# LIFE GREEN SHEEP : for a low carbon and sustainable sheep farming

## 2nd EU Webinar

**November, 20th 2023**

LIFE19 CCM/FR/001245 - LIFE GREEN SHEEP

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

# Welcome to you !

# Small tips for a confortable meeting on Teams

- : to ensure that the meeting is audible and free of unwanted noise, please turn off your microphone

- : to see the presenter, please also turn off your camera

- : in case your internet speed is not enough to receive the sound, you may attend the webinar by phone.
  - The phone number and the code for the meeting are available in the chat. You will also find them in the email you have received with the link to connect.

# Other informations…

- : if you have any question during the presentation, you may write your message in the chat.
  - The chat is moderated and questions will be asked to the speakers at the end of their speech. In case there are a lot of questions, there will be a selection.
- : all the presentations of the webinar will be soon available on the Green Sheep website, as well as the recording of the webinar.
  - An email will be sent later to inform you of the release.
- : a short survey will be launched at the end of the webinar. Please, spend 2 minutes to give your feedback!

# Programme of this webinar

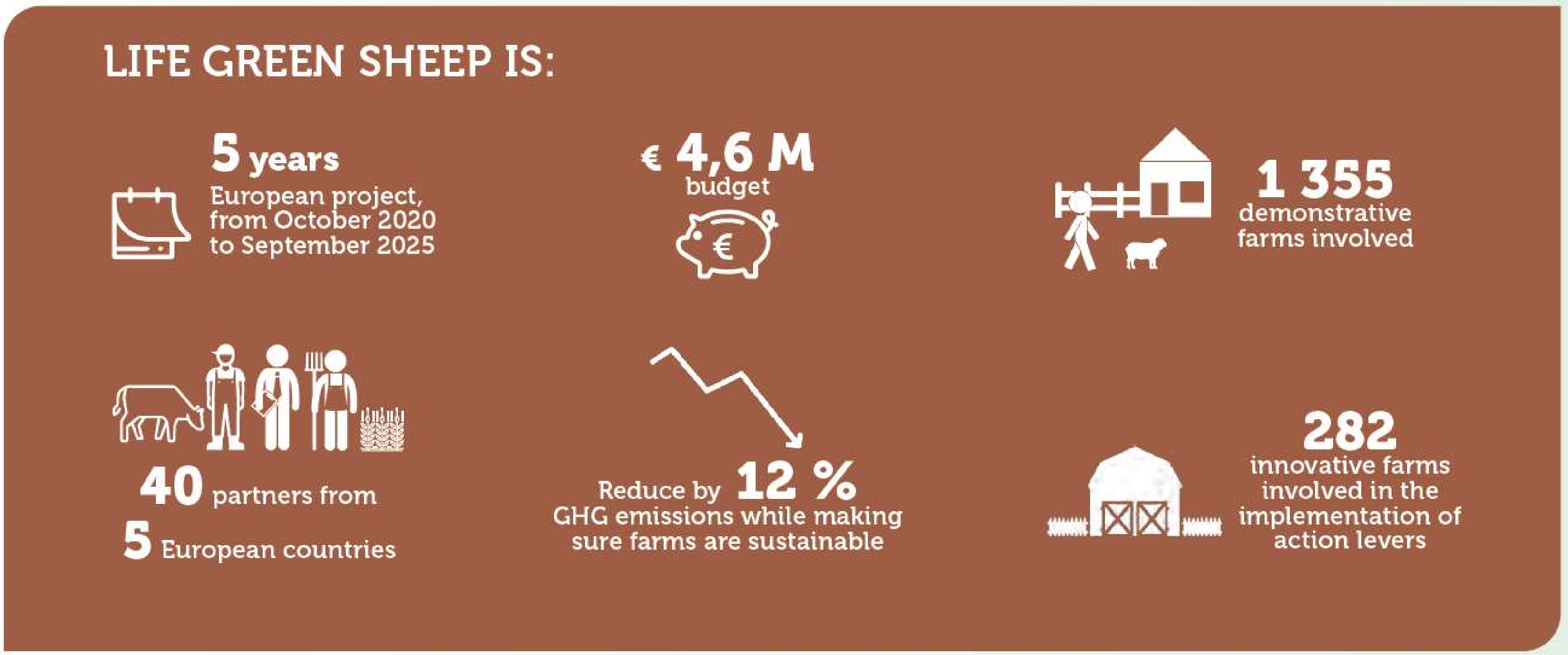
- Overall presentation of the LIFE Green Sheep project
- Harmonization and comparison of GHG emissions assessment tools
- Determining carbon footprint of sheep farms in Europe: first results !
- Testing mitigation actions to reduce GHG emissions from sheep farming in Europe
- « How to disseminate the project results and inform farmers and advisers widely ? »
- Conclusion

# Overall presentation of the project

Sindy Throude – Institut de l'Elevage (France) – Project manager

sindy.throude@idele.fr

# Key figures of the project




# Objectives of the project

Reduce by 12% the carbon footprint of milk and meat produced in sheep farms

- Launch a national and European dynamic progress initiative to reduce greenhouse gas emissions while ensuring sustainability of sheep farms
- Create an national and European observatory of environmental and sustainable performances of sheep production systems
- Promote innovative practices associated with GHG emissions mitigation to ensure the economic, environmental and social sustainability of farms
- Train current and future generations

# The LIFE Green Sheep partnership

**IRELAND**

Teagasc
Agriculture and Food Development Authority

**FRANCE**

Institut de l'Elevage idele
interbev Interprofession Bétail & Viande
FBL France Brebis Laitière
La Coopération Agricole Filière Ovine
Agricultures & Territoires Chambres d'Agriculture
France Conseil Élevage

**SPAIN**

NEIKER
Member of Basque Research & Technology Alliance
LUR GINTZA
pastores grupo cooperativo Oviaragón
Instituto Tecnológico Agrario

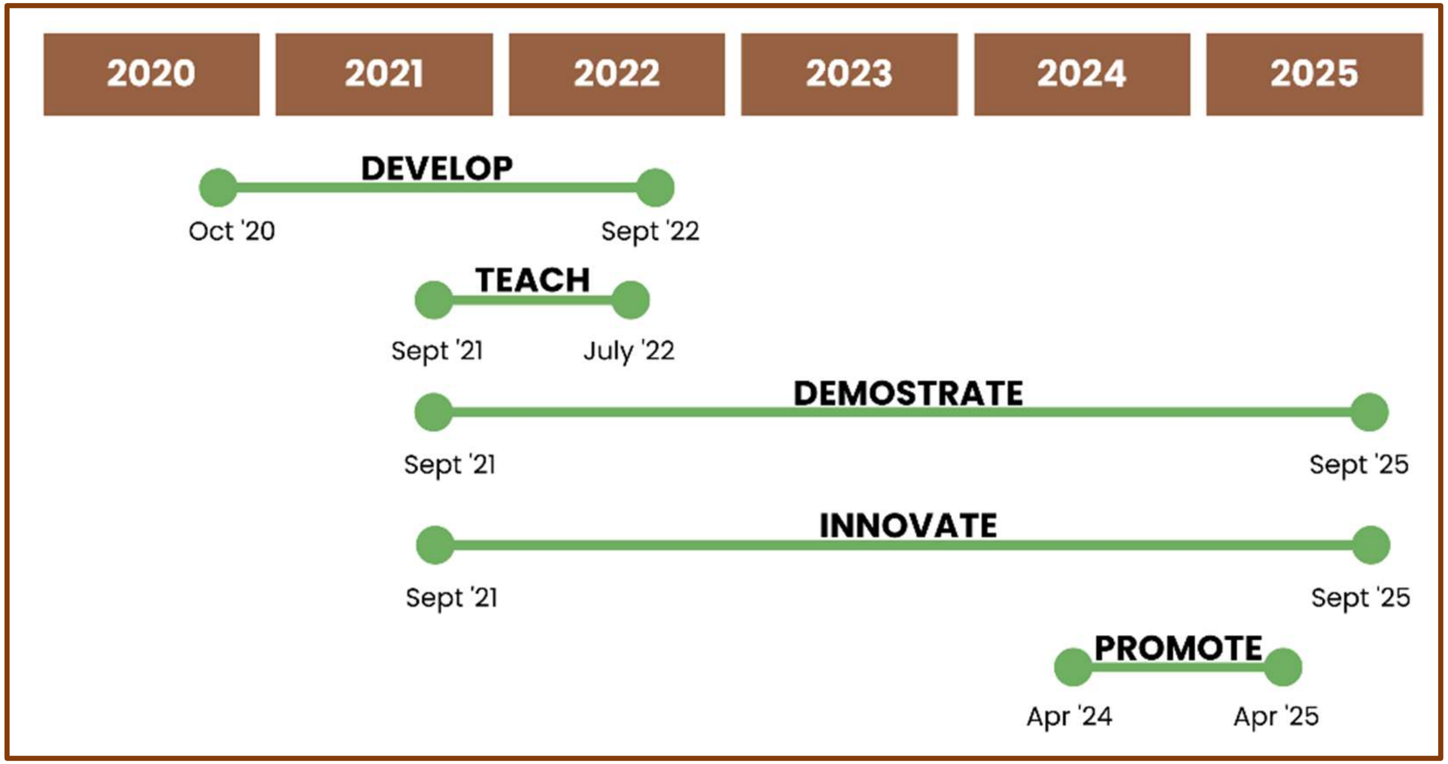
**ITALY**

Agris
uniss Università degli Studi di Sassari
Laore
Agentzia regionale pro s'isvilupu in agricultura
Agenzia regionale per lo sviluppo in agricoltura
Regione Autònoma de Sardigna
Regione Autonoma della Sardegna

**ROMANIA**

IBNA
Institutul de Biologie și Nutriție Animală

# How can we meet these objectives ?
# 5 main actions !



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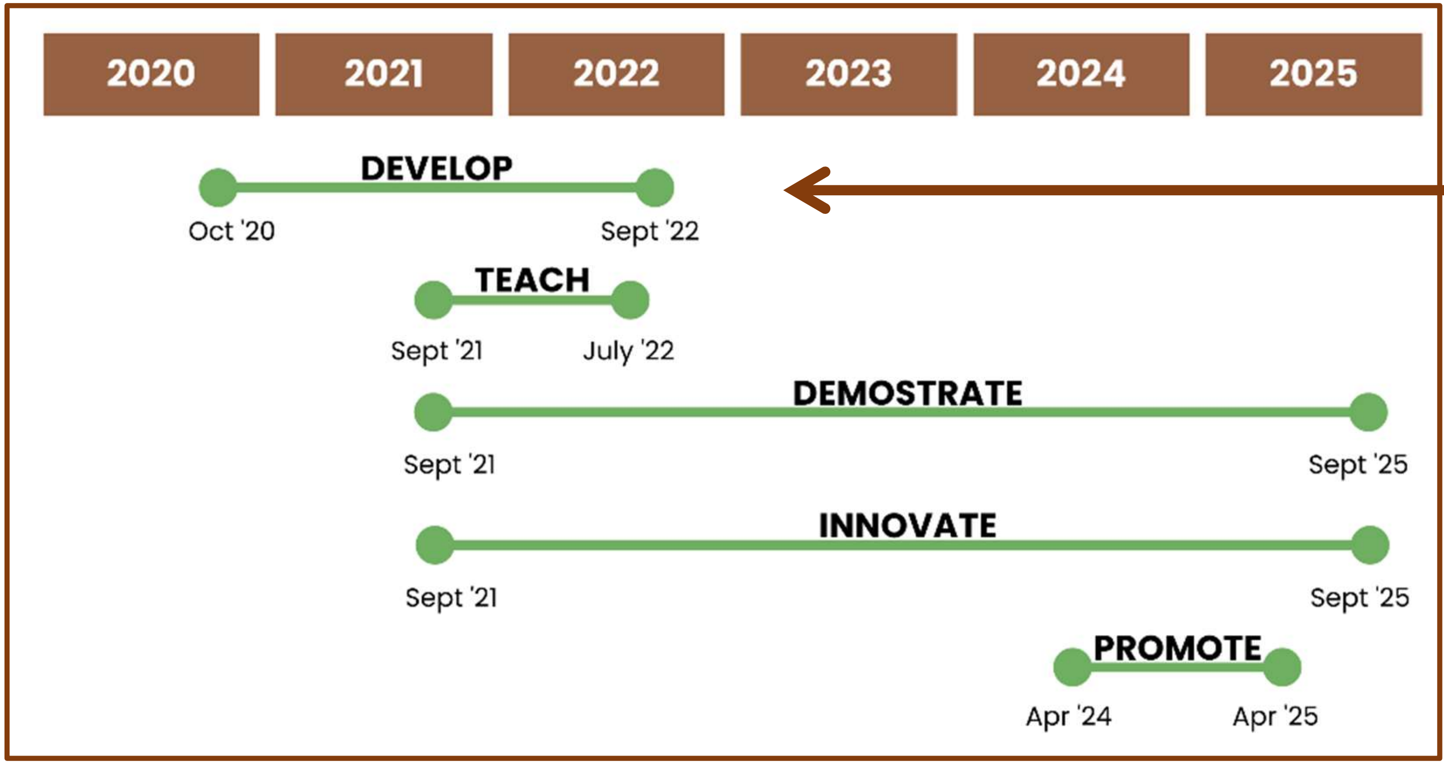
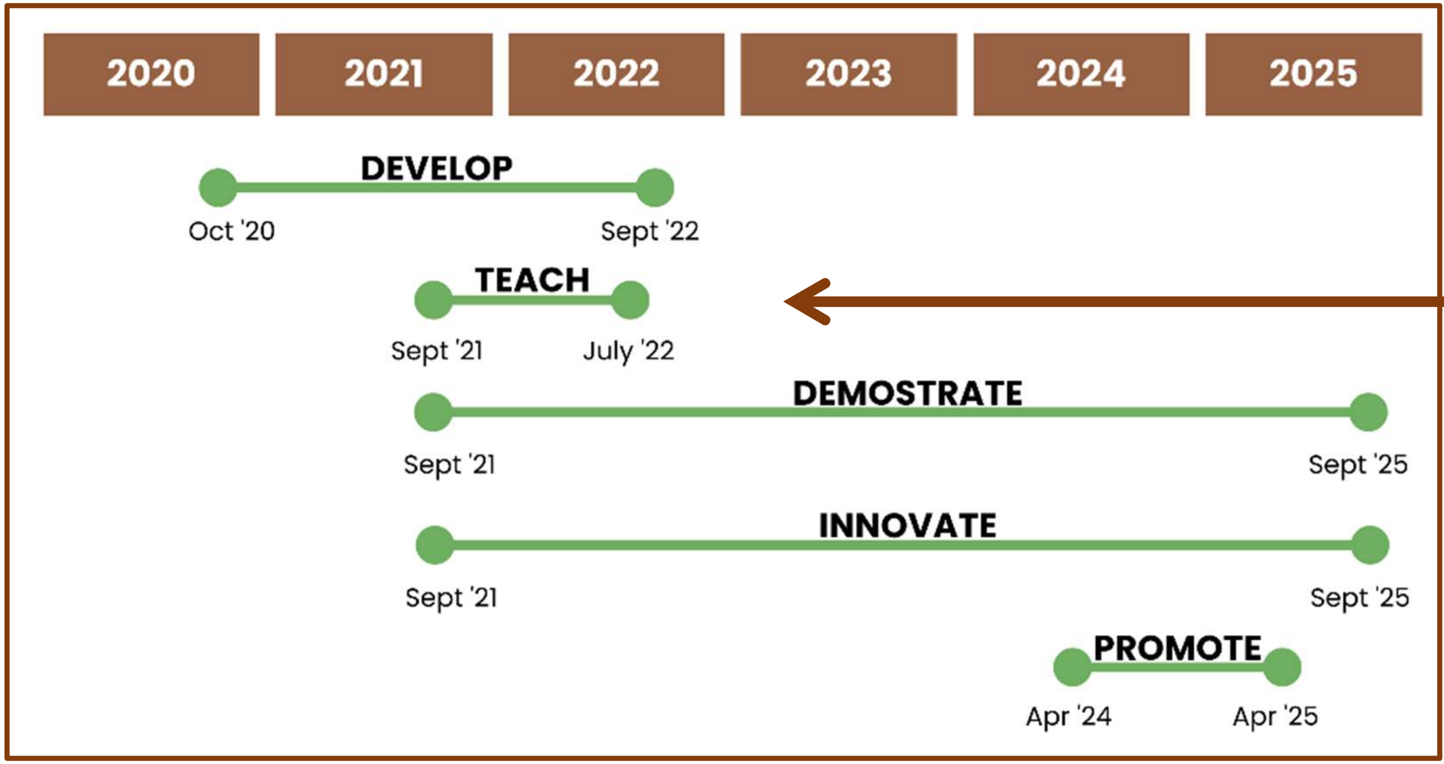



**Action 1 : DEVELOP**

Review, benchmark and harmonize the tools for evaluating GHG emissions and sustainability indicators at a European scale

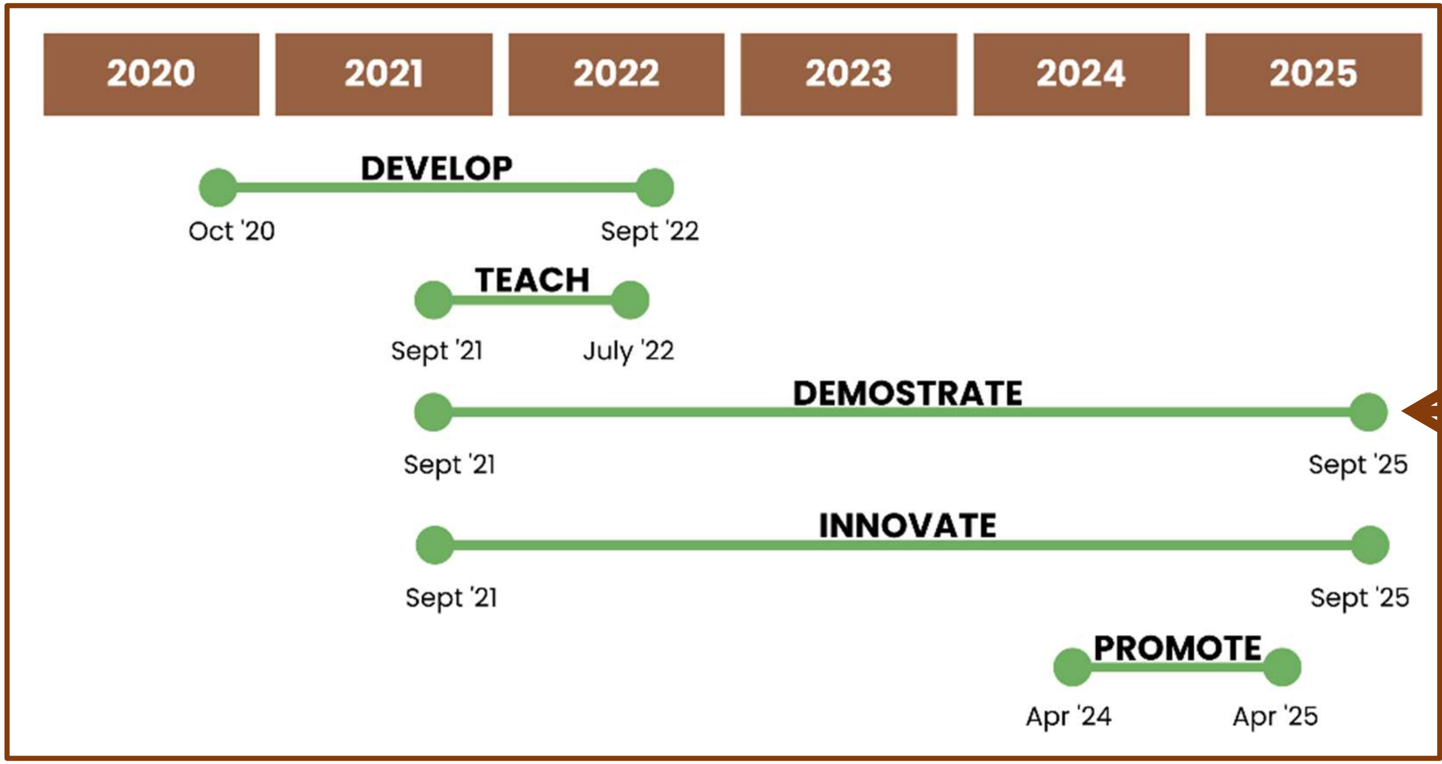
# How can we meet these objectives ?
# 5 main actions !




**Action 2 : TEACH**

Raise awareness and train advisors and technicians on the tools: background, methodologies, analysis of the results and construction of action plans

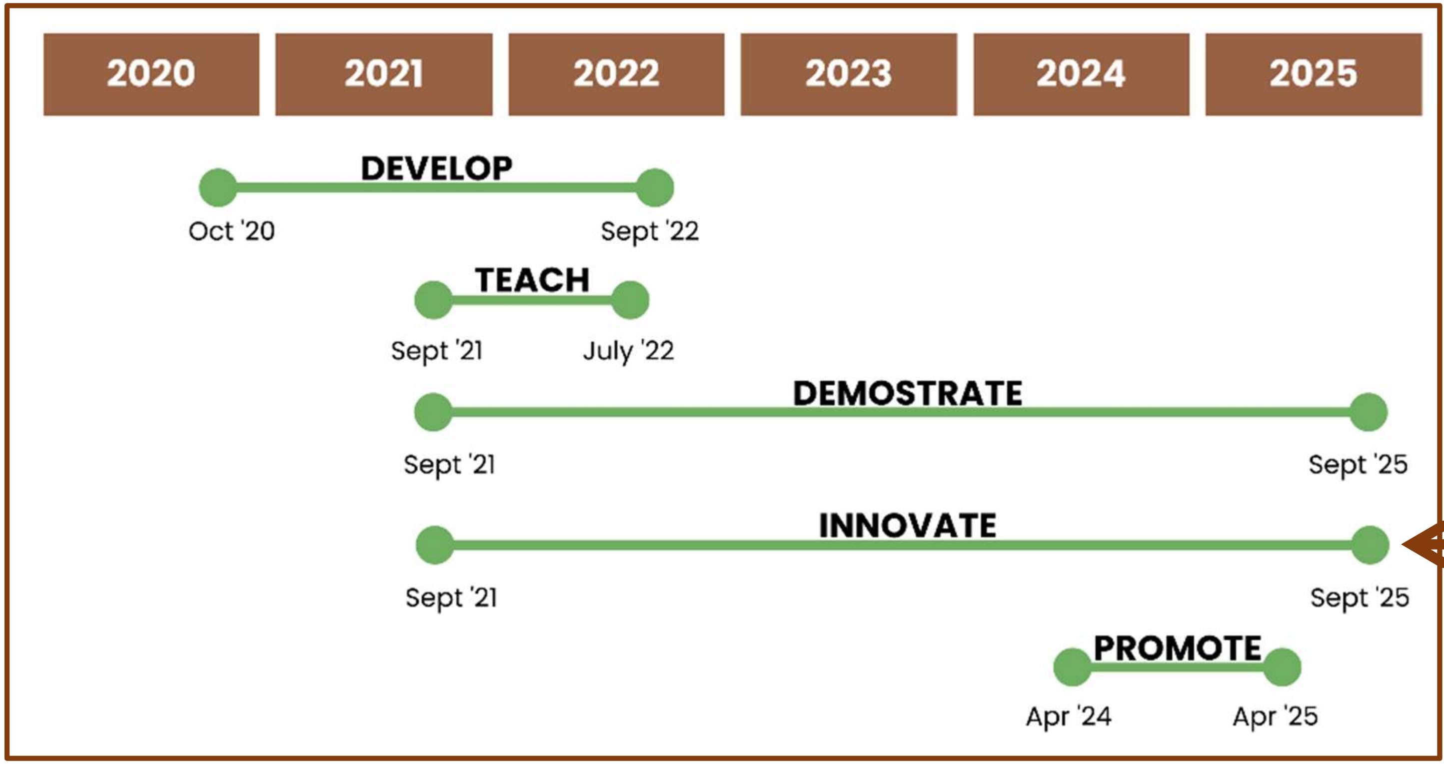
# How can we meet these objectives ?
# 5 main actions !




**Action 3 :**
**DEMONSTRATE**

Creation of an EU observatory of environmental and sustainability performance and reference sheets (results by type of system and by region)

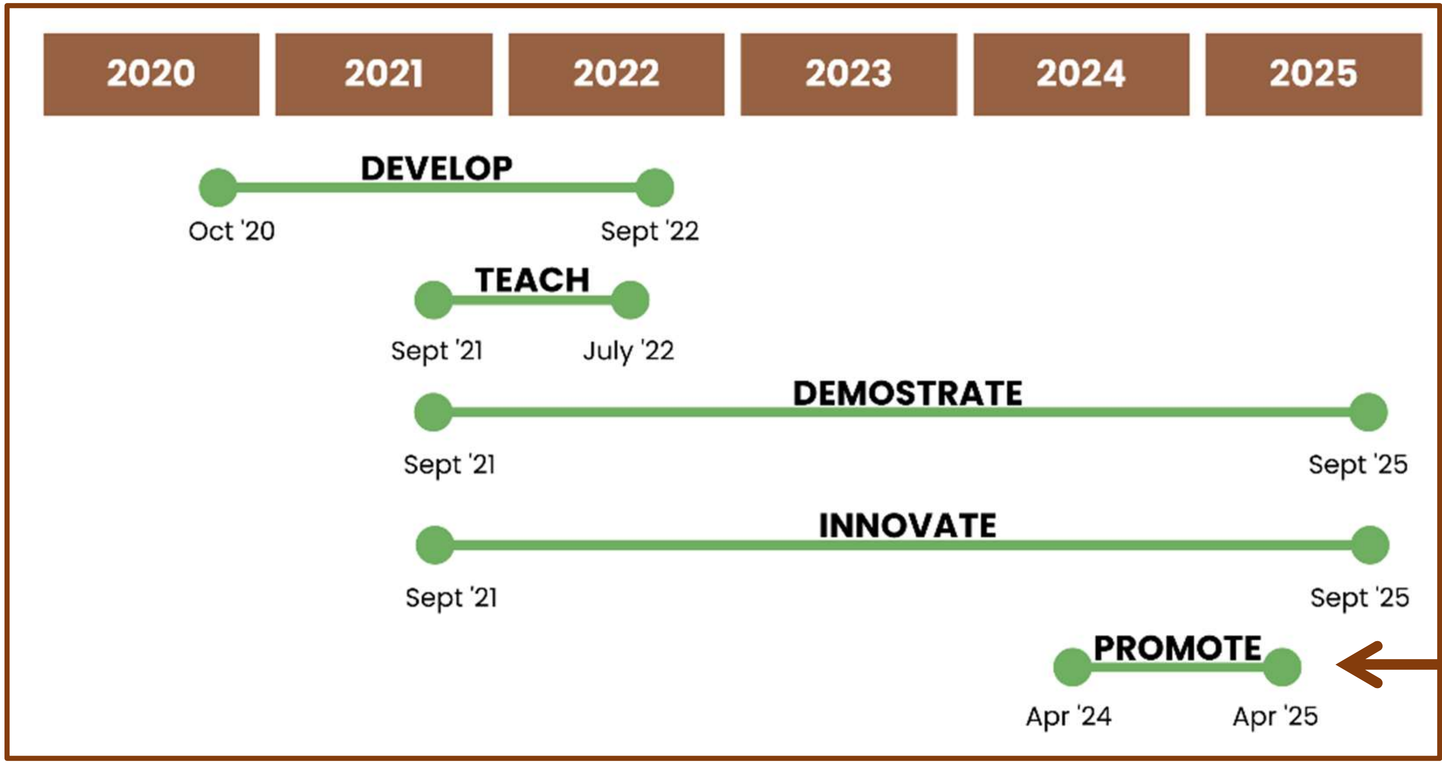
# How can we meet these objectives ?
# 5 main actions !




**Action 4 : INNOVATE**

Development and promotion of low-carbon farms by demonstrating the feasibility of action levers in real conditions

# How can we meet these objectives ?
# 5 main actions !

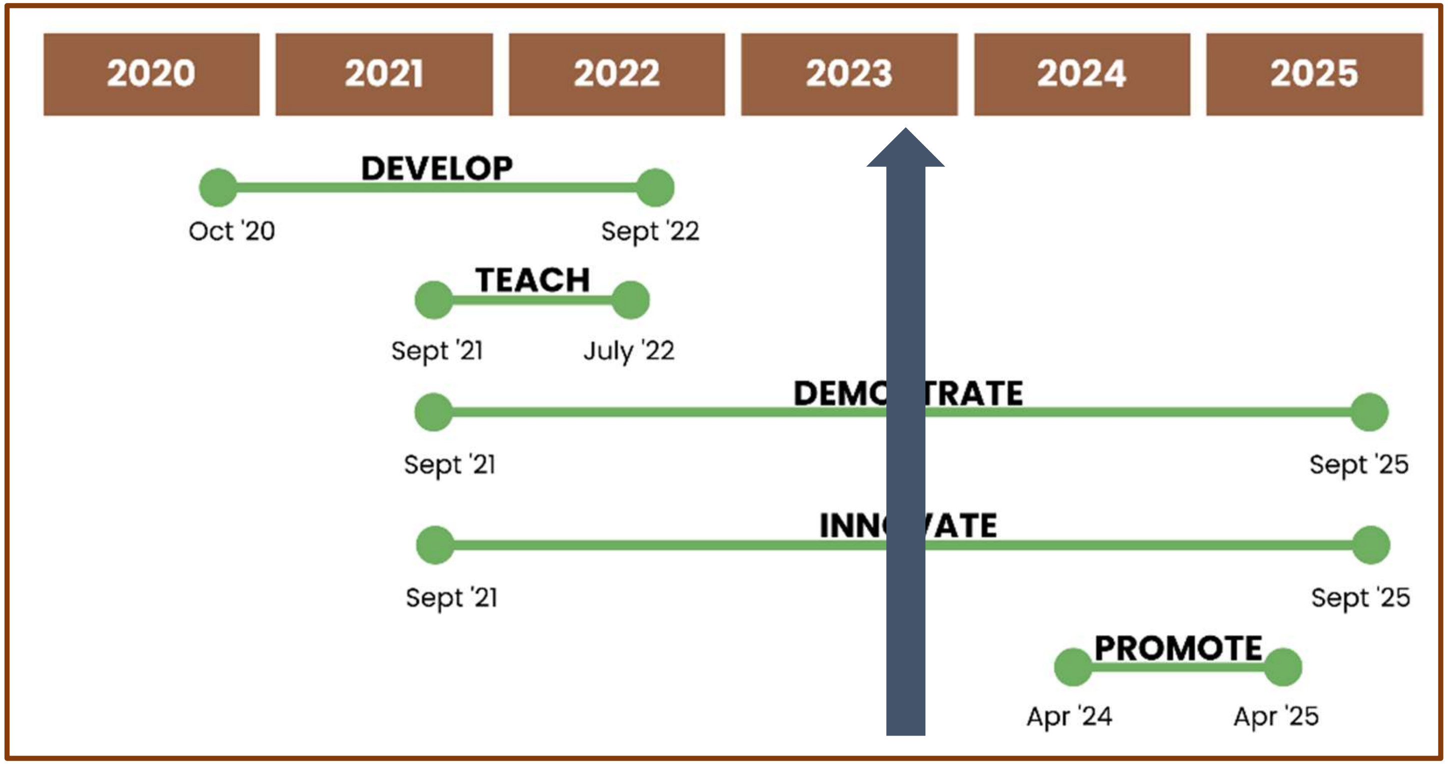



**Action 5 : PROMOTE**

Synthesis of all the knowledge acquired through this project

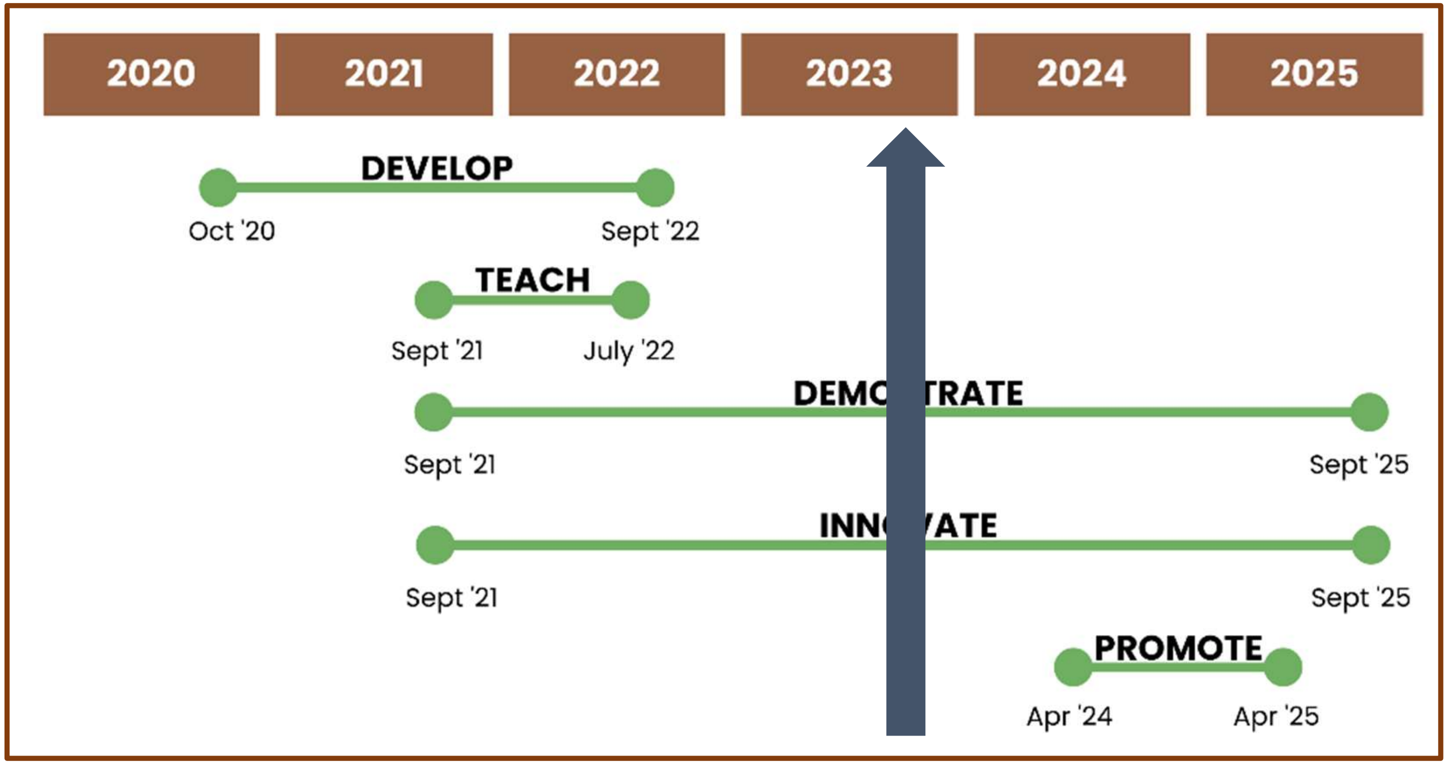
Definition of the national communication strategy and the partnerships to be built for the deployment of a low carbon plan

# How can we meet these objectives ?
# 5 main actions !




Where are we ?

# How can we meet these objectives ?
# 5 main actions !




**Action 1 DEVELOP :**
Almost done !

**Action 2 TEACH :**
Done !

**Actions 3 & 4 DEMONSTRATE & INNOVATE :**
1st wave : Almost done !

# How to follow us ?

- Website : https://life-green-sheep.eu/
- Facebook : https://www.facebook.com/life.green.sheep
- X : https://mobile.twitter.com/LIFEGREENSHEEP1
- Instagram : https://www.instagram.com/lifegreensheep/
- Subscribe to our newsletter : here !

# Harmonization and comparison of GHG emissions assessment tools

Alberto Atzori – UNISS (Italy) – Action 1 leader

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UNISS
UNIVERSITÀ DEGLI STUDI DI SASSARI
DIPARTIMENTO DI AGRARIA

# Objective

To show how different tools available at country level and developed for specific regions can be aligned to perform comparable estimates

SIMPLIFIED LCA!!

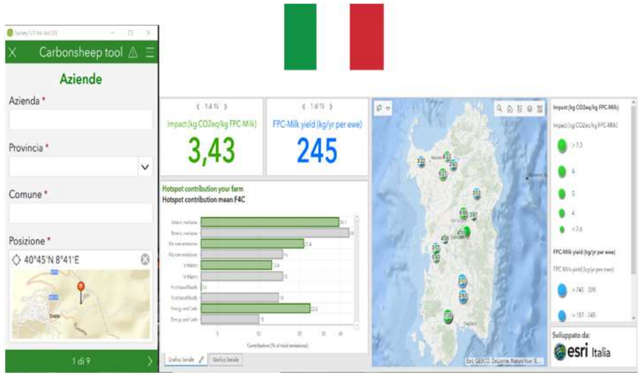
**CAP2ER**
(Institute De L'elevage)

Figure 1.1. CAP'2ER registration widget.

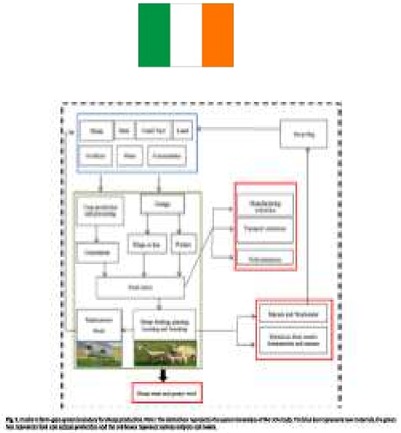
**ARDI CARBON**
(Batalla et al., 2015)

Figure 1.5 Ardicarbon excel interface.

**CarbonSHEEP**
(Atzori et al., 2021)




**SheepLCA**
(O'Brien et al.,2015)



# THE TOOLS: qualitative description (Atzori et al., 2021)

| | Country | Production | Inputs (LCI), n | Detail Flock profile | Output Impact Categories | Approach IPCC | Crops and GHG coeficiencies | OUTCOMES |
|---|---|---|---|---|---|---|---|---|
| **CAP2'ER (Institute elevage)** | FRANCE | Milk/meat | 82 | Annual | ALL Imp. Cat. including Cseq. | Tier 2, IPCC 2019 | Detailled | Software dashboard |
| **ARDI CARBON (Batalla et al., 2014)** | Spain | Milk/meat | 83 | Annual | ALL Imp. Cat. including Cseq. | Tier 2, IPCC 2019 | Detailled | Spreadsheet |
| **CARBON SHEEP (Atzori et al., 2017)** | Italy | Dairy only | **25** | Annual | Only CFP | Tier 2, IPCC 2019 | Generic | Webapp and GIS online |
| **SHEEP LCA (O'Brien et al., 2015)** | Ireland | Meat Only | 100 | Monthly | ALL Imp. Cat. | Tier 2, IPCC 2006 | Medium choice | Spreadsheet |

All the tools perform simplified LCA

# TOOL COMPARISON: data collection and analysis

| Tool | Farms |
|---|---|
| France | 3 milk/3 meat |
| Italy | 3 milk/3 meat |
| Spain | 3 milk/3 meat |
| Ireland | n.a. /3 meat |
| Romania | 3 milk/ n.a. |

| Farms | Runs (each farm x 4 tools) |
|---|---|
| 12 dairy | 48 dairy |
| 12 meat | 48 meat |
| 24 total | 96 total |

**Assumptions:**

- ✓ Mixed and Specialized farming systems both in milk and meat farms
- ✓ Farms were randomly selected, not country average
- ✓ Comparison w/out a reference values, no complete LCA
- ✓ Equal input and outputs in all tools

Statistical Analysis: PROC GLM SAS: $Yij = \mu + \alpha i + \beta j + \alpha\beta_{ij} + \gamma + \varepsilon i$

$\alpha$ = *Tool (i = 4)*; $\beta$ = *Country (j= 3 o 4)*; $\alpha\beta$ = *Tool*Country*

Estimate evaluation among tools, Mean Bias & RMSPE (Tedeschi, 2006)

# DATASET DESCRIPTION

| | | Ewes n° | Land ha | Milk/ewe L/yr | Stock rate ewe/ha | Purch. feeds kg/ewe | Fertilizers kg/ha | Fuel Kg/ha | Eletricity Kwh/yr |
|---|---|---|---|---|---|---|---|---|---|
| DAIRY FARMS (n=12) | Mean | 497 | 185 | 202 | 6.1 | 137 | 78 | 101 | 10640 |
| | SD | 444 | 426 | 131 | 3.0 | 45 | 78 | 120 | 8850 |
| | Max | 1900 | 1600 | 479 | 12.9 | 205 | 352 | 432 | 27600 |
| | Min | 132 | 14 | 16 | 1.2 | 58 | 0 | 1 | 420 |
| | | | | **Meat per ewe, kg/yr** | | | | | |
| MEAT FARMS (n=12) | Mean | 746 | 89 | 33 | 8.4 | 112 | 67 | 76 | 2265 |
| | SD | 692 | 56 | 12 | 5.4 | 79 | 142 | 122 | 2743 |
| | Max | 2214 | 172 | 51 | 21.1 | 263 | 114 | 136 | 8925 |
| | Min | 104 | 15 | 17 | 1.1 | 27 | 0 | 26 | 0 |

# RESULTS: Comparison of estimates per each hotspot,

| | Kg of $CO_2$eq/kg of FPCM | | Kg of $CO_2$eq/kg of Carcass Weight | |
|---|---|---|---|---|
| | **Country*** | **Tool*** | **Country*** | **Tool*** |
| **CF** | <0.001 | **0.01** | <0.001 | **<0.001** |
| Allocation | NS | **<0.001** | - | - |
| Enteric methane | 0.05 | **NS** | <0.001 | **<0.001** |
| **Manure emiss.** | **NS** | **<0.001** | **<0.01** | **<0.001** |
| Crop& fertilizers | NS | <0.01 | <0.01 | 0.03 |
| **Feed purchased** | **<0.01** | **0.01** | **NS** | **NS** |
| Electricity | 0.05 | <0.001 | 0.01 | NS |
| Fuel | 0.06 | NS | <0.001 | NS |

**Relevant Differences for approach**

**Small Differences due to emission coefficients**

*Interaction Country x tool: not significative

# Alignment proposal

## Tool building phase (Task 2) for improvement:

- **Input:** combined input collection from each tool

- **Enteric and Manure**: align intake algorithms → estimation of $CH_4$ and N emissions
- **Manure**: check for excretion and align emission coefficients
- **Fuel**: align emission coefficients
- **Crops**: align land type and emission coefficients
- **Fertilizers:** align fertilizers choice
- **Purchased feed**: align inventories of emission coefficients

- **Electricity**: consider electric mix, not possible align emission coefficients

Align equations for FPCM and allocations .

# Functional units and Allocation

**GWP Conversion:**

**Methane: 27.9 $CO_{2eq}$ and $N_2O$: 273 $CO_{2eq}$ (IPCC, 2021)**

**Functional units:**

**Meat: Carcass weight: (breed coefficients of carcass yield)**

**Milk: Fat and protein corrected milk from Pulina and Nudda (2005) or INRA (2018)**

**Allocation method for milk:**

**- Biophysical based on nutritional requirements**

**- IDF (2015) → All, % 1-6.04 *(meat/milk)**

# Methane emissions: 2 options

- IPCC dairy cattle approach
- GEI = DMI intake X 18.45 MJ/kg of DM X Ym (6.7% sheep)

DMI =

Pulina 2013; or INRA 2018;

Adoption of Ym that varies with Digestibility like cattle?

Methane from Intake level: (Sauvant and Noziere 2013)
(CAP2ER)

$CH_4$ (g/kg Digestible Organic Matter) =

45,2 – 6,66*IL + 0,75*IL$^2$

+ 19,65*Con% – 35*Con%

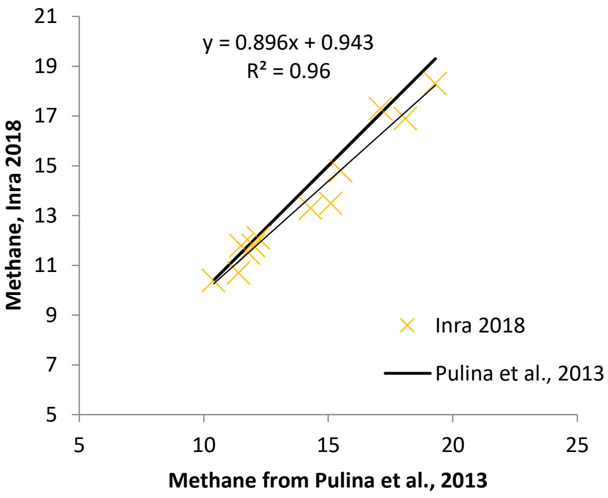
- 2,69*IL*Con%

Consistent also with Vermorel (2008)

# Dairy farm intake and methane emission comparison

| | Pulina et al., 2013 | | | | INRA 2018 | | | |
|---|---|---|---|---|---|---|---|---|
| **Farm Name** | **Ewes DMI** | **Ewes CH4** | **Rams CH4** | **Replacem. sheep CH4** | **Ewes DMI** | **Ewes CH4** | **Rams CH4** | **Replacem. sheep CH4** |
| | kgMS/year | kgCH4/year | kgCH4/year | kgCH4/year | kgMS/ year | kgCH4/year | kgCH4/year | kgCH4/year |
| FR_Cas-type OL PA04 | 720.9 | 15.5 | 9.1 | 8.3 | 675.1 | 14.8 | 9.7 | 10.5 |
| FR_Cas-type OL ROQ02 | 923.5 | 19.3 | 14.8 | 9.9 | 863.4 | 18.3 | 14.6 | 12.3 |
| FR_Cas-type OL ROQ03 | 848.5 | 18.1 | 15.0 | 10.0 | 772.0 | 16.9 | 14.7 | 12.3 |
| IT Arca Farm | 573.3 | 12.2 | 14.3 | 5.8 | 567.3 | 12.1 | 13.1 | 8.5 |
| ITCugusi Farm | 558.6 | 12.0 | 14.5 | 6.6 | 548.0 | 11.8 | 13.5 | 9.0 |
| IT_Farm Manconi | 544.5 | 11.5 | 13.2 | 3.8 | 561.9 | 11.8 | 13.5 | 7.2 |
| IT_ Farm Riu | 545.8 | 11.8 | 14.5 | 6.3 | 530.6 | 11.5 | 13.6 | 8.8 |
| RO_Chicos | 511.4 | 11.4 | 17.0 | 9.2 | 463.3 | 10.7 | 14.9 | 11.4 |
| RO_Dambovita | 462.8 | 10.4 | 13.4 | 0.0 | 461.8 | 10.4 | 12.5 | 0.0 |
| RO_Ovis | 685.3 | 15.1 | 21.9 | 11.8 | 582.6 | 13.5 | 18.9 | 14.2 |
| SP_CL1 | 768.0 | 0.0 | 0.9 | 0.0 | 924.6 | 0.0 | 7.2 | 0.0 |
| SP_CL3 | 971.9 | 17.1 | 18.6 | 6.6 | 980.7 | 17.3 | 18.0 | 10.1 |
| SP_PV1 | 650.1 | 14.3 | 16.3 | 7.4 | 586.9 | 13.3 | 14.6 | 9.6 |
| **Average** | **674.2** | **13.0** | **14.1** | **6.6** | **655.3** | **12.5** | **13.7** | **8.8** |

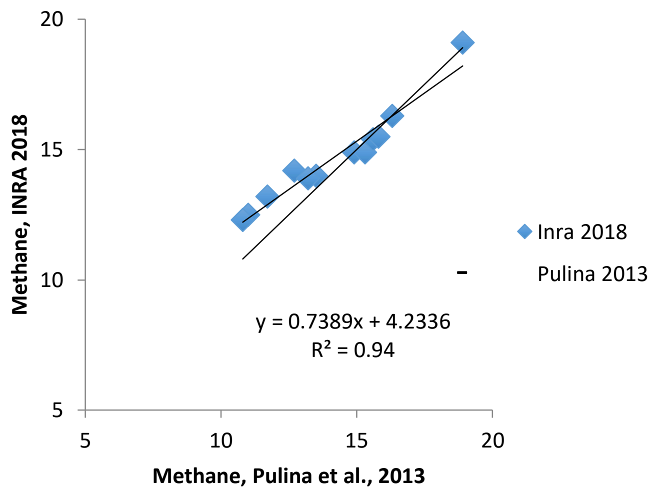
Calculated methane




# Meat farms intake and methane comparison

| Farm name | Pulina et al., 2013 DMI kgMS/ewe/year | Pulina et al., 2013 Sheep CH4 kg CH4/ewe/year | INRA 2018 DMI kgMS/ewe/year | INRA 2018 Sheep CH4 kg CH4/ewe/year |
|---|---|---|---|---|
| FR_Céréalier Ovin fourrager intensif | 885 | 18.9 | 898 | 19.1 |
| FR_Préalpin spécialisé sédentaire | 682 | 14.9 | 687 | 14.9 |
| FR_Spécialisé Semi-extensif zone défavorisée | 750 | 16.3 | 754 | 16.3 |
| IR_13512 | 701 | 15.3 | 676 | 14.9 |
| IR_21121 | 717 | 15.6 | 702 | 15.4 |
| IR_26270 | 739 | 15.8 | 721 | 15.5 |
| SP_MP | 618 | 13.5 | 651 | 14.0 |
| SP_PZ | 632 | 12.7 | 717 | 14.2 |
| SP_SI S.C. | 606 | 13.2 | 646 | 13.9 |
| IT D'agostino | 556 | 11.7 | 651 | 13.2 |
| IT MACRINI | 526 | 11.0 | 618 | 12.5 |
| IT FARINDOLAGRI | 521 | 10.8 | 609 | 12.3 |
| **Average** | **661.1** | **14.1** | **694.1** | **14.7** |

## Calculated methane




# Manure emissions:

Methane: equation 10.23 IPCC 2019:
EF = (VS x 365) x (B0 x 0,67 x ∑ MCF/100 x % MS (management system))

Nitrogen balance

- Excreted = Intake - requirements
- Decandia et al. (2013)
- Fixed values of Nitrogen excretion per head

IPCC, 2019
Emission factors
Based on manure management system

Detailed as much as possible!

# Other emission coefficients

**Fertilizers:**

**Direct:** 1% N losses as N-$N_2O$ + Nvol + Nres + N leach → Ipcc, 2019;
**Indirect:** 3.22 kg of CO2 eq/ kg of N, P, K.

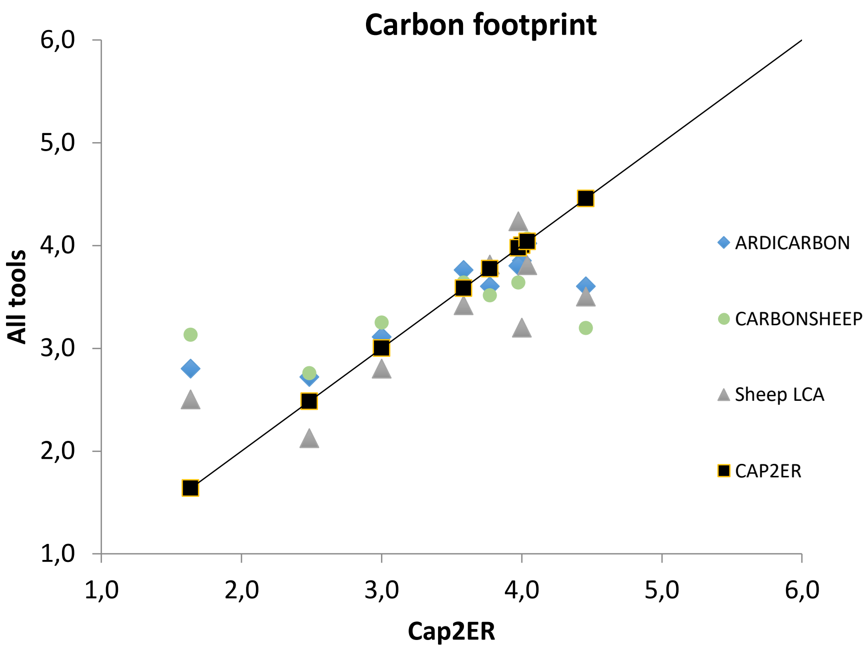
**Purchased feeds**: aligned to AgriBalyse 3.1 or Ecoinvent

**Diesel**: 3.25 kg $CO_{2eq}$/kg fuel

**Energy** kg $CO_2$/kWh: España: 0,3278, France: 0,0855; Italy : 0,3745, Rumanía: 0,4505

**Plastic, Machinery, facilites**: not considered, cut-off 1%

# Simulation with aligned tools for dairy farms




| | CAP2ER | ARDICARBON | CARBONSHEEP | SHEEP LCA |
|---|---|---|---|---|
| **CF_kgFPCM** | **4.21** | **4.24** | **4.14** | **3.99** |
| ENTERIC | 2.35 | 1.68 | 2.35 | 2.11 |
| MANUR | 0.54 | 0.37 | 0.52 | 0.37 |
| CRP&fer | 0.50 | 0.58 | 0.34 | 0.44 |
| FEEDpurch | 0.83 | 0.45 | 0.60 | 0.27 |
| Electricity | 0.0044 | 0.04 | 0.04 | 0.04 |
| Fuel | 0.22 | 0.30 | 0.27 | 0.28 |

Differences in CF: 1 - 5%

# Conclusions

- Alignment can include IPCC (2019) values and equations specifically developed for sheep in European countries
- Alignment would allow reducing differences in estimates among countries
- More evaluations need to be done at territorial level to fit all the production systems and cases
- For the use of software within countries the original more flexible models can be still used
- Is needed a broad agreement amogn institutions to agree on equation changes in order to proceed in common way

# Do you have any questions ?

Sindy Throude – Institut de l'Elevage (France)

Alberto Atzori – UNISS (Italy)

# Determining carbon footprint of sheep farms in Europe: first results !

Sindy Throude – Institut de l'Elevage (France) – Action 3 leader

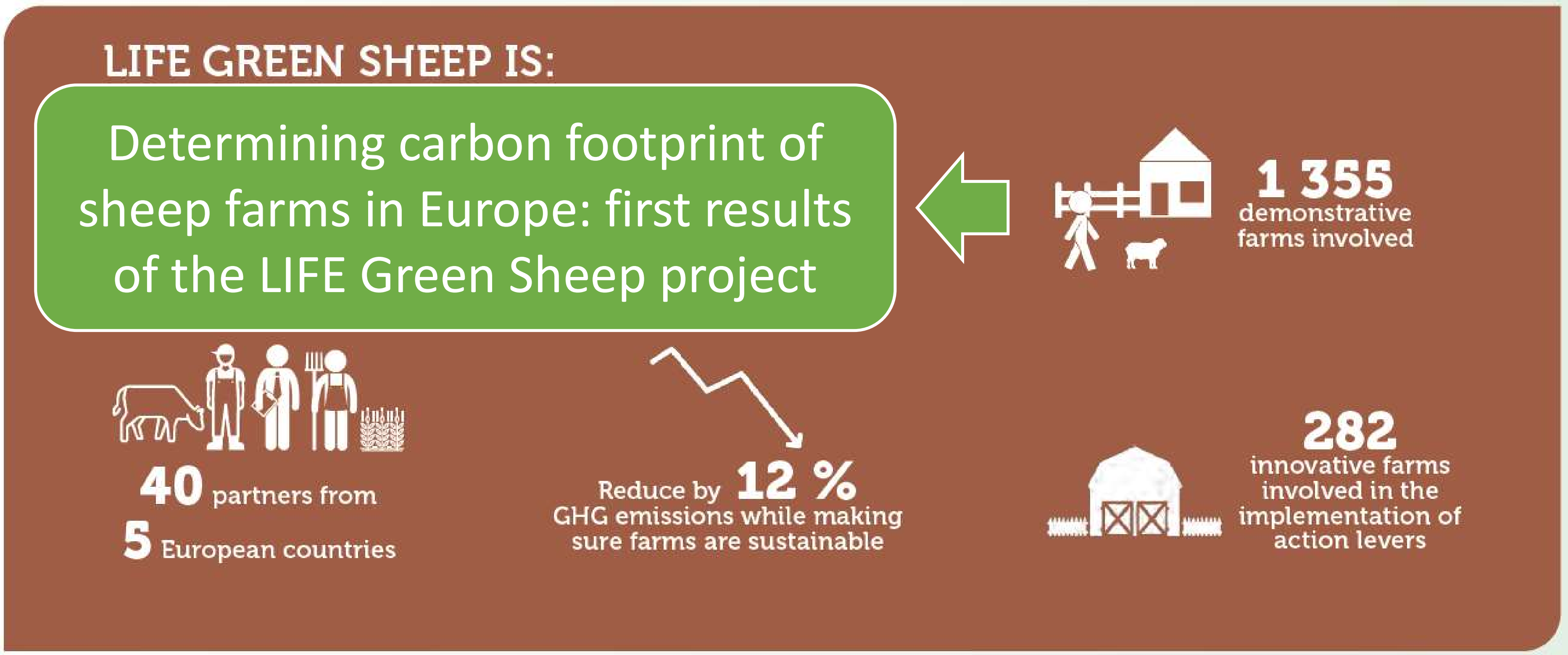
sindy.throude@idele.fr

# Determining carbon footprint of sheep farms in Europe: first results !

S. Throude, M. Acciaro, A. Atzori, R. Ruiz, O. Del Hierro, C. Buckley, L. Bragina, T.W.J. Keady, C. Dragomir, M.A. Gras, J.B. Dollé

With the help of 2 French trainees M. Hiez and R. Pellerin

# Key figures of the project

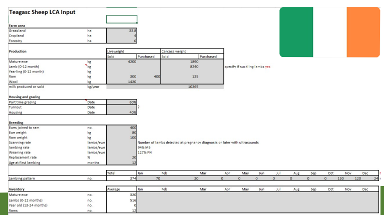



# How determining carbon footprint of sheep farms in Europe ?

- Using tools :
  - CAP'2ER®


  - ArdiCarbon

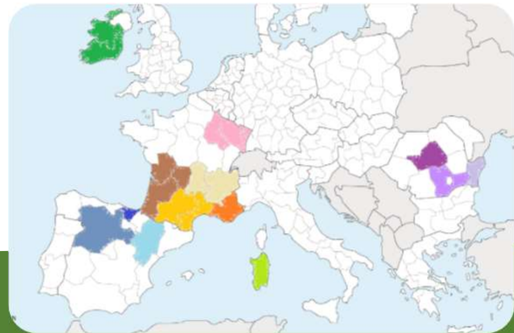

  - SheepLCA




- A sample of 1 355 sheep farms

| | Meat sheep | Dairy sheep |
|---|---|---|
| France | 700 - 584 | 185 - 186 |
| Spain | 30 - 41 | 60 - 41 |
| Ireland | 180 - 180 | - |
| Italy | - | 100 - 101 |
| Romania | - | 100 - 20 |

*Nb of farms foreseen* – *Nb of farms already assessed & analyzed*



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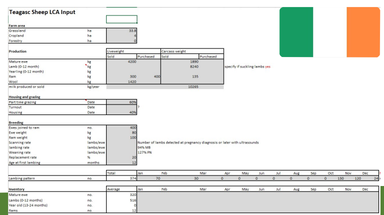


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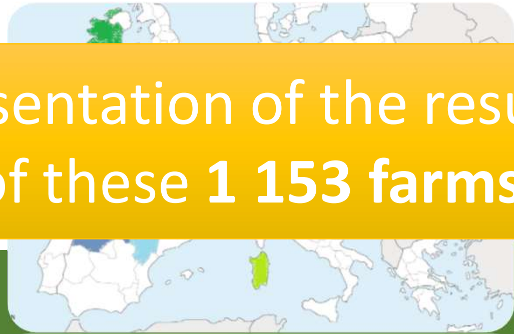
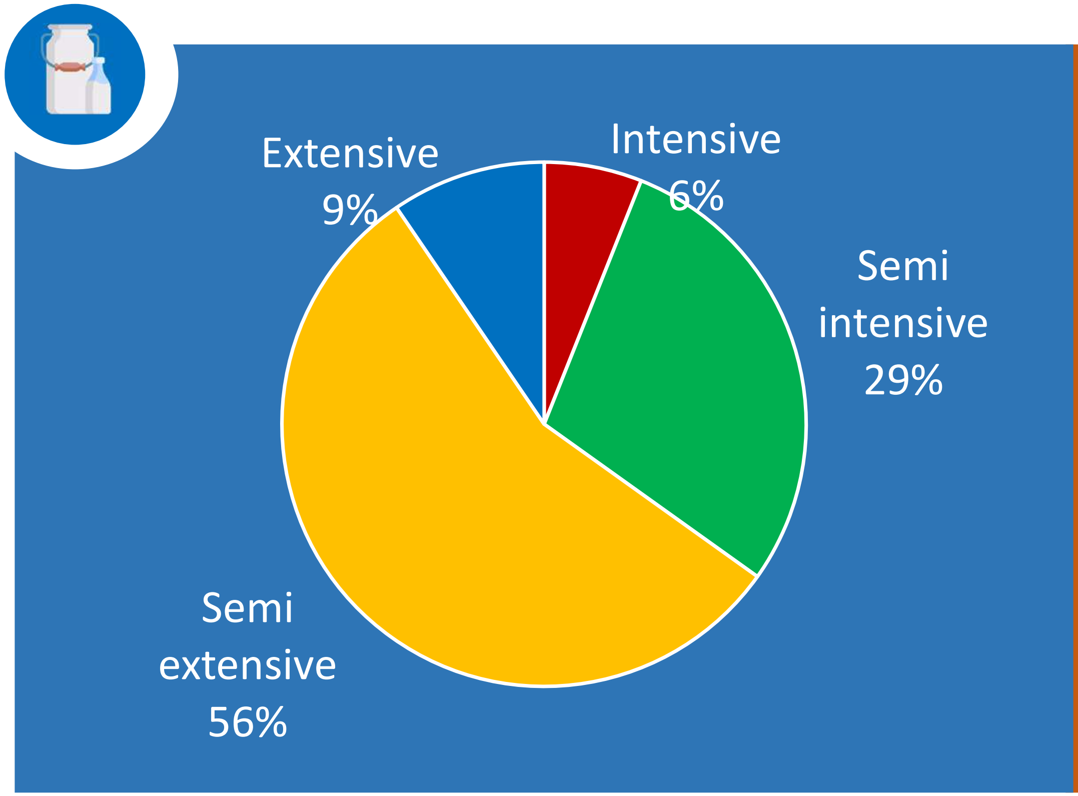
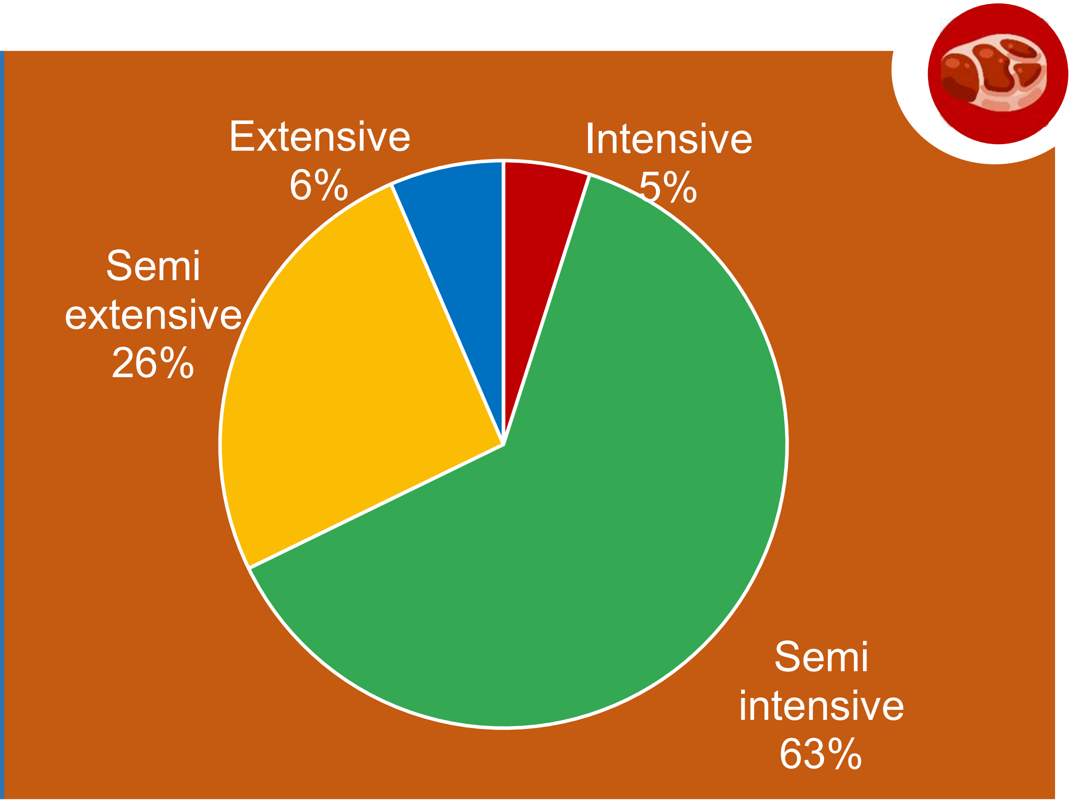


Presentation of the results of these **1 153 farms**

# A EU-scale sample with a diversity of rearing sheep systems



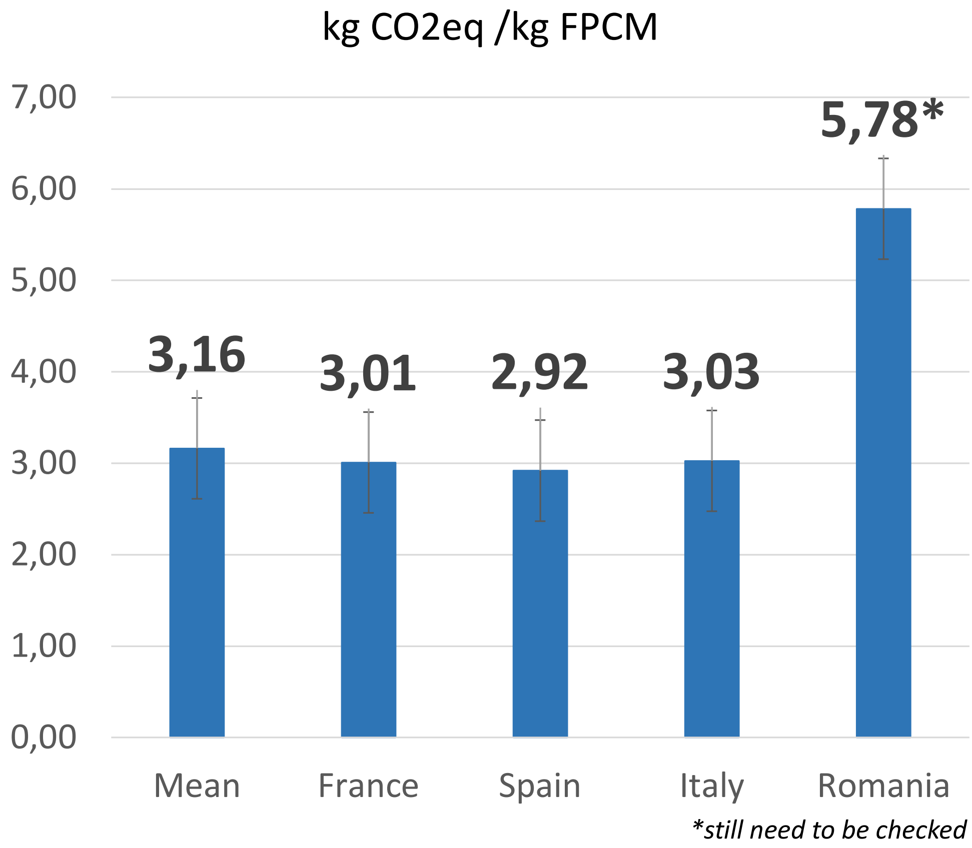




A majority of semi-extensive and semi-intensive systems

# Average EU sheep milk and sheep meat carbon footprint with high variability within each country

**3,16**
**kg CO2eq/kg FPCM**

**42,7**
**kg CO2eq/kg carcass**



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**3,16**

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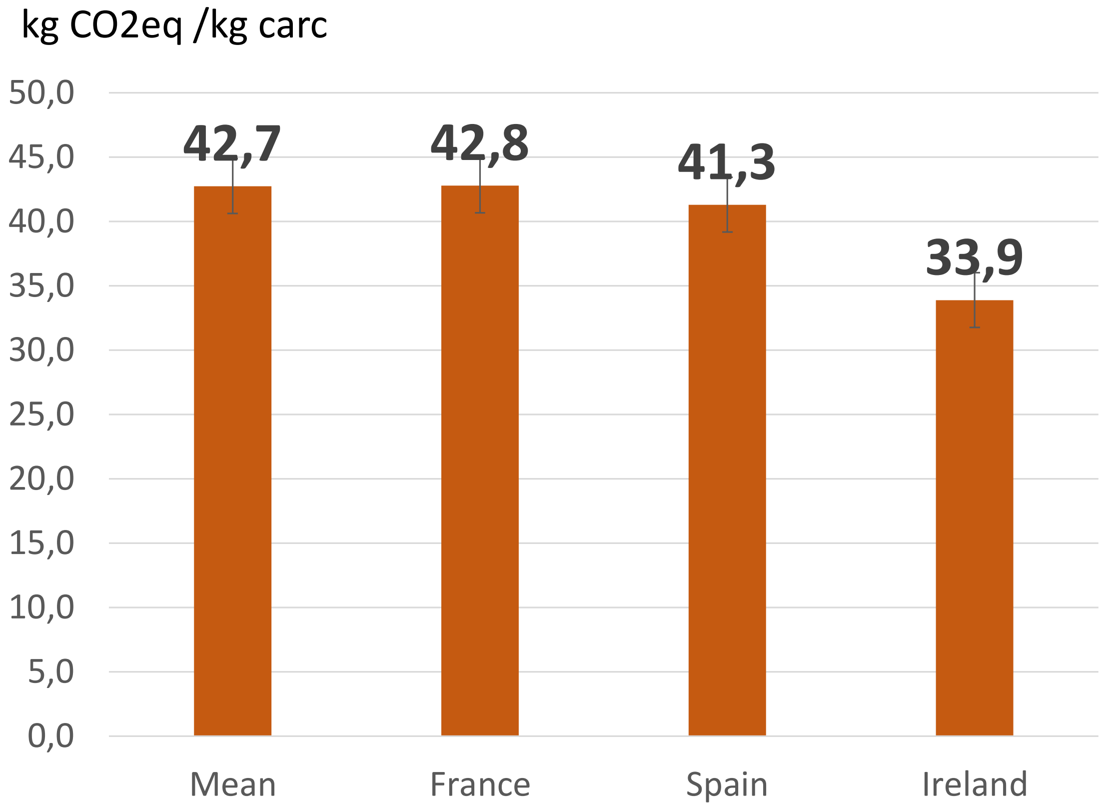
**42,7**

**kg CO2eq/kg carcass**



# Why do we have differences between countries ? Example of dairy sector

| | France | Spain | Italy | Romania |
|---|---|---|---|---|
| CF/ kg FPCM | 3,01 **(a)** | 2,92 **(a)** | 3,03 **(a)** | **5,78 (b)** |
| CF /ha | 6 345 **(a)** | 27 837 **(b)** | 3 285 **(a)** | 2 070 **(a)** |
| Milk production litres/ewe | 254 **(bc)** | 313 **(c)** | 183 **(b)** | **53 (a)** |
| UAA (ha) | 80 **(b)** | 58 **(a)** | 106 **(c)** | 119 **(c)** |

Significant differences for Romania, when CF is expressed per unit of product, due to a low milk production

# Why do we have differences between countries ? Example of dairy sector

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| UAA (ha) | 80 **(b)** | **58 (a)** | 106 **(c)** | 119 **(c)** |

Significant differences for Spain, when CF is expressed per ha, due to a low UAA (semi-intensive & intensive sheep systems)

# Why do we have differences between countries ? Example of dairy sector

| | France | Spain | Italy | Romania |
|---|---|---|---|---|
| CF/ kg FPCM | 3,01 **(a)** | 2,92 **(a)** | 3,03 **(a)** | 5,78 **(b)** |
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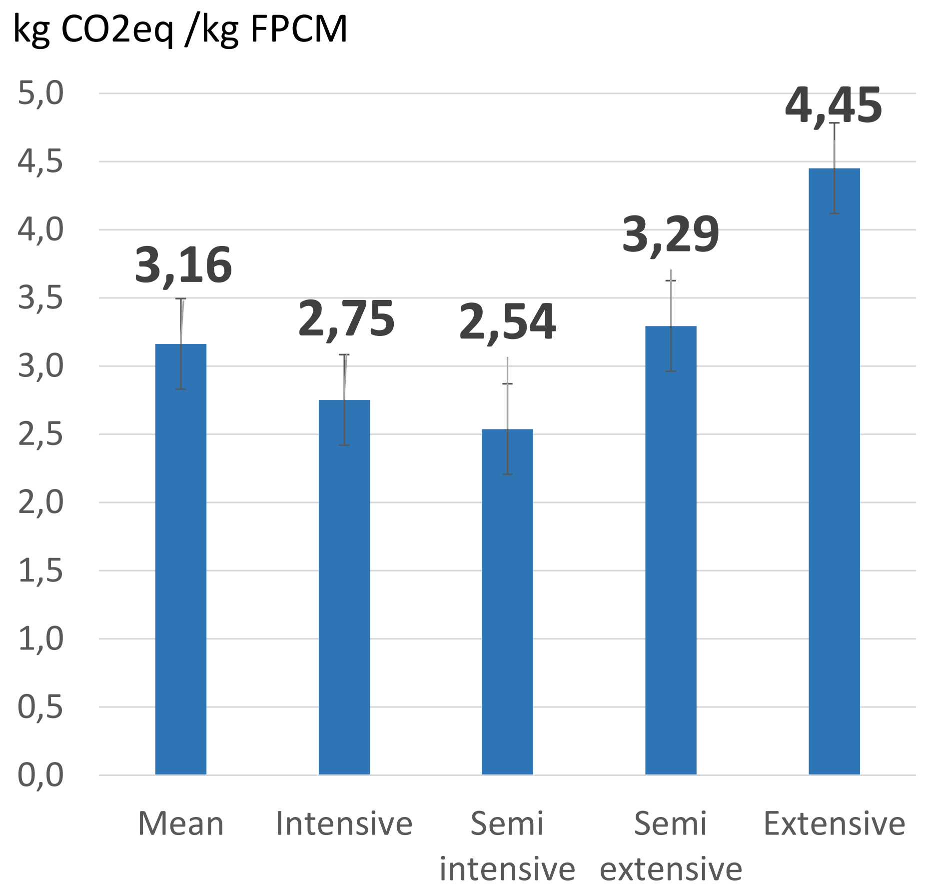
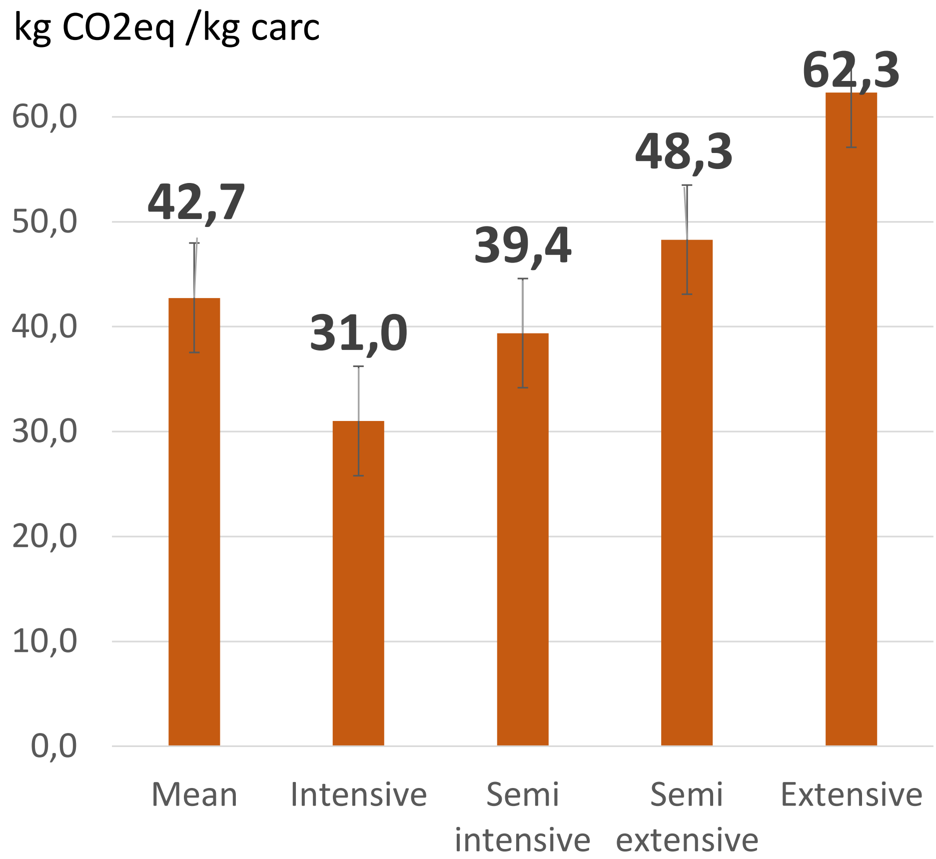
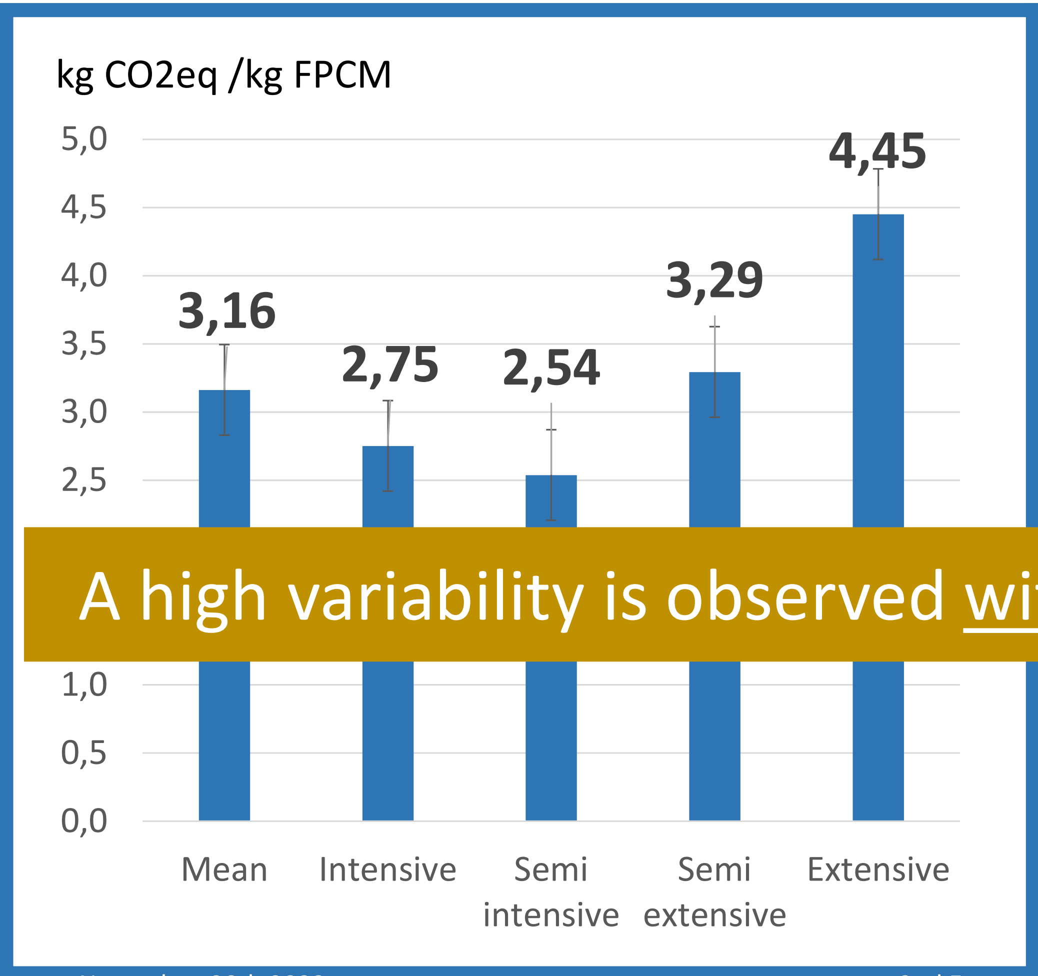
Effect of the functionnal unit and rearing sheep systems

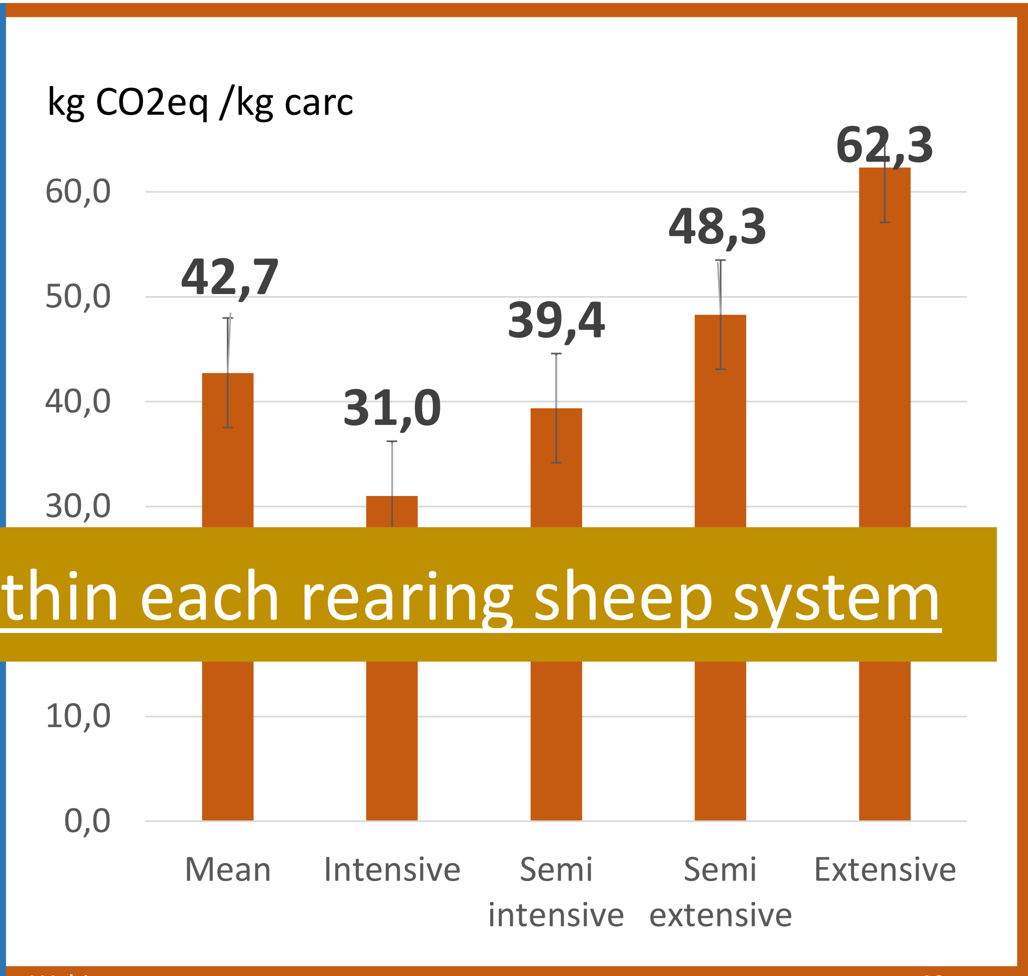
# Average carbon footprint according to the rearing sheep system



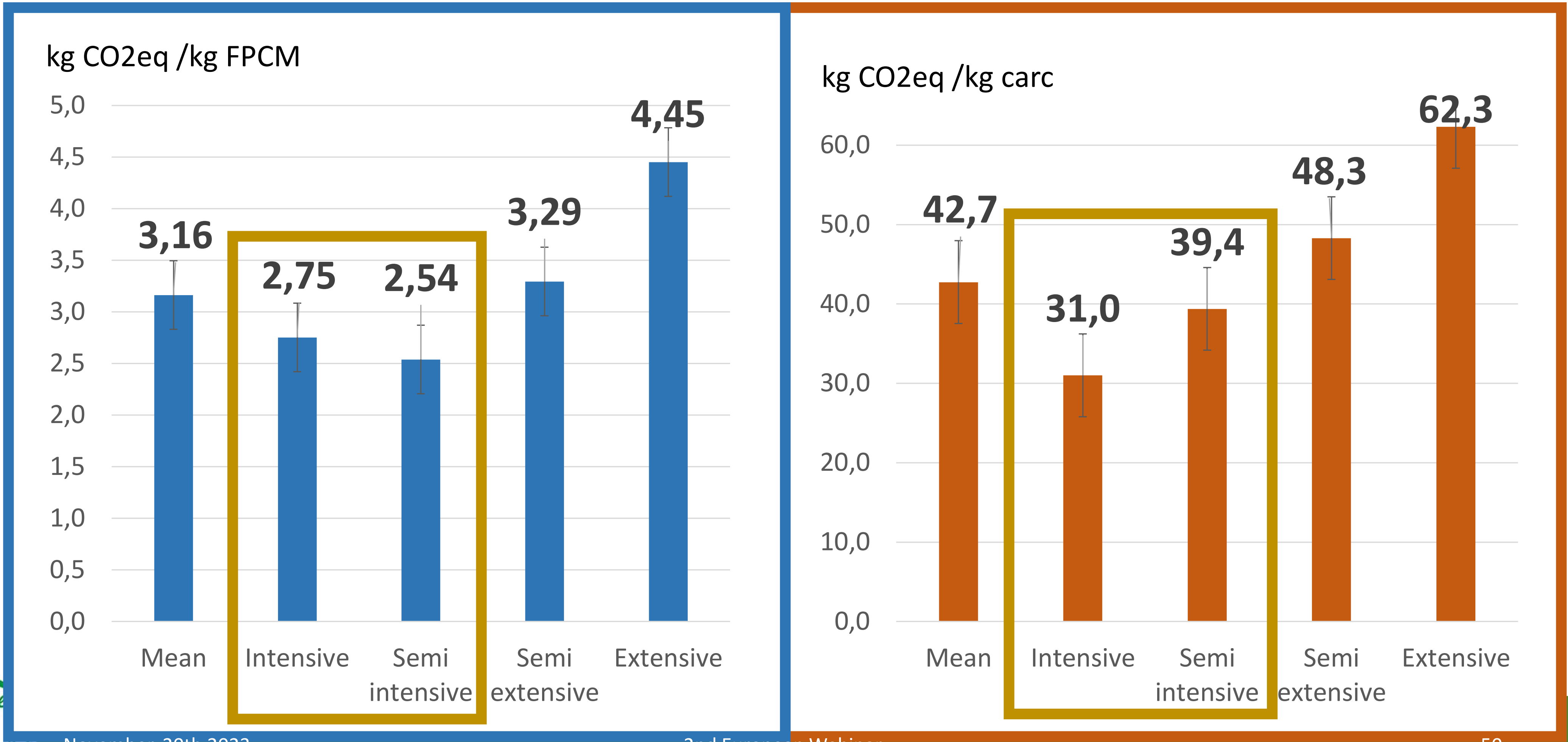
# Average carbon footprint according to the rearing sheep system



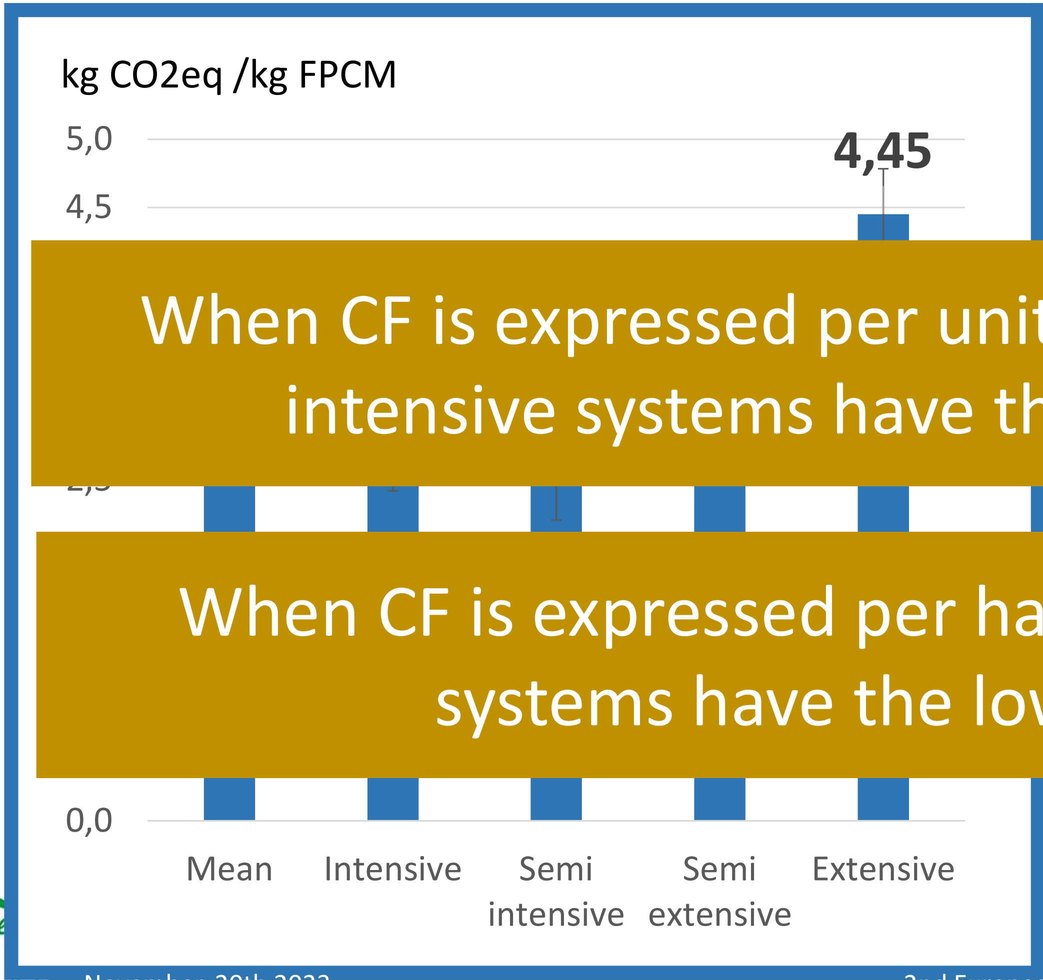



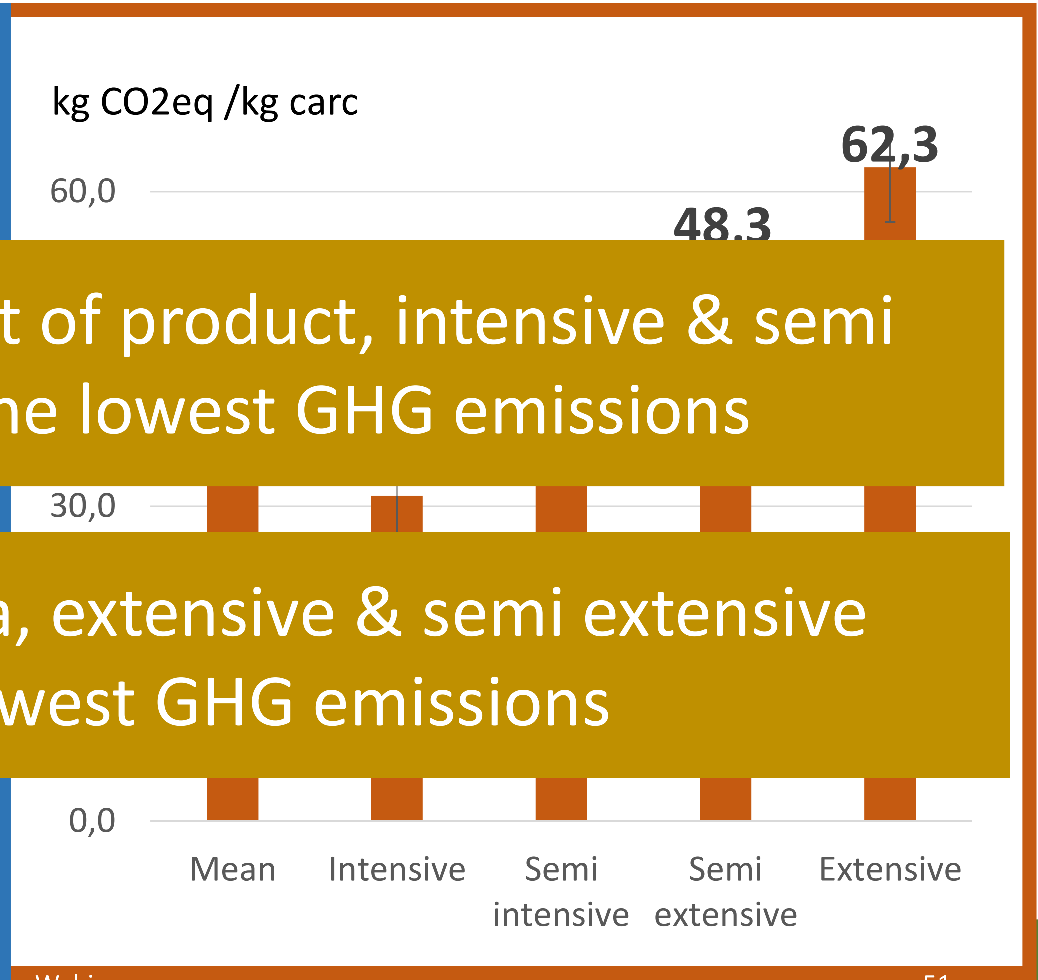

A high variability is observed within each rearing sheep system

# Average carbon footprint according to the rearing sheep system



# Average carbon footprint according to the rearing sheep system

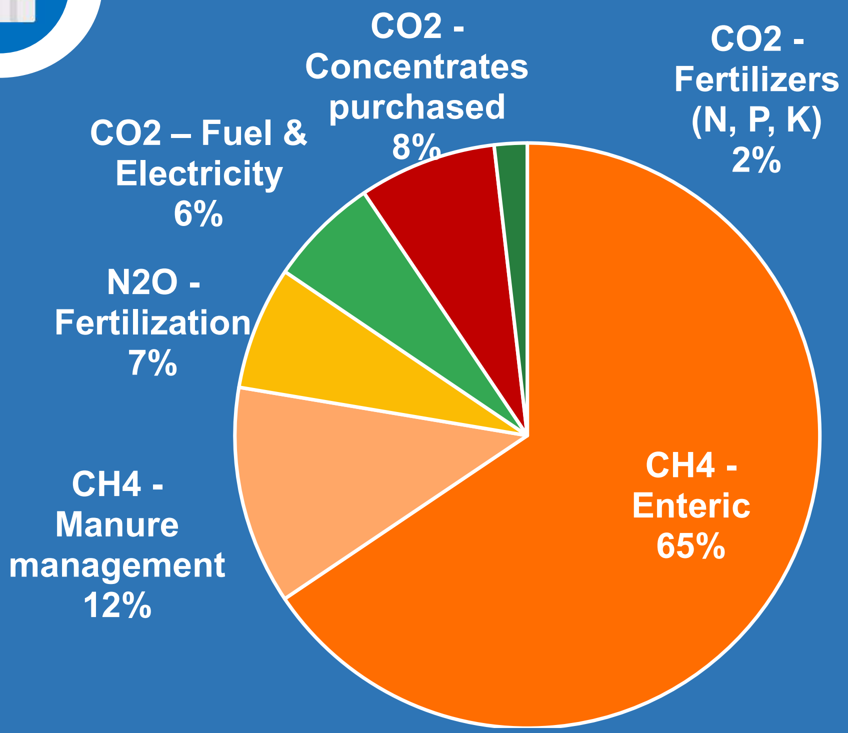


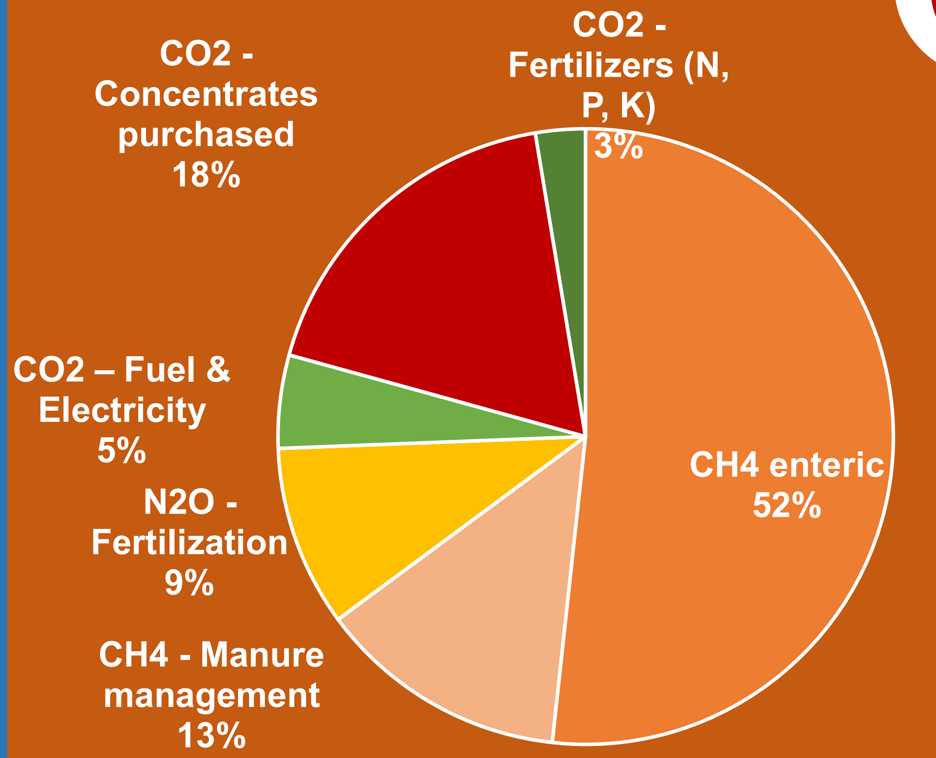




When CF is expressed per unit of product, intensive & semi intensive systems have the lowest GHG emissions

When CF is expressed per ha, extensive & semi extensive systems have the lowest GHG emissions

# Enteric fermentation and manure management are the main sources of GHG



# What are the technical results for the 10% farms with the lowest emissions?

| | | 10 % lowest (77 farms) | Average (770 farms) | 10 % highest (77 farms) |
|---|---|---|---|---|
| Environmental results | GHG emissions (kg CO2eq/kg carcass) | **20** | 41 | **89** |
| | GHG emissions (kg CO2eq/ha) | 6 205 | 5 043 | 3 700 |
| Surfaces | UAA (ha) | 37 | 113 | 125 |
| Flock management and production | Number of ewes | 298 | 398 | 327 |
| | Prolificity rate | **1,17** | 1,45 | **1,18** |
| | Carcass weight of lambs (kg carc/lamb) | **38** | 22 | **22** |
| | Meat production (kg carc/year) | 8 427 | 7 956 | 3 180 |
| | Weight productivity (kg carc/ewe) | **46** | 24 | **12** |
| Flock feeding | Part of purchased concentrates (%) | 93 | 66 | 63 |
| | Grazing time for ewes (days/year) | **282** | 245 | **248** |
| Energy | Fuel consumption (litres/ha) | 94 | 97 | 129 |
| | Electricity consumption (kwh/ha) | 166 | 116 | 122 |

# What are the main factors explaining GHG emissions results ? When expressed per ha

According to systems, 5 factors explain **at least 60% of the GHG emissions :**

- Stocking rate
- N balance
- Mineral & organic nitrogen
- Energy consumption (fuel & elec)
- Prolificacy rate (only for semi-extensive systems)

According to systems, 5 factors explain **at least 60% of the GHG emissions :**

- Stocking rate
- Mineral & organic nitrogen
- N balance
- Weight productivity
- Prolificacy rate

*Statistical test used : Boruta*

# Conclusion

A good overview of the average EU sheep milk and sheep meat carbon footprint based on an important sample of farms

A high variability of CF results whithin each system → Explained by different practices : optimized ones lead to less GHG emissions

Importance of the funtionnal unit → Need to analyse the results expressed per unit of product AND per ha

This work is still in progress and these are preliminary results

- The classification of sheep systems need to be consolidated
- The analysis of intra-system results needs to be more in-depth
- Final results with sustainability aspects by the end of this year, considering also carbon storage & sustainability performances

# Do you have any questions ?

Sindy Throude – Institut de l'Elevage (France)

# Testing mitigation actions to reduce GHG emissions from sheep farming in Europe

Sindy Throude – Institut de l'Elevage (France) – Action 4 leader

sindy.throude@idele.fr

# Testing mitigation actions to reduce GHG emissions from sheep farming in Europe

S. Throude, M. Acciaro, A. Atzori, R. Ruiz, O. Del Hierro, C. Buckley, L. Bragina, T.W.J. Keady, C. Dragomir, M.A. Gras, J.B. Dollé

With the help of 2 French trainees M. Hiez and R. Pellerin

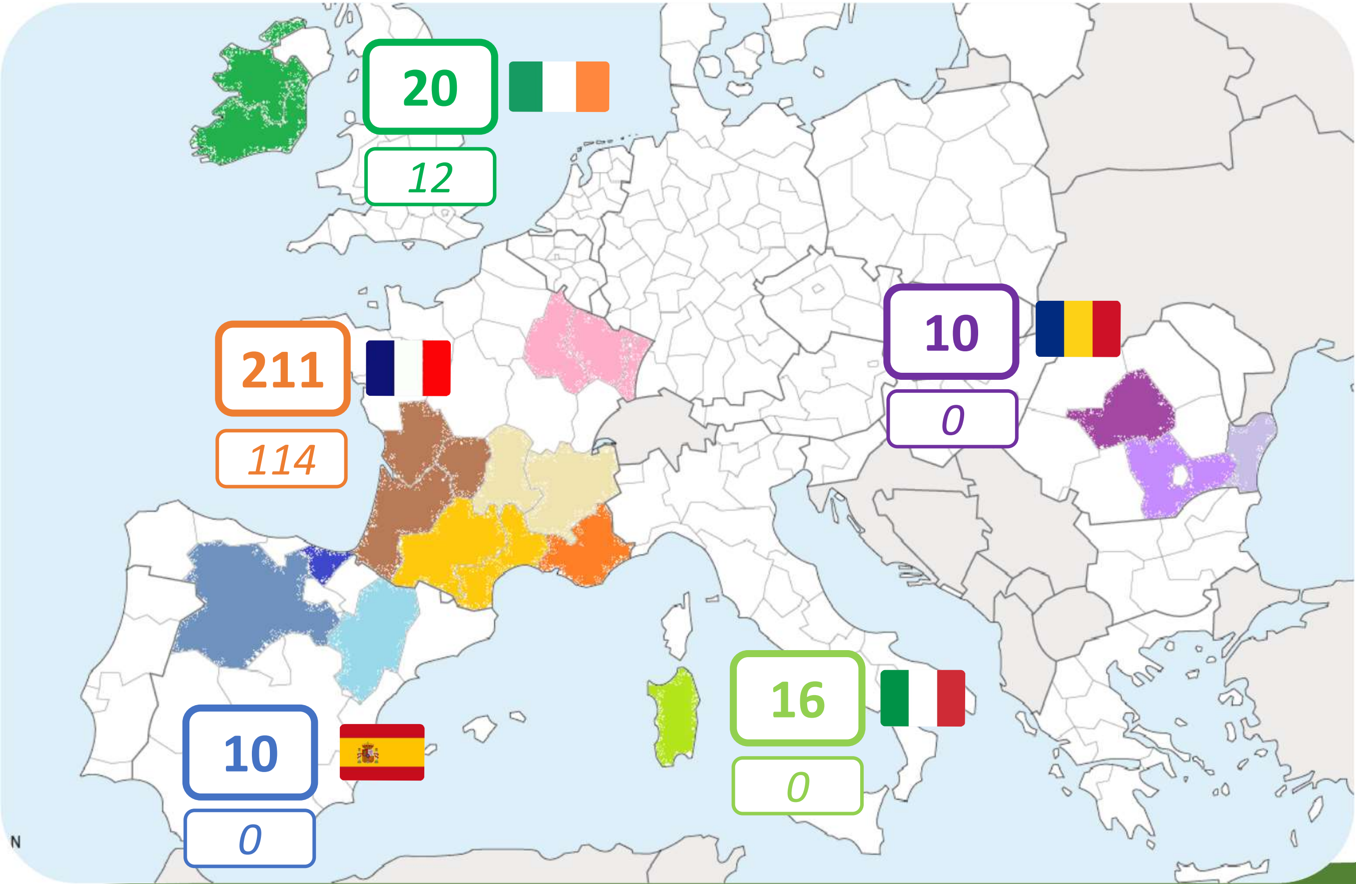
# Review of existing mitigation practices

- **194** mitigation strategies screened and evaluated from previous projects
  - 69 for dairy farms, 81 for meat farms, 44 for both
- Classification of theses practices into 8 detailed topics
  - 2 main ones : sheep flock & surfaces management

| | | | |
|---|---|---|---|
| Animal feeding and nutrition | Animal health and welfare | Animal management | Animal reproduction |
| Animal genetics and breeding | Manure & fertilizers management | Surfaces management | Energy production and consumption |

- Very few quantifications of the impact of mitigation practices in sheep farming !
  - →Need of implementing and testing mitigation practices and assessing their GHG, environmental & economic impacts

# Monitoring of a large EU-scale sample of 282 innovative sheep farms




Since assessments and carbon action plans are still on-going, following results are based on a sample of **126** farms *(identified in italics)*

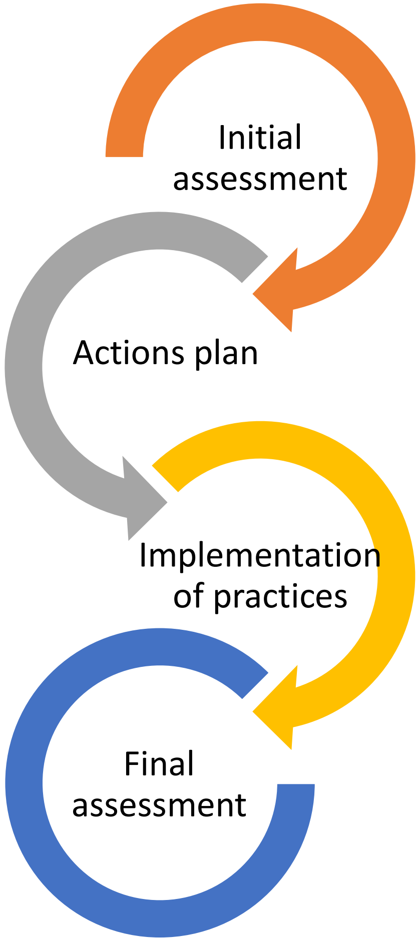
# Implementation of mitigation practices and monitoring

**Initial assessment of CF and also other environmental impacts and sustainability indicators**

**Carbon action plan : A combination of one or several mitigation practices identified → Assessment of the impacts (technical, environmental, economic…) of these practices**

**Implementation of mitigation practices : Monitoring during 3 years**

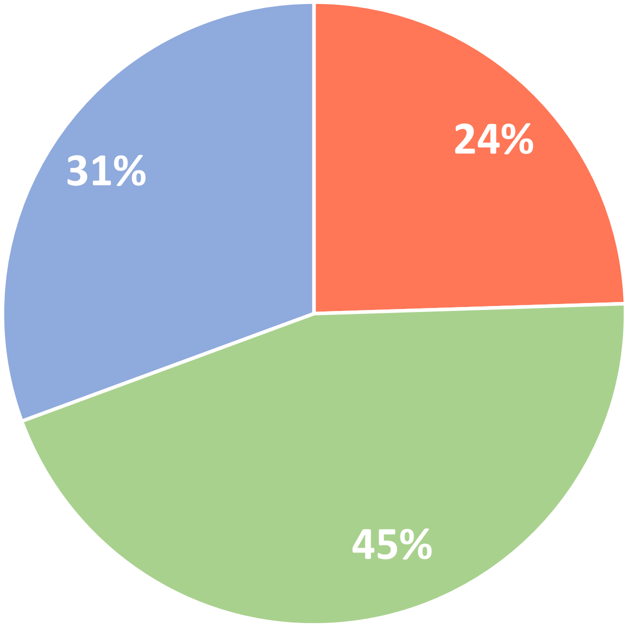
**Final assessment at the end of the project**
**Objective : an average GHG mitigation of -12%**



# For Irish farms, mainly mitigation practices based on overall surface management (12 carbon action plans)

**FLOCK MANAGEMENT**

- Use of Eurostar Ram on Lowland Flock (10%)
- Lambs weaned per ewe per Year (6%)
- Pregnancy rate of ewes and hoggets to ram (6%)
- % of first time lambers as hoggets (6%)
- Animal Health (3%)




**FERTILIZATION**

- **Soil Nutrient Management for Improved N Efficiency (8%)**
- Use of Low Emission Slurry Spreading (LESS) for Slurry application (6%)
- Lime Status - Mineral Soils (4%)
- Use of Protected Urea (2%)
- P Index on High Output Pasture (2%)
- Slurry Spread timing (2%)

**SURFACE MANAGEMENT**

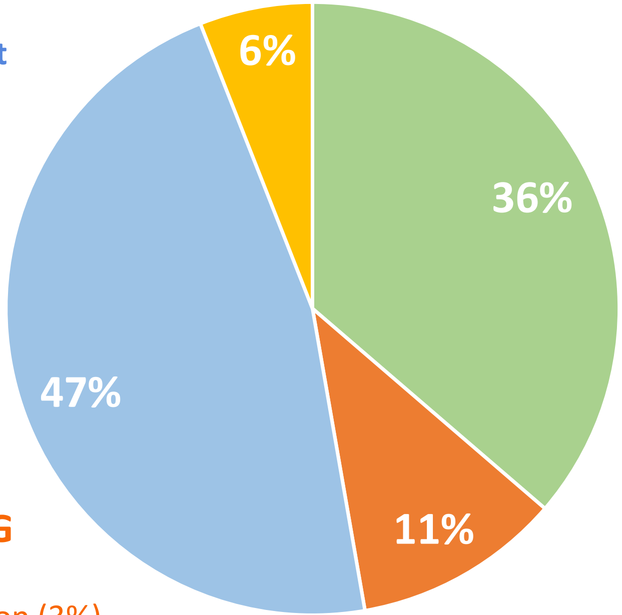
- **Managing the farm for grazing season length (16%)**
- **Grazing management (14%)**
- Improving hedgerow management for carbon (and Biodiversity) (6%)
- Forestry - Commercial Conifer (5%)
- Proportion of Clover in Sward (2%)
- Planting hedges on the farm (2%)

*(%) means the number of times this practice has been identified / number of practices identified*

# For French meat farms, mainly mitigation practices based on herd and surface management *(61 carbon action plans)*

### FLOCK MANAGEMENT

**- Improve sanitary management to boost productivity (19%)**
**- Improve fertility (13%)**
- Improve overall herd management and reduce the number of unproductive animals (7%)
- Increase the finishing rate (6%)
- Decline in lamb mortality (1%)
- Increase in the sheep flock (1%)




### ENERGY AND MANURE MANAGEMENT

- Reduce fuel consumption (3%)
- Reduce electricity consumption (3%)

### SURFACE MANAGEMENT

**- Evolution of the "crops/temporary grassland" rotation (8%)**
**- Optimize fertilization N,P,K (8%)**
- Planting hedges on the farm (6%)
- Planting legumes as a mixture or pure crop (6%)
- Planting intermediate crops (3%)
- Switch to direct seeding (3%)
- Development of intra-plot agroforestry in cultivated plots (1%)
- Conversion of crop rotation to permanent grassland (1%)

### FLOCK FEEDING

- Increase grazing time (5%)
- Optimize concentrate consumption (3%)
- Increase protein autonomy (2%)
- Improve forage quality (1%)

*(%) means the number of times this practice has been identified / number of practices identified*

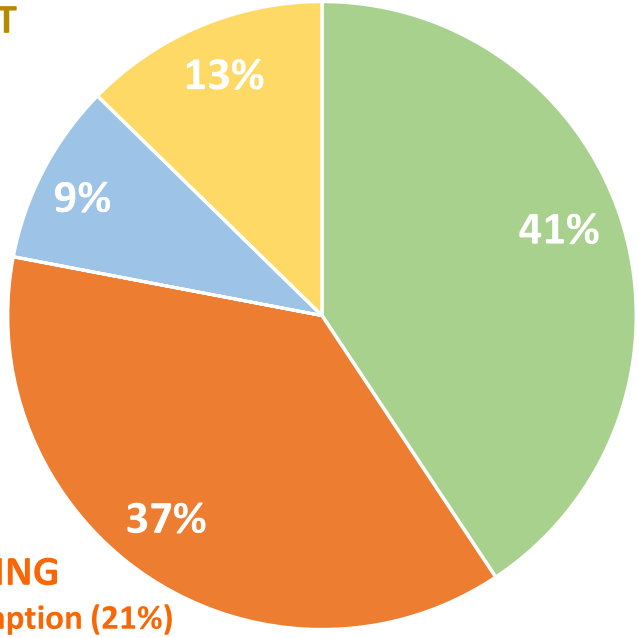
# For French dairy farms, mainly mitigation practices based on surface management & herd feeding *(53 carbon action plans)*

**ENERGY AND MANURE MANAGEMENT**

- Reduce electricity consumption (4%)
- Reduce fuel consumption (3%)
- Improving manure spreading methods (2%)
- Methanization of animal manure (2%)

**FLOCK MANAGEMENT**

- Improve sanitary management to boost productivity (3%)
- Improve fertility (3%)
- Improve overall herd management and reduce the number of unproductive animals (3%)




**SURFACE MANAGEMENT**

- **Planting legumes as a mixture or pure crop (10%)**
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- Switch to direct seeding (6%)
- Planting intermediate crops (4%)
- Planting hedges on the farm (4%)
- Development of intra-plot agroforestry in cultivated plots ha (1%)
- Conversion of crop rotation to permanent grassland (1%)

**FLOCK FEEDING**

- **Optimize concentrate consumption (21%)**
- Increase grazing time (9%)
- Improve forage quality (5%)
- Increase protein autonomy (2%)

*(%) means the number of times this practice has been identified / number of practices identified*

# Do the main topics of mitigation practices differ according to the type of system?

The same mitigation practices topics emerge for each rearing system : **surface management & flock feeding**

Then, energy and manure management & flock management

The same mitigation practices topics emerge for most of the rearing systems : **surfaces management & Flock management**

Except for intensive systems : Energy & manure management

→ Different mitigation practices according to the country / sector / rearing sheep system

# For French meat farms, an average GHG mitigation of 13,3%

| | Intensive (3 farms) | Semi intensive (39 farms) | Semi extensive (14 farms) | Extensive (5 farms) | National average (61 farms) |
|---|---|---|---|---|---|
| **GHG emissions mitigation** | -4,0% | -13,1% | -15,2% | -15,2% | **-13,3%** |
| **Carbon gains (t CO2/year)** | 32 | 182 | 148 | 112 | 157 |
| **Carcass production trend** | + 3,2 % | + 1,9 % | + 5,3 % | + 18,0 % | + 3,1 % |
| **Partial budget/ewe** | + 7€ | + 21€ | + 7€ | + 11€ | + 19€ |

- 12% reduction target achieved but depending on the rearing systems

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- With not always a increasing of the production

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- 12% reduction target achieved but depending on the rearing systems
- With not always a increasing of the production
- With economic gains

# For French dairy farms, an average GHG mitigation of 9,2%

| | Semi intensive (22 farms) | Semi extensive (16 farms) | Extensive (15 farms) | National average (53 farms) |
|---|---|---|---|---|
| GHG emissions mitigation | - 7,6% | - 9,8% | - 9,2% | -9,2% |
| Carbon gains (t CO2/year) | 77 | 69 | 38 | 61 |
| Milk production trend | + 4,3 % | - 2,8 % | + 2,7 % | - 2,1 % |
| Partial budget/ewe | + 15 € | + 29€ | + 24€ | + 21€ |

- 12% reduction target not reached yet

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- 12% reduction target not reached yet
- With not always a increasing of the production
- With economic gains

# Conclusion

Main topics of mitigation practices

- Surfaces management and flock management for meat sheep farms
- Surfaces management and flock feeding for dairy sheep farms

Mitigation practices are different according to the country / sector / rearing system → Need to adapt the practices / no single way to reduce emissions

A mitigation of 12% of GHG in sheep farming is possible !

- With a higher technical efficiency, and a higher competitiveness
- With economic gains !

This work is still in progress and these are preliminary results

- Final results with sustainability aspects by the end of this year
- Considering also carbon storage

# Do you have any questions ?

Sindy Throude – Institut de l'Elevage (France)

# Round table discussion

## « How to disseminate the project results and inform farmers and advisers widely ? »

**Round table discussion with :**

Cathal Buckley from Ireland

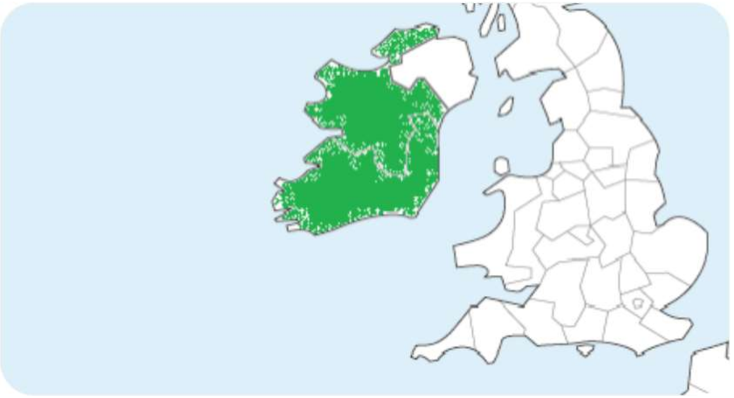
Gabriella Serra from Italy

Sindy Throude from France

Roberto Ruiz from Spain

Catalin Dragomir from Romania

# IRELAND
# Coordinator TEAGASC



**Rearing sheep systems :**
Mainly lowland and hill system

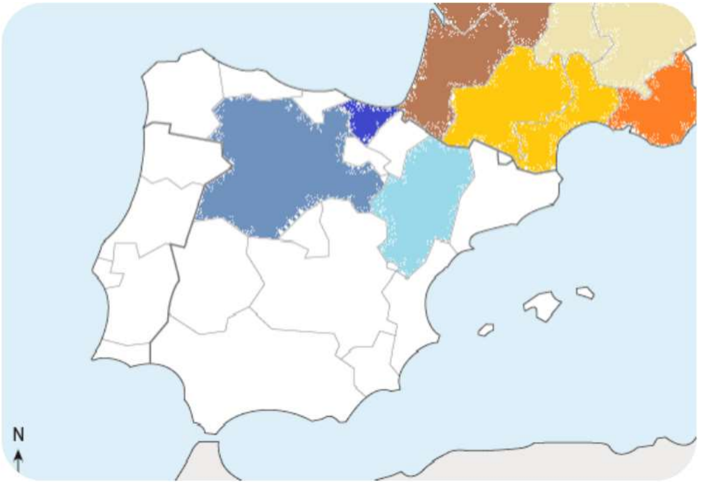
**DEMONSTRATIVE FARMS**
**180 meat sheep farms**

**INNOVATIVE FARMS**
**20 meat sheep farms**

**ADVISORS**
**30 advisors trained**

# SPAIN
# Coordinator NEIKER

NEIKER
MEMBER OF
BASQUE RESEARCH
& TECHNOLOGY ALLIANCE




LURGINTZA

INSTITUTO TECNOLÓGICO AGRARIO

pastores grupo cooperativo

Oviaragón

**Rearing sheep systems :**
Mainly grassland systems in the Basque Country and Navarre
Mainly indoor sheep system in Castille y Leon

**DEMONSTRATIVE FARMS**
**30 meat sheep farms**
**60 dairy sheep farms**

**INNOVATIVE FARMS**
**10 meat sheep farms**
**15 dairy sheep farms**

**ADVISORS**
**20 advisors trained**

# ITALY
# Coordinator AGRIS

Agris

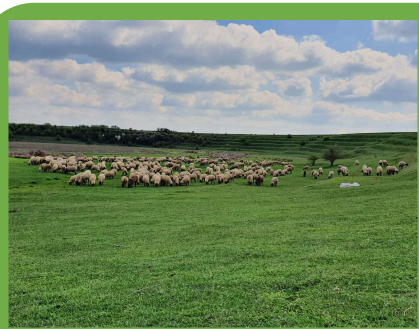
uniss
UNIVERSITÀ DEGLI STUDI DI SASSARI

Laore
Agentzia regionale
pro s'isvilupu in agricultura
Agenzia regionale
per lo sviluppo in agricoltura

**Rearing sheep systems :**
Mainly Grassland

| DEMONSTRATIVE FARMS | INNOVATIVE FARMS | ADVISORS |
| --- | --- | --- |
| 100 dairy sheep farms | 16 dairy sheep farms | 33 advisors trained |

# ROMANIA
# Coordinator IBNA



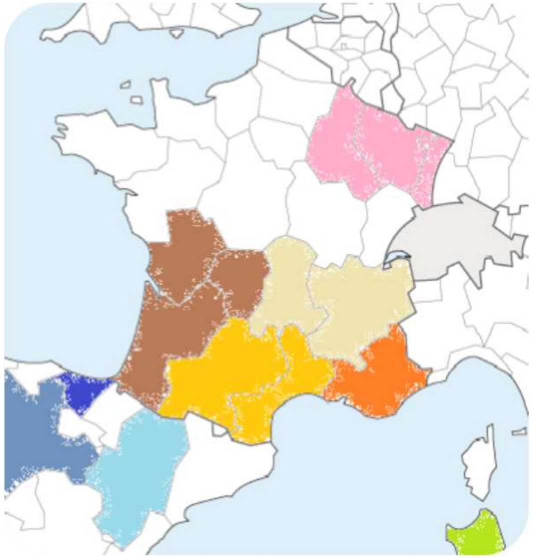
**Rearing sheep systems :**
Grassland based

**DEMONSTRATIVE FARMS**
**100 dairy sheep farms**

**INNOVATIVE FARMS**
**10 dairy sheep farms**

**ADVISORS**
**12 advisors trained**

# FRANCE
# Coordinator IDELE



**Rearing sheep systems :**

Mixed systems with grass, forages and cereals for dairy sheep

Grassland and pastoral systems for meat sheep

**DEMONSTRATIVE FARMS**
**700 meat sheep farms**
**185 dairy sheep farms**

**INNOVATIVE FARMS**
**155 meat sheep farms**
**56 dairy sheep farms**

**ADVISORS**
**72 advisors trained**

# How do the farmers see the climate change issue in your country ?

# What are the main incentives/arguments for farmers to engage low carbon transition in your country ?

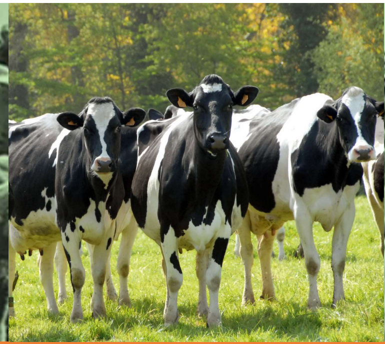
# Did you encounter difficulties to motivates farmers and advisors and how did you solve this problems ?

# What do we need to upscale this initiative ?

# Do you have any questions ?

# Conclusion

Caroline Guinot – Ressources Agro (France)



SAVE THE DATE : NETWORKING EVENT

Tuesday 06 February 2024 – Brussels

# UPSCALING LOW CARBON LIVESTOCK FARMING IN EUROPE

- Exchanging and capitalizing on former and existing European projects
- Identifying collectively the best practices of dissemination and assimilation by advisors, farmers and the sector’s industries
- Getting in touch and forecasting new projects for tomorrow


**LIFE GREEN SHEEP : for a low carbon and sustainable sheep farming**

LIFE19 CCM/FR/001245 - LIFE GREEN SHEEP