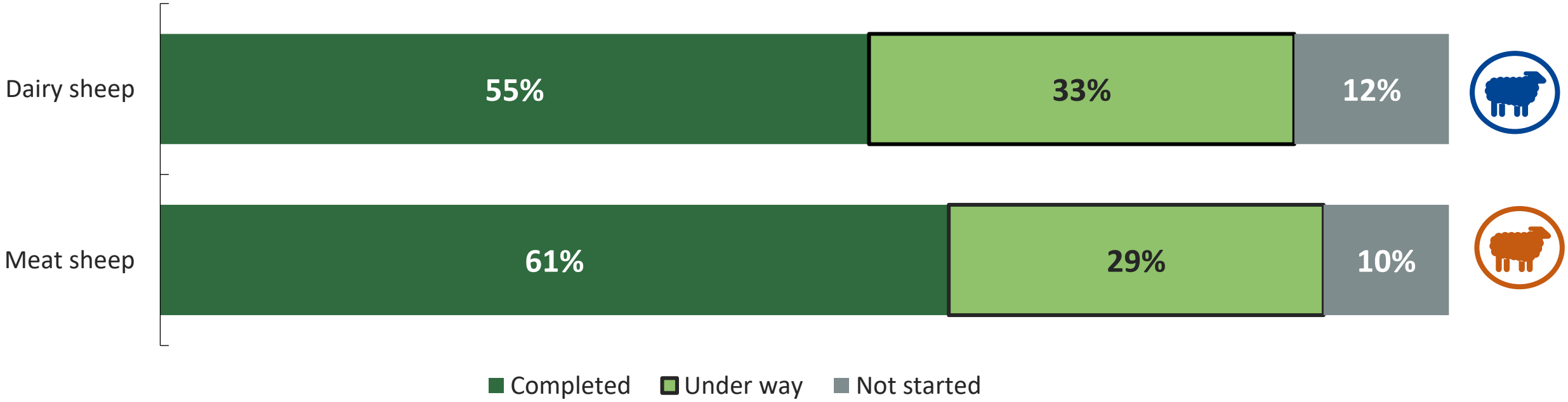
Ireland: P-fertiliser cut and soil pH (75%)

Spain: Improving flock genetics (63%)

KEY MESSAGES

- The **flock management** is the main topic of mitigation practices implemented (but the profile varies by country) : **the core of the technical profession with a direct economic benefit !**
- **Health management** is the first mitigation practice
- Top 5 is almost the same for each system

Farmers Are Genuinely Engaged: Nearly 9 in 10 Practices Are Completed or Under Way



Completed or under way: **88%** of mitigation practices in dairy sheep, **90%** in meat sheep

Effects take time: many mitigation practices are still under way (33% in dairy, 29% in meat)

Example of a SP dairy sheep farm: *Its starting point (2021 data)*

Gabiria (Gipuzkoa, Basque Country) · Dairy sheep, blonde-faced Latxa · 2 AWU



30,2 ha UAA incl. 30,2 ha MFA

Permanent grassland	**92%**
Temporary grassland	**8%**

Technical
Flock in 2021 – 298 ewes

Milk production Raw litres / ewe	237	**Prolificacy** %	137%
Concentrates Raw kg / ewe	201	**Concentrate self-sufficiency / forage** %	0% / 50%

Feeding
Nitrogen optimization

Adjusting the rations based on the needs and introducing other protein sources

Genetic
Production and health

Using a dairy control system and selecting rams with high genetic value

Energy
Electricity

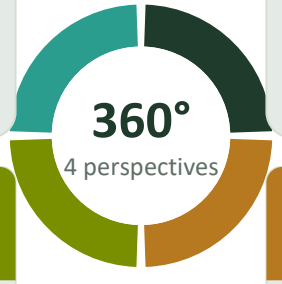
Solar panel installation on the eaves of the barn

Example of a SP dairy sheep farm: *Impact of the mitigation practices (2021 → 2024)*

Mitigation practices : ration adjustment · dairy control system · solar panels

Technical	2021 → 2024	Change
Concentrates per ewe	201 → 139 kg	▼ -31%
Concentrate self-sufficiency	0% → 0%	=
Forage self-sufficiency	50 → 73%	▲ +23pts
Mineral nitrogen /ha	0 → 0 kg N	=
Fuel /ha	99 → 95 litres	▼ –4%

Environment	2021 → 2024	Change
Gross Carbon footprint *(kg eqCO2/l corrected milk 75-55)*	4,53 → 3,25	▼ –28%
Net Carbon footprint *(kg eqCO2/l corrected milk 75-55)*	3,68 → 2,56	▼ –30%
Fossil energy *(MJ/ha)*	4 758 → 4 204	▼ –12%
Nitrogen balance *(kg N/ha)*	185 → 112	▼ –40%
Biodiversity *(ha eq/ha)*	1,12 → 1,97	▲ +76%



Social	2021 → 2024	Change
Food performance people fed per year	244 → 314	▲ +29 %

Economic	2021 → 2024	Change
Partial budget *(€/ewe)* economic gain (revenue, costs) from the levers, excluding investments		▲ +21 %

Green = favorable change, grey = unfavorable.

Example of an IT dairy sheep farm: *Its starting point (2021 data)*

Tula (Sassari, Sardinia) · Dairy sheep, Sarda breed · 3 AWU



97,5 ha UAA incl. 90,7 ha MFA

Permanent grassland	**10%**
Temporary grassland	**83%**
Annual crops	**7%**

Technical
Flock in 2021 – 670 ewes

Milk production Kg FPCM / ewe	218	**Prolificacy** %	120%
Concentrates Raw kg / ewe	190	**Stocking rate**	6,5 ha/ewe

Feeding
Forages self-sufficiency

Improving forage and pasture self-sufficiency (+30%) by eliminating dairy cows unit, land freed up can be used to produce legume hay

Flock
Animal behaviour

The farm is located in an area with high summer temperatures and low winter temperatures

Energy
Fuel

Reduction of fuel use
Thanks to a reduction of tillage and the purchase of a machine that prepares the seedbed in a single pass

Example of a IT dairy sheep farm:
Impact of the mitigation practices (2021 → 2024)

Mitigation practices : forage self-sufficiency · animal behaviour · reduction fuel consumption

Technical	2021 → 2024	Change
Milk production level/ewe	218 → 314 kg	▲ +43%
Concentrate consumption	198 → 220	+11 %
Forage self-sufficiency	75 → 87 %	▲ +12pts
Mineral nitrogen /ha	52 → 10 kg N	- 81 %

Environment	2021 → 2024	Change
Gross Carbon footprint *(kg eqCO2/kg FPCM)*	2,36 → 2,34	▼ –1%
Net Carbon footprint *(kg eqCO2/kg FPCM)*	2,21 → 1,97	▼ –11%
Carbon storage *(kg eqCO2/kg FPCM)*	0,16 → 0,36	▲+125 %
Fuel consumption *(litres/ha)*	191 → 137	▼ -28%
Nitrogen balance *(kg N/ha)*	138 → 40	▼ -71%

360°
3 perspectives

Social	2021 → 2024	Change
Food performance people fed **per ha**	24 → 7	▼ -71 %

At the dairy sheep unit scale, Feed performance : ▼ -20 %

Green = favorable change, grey = unfavorable.

Example of a RO dairy sheep farm: *Its starting point (2022 data)*

Southern Romania · Dairy sheep, Teleorman' Blackhead · traditional, yet self-sufficient and cost-efficient



65 ha UAA incl. 47 ha MFA

Permanent grassland	**63%**
Temporary grassland	**15%**
Self-consumed crops	**22%**

Technical
Flock in 2022 – 400 ewes

Milk production Raw litres / ewe	119	**Prolificacy** %	135%
Concentrates Raw kg / ewe	240	**Concentrate self-sufficiency / forage** %	97% / 89%

Soil
Forage quality

Oat after oleaginous; grass/legume mixtures in grassland.

Feeding
Protein self-sufficiency

Sunflower seeds cultivated on farm land, also triticale and maize

Energy
Fuel

Off-grid farm, minimal conpsumtion of fuels (for transport and crops)

Example of a RO dairy sheep farm:
Impact of the mitigation practices (2022 → 2025)

Mitigation practices : Incorporate legumes in grassland (making better use of pasture) · Reduce the number (proportion) of unproductive animals

Technical	2022 → 2025	Change
Concentrates per ewe	240 → 240 kg	= ; 0%
Concentrate self-sufficiency	97 → 97%	= ; 0%
Forage self-sufficiency	89 → 89%	= ; 0%
Mineral nitrogen / ha	34 → 34 kg N	= ; 0%
Fuel / ha	17 → 16 litres	▼ –6%

Social	2021 → 2024	Change
Food performance people fed per year	262 → 283	▲ +8 %

360°
3 perspectives

Environment	2022 → 2025	Change
Gross Carbon footprint *(kg eqCO2/l corrected milk 130 gMSU)*	3,38 → 2,72	▼ –20 %
Net Carbon Footprint *(kg eqCO2/l corrected milk 130 gMSU)*	2,27 → 1,86	▼ –18 %
Fossil energy *(MJ/ha)*	5524 → 5491	▼ –1 %
Nitrogen balance *(kg N/ha)*	41 → 49	▲ +19%
Biodiversity *(ha eq/ha)*	3,8 → 3,8	= ; 0%

Green = favorable change, grey = unfavorable.

Example of a FR dairy sheep farm: *Its starting point (2021 data)*

Nouvelle-Aquitaine · Dairy sheep, Manech Tête Rousse · 2 AWU · self-sufficient and cost-efficient



48,5 ha UAA incl. 44,7 ha MFA

Permanent grassland	**45%**
Temporary grassland	**47%**
Self-consumed crops	**8%**

Technical
Flock in 2021 – 346 ewes

Milk production Raw litres / ewe	198	**Prolificacy** %	135%
Concentrates Raw kg / ewe	224	**Concentrate self-sufficiency / forage** %	34% / 89%

Soil
Forage quality

Oat/vetch catch crop after soybean and maize; grass/legume mixtures in grassland.

Feeding
Protein self-sufficiency

Barn drying and on-farm soybean in place of purchased feed.

Energy
Fuel

Mixer wagon sold, fewer passes in the fields.

Example of a FR dairy sheep farm:
Impact of the mitigation practices (2021 → 2024)

Mitigation practices : cover crops and legumes · barn drying and soybean · mixer wagon sold

Technical	2021 → 2024	Change
Concentrates per ewe	224 → 130 kg	▼ -42%
Concentrate self-sufficiency	34 → 100%	▲ +66 pts
Forage self-sufficiency	89 → 100%	▲ +11 pts
Mineral nitrogen /ha	36 → 15 kg N	▼ -58 %
Fuel /ha	253 → 166 litres	▼ –34%

Social	2021 → 2024	Change
Food performance people fed per year	391 → 399	▲ +2 %



Environment	2021 → 2024	Change
Gross Carbon footprint *(kg eqCO2/l corrected milk 130 gMSU)*	3,38 → 2,22	▼ –34 %
Net Carbon Footprint *(kg eqCO2/l corrected milk 130 gMSU)*	3,09 → 1,77	▼ –43 %
Fossil energy *(MJ/ha)*	34 740 → 14 978	▼ –57 %
Nitrogen balance *(kg N/ha)*	132 → 51	▼ –61%
Biodiversity *(ha eq/ha)*	3,4 → 3,5	▲ +2.9 %

Green = favorable change, grey = unfavorable.

Example of Irish meat sheep farm : John Curley Starting point (2021)

Roscommon, Ireland · Mid-season prime lamb production · Sheep and suckler beef



Technical
2021 baseline

Mature ewes joined	190	**Assessed sheep area**	25.24 ha
Chemical nitrogen kg N/ha	63	**Protected urea** % of chemical N	11%

Whole farm profile

Pasture area	**36 ha**
Breeding ewes	**~200**
Farming system	**Mixed**

Flock and grassland
Production and nitrogen use

Increase carcass output per hectare.

Limit chemical nitrogen use.

Maximise Grass DM output per ha.

Fertiliser and slurry
Fertiliser choice and spreading method

Use more protected urea.

Use low emission slurry spreading.

Optimise soil fertility (ph)

John Curley's meat sheep farm: Impact of the mitigation practices (2021 → 2024)

Practices: improve sheep output · manage nitrogen · use protected urea · adopt LESS

Technical	2021 → 2024	Change
Carcass output Kg/ha	201 → 262	+23%
Lambs weaned / ewe joined	1.51 → 1.75	+14%
Lamb Mortality rate %	7%- 5%	- 29%

Environment	2021→ 2024	Change
Carbon footprint *kg CO_2e/kg carcass*	20.2→ 19.3	–4.7%
Protected urea *% of chemical nitrogen*	11% → 32%	+290 %
Slurry spread using LESS	0% → 100%	+100 %
Carbon sequestration *kg CO_2e/ha*	1,359 → 1,463	+7.1%



Social	2021 → 2024	Change
Hours worked on the farm As reported in the testimony		Unchanged

Economic	2021 → 2024	Change
Sheep enterprise estimates		
Gross output		+20%
Gross margin		+35%

"Implementing more environmentally friendly practices doesn't have to cost money." John Curley

Example of a SP meat sheep farm: *Its starting point (2021 data)*

Cella, TERUEL · Sheep meat, Rasa Aragonesa ewes · Pastoral grass-based system, 3 lambings in 2 years · 2 UTAs



34 ha SAU + 500 ha rangeland

Grazing of cereals	**22 has**
Grazing of legumes	**12 has**
communal pastures and cereal reeds	**500 Has**

Technical
Flock in 2021 – 900 ewes

Fertility rate %	**103%**	**Prolificacy** %	**126%**
Weight sold kg live / ewe	**20,24**	**Concentrates** kg / ewe	**32**

Reproduction
Target: +7% fertility; -2% mortality lamb

Prepare ewes for mating: supplementation of own forages during the mating period with a quality and balanced feed

Feeding
Self-suficiency: 15%

Increase grazing of own areas (annual crops and legumes), and forage production over food purchases.

Example of a SP meat sheep farm:
Impact of the mitigation practices (2021 → 2024)

Mitigation practices: Increase grazing of own areas, and on-farm forage production over food purchases. Precision feeding in the most important periods. Limit the mortality of lambs. Adjusting the flock size (unproductive animals)

Technical	2021 → 2024	Change
Fertility	103 → 110 %	▲ + 7 pts
Prolificacy	126 → 131 %	▲ +5 pts
Mortality	13 → 10 %	▼ - 3pts
€/lamb (25 kg CW)	83 → 111	▲ 33,7 %
% food purchased/total food	70% → 57%	▼ 13 pts

Environment	2021 → 2024	Change
Gross Carbon footprint *(kg eqCO2/kg carcass)*	44,5 → 37,4	▼ –15,9%
Net Carbon Footprint *(kg eqCO2/kg carcass)*	38,5→ 21,5	▼ -44,3 %
Nitrogen balance *(kg N/ha)*	26→ 18	▼ –30,7%
Fossil energy *(MJ/ha)*	2.254→ 1.564	▼ –30,6%
Biodiversity *(Ha eq/ha)*	0,24 → 0,30	▲ +25%

360°
4 perspectives

Social	2021 → 2024	Change
Kg live weight sold/ewe	20,24 → 27,7	▲ 7,46pts

Economic	2021 → 2024	Change
Gross margin or profit *(€/ewe)* economic gain (revenue, costs) excluding investments	2,5 → 64	▲ +61,5 €

Green = favorable change, grey = unfavorable.

Example of a FR meat sheep farm: *Its starting point (2021 data)*

AURA · Sheep meat, Rava ewes · Pastoral grass-based system, 1 lambing per year · 1,5 AWU



72,5 ha UAA + 8,9 ha rangeland

Permanent grassland	**100%**
Temporary grassland	**0%**
Self-consumed crops	**0%**

Technical
Flock in 2021

Fertility rate %	**74%**	**Numerical productivity** %	**124%**
Weight productivity kg carcass / ewe	**15.7**	**Concentrates** kg / ewe	**134**

Reproduction
Target: +10% fertility

Prepare ewes for mating: feed, minerals and vitamins, sorting, enough rams.

Young stock mortality
Target: −5%

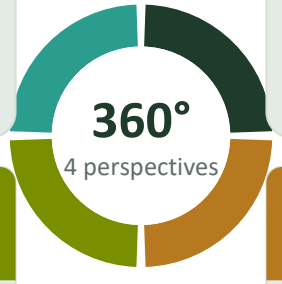
Prepare for lambing: feed and minerals, then health care for 3 weeks.

Example of a FR meat sheep farm:
Impact of the mitigation practices (2021 → 2024)

Mitigation practices : improve flock reproduction · limit lamb mortality

Technical	2021 → 2024	Change
Fertility	74 → 98%	▲ +24 pts
Lamb weight	17,6 → 17,8 kg	▲ +1,1%
Weight productivity *(/ewe)*	15,7 → 17,8 kg	▲ +13%
Forage self-sufficiency	98 → 100%	▲ +2 pts
Mineral nitrogen /ha	30 → 0 kg N	▼ –100 %

Environment	2021 → 2024	Change
Gross Carbon footprint *(kg eqCO2/kg carcass)*	47,4 → 43,0	▼ –9.3%
Net Carbon footprint *(kg eqCO2/kg carcass)*	24,2 → 19,7	▼ –19%
Fossil energy *(MJ/ha)*	10 048 → 7 693	▼ –23 %
Nitrogen balance *(kg N/ha)*	72 → 47	▼ –35%
Biodiversity *(Ha eq/ha)*	5,1 → 4,9	▼ -1,9 %



Social	2021 → 2024	Change
Food performance people fed per year	79 → 86	▲ +8,9 %

Economic	2021 → 2024	Change
Partial budget *(/ewe)* economic gain (revenue, costs) from the levers, excluding investments		▲ +17 €

Green = favorable change, grey = unfavorable.

At Project Level, a Reduction in GHG Emissions and in Both Gross and Net Carbon Footprints

-3,2 % This is the change in Total GHG emissions between 2021 and 2024	**-7,3 %** This is the change in Total GHG emissions between 2021 and 2024	**Total GHG :** *How much emissions do my herd and my farm produce?*
+2,0 % This is the change in Dairy Production between 2021 and 2024	**-8,0 %** This is the change in Meat Production between 2021 and 2024	**Total Productivity :** *How much product is obtained from these emissions?*
-4,7 % This is the change in Gross Carbon Footprint between 2021 and 2024	**-1,1 %** This is the change in Gross Carbon Footprint between 2021 and 2024	**Gross Carbon Footprint :** *What are the GHG emissions of what I produce?*
-28,7 % This is the change in Net Carbon Footprint between 2021 and 2024	**-12,4 %** This is the change in Net Carbon Footprint between 2021 and 2024	**Net Carbon Footprint :** *What is the Carbon Footprint considering carbon storage ?*

The mitigation practices are working : the effect is evident when productivity is held constant and when carbon storage is taken into account !

Factors explaining these results

Total GHG Emissions *A moderate fall*	**-3,2 %** dairy **-7,3 %** meat	• **Unfavourable weather conditions in 2023 (poor-quality forages)** • **Practices still being rolled out (short 3-year period)**
Gross Carbon Footprint *A modest decline*	**-4,7 %** dairy **-1,1 %** meat	• **Reflecting the moderate decline in total emissions** • **Decline in sheep meat production: bluetongue**
Net Carbon Footprint *A sharp fall*	**-28,7 %** dairy **-12,4 %** meat	• **Project objectives achieved, taking carbon sequestration into account**

The mitigation practices are working, but the outcome will be determined on the farm and over the long term

What the results show

1. The **–12% target has been achieved**, taking carbon sequestration into account, despite external factors
2. **The technical mitigation practices** put in place are helping to **improve environmental performance and sustainability !**
3. There are various types of mitigation practices : **optimizing the system is the first one !**
4. **The efficiency and adaptability of farms are key** : good technical results → good technical performance
5. **There is no one-size-fits-all solution :** there are common approaches, but each farm must find its own way to maximise efficiency!

What takes time

Delayed effects
costs first, then GHG savings

Too short a time span
3 years between the two assessments

Perceived risk
drought, uneven growth

Overview of farm management
grass, fertilisation, breeding, health

The time and technical support required

Comprehensive technical support, of which carbon is one component

Technical support covers all aspects of day-to-day operations

- Flock productivity and health
- Nutrition and self-sufficiency
- Grass and fertilisation, Agronomy
- Workload and risk
- Operating economics
- **Environment and carbon**

Technical support is not just another lever : it is what enables the other mitigation practices to work.

When dealing with technical matters, it enables us to achieve technical, economic and environmental benefits.

Do you have any questions ?

Ask your questions live: scan the QR code or join on menti.com.

Scan to join

1 Go to

menti.com

2 Enter the code

5509 7653



No question is too small

Type it in Mentimeter or simply ask out loud.

Do you have any questions ?

Ask your questions live: scan the QR code or join on menti.com.

Scan to join

1 Go to

menti.com

2 Enter the code

5509 7653



No question is too small

Type it in Mentimeter or simply ask out loud.