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THE ROLE OF CARBON SEQUESTRATION IN ORGANIC DEHESAS RUMINANT FARMS

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JUNTA DE EXTREMADURA
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Organic production is considered a sustainable production system based on the respect of natural cycles and the maintenance and improvement of the state of the soil, water, air, plant and animal health. (DOUE-L-2018-80995).

Specific objectives of the Common Agricultural Policy (2023-2027)

Environment Package

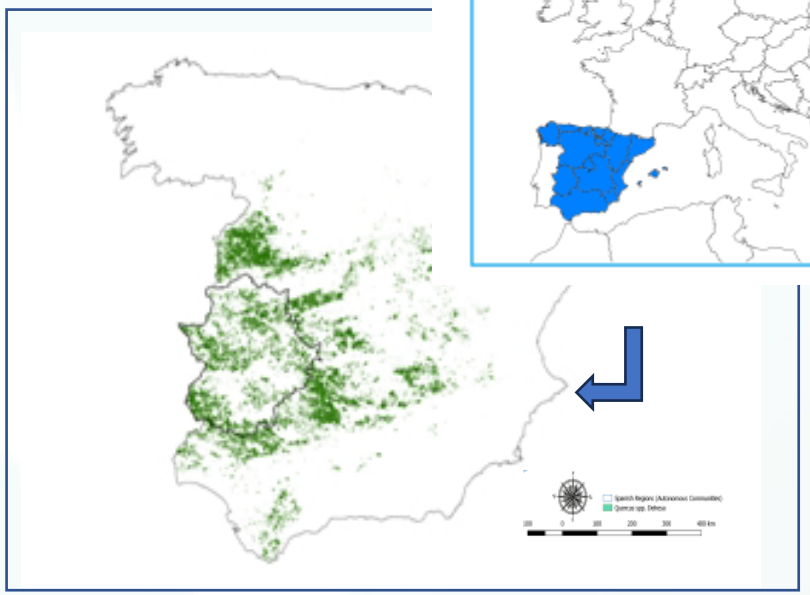
- SO4: Contribute to climate change mitigation and adaptation and sustainable energy.
- SO5: Promote sustainable development and effective management of natural resources such as water, soil and air.
- SO6: Contribute to the protection of biodiversity, the enhancement of ecosystem services and the conservation of habitats and landscapes.

The CAP in Spain: Climate and environmental objectives.

PEPAC Spain

- Reduction of GHG emissions in the agricultural and livestock sectors and in waste management.
- Implementation of forest and agricultural sinks.
- Promotion of practices that promote greater resilience to the impacts of climate change on the food system.

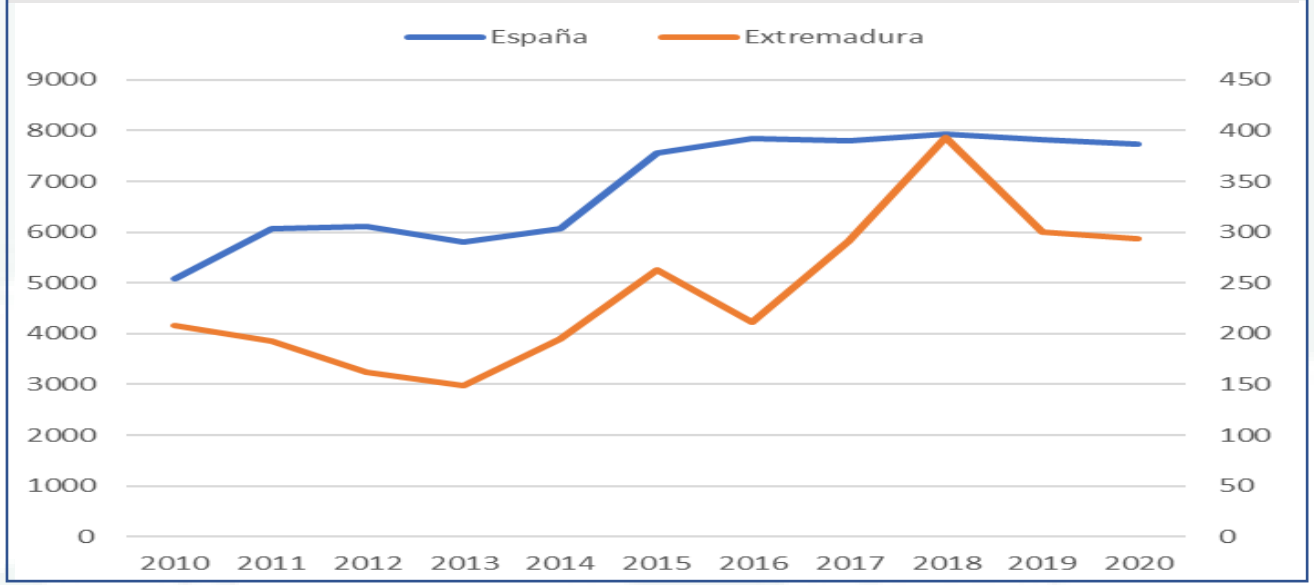
Dehesa



Organic utilised agricultural area (ha)			
2021	2,635,442	% total	10.79
2012	1,808,492	% total	7.49

Organic Permanent pastures	Total (ha)	Dehesa (ha)
2021	1,451,390.1	88,688.3
2012	1,010,238.4	1,792.2

Evolution of the number of organic livestock farms in Spain and Extremadura.



One of the main objectives for the agricultural sector is to adapt its production systems to new challenges, including its contribution to the fight against climate change and the reduction of greenhouse gas (GHG) emissions.

One of the systems best adapted to these principles is the organic ruminant farms located in the *dehesas* of the southwestern Iberian Peninsula (Spain).

However, there must be evidence of this, and details must be available.

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Specific objective: to calculate the balance of GHG emissions.

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- Extremadura region, located in the southwest of Spain.
- Dehesa
- 12 organic *dehesa* ruminants' farms
- Face-to-face interviews in 2022
- Production system: organic extensive systems, mainly grass-fed and focused on the production of meat.

Methodology

Sheep meat (lambs 18,5 to 20 kg live weight) N=3	Sheep meat (lambs >20 to 23 kg live weight) N=3	Beef cattle (calves) N=3	Beef cattle (yearlings) N=3
Average area of 520 ha, of which 450 ha are dedicated to pasture. Average number of breeding females 1,333. The activity is oriented to the sale of lambs between 18.5 and 20 kg live weight. Annual sale of kg of live lamb: 29,691kg/year.	Average area of 264 ha, of which 207 ha are permanent pasture. Average number of breeding females 697. The final product is lambs with a live weight of 22-23 kg. Annual sale of kg of live lamb: 16,830 kg/year.	Average area of 149 ha, of which 146 ha are pasture. The average number of breeding females was 67. The calves are sold at 6 months of age and 220 kg live weight. Annual sale of kg live calf: 10,945 kg/year.	Average area of 260 ha total and 220 ha average permanent pasture. The average number of breeding females is 80. The yearlings are sold at an average age of 12 months and weigh approx. 500 kg. Annual sale of kg live yearlings: 32,000 kg/year.




Methodology

Analysis of GHG emissions and Carbon sequestration in the farms.

The Life Cycle Assessment method (LCA)

Carbon footprint:

LCA was done following the guidelines of the ISO standards (14040:2006-14044:2006) and the IPCC (2019) standards, adapted to GHG emission national inventories in Spain

Scope: the entire production cycle of the extensive farms

The functional unit (FU): kg CO_2 eq / kg live weight

Carbon sequestration

The methods for estimating carbon sequestration were IPCC (2006) and the balance of net C flows in the livestock systems proposed by Petersen et al., (2013) adapted to extensive livestock's systems.

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Greenhouse gas emissions and carbon sequestration in organic dehesa livestock farms. Does technical-economic management matters?

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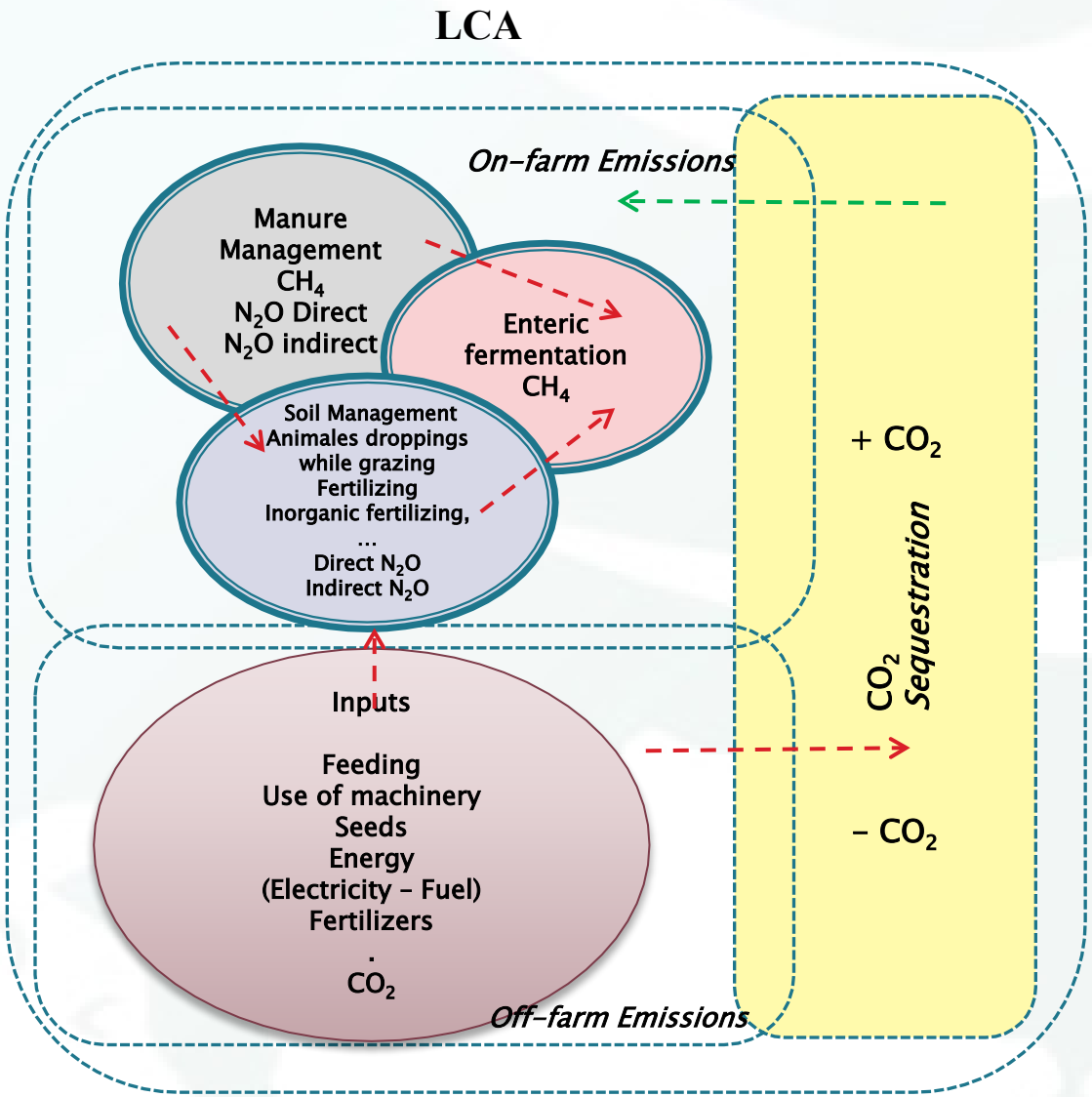
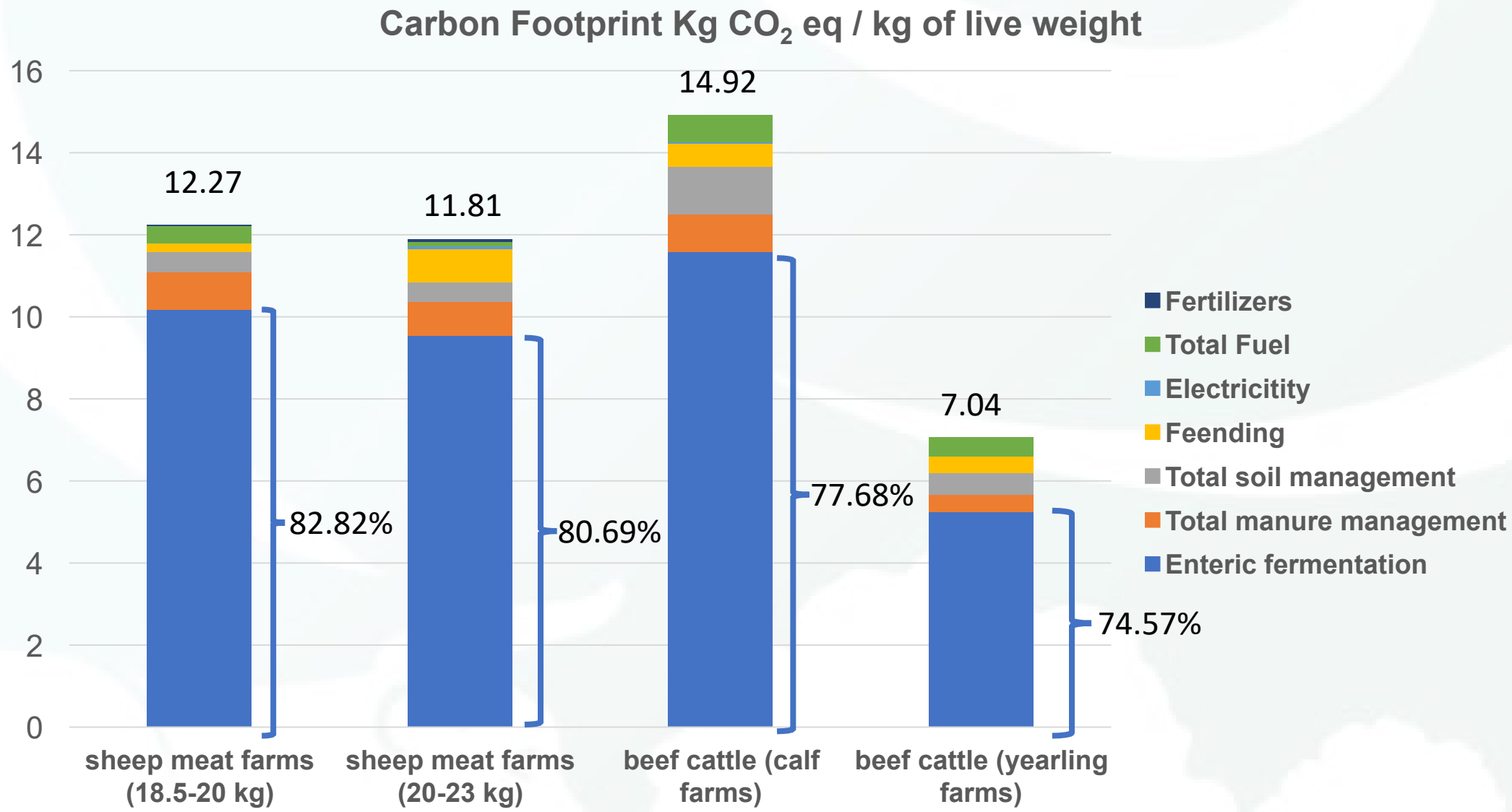
Methodology

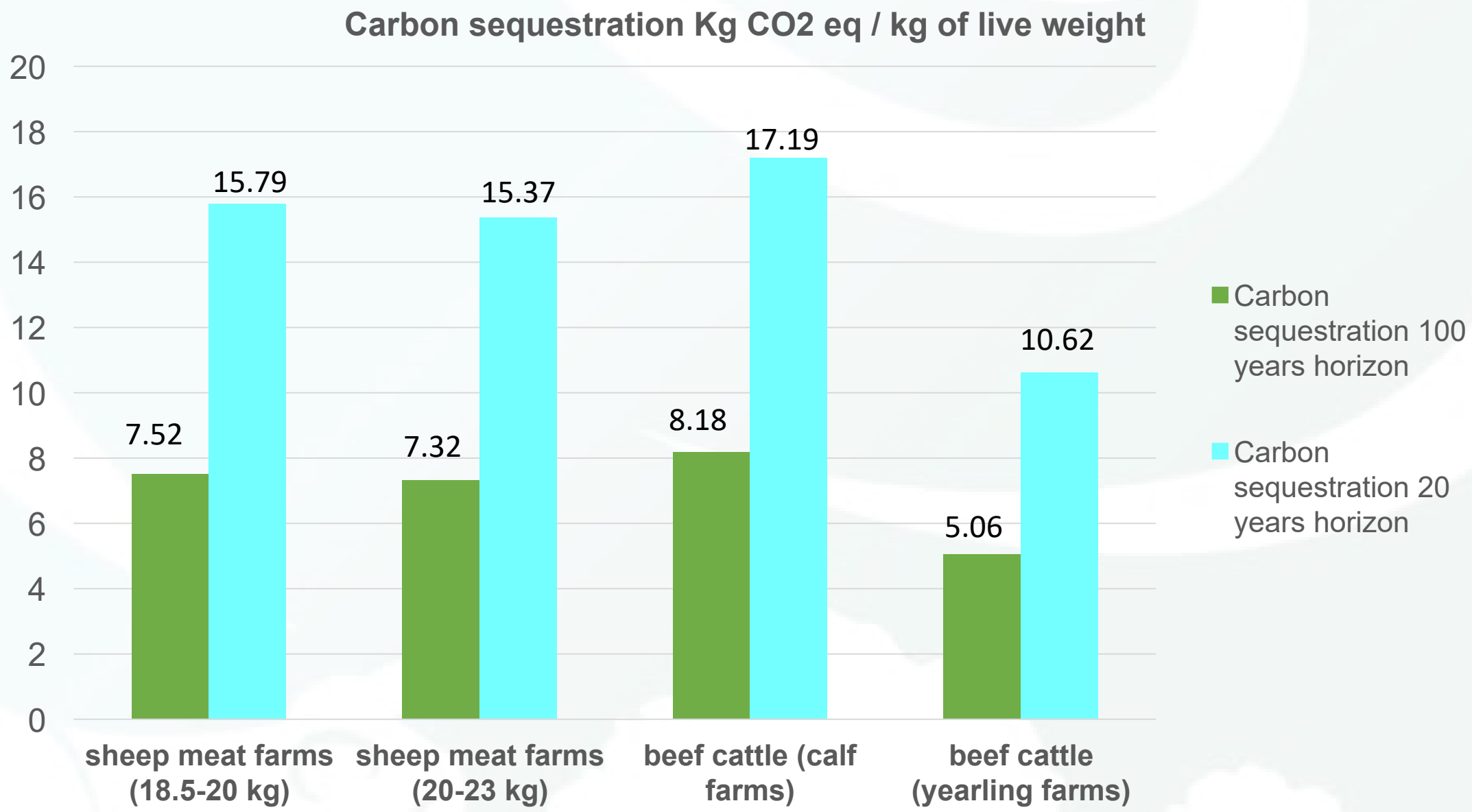
Enviromental Analysis
kg CO_2/ FU

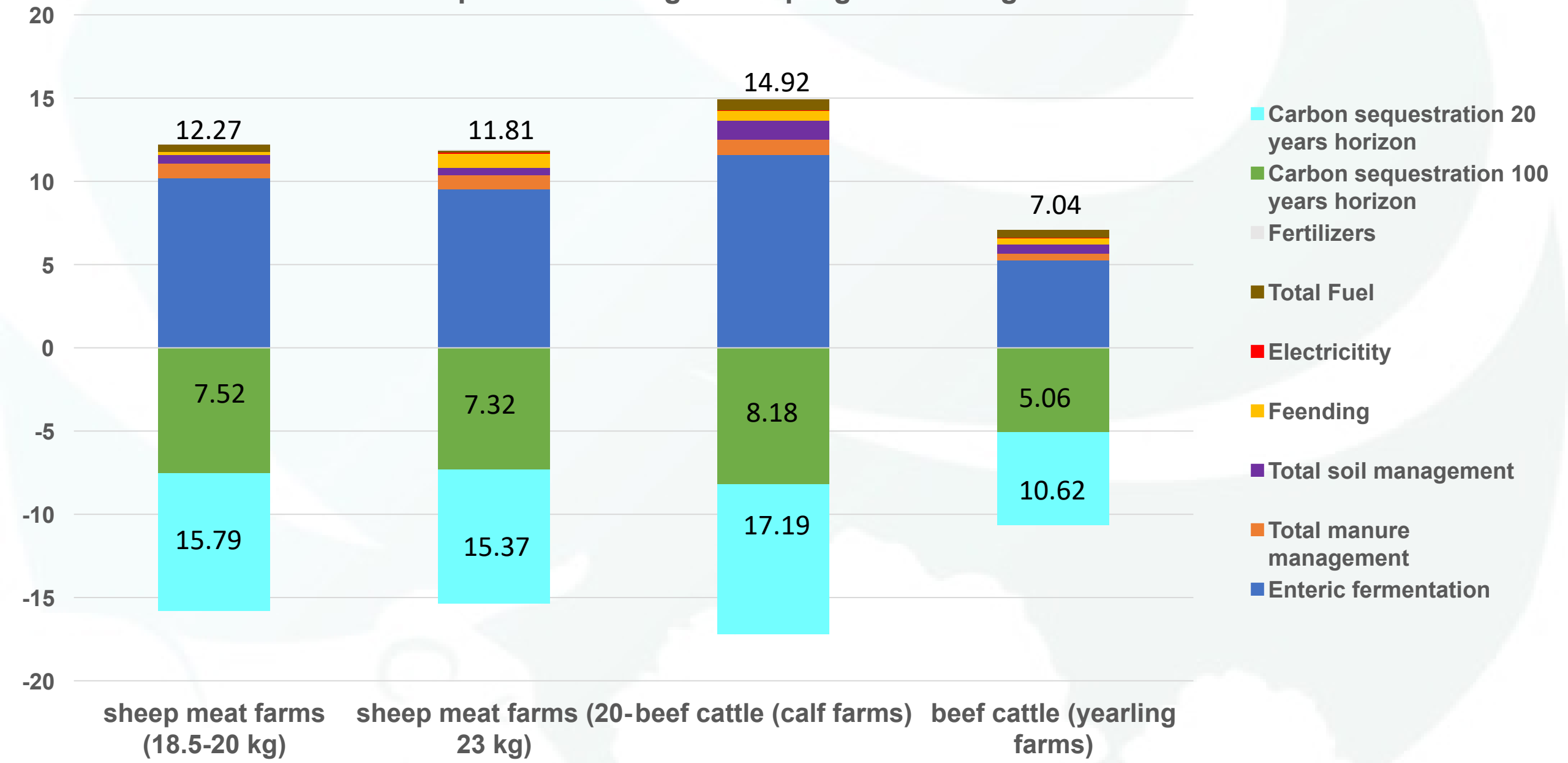
Case study Boundaries

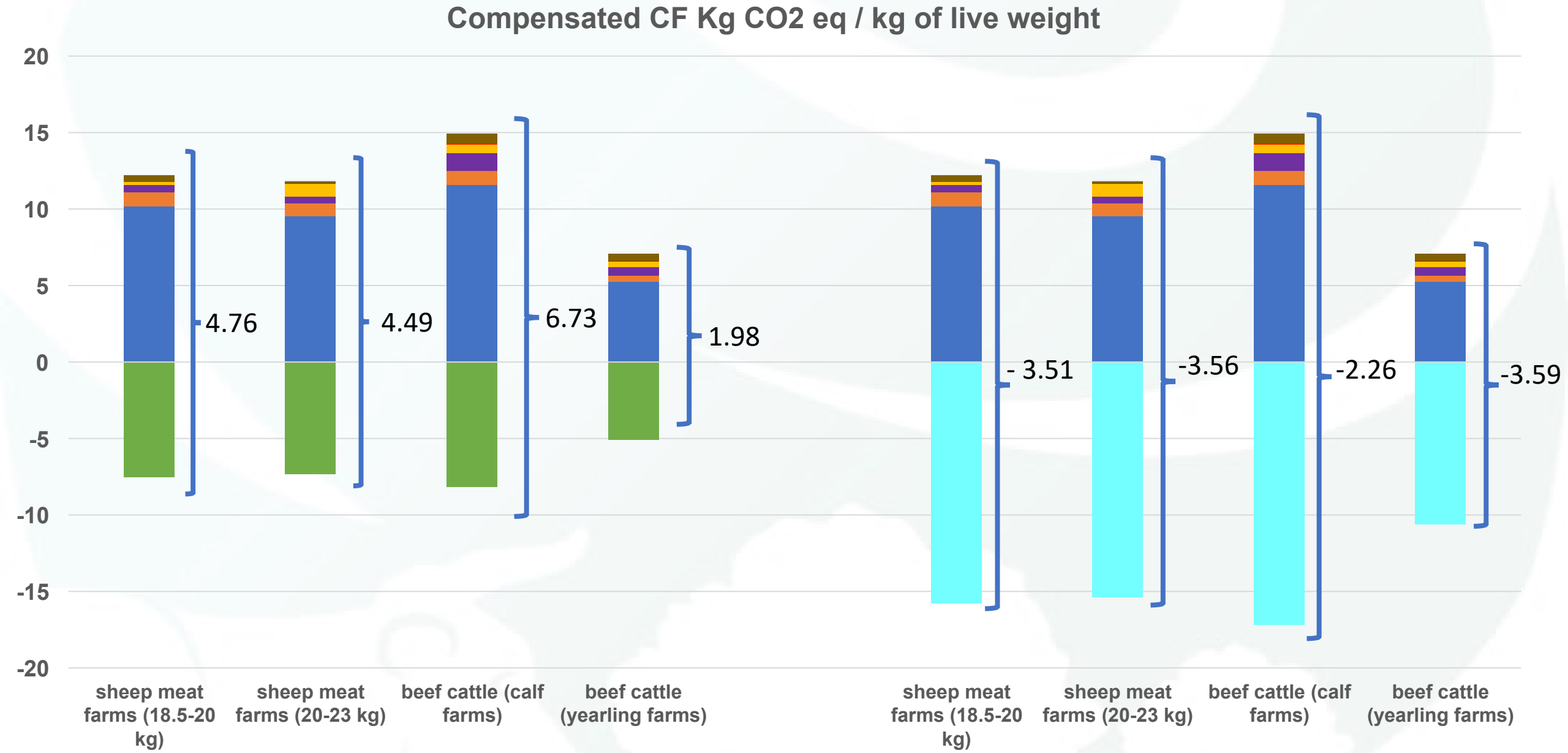


Results


Carbon Footprint Kg CO_2 eq / kg of live weight
16
14
12
10
8
6
4
2
0
12.27
11.81
14.92
7.04
82.82%
80.69%
77.68%
74.57%
sheep meat farms (18.5-20 kg)
sheep meat farms (20-23 kg)
beef cattle (calf farms)
beef cattle (yearling farms)
Fertilizers
Total Fuel
Electricitity
Feending
Total soil management
Total manure management
Enteric fermentation


Carbon sequestration Kg CO2 eq / kg of live weight
20
18
16
14
12
10
8
6
4
2
0
7.52
15.79
7.32
15.37
8.18
17.19
5.06
10.62
sheep meat farms (18.5-20 kg)
sheep meat farms (20-23 kg)
beef cattle (calf farms)
beef cattle (yearling farms)
Carbon sequestration 100 years horizon
Carbon sequestration 20 years horizon


Compensated CF Kg CO2 eq / kg of live weight
20
15
10
5
0
-5
-10
-15
-20
12.27
11.81
14.92
7.04
7.52
7.32
8.18
5.06
15.79
15.37
17.19
10.62
sheep meat farms (18.5-20 kg)
sheep meat farms (20-23 kg)
beef cattle (calf farms)
beef cattle (yearling farms)
Carbon sequestration 20 years horizon
Carbon sequestration 100 years horizon
Fertilizers
Total Fuel
Electricitity
Feending
Total soil management
Total manure management
Enteric fermentation


Compensated CF Kg CO2 eq / kg of live weight
20
15
10
5
0
-5
-10
-15
-20
4.76
4.49
6.73
1.98
- 3.51
-3.56
-2.26
-3.59
sheep meat farms (18.5-20 kg)
sheep meat farms (20-23 kg)
beef cattle (calf farms)
beef cattle (yearling farms)
sheep meat farms (18.5-20 kg)
sheep meat farms (20-23 kg)
beef cattle (calf farms)
beef cattle (yearling farms)

FINAL CONSIDERATIONS

- Enteric fermentation is the main source of emissions at the farms in the study. However, these organic production systems linked to the territory generate less GHG emissions, given the lower dependence on inputs and the use of grass resources present on the farms.

- Organic production systems in *dehesas* are characterized by large areas of pastures, which means a greater capacity for carbon sequestration. These analyses estimate that a large proportion of the greenhouse gas emissions produced on the farm can be offset.

- The conversion from conventional to organic animal production systems, the introduction of measures to preserve soil health, and improved techniques for the quantification of soil components may be some of the lines of future research to mitigate the impact of livestock farming.

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