LIFE GreenSheep project

“Demonstration and dissemination actions to reduce the carbon footprint in sheep farming”

Action C2: Training of advisers

TRAINING KIT

“How to assess and reduce the GHG emissions from the sheep farms”

INSTITUT DE L'ELEVAGE idele

teagasc Agriculture and Food Development Authority

Agris

NEIKER MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

IBNA Institutul de Biologie și Nutriție Animală

Life

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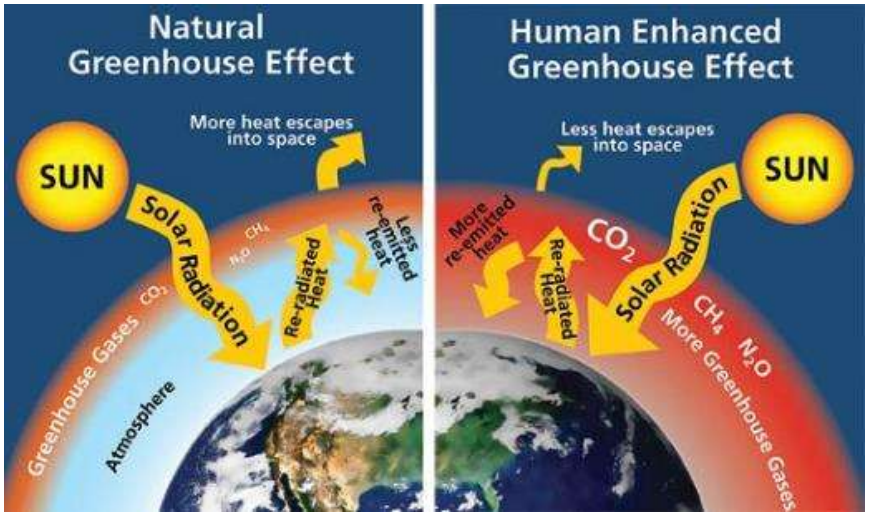
Chapter 1. GHG & Animal production activities

GHG = GREENHOUSE GASES

Because of their molecular structure they trap heat or longwave radiation released in the atmosphere and re-emit it back to the earth.

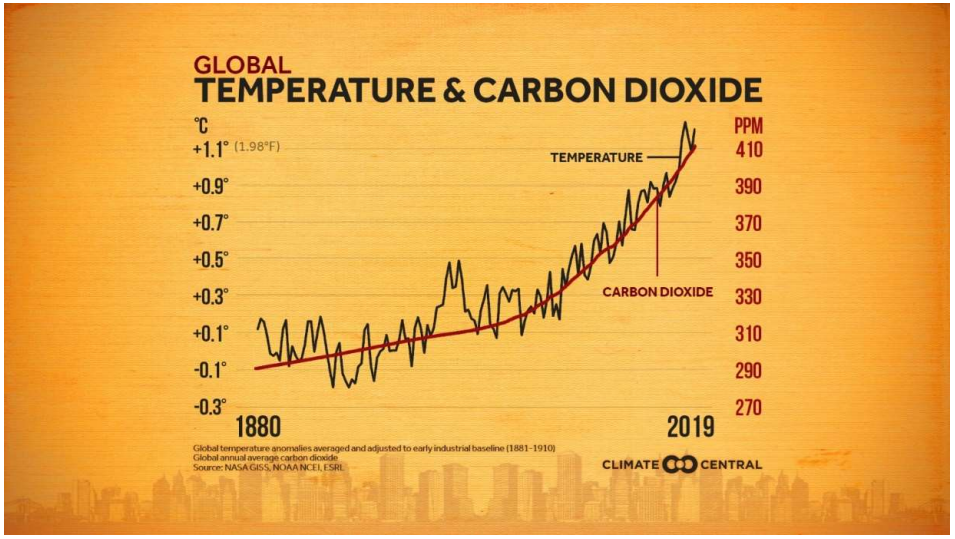
This heat trapping phenomenon is known as the **GREENHOUSE EFFECT.**

more GHG
↓
stronger greenhouse effect
↓
more global warming



natural GH effect = actually allowed the life on Earth

human GHG effect = too hot



strong correlation between GHG (for example %CO2) and the average temperature

Livestock production is indispensable...

(growing needs...)

but it has its costs

- financial costs,
- resources costs (land, cereals,...)
- environmental costs

it also has an environmental footprint

... organic wastes, packing wastes, plastics, Nitrogen leakages, GHG...

which has to be reduced

"Environmental pollution adversely affect the ecosystem. For many years, animals farming (although recognized as being necessary) raises a lot of policy concerns in terms of economic, environmental, and social aspects of sustainable agriculture"

GHG from livestock production:

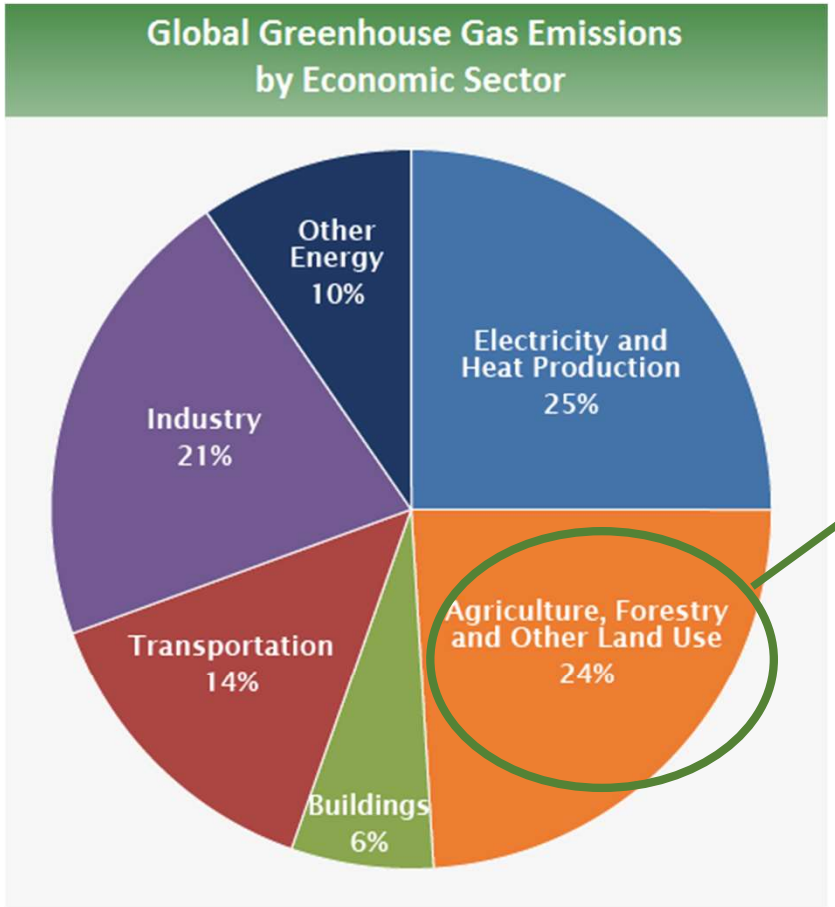
- CO_2 (32%)
- CH_4 (25%)
- N_2O (31%)
- others (water vapors, fluorinated gases)

(worldwide values, Moran, 2011)

expressed by a single parameter:
CO_2 equivalent (CO_2 eq),
using **GWP** values:
CO_2 = 1; CH_4 = 28; N_2O = 265
(GWP = Global Warming Potential)

 # tons of emitted CO_2

 # tons of CO_2 to be reduced

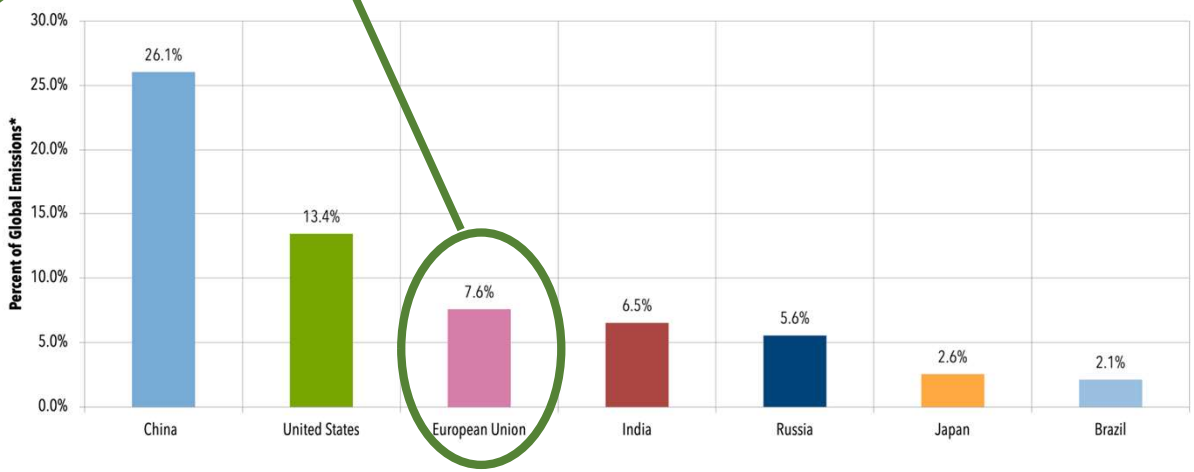


reference (Mihai .....)

there is room for improvement / mitigation

24%

7.6%

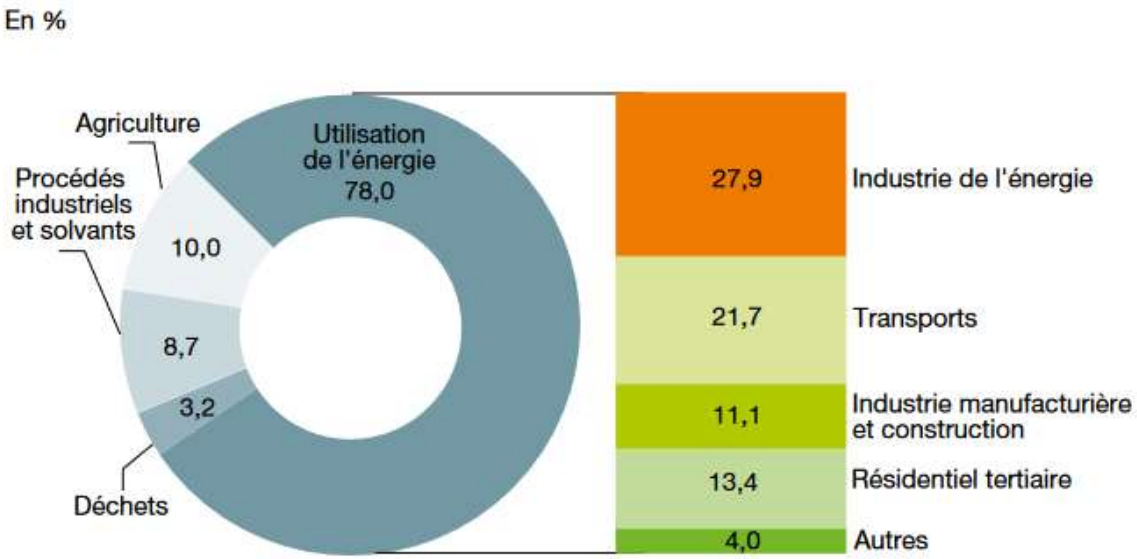


Greenhouse Gas Emissions By Top Emitters, 2018

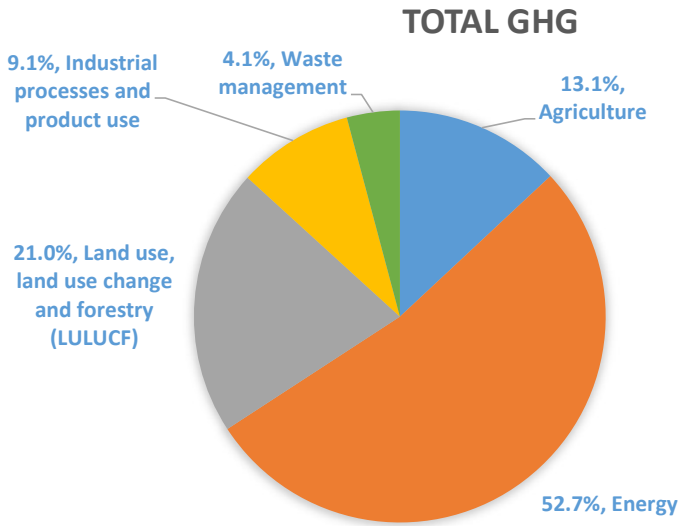
Agriculture contribution to the EU / national emissions of GHG

E.U.: 10% contribution of agriculture

ROMANIA: 13.1% contribution of agriculture



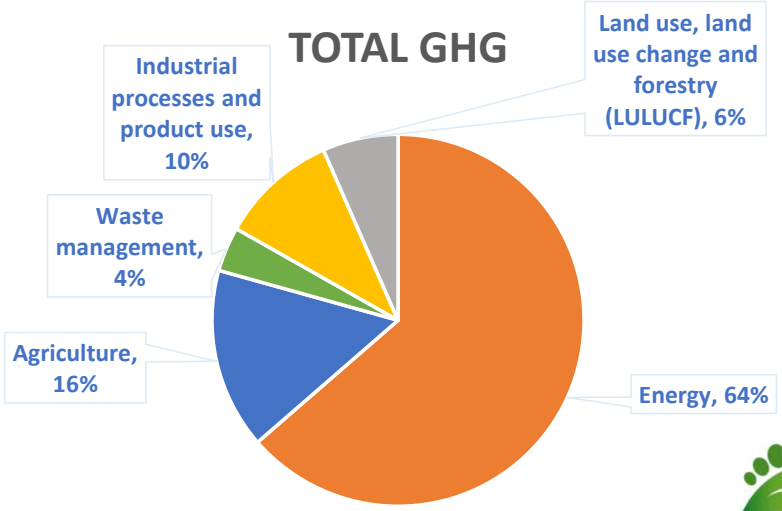
Source : AEE, 2018



Source: Eurostat, 2019

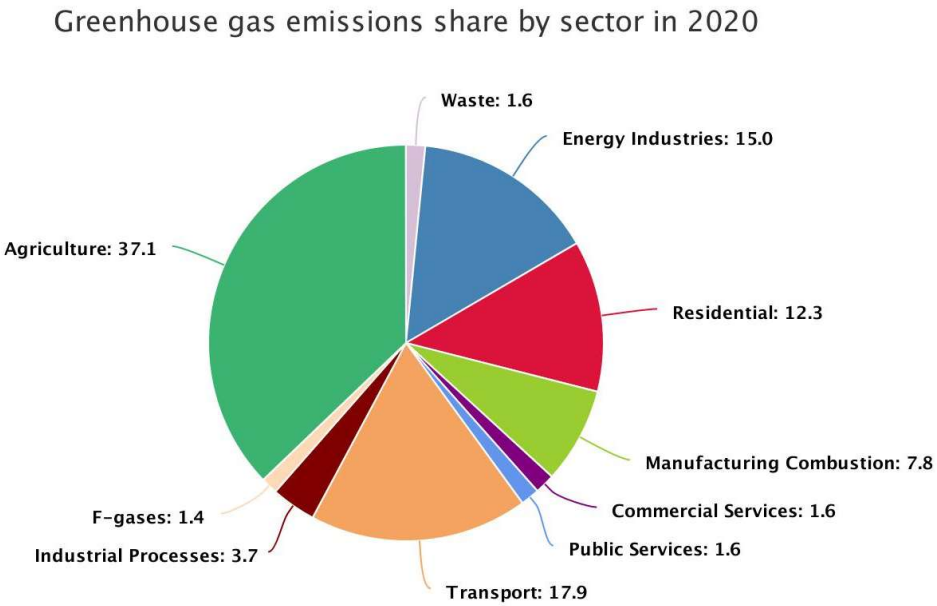
Agriculture contribution to the EU / national emissions of GHG

FRANCE: 16% contribution of agriculture



Source: Eurostat, 2019

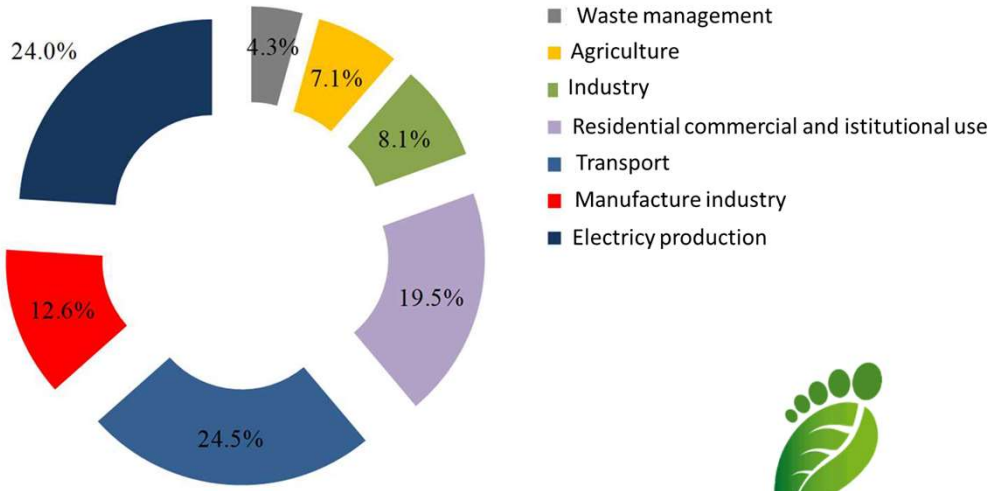
IRELAND: 37.1% contribution of agriculture



Source: EPA, 2022

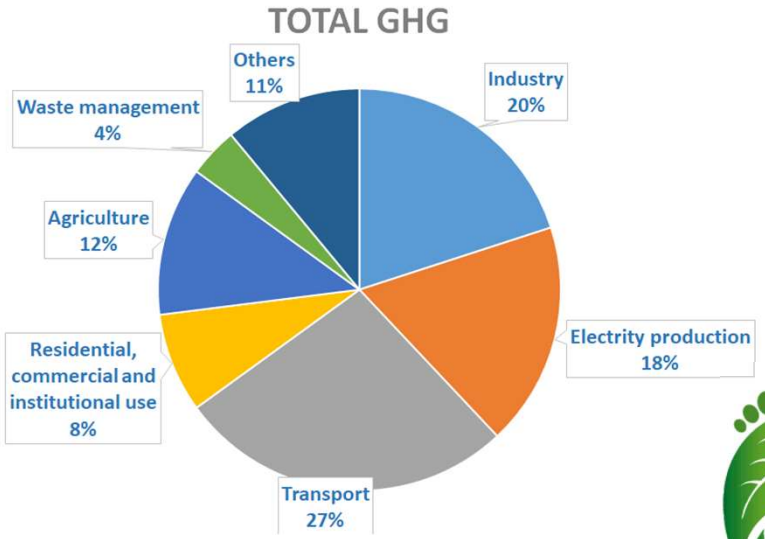
Agriculture contribution to the EU / national emissions of GHG

ITALY: 7.1% contribution of agriculture



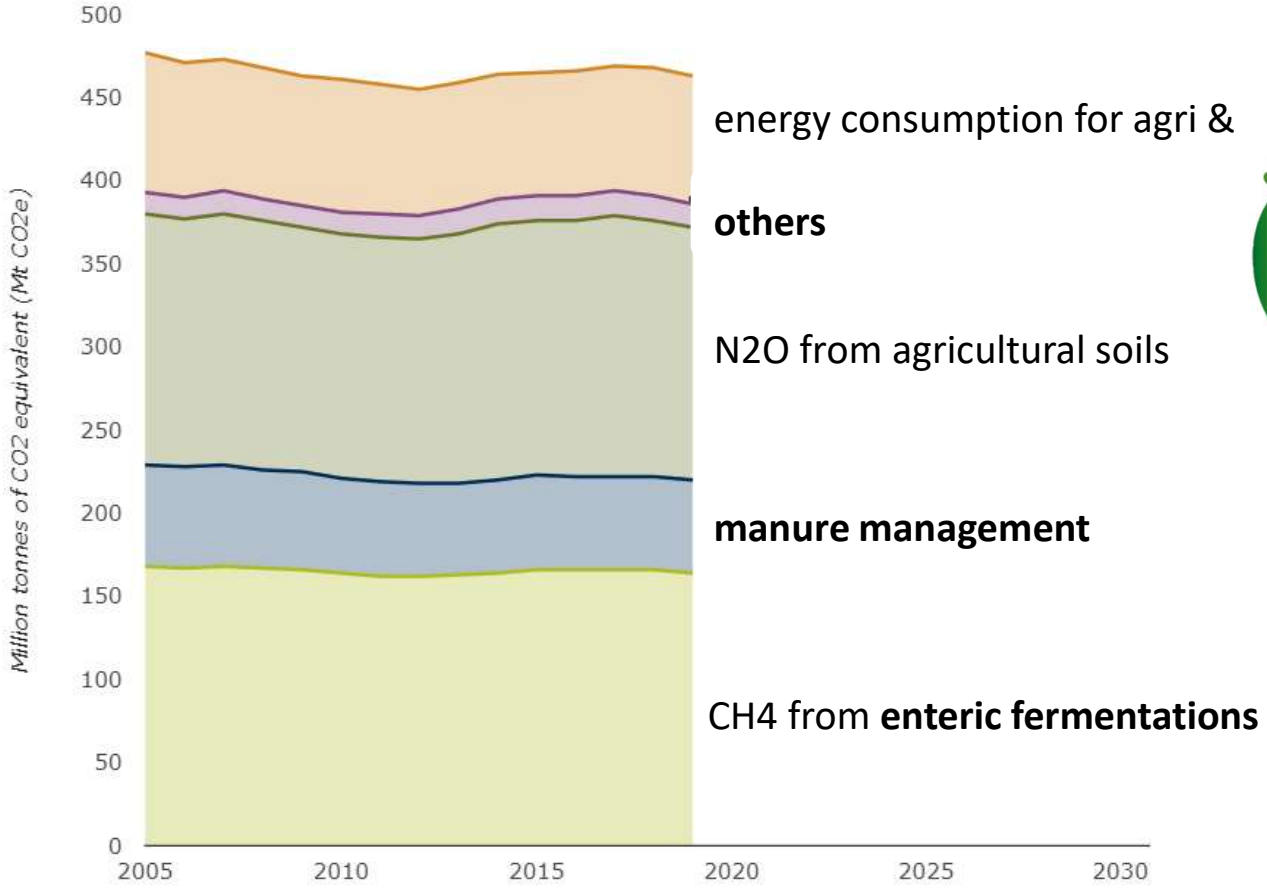
Source: ISPRA, 2018

SPAIN: 12 % contribution of agriculture



Source: MITECO, 2020

Livestock contribution to the agricultural emissions of GHG

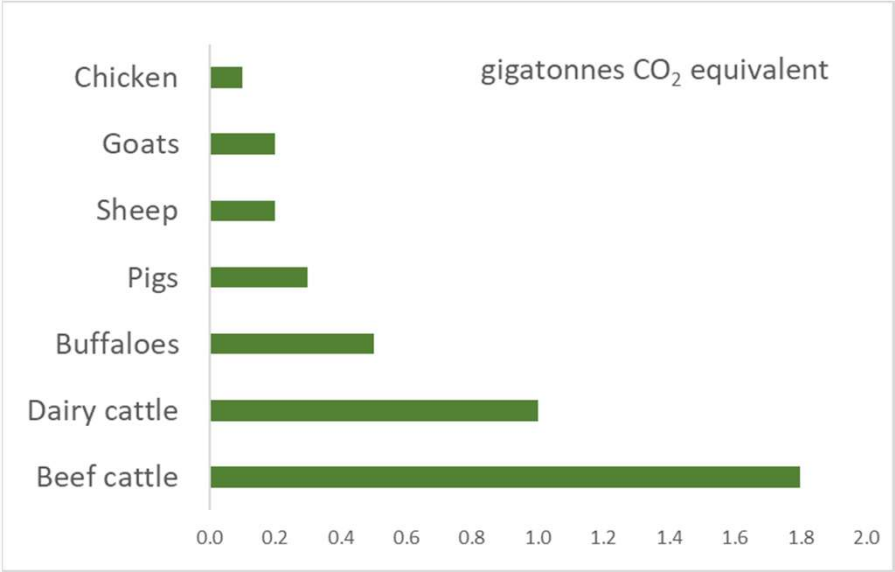


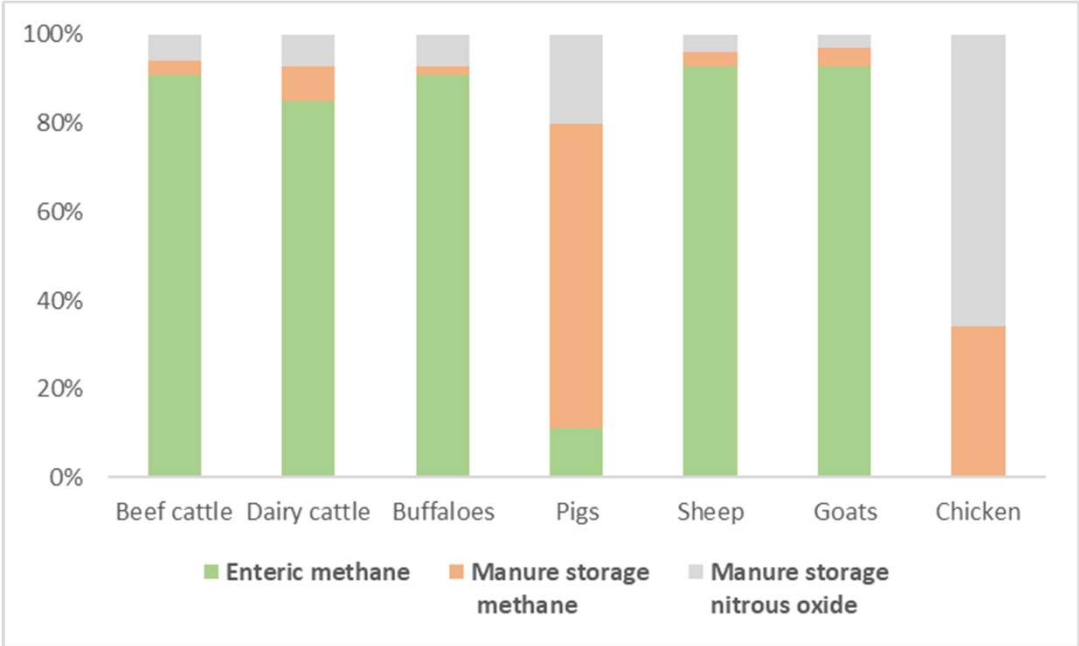
an important part of agricultural GHG is originating from the agriculture

with two main mitigation directions

https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-agriculture

Details on the GHG emissions from the livestock production



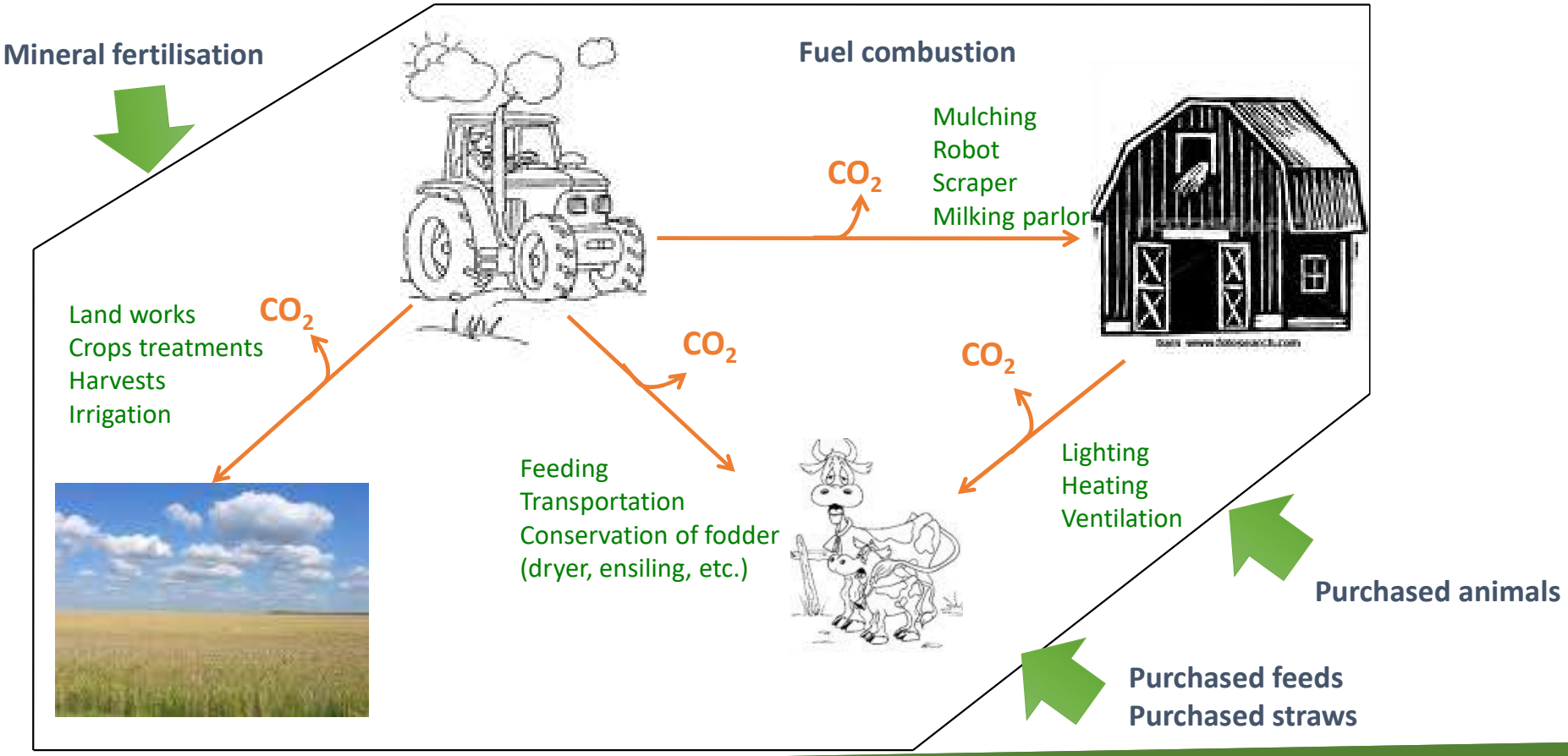


the time has come to focus on **sheep too**...

source: Grossi, 2019 (citing FAO data / 2010)

enteric fermentations = very important in ruminants

Livestock CO_2 emissions (GWP 1)



Livestock CH4 emissions (GWP 28) ≡ CO_2

Rumination

Enteric CH_4

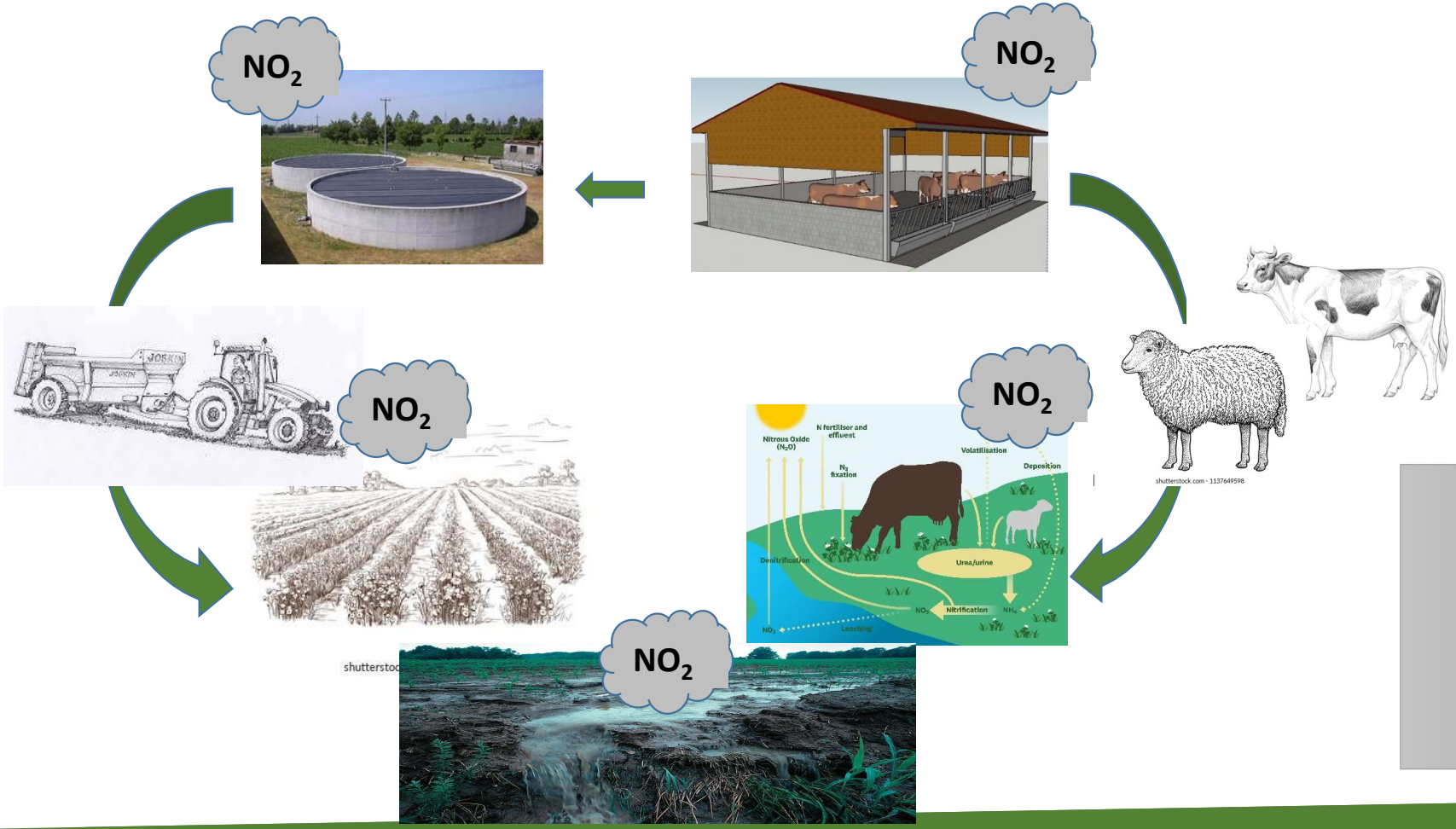
Manure

Building Storage Pasture

Manure CH_4

4 emissions'zones = animals (enteric fermentation) / building / storage / pasture

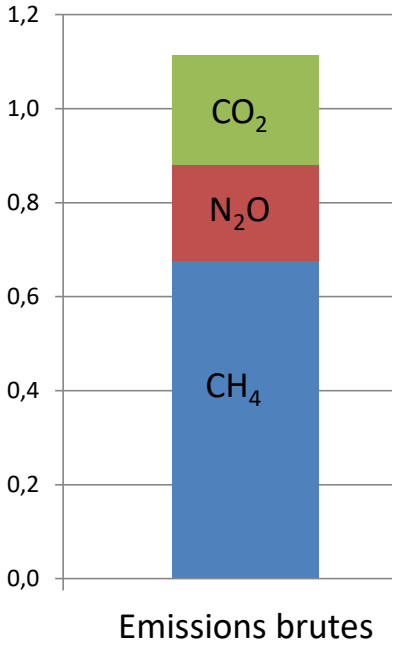
Livestock N2O emissions (GWP 265) ≡ CO_2



5 emissions' zones:
- buildings
- storage
- pasture
- spreading
- soil

Calculation of the GES emissions
(impact on climate changes)

Total GES emissions (kg éq CO_2)

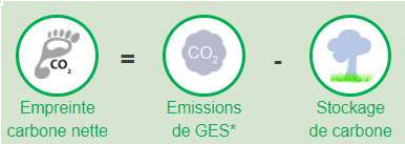


Total GES emissions (kg éq CO_2)

= CO_2 (kg éq CO_2) + CH_4 (kg éq CO_2) + N_2O (kg éq CO_2)

Global Warming Potential of the main GES originating from agriculture (GIEC, 2007)

GES	GWP coefficient / 100 years
CO_2	1
CH_4	28
N_2O	265



Conclusion: the impact of livestock production is both negative and ....positive

livestock production

Air

- Greenhouse gases emissions
- Ammonia (Acidification)

Land

- Land use
- Valorising the less accessible surface' waters
- Landscape maintenance
- Biodiversity

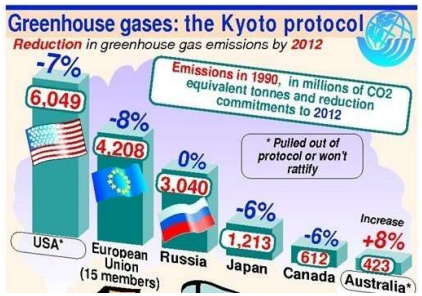
Soil / Natural respurces

- Fossile and renewable energies
- Carbon storage
- Fight against errosion

Water

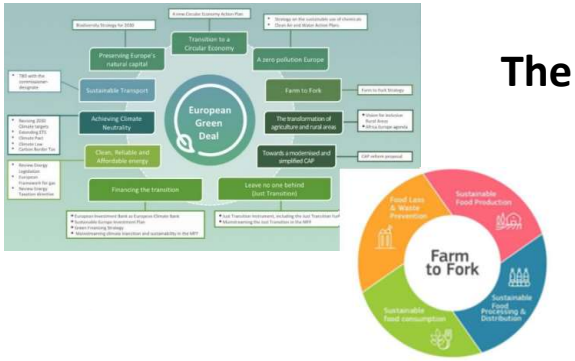
- Water uptake
- Water quality

Chapter 2. The need for GHG mitigation



Kyoto Protocol

Paris Agreement



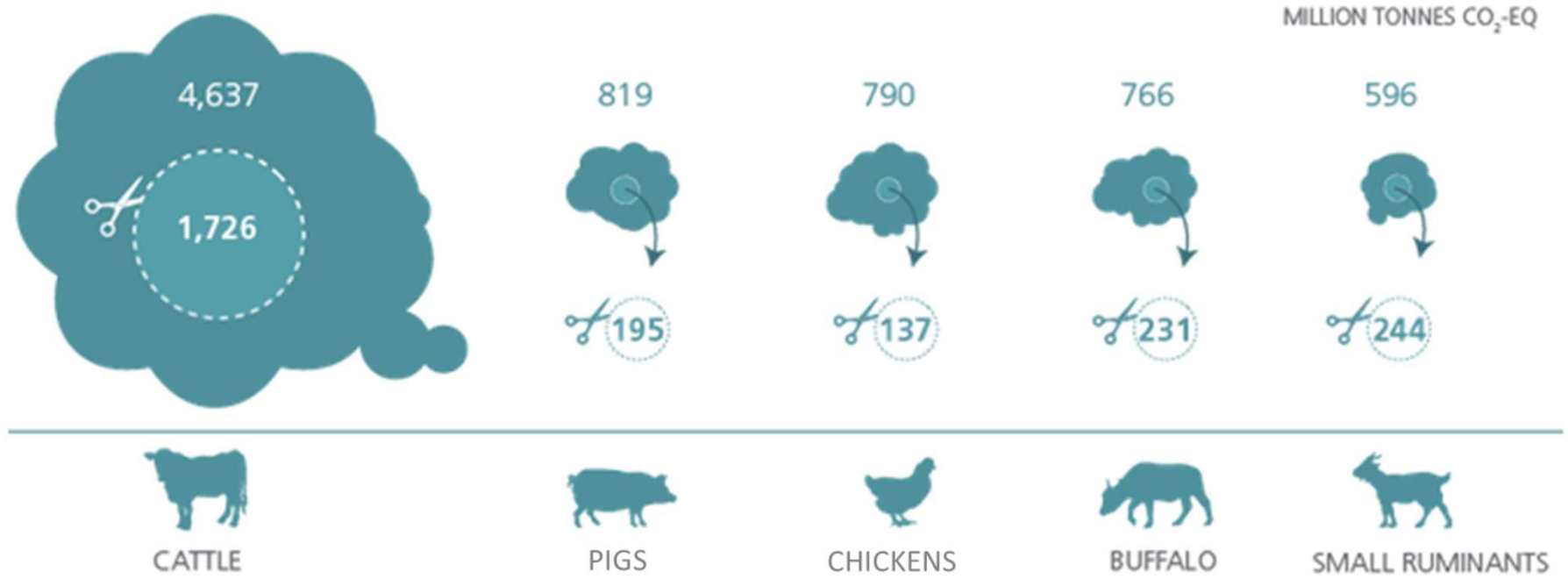
The EU Green Deal

various nations committed to implement measures that lead to various degrees of decreasing the impact of the human activities on environment

this includes GHG mitigation measures...

....even "farms' climate neutrality" is envisaged

The magnitudes of the foreseen emissions cuts:



which are not quite not small... also in case of sheep

There's a negative perception of the society regarding the livestock sector

(mainly cattle, but... extensive livestock production may also be targeted)

- public info measures...
- mitigation measures...
- RDI & training / education...

... are necessary

to balance it

(solving the issues, informing the society, etc.)

so the perception can be this one

(at least for the sheep sector)

NEED FOR GHG MITIGATION AT THE NATIONAL LEVEL

 # each member state has to contribute to the reach of EU goals:

*- "Member States' and regional/local authorities' **efforts to reduce greenhouse gas emissions** in the EU Emissions Trading System [...], agriculture, [...], land use, ..."*

*- "The development and implementation of **greenhouse gas accounting** and **climate change mitigation** …"*

*- "The **development of** [...] **practices which have an impact** on emissions and removals of emissions"*

the countries have to provide reports on GHG & livestock

the countries have to reduce the GHG and **prove it**

e.g. if the GHG estimations are **based on number of animals only**, **the only way** to reduce GHG is **reducing the number of animals**

 # more detailed assessment / monitoring = **more opportunities** to apply GHG mitigation techniques (that **may go hand in hand with the farm efficiency**)

mitigation initiatives

mitigation programs (subsidies, taxes...)

RDI financers

financed thematics (FP, H2020, HE, LIFE...)

Greensheep project

Chapter 3. Presentation of the GreenSheep project

Implementing countries: France, Italy, Spain, Romania, Ireland
Duration: 01.10.2020 – 30.09.2025
Budget: 4.612.221 euro (55% EC co-funding)
Coordinated by: IDELE, France

Project objectives:

- Launch a national and European dynamic progress initiative to reduce greenhouse gas emissions while ensuring sustainability of sheep farms
- Reduce by 12% the carbon footprint of milk and meat produced in sheep farms
- Train current and future generations
- Create an national and European observatory of environmental and sustainable performances of sheep production systems
- Promote innovative practices associated with GHG emissions mitigation in order to ensure the techno-economic, environmental and social sustainability of sheep farms

Project coverage & impact:

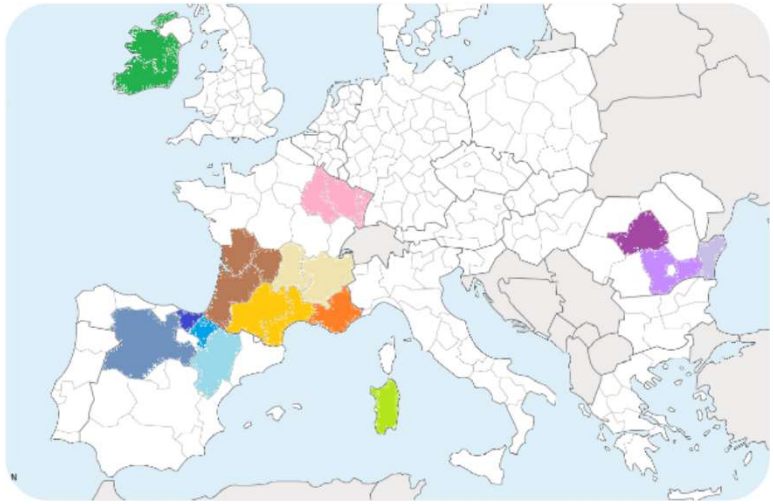
France (5 regions)

Ireland (all regions)

Italy (1 region)

Romania (3 regions)

Spain (3 regions)



Project coverage & impact:

the five countries cover **47% of European meat sheep** production and **63% of European milk sheep** production

this partnership allows us to cover **13 production systems** (from extensive grazing / low input to intensive / indoor), various **feed resources**, various **feeding systems**, various **types of farms**, various **breeds**, etc.

the project targets a **large network of farms and advisors** :

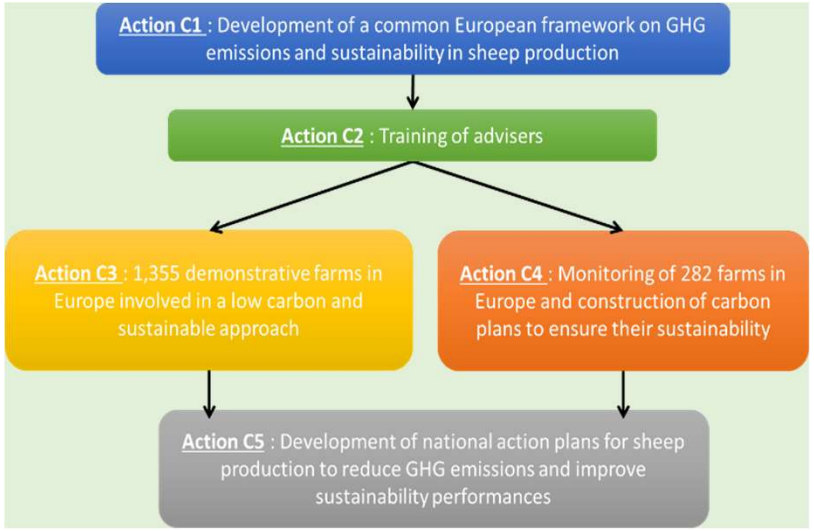
- 1 355 demonstration farms
- 282 innovative farms
- 143 advisers trained on monitoring tools & mitigation techniques

the project will sum up a **large set of mitigation techniques** that can lead to the **GHG emissions reduction while maintaining farm profitability**

Project actions:

Actions F : Project management and monitoring of the project' progress

Actions C : Implementation actions



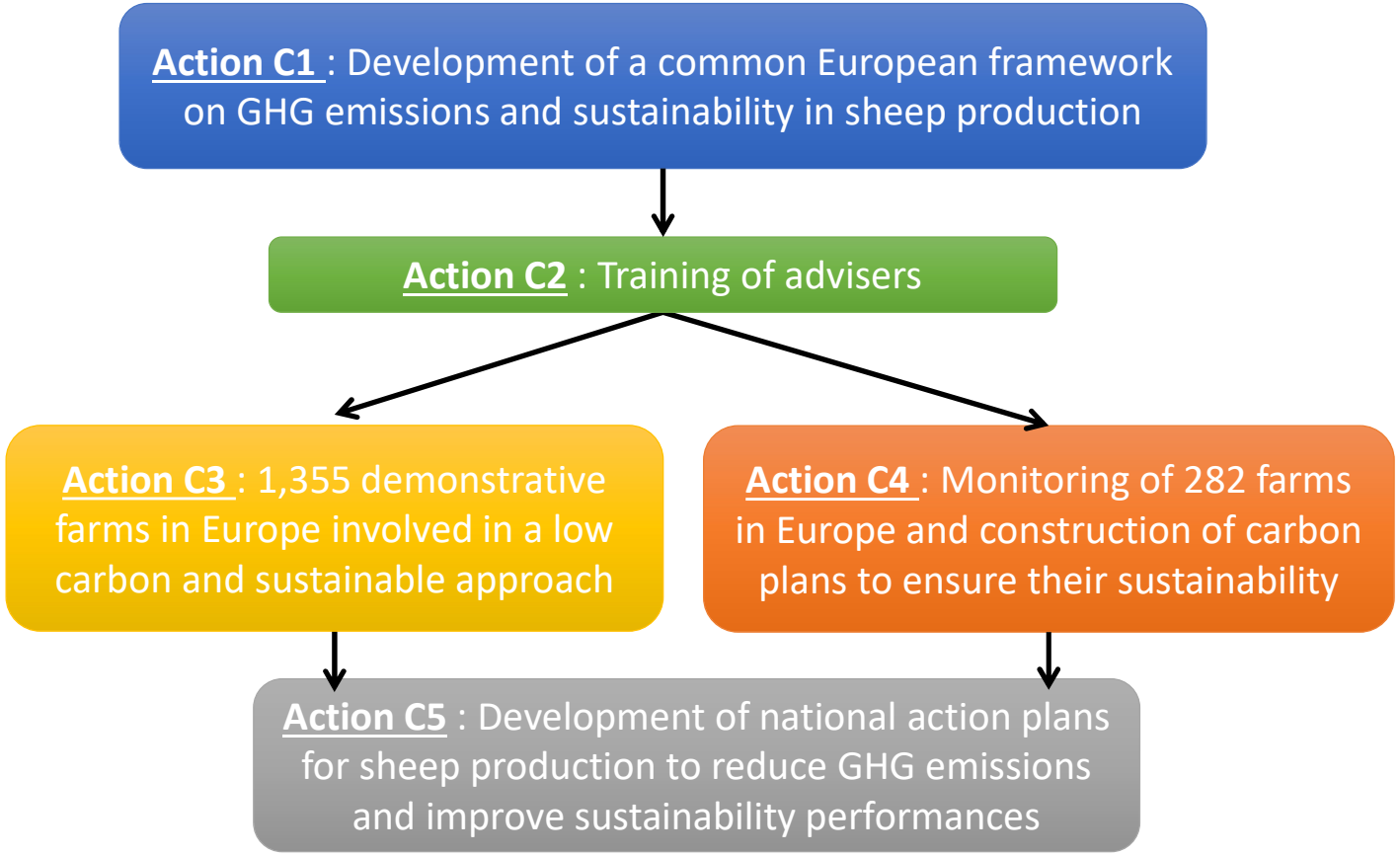
Action D : Monitoring of the impact of the project actions

- D1 : Quantifying the GHG emissions mitigation and carbon sequestration gains
- D2 : Evaluation of the other environmental gains allowed by the project
- D3 : Analysis of the socio-economic impacts of the project

Actions E : Communication & dissemination of results

- E1 : Communication Kit
- E2 : LIFE Green Sheep Communication
- E3 : LIFE Green Sheep project information and awareness
- E4 : LIFE Green Sheep results dissemination
- E5 : European projects networking

… focus on C-type (technical) actions:



Action C1 : Development of a common European framework on GHG emissions and sustainability in sheep production

focus on:

- inventory of the existing methodologies/tools
- knowledge sharing on the different approaches
- build a common methodology
- propose specific tools adapted to each production context in France, Ireland, Italy, Romania and Spain
- designing and sharing an inventory and a description of the mitigation techniques of GHG emissions

Expected results

- A common carbon footprint and sustainability assessment methodology
- National tools in adequacy with French, Irish, Italian, Romanian and Spanish sheep production context allowing comparisons
- A comparison of existing methodologies / tools
- A list of best mitigation practices inventoried

Action C2 : Training of advisers

building **a common knowledge,** for delivering on

- farm assessments
- on-farm demonstrations (CHG mitigation)
- dissemination (CHG mitigation)

providing **a harmonized training kit**

(translated in partner' language; to be used by the advisers for the environmental & sustainability farm assessments)

organising **training courses for the projects' advisors**

Expected results

a **harmonized training kit (the training support)**;

143 trained advisors

+ skills to implement innovative solutions;
+ skills to monitor the 282 innovative farms;
+ skills to disseminate
+ skills to build action plans (part of them)

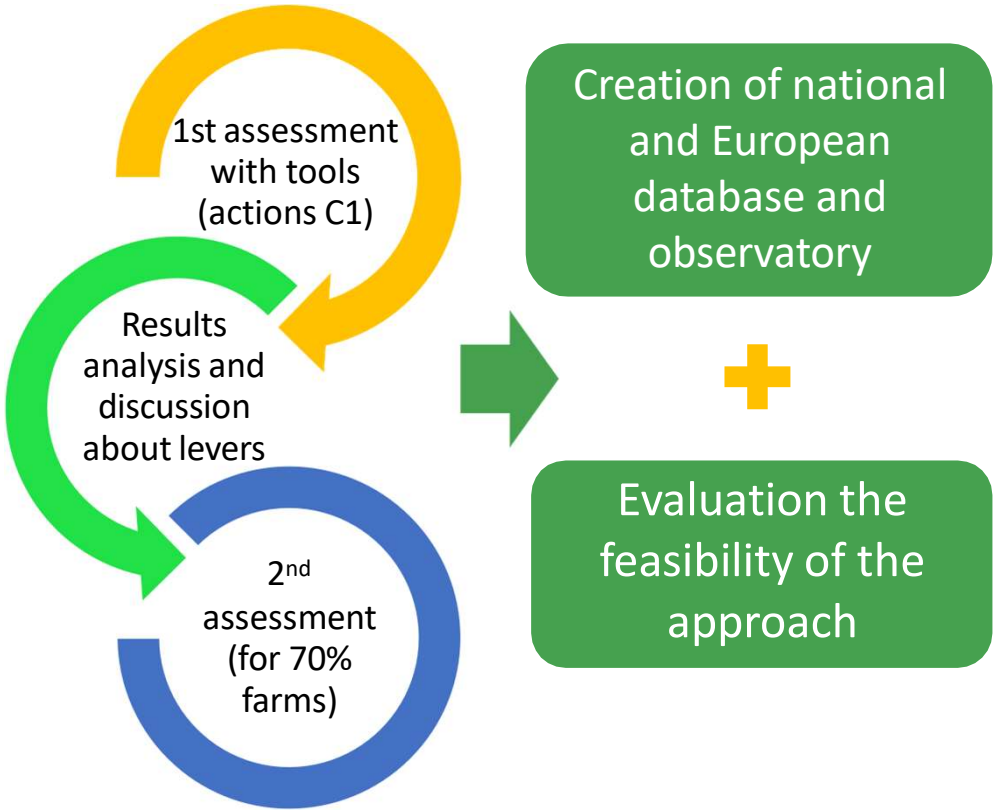
Action C3: 1,355 demonstrative farms in Europe involved in a low carbon and sustainable approach

Assessing GHG emissions but also other environmental, economic and social performances, on 1,355 demonstrative farms,

Creating a national and European observatory with 1,355 sheep farms in contrasting production contexts,

Determining the environnemental efficiency and the sustainability performances of farms according to production systems and practices,

Achieve 5% GHG mitigation on demonstrative farms scale.



Action C4: Monitoring of 282 farms in Europe and construction of carbon plans to ensure their sustainability

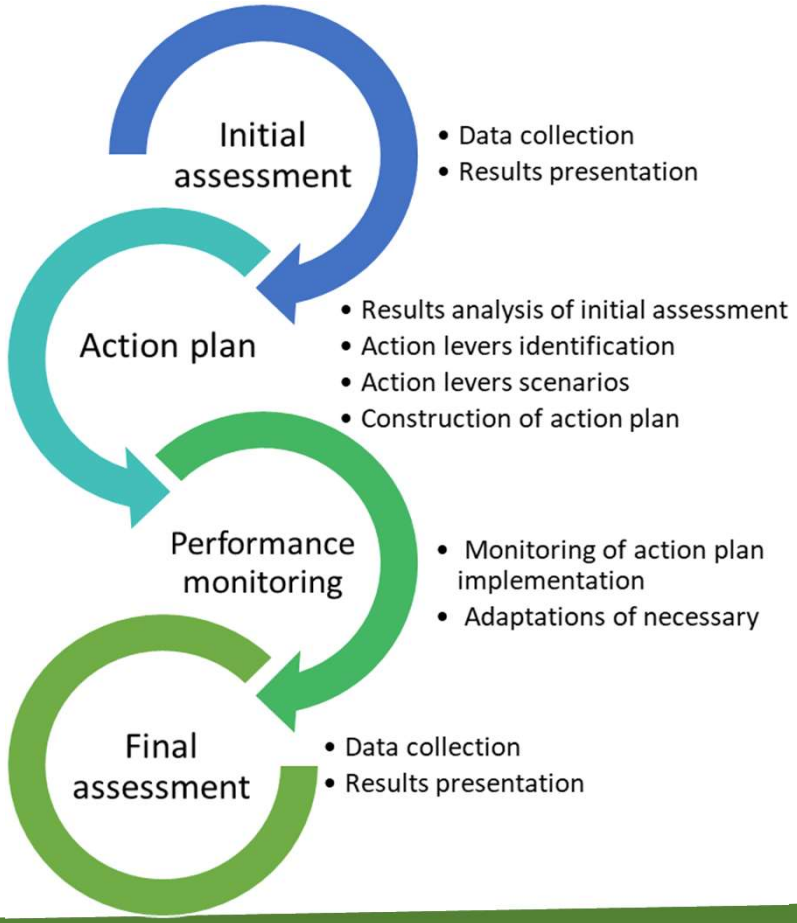
Assessing GHG emissions but also other environmental, economic and social performances, on 282 innovative farms,

Developing innovative farms with a low carbon footprint,

Demonstrating the feasability of mitigation practices in real conditions,

Evaluating the technical, environmental and economic benefits of adopting mitigation GHG practices at farm level,

Achieve 12% GHG mitigation on innovative farms scale.



Action C5 : Development of national action plans for sheep production to reduce GHG emissions and improve sustainability performances

Establishing 22 low carbon and sustainable action plans corresponding to the main production systems existing in the five countries,

Collecting & analyzing farmers' and advisers' feedback

Describing the partnership strategy to be put in place for the wide spreading of a Green Sheep action plan.

Expected results

22 Green Sheep **national action plans**,

> 3 **“low carbon” practices** for each system,

survey including > 70% of the farmers and advisers,

> 1 partnership developed/country/production

GHG emission mitigations, via “low carbon” plans

farmers' & advisers' feedback, surveys & synthesis

Green Sheep partnership strategy

Chapter 4. The tools used for GHG assessment & monitoring

Carbon Sheep : the Italian tool

ArdiCarbon : the Spanish tool

see the ARDICARBON section

Teagasc Sheep LCA: the Irish tool

see the SheepLCA section

CAP'2ER® / DEO : the French tools

adapted for the Italian & Romanian specifics (breeds, production systems, input data availability, etc.)

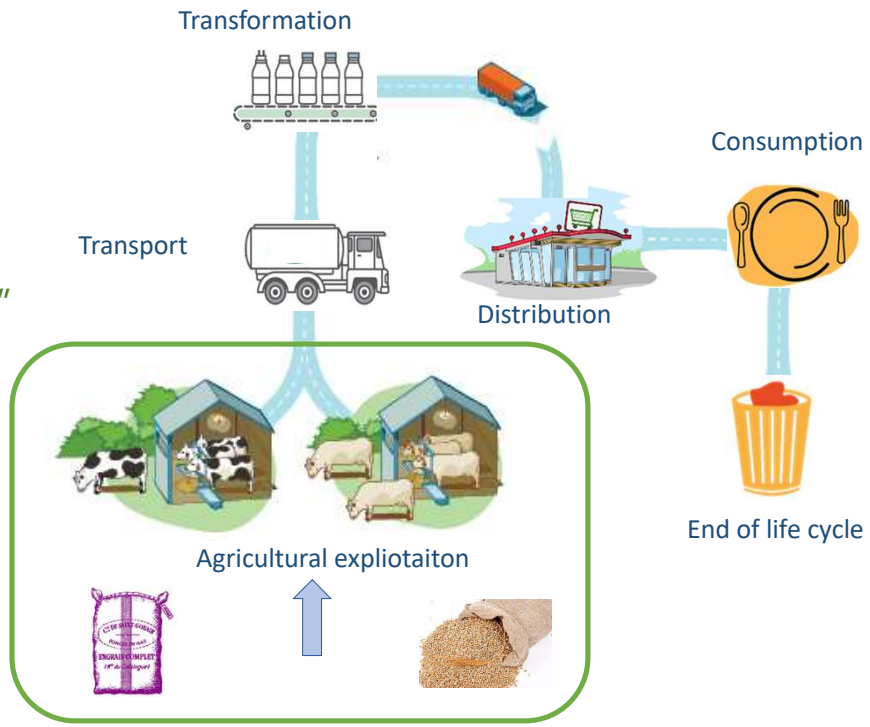
see the CAP2'ER section

all three tools (CAP'2ER, ArdiCarbon, LCA Sheep) are based on the principles of LCA (life-cycle assessment)

INPUT DATA:

- animals' data (heads / categories)
- details on land surfaces
- production parameters
- feeding data...

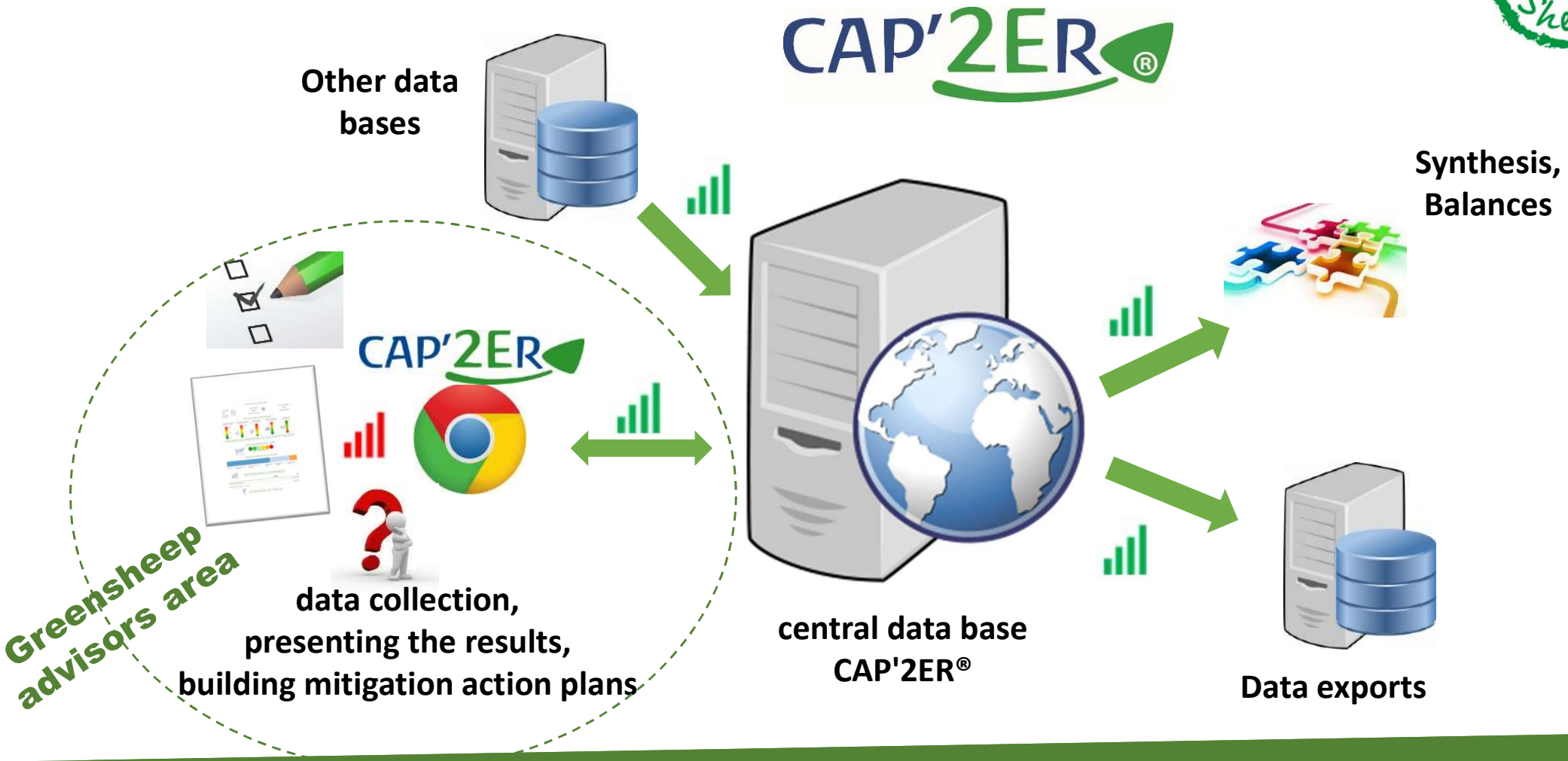
the tools address the upper part of the "farm to fork" flux:



OUTPUT DATA:

- GHG emissions (all three)
- C sequestration (CAP2ER, ARDICARBON ...
- N use efficiency (CAP2ER, ARDICARBON...
- other output data...

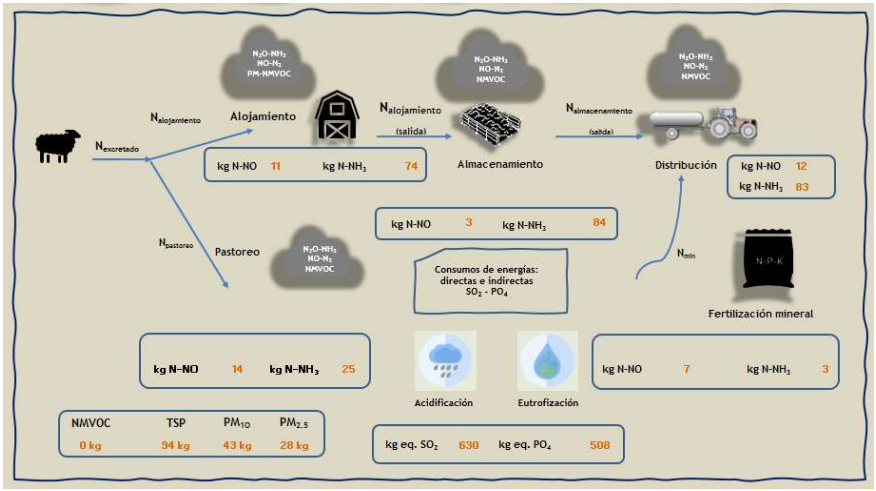
a glimpse on CAP’2ER:



a glimpse on ARDICARBON:

INPUT DATA …

… Excel based tool …

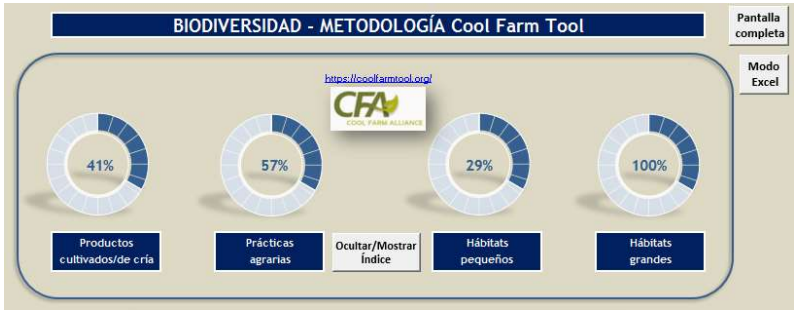


It also allows tailor made and ex ante assessments (What if..?)

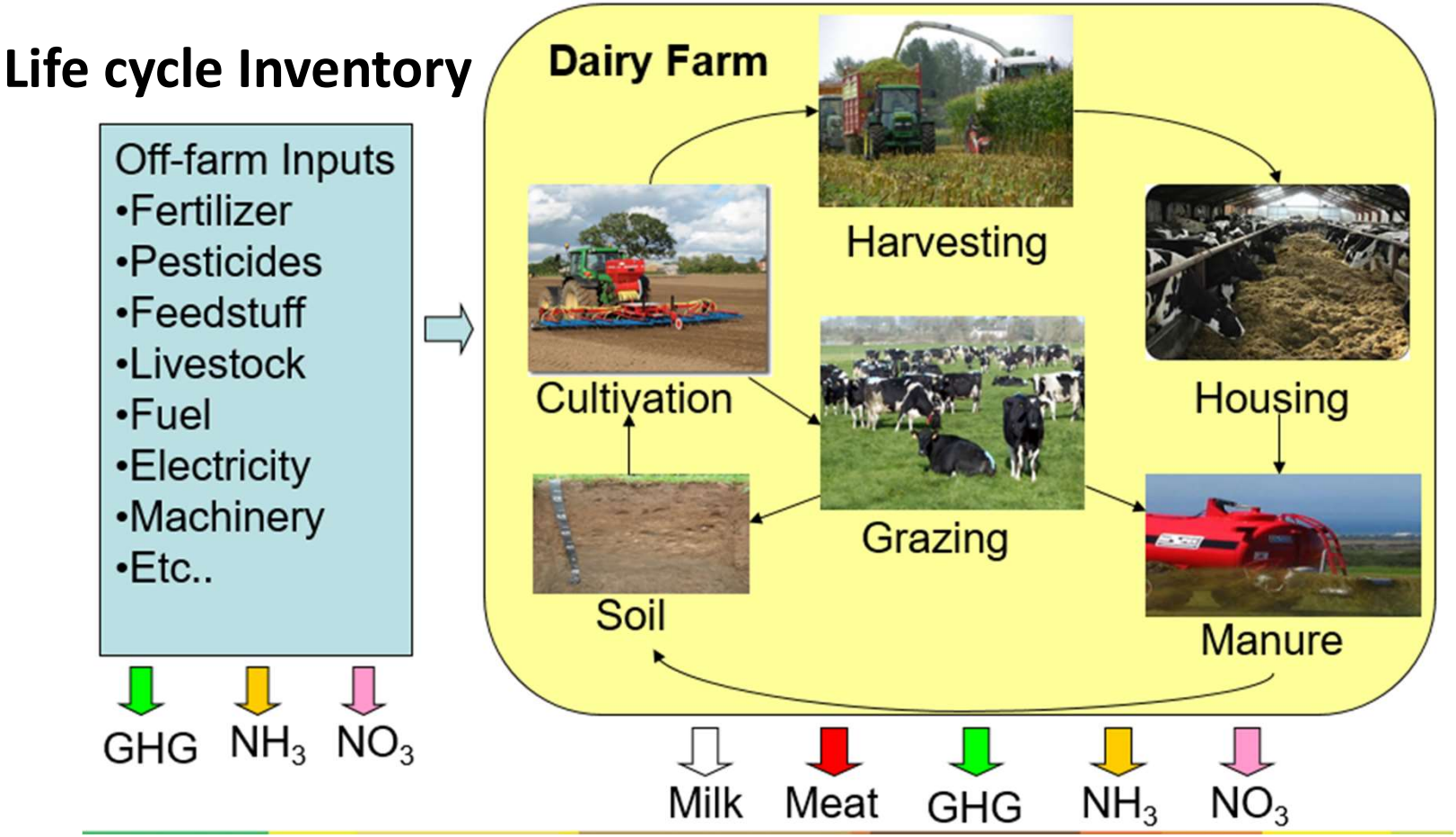
	- del Hierro - ARABA - Leche				MTDs			
	IPCC 2006		IPCC 2019		IPCC 2006		IPCC 2019	
Emisiones/Método IPCC	Incluye	NO incluye	Incluye	NO incluye	Incluye	NO incluye	Incluye	NO incluye
Fermentación entérica	62,43 %	62,43 %	67,63 %	67,63 %	62,43 %	62,43 %	67,63 %	67,63 %
Gestión del estiércol	7,51 %	7,51 %	10,27 %	10,27 %	7,51 %	7,51 %	10,27 %	10,27 %
Emisiones del suelo	15,10 %	15,10 %	5,88 %	5,88 %	15,10 %	15,10 %	5,88 %	5,88 %
Alimentación	10,11 %	10,11 %	10,95 %	10,95 %	10,11 %	10,11 %	10,95 %	10,95 %
Compra de fertilizantes	1,07 %	1,07 %	1,16 %	1,16 %	1,07 %	1,07 %	1,16 %	1,16 %
Consumo eléctrico	0,10 %	0,10 %	0,11 %	0,11 %	0,10 %	0,10 %	0,11 %	0,11 %
Consumo combustibles	3,62 %	3,62 %	3,92 %	3,92 %	3,62 %	3,62 %	3,92 %	3,92 %
Otras compras	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Maquinaria-Edificaciones	0,00 %		0,00 %		0,00 %		0,00 %	
Huella de carbono	kg CO_2e/kg FPCM		kg CO_2e/kg FPCM		kg CO_2e/kg FPCM		kg CO_2e/kg FPCM	
Allocation to milk: 100 %	5,03	5,03	4,64	4,64				
Allocation to milk: 96,73%	4,87	4,87	4,49	4,49				
Huella de carbono	kg CO_2e/kg PV		kg CO_2e/kg PV		kg CO_2e/kg FPCM		kg CO_2e/kg FPCM	
Allocation to meat: 100 %	54,40	54,40	50,21	50,21	4.351	4.351	4.016	4.016
Allocation to meat: 8,47%	4,61	4,61	4,25	4,25	0	0	0	0

… sustainability, LCA and carbon sequestration assessment from a holistic approach …

… and dashboards to present results.



a glimpse on Teagasc Sheep LCA:



Chapter 5. Potential GHG mitigation techniques

at the farm level, <u>two purposes</u> of focusing on these techniques

to **promote the techniques** toward the **<u>demo farms</u>** & outside the project in order to generally stimulate GHG mitigation & farms efficiency

to **present the techniques** to the **<u>innovative farms</u>**, **analyse** them, etc., **choose** the most convenient, in order to generate **<u>action plans</u>** allowing **GHG mitigation &** (preferably) **farm efficiency**

=> there is a need to focus on their side effects, e.g. on feeding efficiency

=> there is a need to build an inventory to choose from (clustered by specialties)

Factors that are known to influence GHG emissions from the livestock production

HERD MANAGEMENT & PERFORMANCE
Choice of animal species/breed
Genetic selection
Herd structure
Health & fertility management

MANURE STORAGE & USE
Adapted protein intake
Reduced protein digestibility
Improved diet digestibility
Use of fibrous feeds
Optimized excreta management
Excreta recycling

FEED PRODUCTION AND STORAGE
Choice of feed types
Plant breeding
Improved harvested methods
Optimized fertilizer use
Feed conservation/processing methods
Feed waste management

ENTERIC FERMENTATION
Choice of diet components
Improved diet digestibility
Enhanced feed intake capacity
Rumen modifiers

sources: Dickhoefer et al. (2014), Livestock Management and Environment (2016)

Potential mitigation directions (drivers)

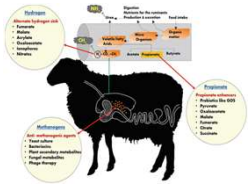
The European Union has strongly highlighted the importance of GHGS mitigation practices in the Directives and Common Agriculture Policy (CAP) measures 2014-2020.

«Herd management & performance» driver

«Manure storage & use» driver

«Feed production, storage & use» driver

«Enteric fermentation» highlight



Mitigation techniques – inventory

(based on previous projects, literature data, feed-back from industry, ...)

HERD MANAGEMENT & PERFORMANCE / FARM MANAGEMENT

Increased production efficiency trough **individual production control**

Increased **reproduction efficiency** through Vet Service

Low input **soil tillage techniques** (minimum tillage.. etc.)

Optimal **sizing of machinery and tools** equipment

Use of **renewable energy sources** (self-production and/or supplier selection)

Collect data to describe the animal's typical diet and performance in **each subcategory**;

Estimate feed intake from the animal performance and diet data for each subcategory (IPCC, 2006)

MANURE STORAGE & USE / MANURE MANAGEMENT

Use of manure as a **natural fertilizer** for agricultural land but also for pastures

Adaptation of the manure storage facilities

FEED PRODUCTION, STORAGE & USE

Feedstuffs supply strategies

Early harvest and/or **hay wrapping**

Increase of **self-produced forage**

Increase of self-produced/local **concentrates use**

Permanent grassland and **pasture cultivation**

Use of feeds from **sustainable supply chains**

Dietary optimisation

Use of **feed additives** for methanogenesis reduction

Use of **feed blocks** as integration for low quality forages

Increase the proportion of **dietary lipids** (with cautions)

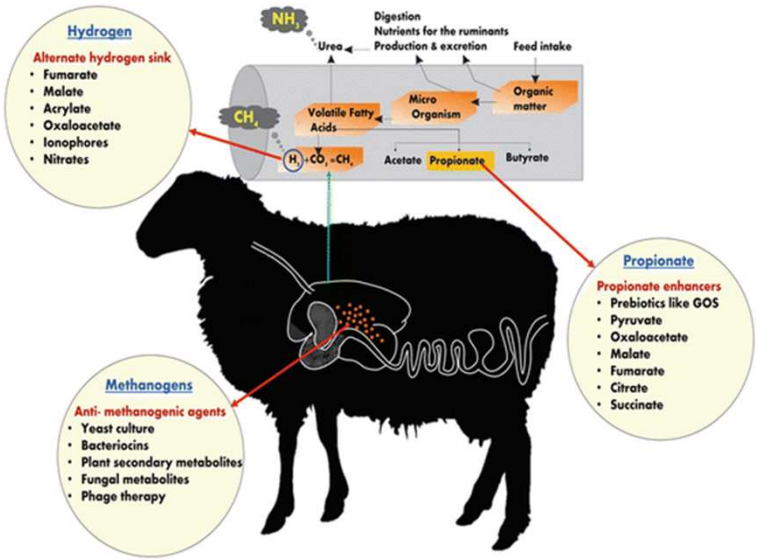
Overall **anti-methanogenic feeding strategies**.

Increase the **overall digestibility** of the diet

Increase of **legume forages** and reduction of **protein concentrates**

HIGHLIGHT: Manipulation of enteric fermentation

feed additives, lipids, protozoa roles, overall feeding strategies, choice of ingredients...



CONCLUSION: It is possible to obtain both GHG mitigation and livestock production efficiency / farm profitability

Optimising the overall farm management
feeding, herd management, manure / fertilisers, use of energy….

↓

Improving the production performances

Controlling the production costs

Reducing the environmental footprint (including GHG)

Annexes

Annex 1

CAP’2ER SECTION

(to be used in FRANCE, ITALY and ROMANIA)

4.a. presentation of the tool (Cap2ER) & the assessment process

Two levels of assessment in CAP'2ER®

CAP'2ER® Level 1

A simplified analysis

30 activity data / 1 hour to collect data and to present results to farmers

To develop an observatory

To highlight the link between practices and environment

CAP'2ER® Level 2

A Complete analysis

150 activity data / half day/one day to collect data and to present results to farmers

To simulate mitigation practices

To build individual carbon action plans

farm-level inputs,
one-year equivalent
(LCA approach)
(animals, feeding, surfaces, ...)

↓

set of equations
(upon IPCC)
set of assumptions

↓

calculated **farm-level parameters**
(GHG, nitrogen balance, biodiversity...)

Farm assessment process – how it works:

- **the advisor*** visit a farm or **get in contact with a farmer** (e.g. phone / on-line)

  ***previously trained to collect data, fill in data (on paper, in Excel, in CAP'2ER), interpret the results)**

- collect input data: **30 data** for Level 1 (in **Demo farms**) or **150 data** for Level 2 (in **Innovative farms**)

- **get the diagnosis** and **explain it to the farmer** (printer-friendly pdf).

- **draw conclusions + identify measures** (adapted feeding strategies, etc.) to be taken in order to:
  - **reduce farm-level GHG**
  - **maintain / <u>increase</u> the farm efficiency**

- **explain the demo farmers** the benefits of applying the **identified optimisation measures**
- **explain & assist the innovative farmers** on applying the **identified optimisation measures** (action plans)

Demo farms:
- first round of assessments (2022)
- targeted by dissemination / awareness / promo actions
- second round of assessment (2024)

Innovative farms:
- first round of assessments (2022)
- implementation of measures / mitigation plans
- monitoring throughout the project

Before the meeting with the farmer

For easy questioning the <u>farmer should be asked to prepare</u>:

- **Documents** for the **inputs** used along the year (e.g. purchased animals, feed, fuel)
- **Herd registers** (e.g. lambing, artificial inseminations)
- Milk/meat **production records**
- **Fertilizations** applied along the year
- **Manure** data (bought/sold)
- etc

Also, the <u>advisor should get prepared</u>:

- Know very well **the tool** to be used
- Know **the averages** of a typical local farm (e.g. milk yield, animals: surface ratio, etc.)
- Know the **normal range of** the sheep breed **parameters** (e.g. feed intake, live weight..)
- Know the **conversion factors** (milk to cheese, milk consumption by lambs, ...)
- etc.

4.b. Data collection (sheep data only)

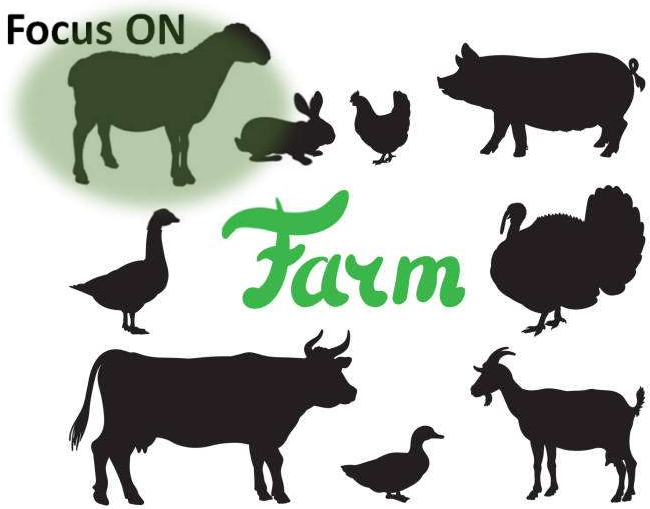
Demo farms

Utilised Agricultural Land (UAL)
Natural grasslands
Temporary grasslands

parameter # 1
parameter # 2
parameter # 3
.
.
.

Including dehydrated forages
Purchased straw

parameter # 30



Innovative farms

parameter # 1
parameter # 2
parameter # 3
.
.
.
parameter # 150

GENERAL ADVICES during data collection:

- be **prepared to cope** with misunderstandings
- **focus on** essential inputs
- **be efficient** (don't interview **longer** than needed)
- **collect as much** as possible (esp. Level 2)

& after the data collection:

- **hand your data** to the person doing data processing

or

- proceed with the **software run**
- don't forget to **give the farmer a feed-back**

Specific advices for the data collector:

- ail the **input data = one year basis** (calculations needed)

- know the **sheep farm basis**: - the **usual** animal load / surface
  - the **average** milk production (for the area, production system, race...)
  - the **usual** feed consumption
  - the **common**/widespread feeding strategies in the area

- **be prepared for conversions**: e.g. milk production is sold as cheese, the farmer report the cheese sells => milk: cheese yield ratio to be used to convert in litres of milk (/head, /farm...)

- **be prepared to extrapolate the feed consumption** / head / season => whole year, whole farm (if data are not available)

- ask **supplementary questions** when you notice biases / errors
  e.g. declared milk production way too low
  e.g. way too many / way too few animals / a certain surface
  (maybe it's real => look for the reason / but maybe it's a misunderstanding => clarify)

Pay attention – input data are clustered

SURFACE DATA:

Utilised Agricultural Land (UAL)	25.4	ha
Natural grasslands	25.4	ha
Temporary grasslands	0.0	ha
Forage crops	0.0	ha
Annual crops	0.0	ha
Other areas	0.0	ha
Individual pastoral areas	13.6	ha
Collective pastoral areas	9.2	ha
Additional areas	0.0	ha
Total livestock Unit (LU) on farm	47.0	

WARNING:

- **only** surface for **sheep**
- clarify **collective** areas

ANIMALS DATA:

WARNING:

check whether the values are within the range of breed / production system:

- male/female **ratio**
- culling **rate**
- **prolificacy**

Milk sheep herd		
Main breed	Manech tête rousse	
Number of ewes	352	heads
Number of rams	0	heads
Number of renewal ewe lambs	50	heads
ncluding number of purchased ewe lambs	0	heads
Number of sold milk lambs	189	heads
Average weight of milk lambs	11.0	live weight/lamb
Prolificacy rate	103%	%
Total annual sheep milk production	34,184	liters/an
Fat content	65.7	g/l
Protein content	51.2	g/l

Pay also attention to the 3F:

FEED/FERTILIZATION/FUEL DATA

Inputs used by sheep herd		
Electricity consumption	4,874	kWh/year
Fuel consumption	3,699	liters/year
Mineral nitrogen used	0	unit N/year
Organic nitrogen imported	0	unit N/year
Purchased concentrates	43.4	tons/year
Including cereals	23.7	tons/year
Including soybean meal	0.0	tons/year
heep concentrate - Protein content <=20%	8.0	tons/year
sheep concentrate - Protein content >20%	10.6	tons/year
Including dehydrated concentrates	0.0	tons/year
Including minerals and vitamins	1.03	tons/year
Purchased forages	28.0	tons DM/year
Including dehydrated forages	2.0	tons DM/year
Purchased straw	9.0	tons/year

WARNING:

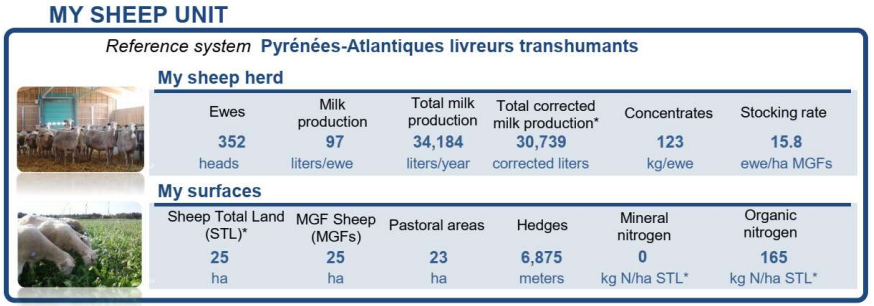
Breed characteristics

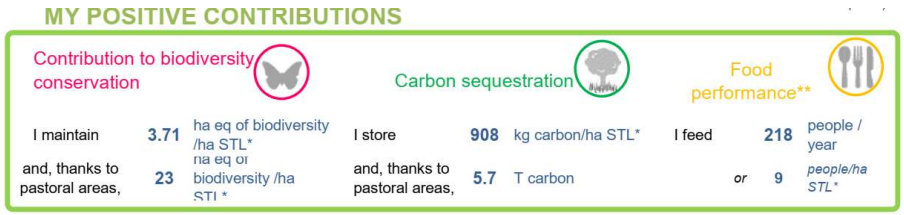
- feed **intake / category**
- protein % by **age**

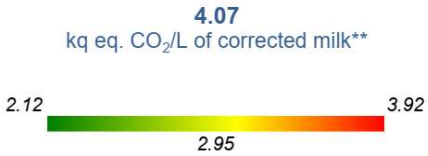
Electricity and fuel = **only** for sheep

4.c. guidelines on the results analysis and interpretation (Cap2ER)
(Results and Solutions)

User friendly inputs' recap

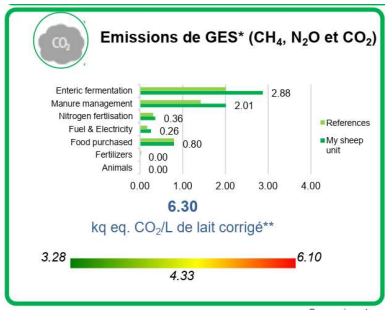


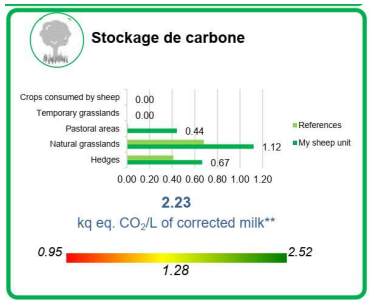


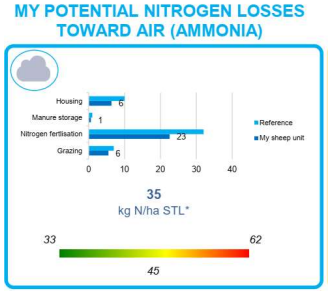


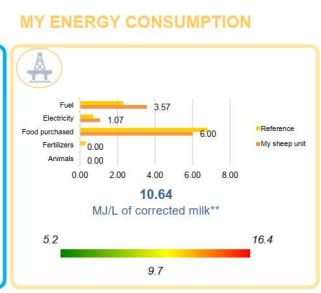
Positive results check

Be aware of the values here





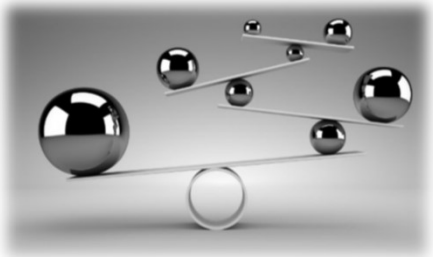




INPUTS
Concentrates and forages
Fertilizers
Imported manure
Purchased ewe lambs
Symbiotic fixation
Atmospheric deposition

OUPTPUTS
Milk
Sheep meat
Wool
Exported manure

Balance for:



Minimizing the GHG emissions

Maintaining or (even better) improving the farm efficiency

SWOT analysis:

=> FIND THE BEST SOLUTION FOR THE FARMER, e.g:

Change feeding strategy
=> higher efficiency

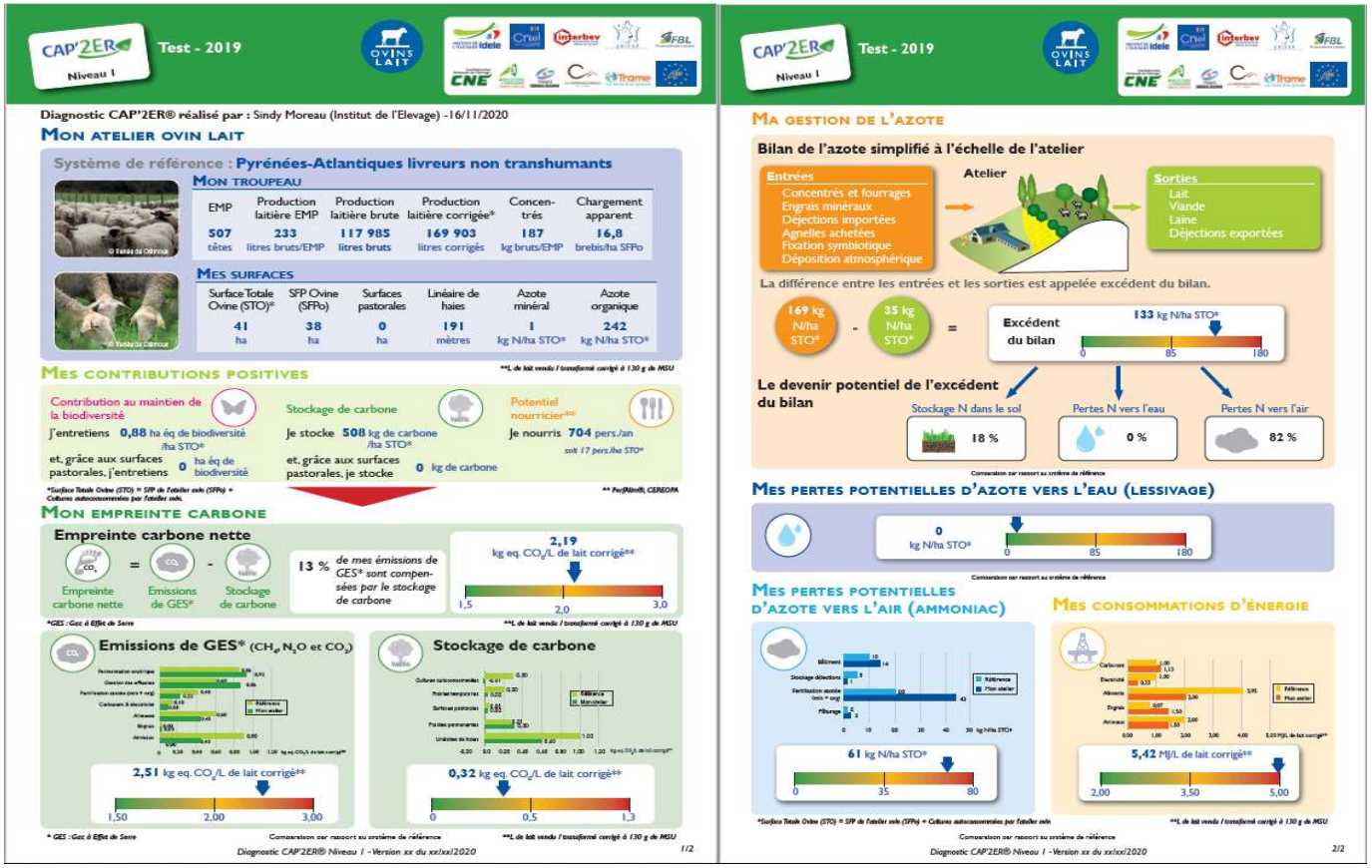
less GHG / unit of product

Improve reproductive performances
=> higher efficiency

less GHG / unit of product (e.g. milk)

Investment in manure equipment
=> no headaches & ...

reduce GHG (e.g. bio-fuel)



a brief (two-A4 pages) nice looking & **condensed report**

which has **to be explained to the farmer**

which (beside the inputs) is **the base for mitigation measures**

which **can be printed / forwarded, etc.**

FOLLOW UP

Don’t forget to do the follow-up...

first of all – these assessments (farm reports) **are the base for** action plans, national policies (e.g. subsidies), ...

But also **an interest for the farmers** – e.g. identification of the **sources of inefficiencies** (e.g. feeding inefficiency)
& for the advisor – e.g. **better “know the farm”** (in a systematic way) / **comparisons** with the average

e.g. high Nitrogen losses = inefficient use of dietary proteins, high specific consumption / product unit, high costs / products unit, economic losses etc.

→ advices to the farmer, for a better use of nitrogen feeds (which, btw, are expensive)

e.g. identify the outliers in the input data (comparing to other farms in the area / using same breed), and discuss the with the farmer, e.g.

→ “your reproduction parameters are lower than normal, this leads to both high GHG and economic losses...”
“let’s find a way to improve them...”

and therefore make sure there’s a win-win situation...

Annex 2

ARDICARBON SECTION

(to be used in SPAIN)

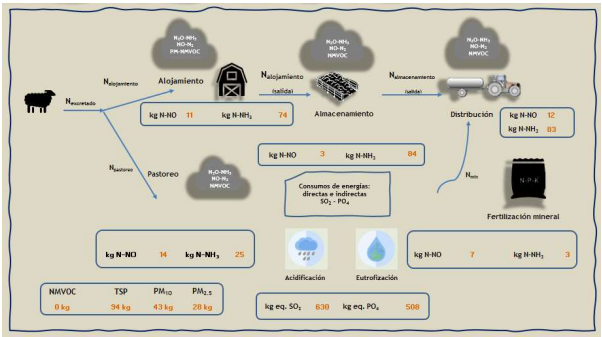
ArdiCarbon es una herramienta diseñada en Excel: mediante un diseño funcional, sencillo y amigable para el usuario

Permite la actualización en continuo (IPCC 2006, IPCC 2019, EMEP/EAA 2019, Guidelines for Spanish GHG inventories)

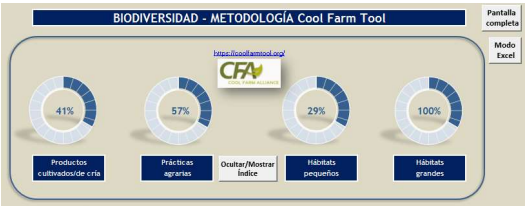
Objetivo: analizar la sostenibilidad del sector ovino desde un punto de vista holístico (económico, social y ambiental)

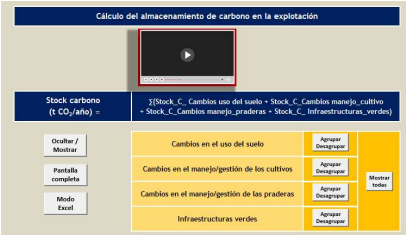
Permite realizar análisis a la carta – escenarios “what happens if”

2. Resultados vía cuadros de mando



	- del Hierro - ARABA - Leche				MTDs			
	IPCC 2006		IPCC 2019		IPCC 2006		IPCC 2019	
Emisiones/Método IPCC	Incluye	NO incluye	Incluye	NO incluye	Incluye	NO incluye	Incluye	NO incluye
Fermentación entérica	67,43 %	67,43 %	67,63 %	67,63 %	67,43 %	67,43 %	67,63 %	67,63 %
Gestión del estiércol	7,51 %	7,51 %	10,27 %	10,27 %	7,51 %	7,51 %	10,27 %	10,27 %
Emisiones del suelo	15,10 %	15,10 %	5,88 %	5,88 %	15,10 %	15,10 %	5,88 %	5,88 %
Alimentación	10,11 %	10,11 %	10,95 %	10,95 %	10,11 %	10,11 %	10,95 %	10,95 %
Compra de fertilizantes	1,07 %	1,07 %	1,16 %	1,16 %	1,07 %	1,07 %	1,16 %	1,16 %
Consumo eléctrico	0,10 %	0,10 %	0,11 %	0,11 %	0,10 %	0,10 %	0,11 %	0,11 %
Consumo combustibles	3,62 %	3,62 %	3,92 %	3,92 %	3,62 %	3,62 %	3,92 %	3,92 %
Otras compras	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Maquinaria-Edificaciones	0,00 %		0,00 %		0,00 %		0,00 %	
Huella de carbono	kg CO_2e/kg FPCM		kg CO_2e/kg FPCM		kg CO_2e/kg FPCM		kg CO_2e/kg FPCM	
Allocation to milk: 100 %	5,03	5,03	4,64	4,64				
Allocation to milk: 96,73%	4,87	4,87	4,49	4,49				
Huella de carbono	kg CO_2e/kg PV		kg CO_2e/kg PV		kg CO_2e/kg FPCM		kg CO_2e/kg FPCM	
Allocation to meat: 100 %	54,40	54,40	50,21	50,21	4.351	4.351	4.016	4.016
Allocation to meat: 8,47%	4,61	4,61	4,25	4,25	0	0	0	0





INSTRUCCIONES PARA LA CUMPLIMENTACIÓN

CELDAS QUE CUMPLIMENTAR

- Dato numérico a introducir en las unidades indicadas
- Dato a introducir entre los disponibles en el desplegable
- Dato de referencia

CELDAS QUE SE AUTOCOMPLETAN

- Resultado parcial
- Resultado final

Observaciones o explicaciones que servirán de ayuda para la correcta cumplimentación de la herramienta

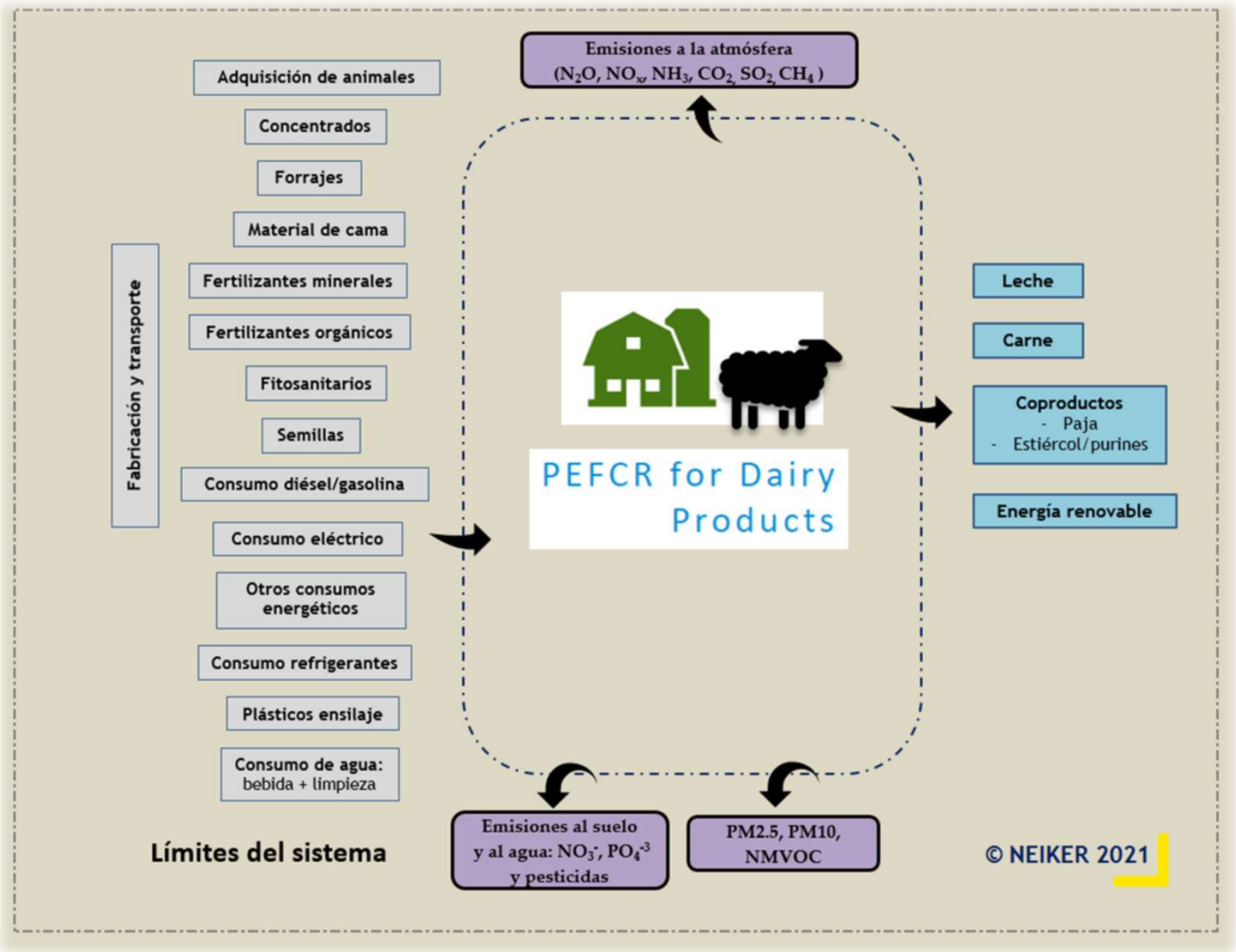
CELDAS QUE SE AUTOCOMPLETAN

El archivo debe estar habilitado para macros (extensión .xlxs)

ArdiCarbon: Herramienta de evaluación ambiental de apoyo técnico a explotaciones ovinas
Análisis multicreterio de evaluación de la sostenibilidad

Ocultar / Mostrar	Oculta o muestra el índice de la herramienta	Modo Excel	Desactiva el modo pantalla completa
Pantalla completa	Activa el modo pantalla completa	Limpiar formulario	Permite limpiar las celdas de cada hoja

Los recursos gráficos incluidos en ArdiCarbon han sido creados por freepik (www.freepik.es)


Emisiones a la atmósfera
(N_2O, NO_x, NH_3, CO_2, SO_2, CH_4)
Adquisición de animales
Concentrados
Forrajes
Material de cama
Fertilizantes minerales
Fertilizantes orgánicos
Fitosanitarios
Semillas
Consumo diésel/gasolina
Consumo eléctrico
Otros consumos energéticos
Consumo refrigerantes
Plásticos ensilaje
Consumo de agua: bebida + limpieza
Fabricación y transporte
PEFCR for Dairy Products
Leche
Carne
Coproductos
- Paja
- Estiércol/purines
Energía renovable
Límites del sistema
Emisiones al suelo y al agua: NO_3^-, PO_4^{-3} y pesticidas
PM2.5, PM10, NMVOC
© NEIKER 2021

1. CARACTERÍSTICAS GENERALES DE LA EXPLOTACIÓN

Año	2020
Nombre explotación	Fr-OL PA 04
Provincia	ALBACETE
Municipio	Abengibre
Temperatura (°C)	14,0 °C
Precipitación (mm)	344 mm
Clima	Templado Cálido Seco
Leche/carne	Leche
Raza	Latxa
Economía social de la explotación	Explotación asociativa
Profesionalidad responsable principal	Explotación profesional
UTA	3,00
UGM	50,55
¿Explotación en ecológico?	NO

Aprovechamiento de comunales	SI
Superficie comunales (ha)	0,00
Superficie TOTAL (ha)	53,20
SAU en propiedad (ha)	37,10
SAU arrendada (renta) (ha)	0,00
Praderas (ha)	49,70
Cultivos (ha)	3,50
pH de la provincia	básico
pH de la explotación	pH <=7
Frío pH <=7	Frío
Tipo de alimentación	Pastoreo
Pendiente media (%)	<3%
Diagnóstico ArdiCarbon realizado por	Óscar del Hierro

TITULARIDAD

GÉNERO	EDAD	UTAS	Seguridad social	Familiar/ Asalariada	SUELDOS Y SS ASALARIADO	SS M. OBRA FAMILIAR
HOMBRE	40	1,00	SI	ASALARIADA	1.000,00	
MUJER	45	1,00	SI	ASALARIADA	1.000,00	
HOMBRE	50	0,50	SI	FAMILIAR	1.000,00	
MUJER	35	0,50	NO	FAMILIAR	1.000,00	

	Número	Edad media	UTAs	UTA Familiar	UTA Asalariada
HOMBRES	2,00	45	1,50	0,50	1,00
MUJERES	2,00	40	1,50	0,50	1,00
UTA Familiar			1,50		
UTA Asalariada			2,00		

100 %

Barra de progreso

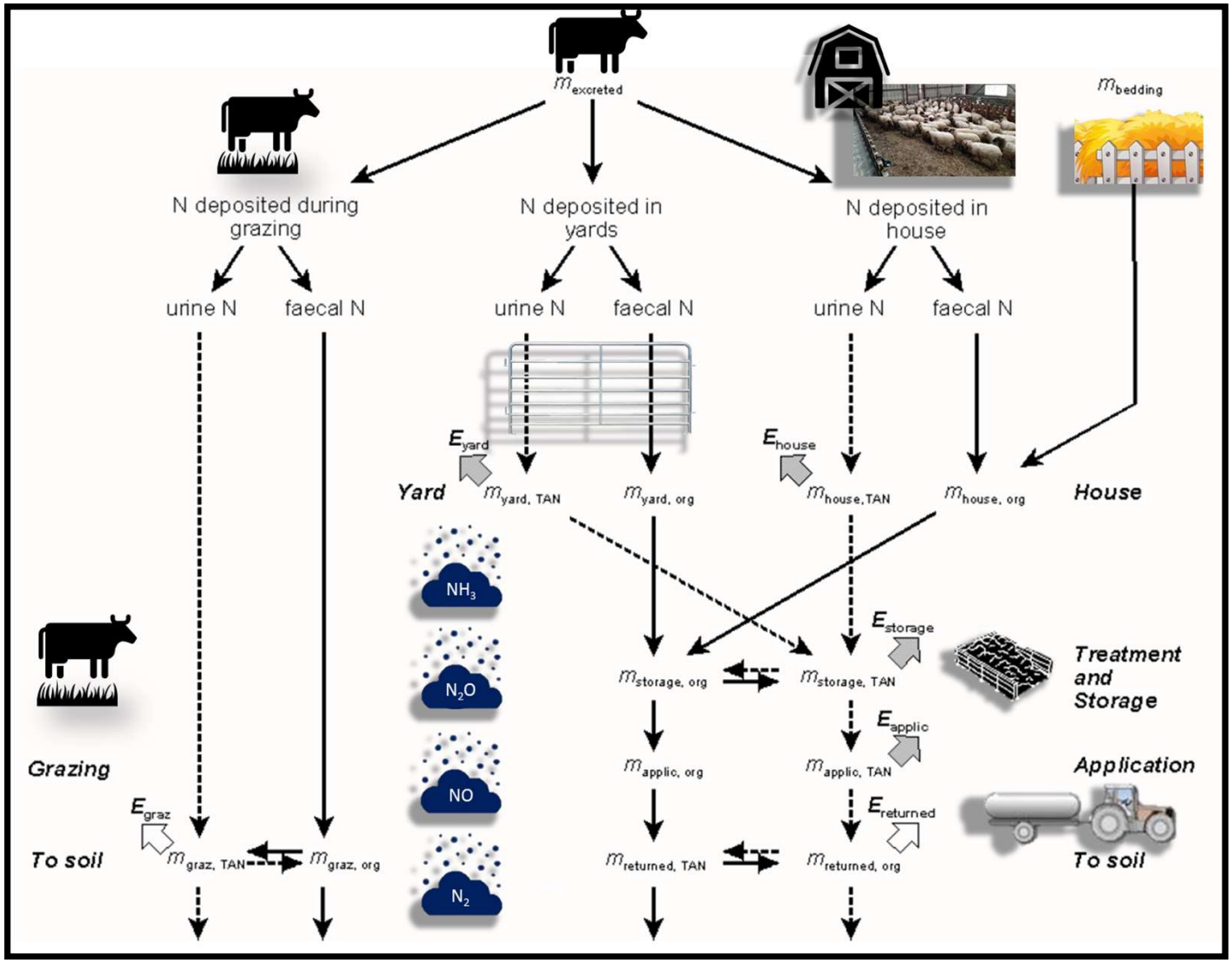
Ocultar / Mostrar

Limpiar formulario

Pantalla completa

Modo Excel

Hombres (%)	Mujeres (%)
50 %	50 %



Balance de N Emisiones

Censo Ganadero: Ovino Leche

Ocultar / Mostrar Índice | Limpiar formulario | Pantalla completa | Modo Excel

Selección Leche

Mostrar/Ocultar (Leche)

Mostrar/Ocultar (Carne)

	CATEGORÍAS	Comienzo del año (Nº)	Peso vivo inicio (kg)	Periodo en la explotación (días/año)	Periodo estabulación (días)	Proporción excreta en patios (0-1)	Final del año (Nº)	Peso vivo final (kg)	PPA	kg MS ingerida día/cabeza	UGM
LECHE	Corderos lechales norteños (P)		5	25	25		322	11	22,05		0
	Corderos lechales castellanos (E)								0,00		0
	Corderos pascuales-lecheras (E)								0,00		0
	Corderos hembra reposición leche		11	365	150		66	15	66,00		1
	Corderos macho reposición leche								0,00		0
	Sementales jóvenes leche (E)								0,00		0
	Sementales jóvenes leche (P)	2	55	365	150		2	55	2,00		0
	Sementales leche (E)								0,00		0
	Sementales leche (P)	5	65	365	150		5	65	5,00		1
	Ovejas no cubiertas leche (E)								0,00		0
	Ovejas no cubiertas leche (P)								0,00		0
	Ovejas en 1ª gestación leche (E)								0,00		0
	Ovejas en 1ª gestación leche (P)	66	60	365	150		66	60	66,00		10
	Ovejas paridas leche (E)								0,00		0
	Ovejas paridas leche (P)	264	65	365	150		264	65	264,00		40
CARNE	Corderos pascuales-carne-lactación								0,00		0
	Corderos-pascuales-carne-cebo								0,00		0
	Corderos hembra reposición carne								0,00		0
	Corderos macho reposición carne								0,00		0
	Sementales jóvenes carne (E)								0,00		0
	Sementales jóvenes carne (P)								0,00		0
	Sementales carne (E)								0,00		0
	Sementales carne (P)								0,00		0
	Ovejas no cubiertas carne (E)								0,00		0
	Ovejas no cubiertas carne (P)								0,00		0
	Ovejas en 1ª gestación carne (E)								0,00		0
	Ovejas en 1ª gestación carne (P)								0,00		0
	Ovejas paridas carne (E)								0,00		0
	Ovejas paridas carne (P)								0,00		0
	TOTAL	337					725		337		51

* (E) = Estabulado; (P) = Pastoreo

¿Conoce la ingesta de MS/día/animal?

SÍ ☐ NO ☐

Gestión de estiércol	Limpiar casillas de verificación
Distribución diaria	☐
Almacenaje de sólidos	☐
Almacenaje de sólidos - compactado cubierto	☐
Almacenaje de sólidos - adición de estructurantes	☐
Almacenaje de sólidos - aditivos	☐
Dry lot - Corral de engorde	☐
Líquido-purín con cobertura de costra natural	☐
Líquido-purín sin cobertura de costra natural	☐
Líquido-purín 1 mes	☐
Líquido-purín 3 meses	☐
Líquido-purín 4 meses	☐
Líquido-purín 6 meses	☐
Líquido-purín 12 meses	☐
Laguna anaeróbica no cubierta	☐
Almacenamiento en pozos por debajo de lugares de confinamiento animal. 1 mes	☐
Almacenamiento en pozos por debajo de lugares de confinamiento animal. 3 meses	☐
Almacenamiento en pozos por debajo de lugares de confinamiento animal. 4 meses	☐
Almacenamiento en pozos por debajo de lugares de confinamiento animal. 6 meses	☐
Almacenamiento en pozos por debajo de lugares de confinamiento animal. 12 meses	☐
Camas profundas. Sin mezclado. < 1 mes	☐
Camas profundas. Mezclado activo. > 1 mes	☐
Fabricación de compost (en tambor)	☐
Fabricación de compost - en pila estática	☐
Fabricación de compost (intensivo en filas)	☐
Fabricación de compost (pasivo en filas)	☐

Otras enmiendas orgánicas	kg N/año
Aplicación de lodos de depuradora	
Aplicación de compost	
Otras enmiendas orgánicas	

CLIMA
Dry

Proporción depositado en los alojamientos como purín (Xhouse_slurry; 0-1)
0,00

Proporción de estiércol/purín almacenado en la explotación (como decimal, (0-1))	
xstore_slurry_sheep	0,00
xstore_solid_sheep	1,00

Proporción del estiércol/purín almacenado en la explotación utilizado para la producción de biogás (como decimal, 0-1)	
xbiogas_slurry	0,00
xbiogas_solid	0,00

Características opcionales del ganado	
Variable	Unidad
Edad al primer parto (meses)	
Intervalo ente partos	
Tasa de parto	
Tasa de reemplazo	
Edad al descarte (sacrificio)	

	Categoría	PASTOREO: número de horas pastoreo/mes/día (ej. 8-12-24) - Leche												Días en comunales	Días en pastoreo
		Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Sept.	Octubre	Noviembre	Diciembre		
Pastoreo	Corderos lechales norteños (P)	0											0		0
	Corderos lechales castellanos (E)	0											0		0
	Corderos pascuales-lecheras (E)														0
	Corderos hembra reposición leche	24	24	24	24	24	24	24	24	24	24	24	24		365
	Corderos macho reposición leche	24	24	24	24	24	24	24	24	24	24	24	24		365
	Sementales jóvenes leche (E)														0
	Sementales jóvenes leche (P)	24	24	24	24	24	24	24	24	24	24	24	24		365
	Sementales leche (E)														0
	Sementales leche (P)	24	24	24	24	24	24	24	24	24	24	24	24		365
	Ovejas no cubiertas leche (E)														0
	Ovejas no cubiertas leche (P)	24	24	24	24	24	24	24	24	24	24	24	24		365
	Ovejas en 1ª gestación leche (E)														0
	Ovejas en 1ª gestación leche (P)	24	24	24	24	24	24	24	24	24	24	24	24		365
	Ovejas paridas leche (E)														0
	Ovejas paridas leche (P)	6	6	6	6	15	24	24	24	24	24	5	5		215

Limpiar gestión del estiércol

Gestión del estiércol

Agrupe o desagrupe en función de la gestión seleccionada

	Nitrógeno excretado					
kg N/cabeza/año Pastoreo	kg N/cabeza/año Estabulación	Estabulación (kg N)	En los patios (kg N)	Pastoreo (kg N)	% N en pastoreo	Total (kg N/año)
1,19	1,19	26	0	0	0	26
1,47	1,47		0		0	0
1,47	1,47		0		0	0
3,68	3,68	100	0	143	59	243
3,68	3,68		0		0	0
7,25	7,25		0		0	0
6,08	6,08	5	0	7	59	12
7,25	7,25		0		0	0
6,08	6,08	12	0	18	59	30
4,34	4,34		0		0	0
2,15	2,15		0		0	0
6,06	6,06		0		0	0
6,06	6,06	164	0	236	59	400
9,86	9,86		0		0	0
9,86	9,86	1.070	0	1.533	59	2.603
1,47	1,47		0		0	0
1,47	1,47		0		0	0
3,68	3,68		0		0	0
3,68	3,68		0		0	0
7,25	7,25		0		0	0
6,08	6,08		0		0	0
7,25	7,25		0		0	0
6,08	6,08		0		0	0
4,34	4,34		0		0	0
2,15	2,15		0		0	0
4,87	4,87		0		0	0
4,87	4,87		0		0	0
5,19	5,19		0		0	0
5,19	5,19		0		0	0
C/N	13,40	1.378	0	1.937		3.314
Kg C durante el pastoreo	488 kg C/ha	25.954 kg C		FPRP (kg N/año)		Total (kg N/año)
Kg C aplicado al suelo	243 kg C/ha	12.921 kg C				

Mediante el Censo Agrario ArdiCarbon calcula los siguientes parámetros:

Ocultar / Mostrar Índice

* Extracciones de N-P_2O_5-K_2O por parte de los cultivos (grano y paja)
* Balance energético (MJ)
* Emisiones GEI asociadas a la incorporación de los residuos agrícolas al suelo, (kg N_2O)
* Emisiones GEI asociadas a la quema de los residuos agrícolas, (kg N_2O, kg CH_4)
* Almacenamiento de carbono en los residuos agrícolas (kg CO_2)

CULTIVOS contemplados: agrupar / desagrupar

Cereales grano	Agrupar Desagrupar	Leguminosas grano	Agrupar Desagrupar
Cultivos industriales	Agrupar Desagrupar	Leguminosas forrajeras	Agrupar Desagrupar
Praderas	Agrupar Desagrupar	Cultivos forrajeros	Agrupar Desagrupar

Agrupar Desagrupar todas

Mostrar todas

Limpiar formulario

Pantalla completa

Modo Excel

COMPRAS REALIZADAS EN LA EXPLOTACIÓN		
Animales	Agrupar Desagrupar	Mostrar todas
Concentrados	Agrupar Desagrupar	
Forrajes	Agrupar Desagrupar	

Ocultar / Mostrar

Limpiar formulario

Pantalla completa

Modo Excel

Ocultar resultados ☑

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5.2 Consumo combustibles
6. Maquinaria
7. Edificaciones
8. Salidas: productos
9. Fluorados
10. Biodiversidad
11. Stock de C
12.1 Acciones MTDs
12.2 Analítica de suelos
13. Social
Cuadros de mando
BALANCES NPK-ENERGÍA
Huella de carbono
Nivel 1
Biodiversidad
Acidificación-eutrofización
Calculadora de piensos

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Calculadora de Piensos

2.1 CONCENTRADOS	Cantidad (kg)	CP (%)
Avena de primavera (CAP2ER)		
Pienso pequeño rumiante (16% MAT)		
Alfalfa deshidratada/Alfalfa energía 23% (CAP2ER)		
Correctores vitamínico-minerales (CMV)	1.000,00	
Mais grain (CAP2ER)	6.000,00	
Pienso pequeño rumiante (18% MAT)	21.500,00	
Colza grano (CAP2ER)		
Habas de otoño		
Pulpa de remolacha/Mélasse de betterave (CAP2ER)		
Torta de soja 44		
Pienso cebo. Harina preiniciación		
TOTAL	28.500,00	

2.2 FORRAJES	Cantidad (kg)
Heno alfalfa pura	20.000,00
Alfalfa deshidratada/Alfalfa energía 23 %	9.000,00
Pulpa de remolacha deshidratada	9.000,00
Maíz deshidratado	
Heno alfalfa pura	
Melaza de remolacha	
Heno alfalfa pura	
Paja no tratada	
TOTAL	38.000

2,3 Material para cama de ganado	Cantidad (kg)
PAJA	26.000,00
SERRÍN	
ARENA	
TOTAL	26.000


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COMPRAS REALIZADAS EN LA EXPLOTACIÓN
Fertilizantes minerales
Agrupar Desagrupar
Fertilizantes orgánicos
Agrupar Desagrupar
Enmiendas minerales
Agrupar Desagrupar
Encalantes, fitos. y semillas
Agrupar Desagrupar
Mostrar todas
Otras compras realizadas (€)
Agrupar Desagrupar
Gastos
Agrupar Desagrupar
Ocultar / Mostrar
Limpiar formulario
Pantalla completa
Modo Excel
Ocultar resultados

Consumo eléctrico

kWh/año	Año	Suministrador	kg eq CO_2	kg eq SO_2	kg eq PO_4	MJ
19.400,00	2020	IBERDROLA CLIENTES, S.A.U.	3.880,00	17,62	3,43	69.840,00

COSTE (€)		0,00 €

Riego - Consumo eléctrico - Individual o Colectivo

Superficie regada (ha)

	m^3	Método de bombeo	kg eq CO_2	kg eq SO_2	kg eq PO_4	MJ
Individual		Baja electricidad (0,3 k	0,00	0,00	0,00	0,00
Colectivo		Baja electricidad (0,3 k	0,00	0,00	0,00	0,00
COSTE (€)			0,00	0,00	0,00	0,00

Ocultar/Mostrar Índice | Limpiar formulario | Pantalla completa | Modo Excel

AGUA POTABLE AGUA DE RED

m^3	kg CO_2e	kg eq SO_2	kg eq PO_4	MJ
	0,00	0,00	0,00	0,00

COSTE (€)		

Comentarios:

Diagnóstico ArdiCarbon realizado por Óscar del Hierro

ALCANCE 2: Consumo combustibles

COMBUSTIBLES		Consumo	kg eq CO_2	kg eq SO_2	kg eq PO_4	MJ	COSTE (€)
Vehículos	Gasolina		0	0	0	0	
	Gasóleo A		0	0	0	0	
	Gasóleo B	1.400 l	6.050	39	7	48.951	
	Gasóleo C	4.850 l	22.658	146	27	183.330	
	E10		0			0	
	E85		0			0	
	E100		0			0	
	B7		0			0	
	B10		0			0	
	B30		0			0	
	B100		0			0	
	GNL		0			0	
	GNC		0			0	
	GLP		0			0	
TOTAL			28.708	184	34	232.281	0
Equipos de combustión fija	Gas natural		0	0			
	Gasóleo C		0	0	0	0	
	Gasóleo B		0	0	0	0	
	Gas butano		0	0			
	Gas propano		0	0			
	Fuelóleo		0				
	GLP genérico		0				
	Carbón nacional		0				
	Carbón de importación		0				
	Coque de petróleo		0				
TOTAL			0	0	0	0	0,00 €

* Consumo combustibles: laboreo (20 l/ha), abonado (5 l/ha), siembra (6 l/ha) y cosechado (12 l/ha)

Fuente: Consumos energeticos operaciones agrícolas en Espana" del IDEA

Consumo y generación de energía renovable

CONSUMO DE ENERGÍAS RENOVABLES: en la propia explotación

Tipo de energía	Consumo (cantidad)	Energía (GJ)	Energía substituida	t CO_2 evitados
Leña (t)		0,00 GJ	Fuelóleo	0,00 t CO2
Astillas de madera				
Energía solar térmica				
Energía fotovoltaica				
Energía eólica				
Biocombustibles				
Electricidad de biogás				
Calor del biogás				
Biogás				

CONSUMO DE ENERGÍAS RENOVABLES: consumo doméstico

Tipo de energía	Consumo (cantidad)	Energía (GJ)	Energía substituida	t CO_2 evitados
Leña		0,00 GJ	Fuelóleo	0,00 t CO2
Astillas de madera		0,00 GJ	Fuelóleo	0,00 t CO2
Energía solar térmica		0,00 GJ	Electricidad	0,00 t CO2
			ricidad	0,00 t CO2
			ricidad	0,00 t CO2
			óleo	0,00 t CO2
			ricidad	0,00 t CO2
			natural	0,00 t CO2
			natural	0,00 t CO2
				0,00 t CO2

Principales consumos energéticos

	MJ	
Combustibles-vehículos	2,32E+05	28,33 %
Combustibles-equipos	0,00E+00	0,00 %
Electricidad	6,98E+04	8,52 %
Concentrados	8,92E+04	10,87 %
Forrajes	2,42E+05	29,48 %
Fertilizantes	1,87E+05	22,79 %
	8,20E+05	

MJ/FPCM (kg) — 12,34 MJ/kg FPCM

MJ/kg PV — 123 MJ/kg Peso Vivo

CONSUMO DE

Tipo de energía				
Leña				
Astillas de madera				
Energía solar térmica				
Energía fotovoltaica				
Energía eólica				
Biocombustibles		0,00 GJ	Gasóleo	0,00 t CO2
Electricidad de biogás		0,00 GJ	Electricidad	0,00 t CO2
Calor del biogás		0,00 GJ	Gas natural	0,00 t CO2
Biogás		0,00 GJ	Gas natural	0,00 t CO2
		0,00 GJ		0,00 t CO2

Tipo de energía	Consumo (cantidad)	Energía (GJ)	Energía substituida	t CO_2 evitados
Leña			lóleo	0,00 t CO2
Astillas de madera			lóleo	0,00 t CO2
Energía solar térmica			ricidad	0,00 t CO2
			ricidad	0,00 t CO2
			ricidad	0,00 t CO2
Biocombustibles		0,00 GJ	Gasóleo	0,00 t CO2
Electricidad de biogás		0,00 GJ	Electricidad	0,00 t CO2
Calor del biogás		0,00 GJ	Gas natural	0,00 t CO2
Biogás		0,00 GJ	Gas natural	0,00 t CO2
1kWh = 3,6 MJ		0,00 GJ		0,00 t CO2

ALCANCE 1: EMISIONES FUGITIVAS - FLUORADOS

Ocultar / Mostrar

Cumplimentar en caso de que la organización disponga de equipos de refrigeración y/o climatización que utilicen gases refrigerantes fluorados y de que se haya detectado que se han producido fugas (ya sea por su uso, un accidente, etc.) de estos gases en los mismos.

REFRIGERACIÓN Y CLIMATIZACIÓN (FUGA DE GASES FLUORADOS)

Refrigerante de cada equipo				Tipo de equipo	Carga inicial del equipo (kg)	Recarga anual (kg)	Emisiones parciales (kg CO_2eq)	Emisiones totales (kg CO_2eq)
Nombre del gas o del preparado	PCG (kg CO2eq)	OTROS PREPARADOS[A]		Fórmula química				
		Nombre	PCG					
HFC-23	14800			CH2F3			0,00	0,00
HFC-32	675			CH2F2			0,00	
HFC-41	92			CH3F			0,00	
HFC-43-10mee	1640			C5H2F10			0,00	
HFC-125	3500			C2HF5			0,00	
HFC-134	1100			C2H2F4			0,00	
HFC-134a	1430			CH2FCF3			0,00	
HFC-143	353			C2H3F3-			0,00	
HFC-143a	4470			C2H3F3			0,00	
R-407C	1773,85			R-32/125/134a (23/25/52)			0,00	
R-410B	2228,75			R-32/125 (45/55)			0,00	
Otros								
Otros								
Otros								

Ocultar PCG

Mostrar

Pantalla completa

Modo Excel

[A] En caso de que el refrigerante sea "Otro Preparado" no incluido en la lista desplegable, se calculará su Potencial de Calentamiento Global (PCG) a través de la calculadora que se presenta a continuación.

1. VENTA LECHE

Ocultar resultados

Tipo de leche	Litros	Kilogramos	Proteína (%)	Grasa (%)	Carbohidratos (%)	Minerales (%)	Lactosa (%)	Proteína (Kg)
Vendida	64.000 l	65.984 kg	5,1 %	6,8 %	4,80 %	0,75 %	4,80 %	3.365 kg
Para corderos		¿TIENE DATOS DE CALIDAD FUNCIONAL?					NO	
Para autoconsumo		Ácidos grasos (%)				Vitaminas		Recuento de células somáticas
Desechada		Omega 3	Omega 6	Omega 6/Omega 3	CLA	Alfa-tocoferol	Retinol	

Destinada a queso (L)		Queso producido (kg)		Venta de lana (kg)	500 kg	Pieles (nº)	

Leche (€/L)	Ventas leche (€)
2,17	139.008 €
Lana (€/kg)	Ventas lana (€)
	0 €
Piel (€/piel)	Ventas piel (€)
	0 €

€

2- ESTANDARIZACIÓN DE LA LECHE

FPCM-Pulina et al. (2005)	FPCM
	66.413 kg

Ocultar / Mostrar Índice | Pantalla completa | Modo Excel | Limpiar formulario

2. VENTA DE OTROS PRODUCTOS EN LA EXPLOTACIÓN

Cordero lechal: País Vasco, Navarra y Castilla y León (lechazo). Se sacrifica a los 30-35 días, con 9-14 kg
Ternasco y pascuales: Castilla-La Mancha, Aragón y zona oeste y suroeste peninsular. Cría hasta destete (40-50 días) y posterior cebo en granjas hasta los 22-26 kg a los 70-90 días de edad

Carne	Número de animales (Nº)	Peso vivo de venta (kg)	Peso final del animal en la venta	PBVV (kg/año)	Precio medio (€/lg)	Ventas carne (€)	Ventas carne Peso vivo (kg)	Ventas carne Peso canal (kg)
Ovejas - vida						0,00 €	0 kg	0 kg
Corderos	322,00	11,00	*9-14;22-26*	6.662 kg	3,53 €/kg	12.500,04 €	3.542 kg	1.700 kg
Desvieje	48,00	65,00			0,41 €/kg	1.272,00 €	3.120 kg	1.498 kg
Corderas/os de selección como reproductores						0,00 €	0 kg	0 kg
Sementales						0,00 €	0 kg	0 kg
TOTAL	370					13.772 €	6.662	3.198

Factor de asignación para la leche		Factor de asignación para la carne	
Económico	91 %	Económico	0 %
Masas	90 %	Masas	0 %

Proteína	
Leche	89 %
Carne	11 %

4. ANIMALES MUERTOS EN LA EXPLOTACIÓN - INCINERACIÓN

A partir del % de muertes

	Número	Peso medio	kg CO_2/ton
Corderos	45,00	11,00	132,00
Sementales	17,00	65,00	132,00
Desvieje			132,00
Ovejas			132,00
	62,00		

3- VENTA DE LACTOSUERO (1 kg de queso-6,5 L de leche-5L lactosuero)

Cantidad de lactosuero producida/vendida	100 L
Cantidad de pienso que puede ser sustituido	10 kg
Concentración en proteínas del lactosuero	9 g proteína/L suero
Concentración del pienso a sustituir	90 g proteína/kg pienso
Emisiones evitadas (kg CO_2eq)	4,09 kg CO2

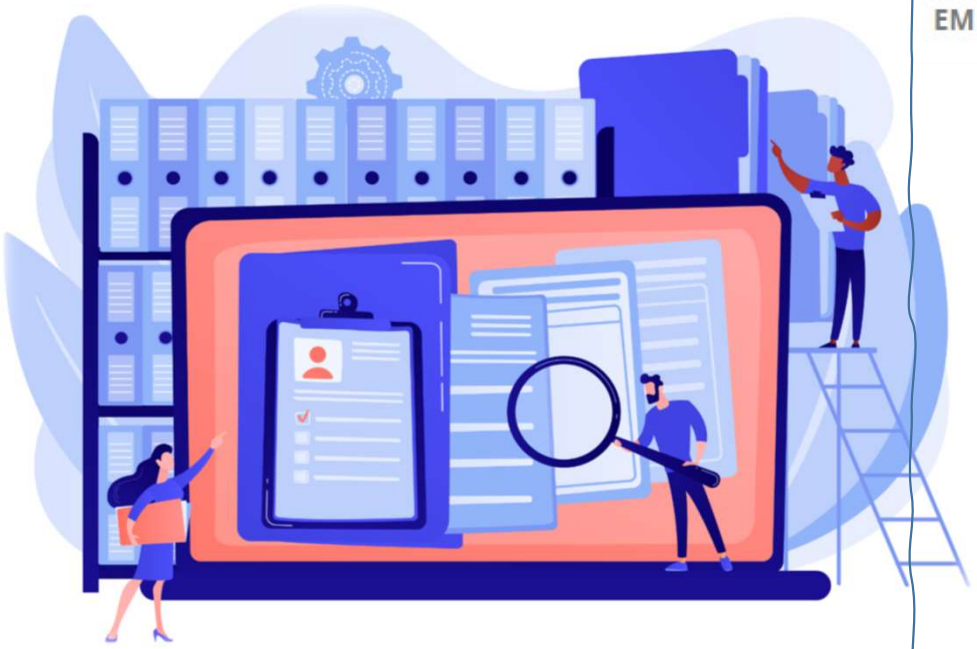
	Composición del pienso escogido		
Producto evitado SimaPRO Agri-footprint	Maíz: 65 %	Soja: 17 %	Cebada 10: %
	Trigo: 3 %	Remolacha: 3 %	Girasol: 2 %
	409 kg CO2/ton		

Calculadora de piensos: las materias primas se han agrupado en 8 bloques: 1. Aminoácidos; 2. Granos de cereales; 3. Subproductos de cereales; 4. Leguminosas y semillas oleaginosas; 5. Grasas y aceites; 6. Coproductos de origen vegetal y otros productos; 7. Productos lácteos y animales; 8. Frutos y tubérculos, melazas y vinazas; 9. Tortas de oleaginosas

Seleccione las materias primas que contiene cada pienso e incluya su porcentaje en el mismo

Ocultar/Mostrar

Limpiar formulario	Materias primas (C) Convencional	%	kg CO_2 eq/kg MP	kg eq SO_2,kg MP	kg eq PO_4/kg MP	MJ/kg MP
Aminoácidos						
Granos de cereales	Maize grain dried, conventional, France, without lever, at stoarge agency	25,40 %	0,101	0,002	0,001	1,383
	Feed barley grain, conventional, France, at storage agency	40,00 %	0,140	0,002	0,002	1,011
Subproductos de cereales						
Leguminosas y semillas oleaginosas	Soybean, Brazil, average deforestation, at french port	16,50 %	0,223	0,001	0,001	2,311
Grasas y aceites						
Otros productos y coproductos de origen vegetal	Alfafa dehydrated, France, at plant					



BD incluidas en ArdiCarbon

2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

European Environment Agency

EMEP/EEA air pollutant emission inventory Guidebook 2019

Database ECO-ALIM

ecoinvent

Database

AGRIBALYSE agricultural and food database

AGRIBALYSE 3.0 is the French LCI database for the agriculture
published in 2020, comprises LCIs for 2 500 agricultural and fo
consumed in France, combining a production-based approach a
Built upon previous datasets (versions 1.3 and 1.4) for French a
was developed by INRAE for agriculture datasets and by Gingko
value chains.

AGRIBALYSE uses a transparent methodology that was co-deve
between public and private research institutes, coordinated by
principles follow the key international guidelines as much as possible (ISO, LEAP, PEF). The
development program is ongoing, and more updates will follow.

SimaPro

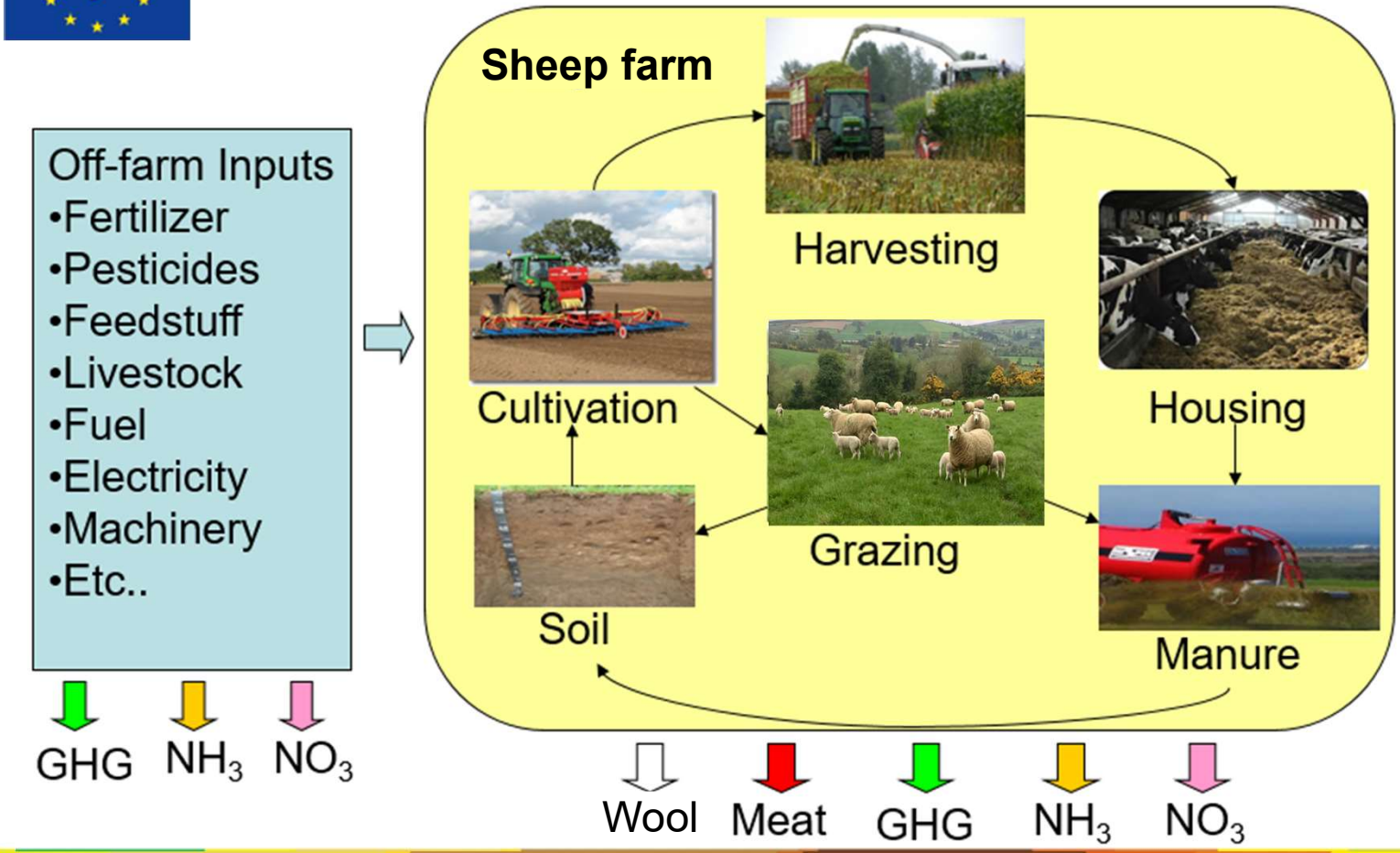
BASES ZOOTÉCNICAS PARA EL CÁLCULO DEL BALANCE ALIMENTARIO DE NITRÓGENO Y FOSFORO

Teagasc sheep life cycle assessment (LCA) model

Teagasc
Agriculture and Food Development Authority

The Irish Agriculture and Food Development Authority

Teagasc Sheep LCA – How it works



Life cycle inventory

Model operates:

- Over one production year
- Monthly time step

5 animal categories

- Mature ewe
- Hogget
- Lambs
- Replacement lambs
- Rams

Life cycle inventory

Sheep specific emissions

- Driven by sheep system inputs
- Concentrate feed
- Synthetic fertiliser use

General farm emission sources:

- Agricultural lime
- Fossil fuel use
- Energy consumption
- Chemicals

Model Input Interface – Part 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	**Farm Name**														
2															
3			**Farm**												
4	**Farm size**	ha													
5															
6	**Production**		Sold	Purchased											
7	Live weight	kg													
8	Carcass weight	kg													
9	Wool	kg													
10															
11	**Housing and grazing**														
12	Turnout	Date													
13	Housing	Date													
14															
15	**Breeding**														
16	Ewes joined to ram	no.													
17	Ewe weight	kg													
18	Scanning rate	lambs/ewe													
19	lambing rate	lambs/ewe													
20	Weaning rate	lambs/ewe													
21	Replacement rate	%													
22	Age at first lambing	months	24												
23															
24				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25	Lambing pattern	no.													
26															
27	**Inventory**		Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
28	Mature ewe	no.													
29	Ewe lambs (0-12 months)	no.													
30	Lambs (0-12 months)	no.													
31	Year old (13-24 months)	no.													
32	Rams	no.													

Model Input Interface – Part 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	**Farm Name**														
33															
34	**Purchase**		Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
35	Mature ewe	no.		0	0	0	0	0	0	0	0	0	0	0	0
36	Lambs (0-12 months)	no.		0	0	0	0	0	0	0	0	0	0	0	0
37	Year old (13-24 months)	no.	9	0	0	0	0	0	0	0	0	10	0	0	0
38	Rams	no.	1	0	0	0	0	0	0	0	0	1	0	0	0
39															
40	**Sales**		Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
41	Mature ewe	no.	9	0	0	0	0	0	10	0	0	0	0	0	0
42	Lambs (0-12 months)	no.	140	0	0	0	0	0	0	140	0	0	0	0	0
43	Year old (13-24 months)	no.		0	0	0	0	0	0	0	0	0	0	0	0
44	Rams	no.	1	0	0	0	0	0	0	0	0	1	0	0	0
45															
46	**Fertiliser**														
47	Nitrogen	kg N/ha	79.9												
48	CAN	% N	80												
49	Urea	% N	20												
50	Protected urea	% N	0												
51	Phosphorus	kg P/ha	12.1												
52	Potassium	kg K/ha	24.1												
53	Lime	tonnes/ha	0												
54															
55	**Concentrate feed**														
56	Ewe concentrate	kg	7200												
57	Lamb concentrate	kg													
58															
59	**Feeding rate**		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
60	ewe	kg/day													
61	lamb	kg/day													
62	Hogget	kg/day													
63	Ram	kg/day													
64															

Model Input Interface – Part 3

File Home Insert Page Layout Formulas Data Review View Tell me what you want to do...

A96 | Ploughing

	A	B	C	D	E
1	**Farm Name**				
65	**Housing type**				
66	Slatted housing	%			
67	Outpad/drylot	%			
68	Straw bedding	%	100		
69					
70	**Manure application**				
71	Spring	%			
72	Summer	%			
73	Autumn	%			
74					
75	**Forage**		**Imported**	**Exported**	
76	Grass silage	tonne	2.5		Hay
77	Maize silage	tonne			
78	Wholecrop silage	tonne			
79	Hay	tonne			
80	Straw	tonne			
81	Milk replacer	kg			
82					
83	**Fossil fuel**				
84	Diesel	L	379		
85	Petrol	L			
86	Gas	m3			
87	Oil	L			
88	Electricity	kwh	1025		
89					
90	**Contractor**				
91	Fertiliser spreading	ha			
92	Slurry application	ha			
93	FYM application	ha			
94	Silage cutting	ha			
95	Silage harvesting	ha	3		
96	Ploughing	ha			
97	Harrowing	ha			
98	Reseeding	ha			
99	Hedge cutting				
100					

Teagasc LCA Process

Animal emissions are

Driven by feed intake

Computation of monthly net energy requirement for:

Ewe and hogget

Maintenance	(UFL/d) = $(0.033 \times LW^{0.75}) \times AA$
BCS gain	(UFL/d) = $LW \times 0.13 \times 5.6 \times$ BCS gain
BCS loss	(UFL/d) = $LW \times 0.13 \times 4.36 \times$ BCS gain
Milk production	(UFL/d) = $MY \times ((0.0071 \times PC) + (0.0043 \times FC) + 0.2224)$

Where MY=milk yield (kg/d); PC=protein content (%); FC=fat content (%); LW=live weight (kg); and AA=activity allowance

Lamb

Maintenance	(UFL/d) = 0.033*(LW^0.75)
Live weight gain	(UFL/d) = 3.42*LWG

Where LW=live weight (kg); and LWG= liveweight gain (kg/day)

Life cycle inventory

Direct methane emissions			
Enteric fermentation	GEI%	7	IPCC (2019)
Enteric fermentation	GEI%	6.7	IPCC (2019)
Enteric fermentation	GEI%	6.3	IPCC (2019)
Manure excreted at pasture	kg CH4/kg VS	Bo 0.19; MCF 0.47%	IPCC (2019)
Solid manure housing	kg CH4/kg VS	Bo 0.19; MCF 2%	IPCC (2019)
Direct nitrous oxide emissions			
Solid manure storage	kg N2O-N/kg N	0.01	IPCC (2019)
Dung at pasture	kg N2O-N/kg N	0.0004	IPCC (2019)
Urine at pasture	kg N2O-N/kg N	0.004	IPCC (2019)
CAN fertiliser application	kg N2O-N/kg N	0.0149	Harty et al (2016)
Urea fertiliser application	kg N2O-N/kg N	0.0025	Harty et al (2016)
Direct carbon dioxide emissions			
Diesel use	kg CO2 / L	2.91	EPA (2019)
Indirect nitrous oxide emissions			
Housing ammonia emissions solid manure system	kg NH3-N/ kg TAN	0.168	EPA (2019)
Solid manure storage	kg NH3-N/ kg TAN	0.35	EPA (2019)
Solid manure spreading	kg NH3-N/ kg TAN	0.68	EPA (2019)
Grazing	kg NH3-N/ kg TAN	0.06	EPA (2019)
CAN fertiliser application	kg NH3-N/ kg N	0.08	EPA (2019)
Urea fertiliser application	kg NH3-N/ kg N	0.159	EPA (2019)
Nitrate leaching	kg NO3-N/ kg N	0.1	EPA (2019)

Life cycle impact assessment - GWP

- Environmental impact of animal production can be measured as global warming potential (GWP), acidification potential, eutrophication potential, photochemical ozone creation potential, ozone depletion potential and energy use and land use.
- Global warming potential shows how much heat trapped in the atmosphere and it is usually reported as carbon dioxide (CO_2) equivalents (CO_2-e).
- It measures accumulative warming over 100 years period of time which resulted from a unit of the gas mass produced at the beginning of a 100 years reference period.
- Greenhouse gas emissions are calculated for biogenic greenhouse gases: CO_2, methane (CH_4) and nitrous oxide (N_2O).

Life cycle impact assessment - GWP

- The GWP of CO_2 is 1, where CH_4 has GWP of 28, while GWP of NO_2 is 265 (IPCC, 2014).

- That means that, each kg of emitted CH_4 absorbs the same quantity of heat as would 28 kg of emitted CO_2, while one kg of N_2O absorb the same amount of heat as would 265 kg of CO_2 over a 100 years period of time.

- Greenhouse gases directly affect overall global temperature and causing climate change. It is predicted that after complete termination of net emissions of CO_2 the effect of global warming will last hundreds if not thousand years, unless a large quantity of net CO_2 is removed over an extended period of time.

Model Outputs - Example

	CO2	CH4	N2O
Enteric fermentation	0	42705.74	0
Manure housing and storage	0	275.0653	1872.245
Manure spreading	0	0	1502.24
Grazing	0	202.4159	1974.361
Fertiliser application	814.104	0	6074.719
Ammonia emissions	0	0	1077.994
Nitrate leaching	0	0	1427.197
Concentrate feed	2123.41	45.70376	632.2698
Fertiliser production	3500.921	143.958	293.9123
Fossil fuel	1764.664	29.2345	97.10418
Purchased animals	1107.415	2730.388	1226.208
Purchased forage/bedding	328.5133	62.37497	360.69
Other	459.5506	9.484869	4.512007
Total	10098.58	46204.37	16543.45
Contribution (%)	0.138628	0.634271	0.2271