



Greenhouse Gas Emission Intensity of Irish Sheep Meat: Irish Data Component of LIFE Green Sheep Project

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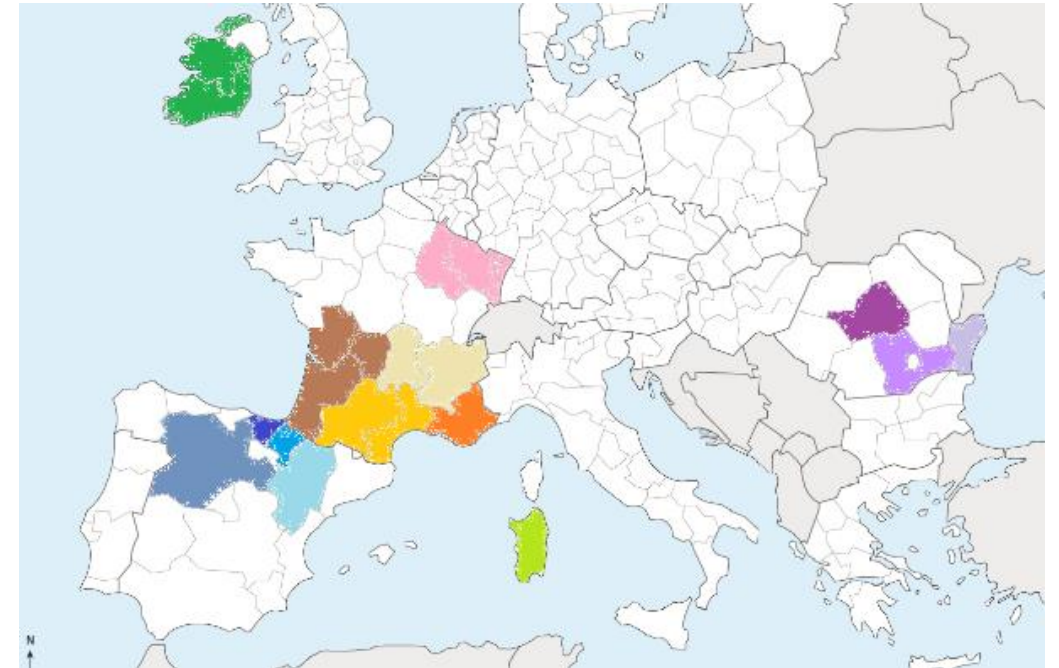
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LIFE Green Sheep Project

Small ruminant production accounts for 7.4% of Global GHG emissions.

- The project involves France, Ireland, Italy, Romania and Spain.
- These 5 countries represent 47% of the EU sheep meat and 63% of the sheep milk production.
- Aim is to reduce by 12% the carbon footprint of sheep meat and milk while ensuring farm sustainability



Irish Sheep Sector Overview

- 2.56 m breeding ewes
- 34,519 sheep farms
- 4th largest sheep meat exporter worldwide
the largest net exporter in the EU
- 400% self-sufficient in sheep meat production
- 80% is exported to France, UK, Germany, Sweden and Belgium
- 77,000 tonnes of sheep meat were exported
an export value of €440 million



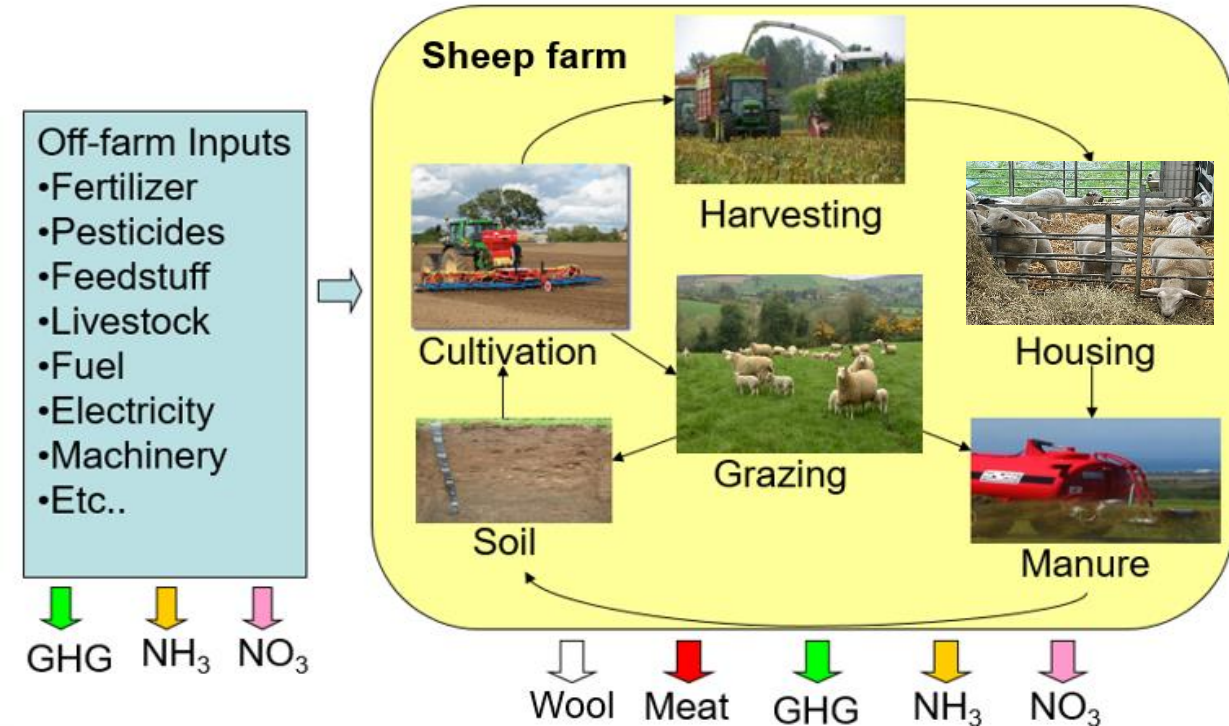
Sheep Sector Emissions

- Ireland committed reduce the GHG emissions by 51% by 2030
- Aim is for carbon neutrality by 2050
- In 2023, Ireland emitted 55 Mt CO₂ eq, of which 38% came from Agriculture.
- Sheep responsible for c. 7% of agricultural emissions (enteric fermentation and manure management are main sources)
- Emissions from agriculture decreased by 4.6% in 2023



Teagasc Irish Sheep LCA

- System boundary “cradle to farm gate”
- IPCC and Irish based equations
- Animal categories: mature ewes, lambs, hoggets and rams
- Detailed monthly data collected on:
 - on farm structure
 - animal performance and breeding
 - animal movements
 - all inputs
 - all outputs



Functional unit

- CO₂ eq per 1 kg live weight, carcass weight and per ha



Carbon Sequestration



- No approved methodology exist
- Petersen *et al.* (2013) approach
- This method considered two C fluxes:
 - 1) from the soil to the atmosphere during the decomposition of soil organic matter, and
 - 2) from the atmosphere to the soil, when atmospheric C in the form of carbon dioxide (CO₂) is removed or sequestered by land

It is estimated that 9.7% of C was added to the soil in the form of plant residues (above and below-ground), application of animal manures, and direct deposition of faecal matter and urine will be sequestered in a 100-years perspective.



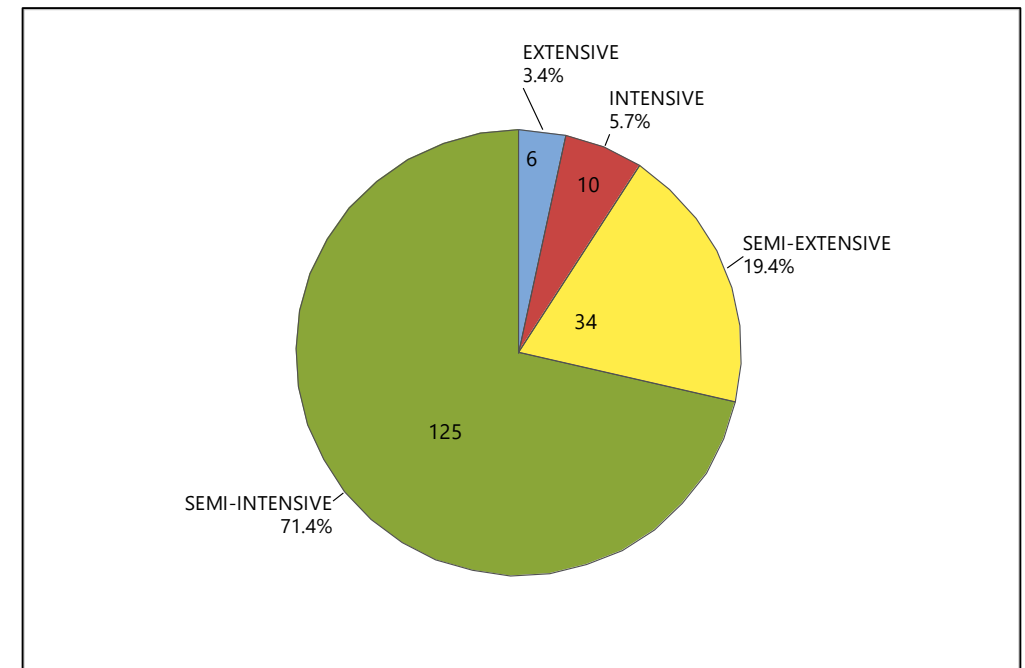
Irish Sheep farms sample

- Sample of 175 specialist sheep farms, which are population weighted to represent 21037 sheep farms on a national basis

EU classification of sheep meat farms

Shepherded: Continuous presence of the shepherd with the sheep
Extensive: <1 ewe/ha
Semi-Extensive: 2-4 ewes/ha
Semi-Intensive: 5-11 ewes/ha
Intensive: >12 ewes/ha

Farms distribution

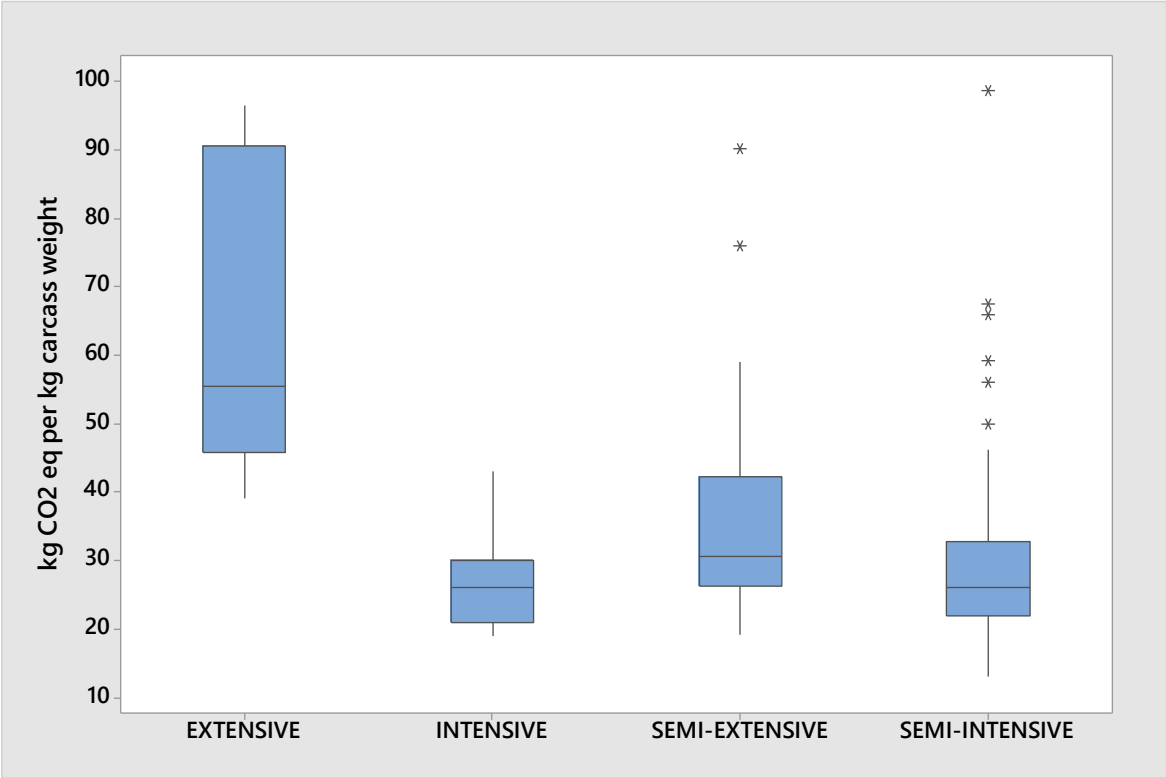


Technical Farm Performance Indicators

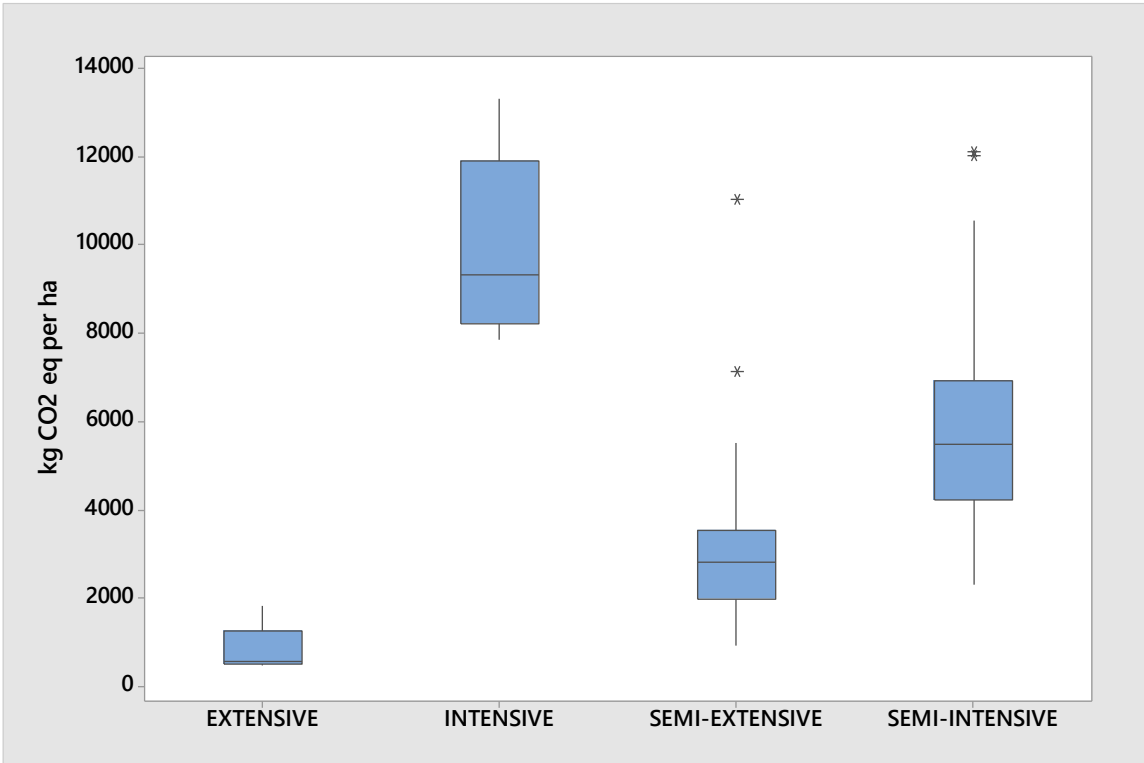
Variable	Extensive Farms	Semi-Extensive Farms	Semi-Intensive Farms	Intensive Farms	<i>P-Value</i>
Farm size, ha	127	33	20	24	0.000
Stocking rate, ewes ha ⁻¹	1.05	3.30	7.18	13.29	0.000
Lambs reared ewe joined, n	0.97	1.39	1.44	1.50	0.017
CW sold, kg ha ⁻¹	13	90	216	385	0.000
Concentrates fed, kg ewe ⁻¹	53	126	98	74	NS
Inorganic N input, kg ha ⁻¹	18	29	66	93	0.000
Farm fuel, L ha ⁻¹	15	47	122	162	0.016
Electricity, kwh ha ⁻¹	13	140	233	321	0.020



GHG Emissions Distribution Between Farm Systems



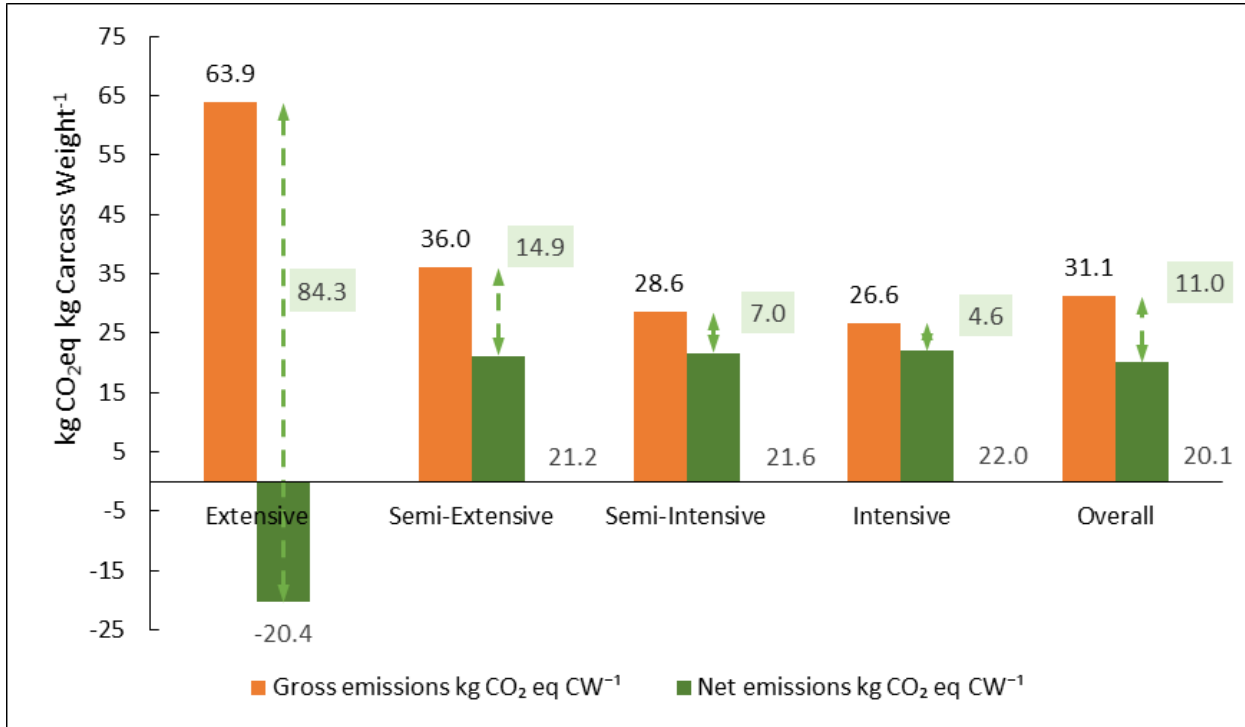
Distribution of GHG emissions per kg of product across sheep farm systems, kg CO₂ eq kg CW⁻¹ (min 13.0 and max 98.6)



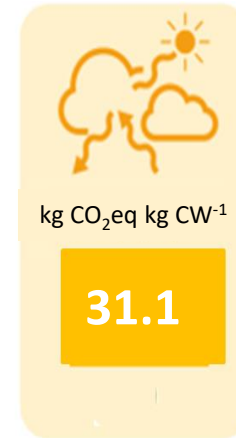
Distribution of GHG emissions per hectare across sheep farm systems, kg CO₂ eq ha⁻¹ (min 457 and max 13291)



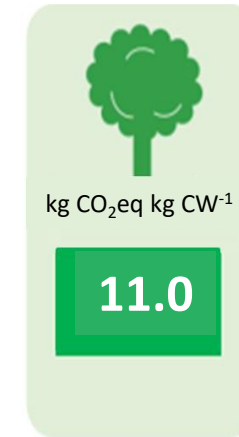
GHG Emissions per Carcass Weight (Carbon Footprint per kg product)



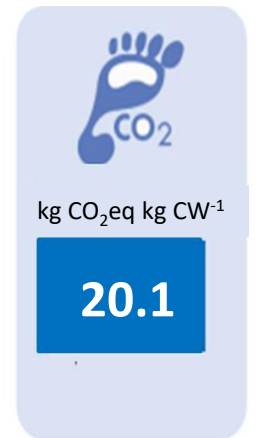
Gross emissions



Storage



Net emissions

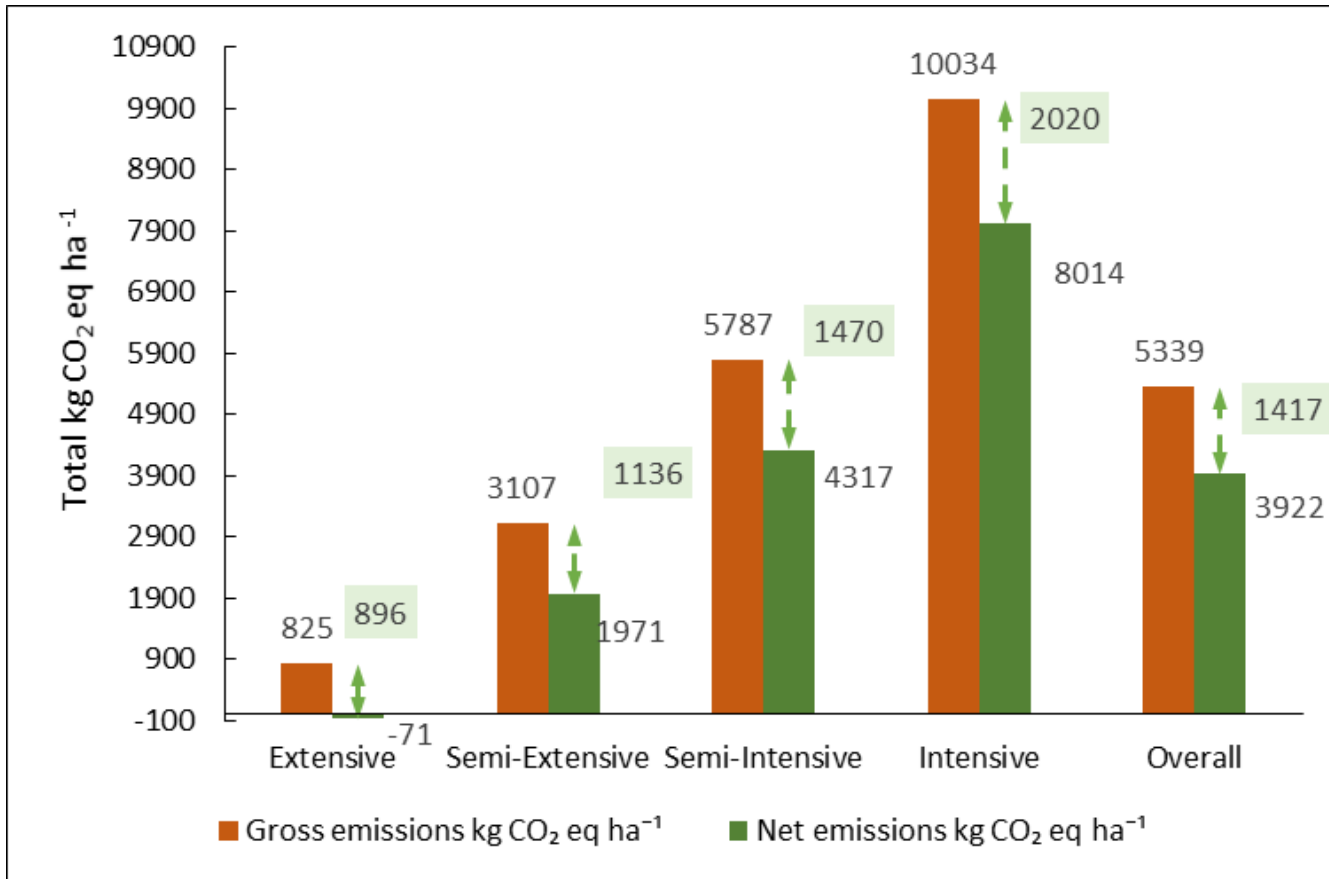


Mean GHG emission per kg carcass weight is 31.1 kg CO₂ eq (20.1 kg CO₂ eq if include CO₂ sequestration)

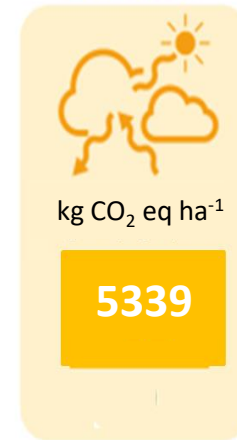
35 % offset by carbon storage



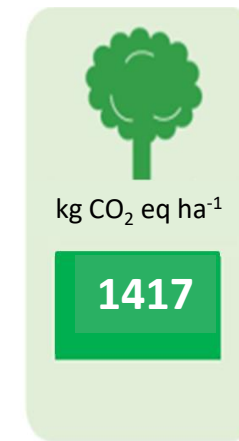
GHG Emissions per ha



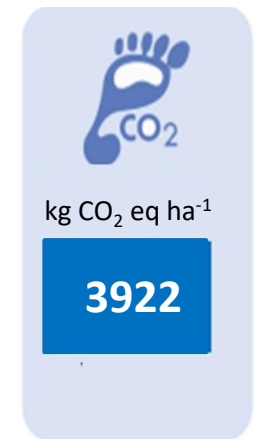
Gross emissions



Storage



Net emissions



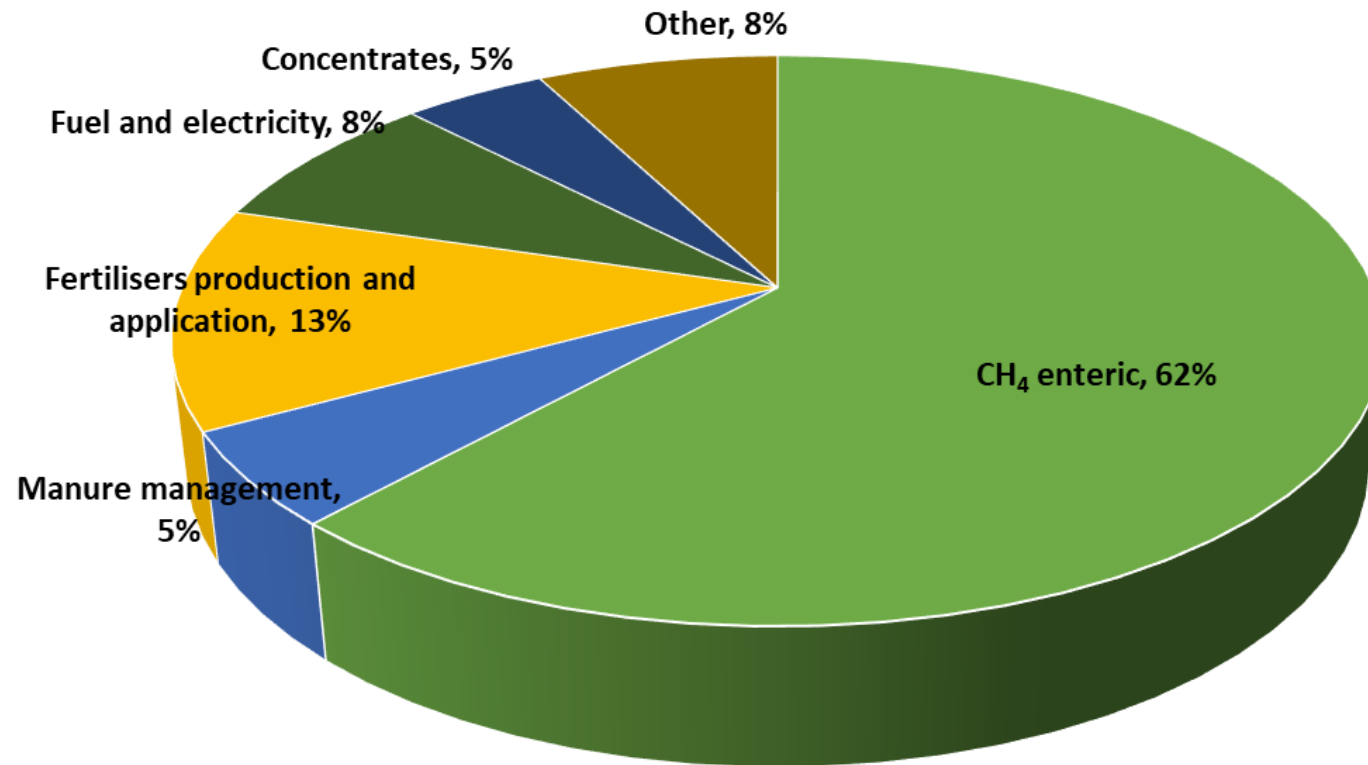
27 % offset by carbon storage

Mean GHG emission per kg ha of sheep forage area is 5339 kg CO₂ eq (3922 kg CO₂ eq if include CO₂ sequestration)



GHG Emissions Sources

GHG emissions sources



Conclusions

- Mean GHG emission is 31.1 kg CO₂ eq per kg of lamb carcass produced
- Significant heterogeneity of GHG emissions between the farm systems and within each individual farm system
- Intensive farms produce less GHG emissions per kg of sheep meat
- Extensive farms produce less GHG emissions per ha
- Trade-offs between productivity and environmental sustainability
- Improving farm efficiency and adopting low-emission technologies can reduce the GHG intensity of sheep meat





Thank you

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<https://life-green-sheep.eu/>



GHG Mitigation Practices

- 1) Grassland management (protected urea, grass clover swards, optimal soil pH, P and K levels)
- 2) Manure management (using LESS)
- 3) Animal feeding and nutrition (optimise feed formulation)
- 4) Animal health and welfare (improved health, reduced stress, extended animal longevity)
- 5) Animal genetics and breeding

