This project has received funding from the European Union's Horizon 20202 research and innovation programme under grant agreement No. 862050

Integrating innovative TECHnologies along the value Chain to improve small ruminant welfARE management

# Full-flock-full-pregnancy monitoring of liveweight progression in *Romane* meat ewes, using a walk-over-weighing system in rangelands

I. Llach[1]; G. Bonnafé[2]; C. Durand[2]; S. Douls[2]; I. Sanchez[3]; B. Cloez[3] ; M. Lamarque [2] &
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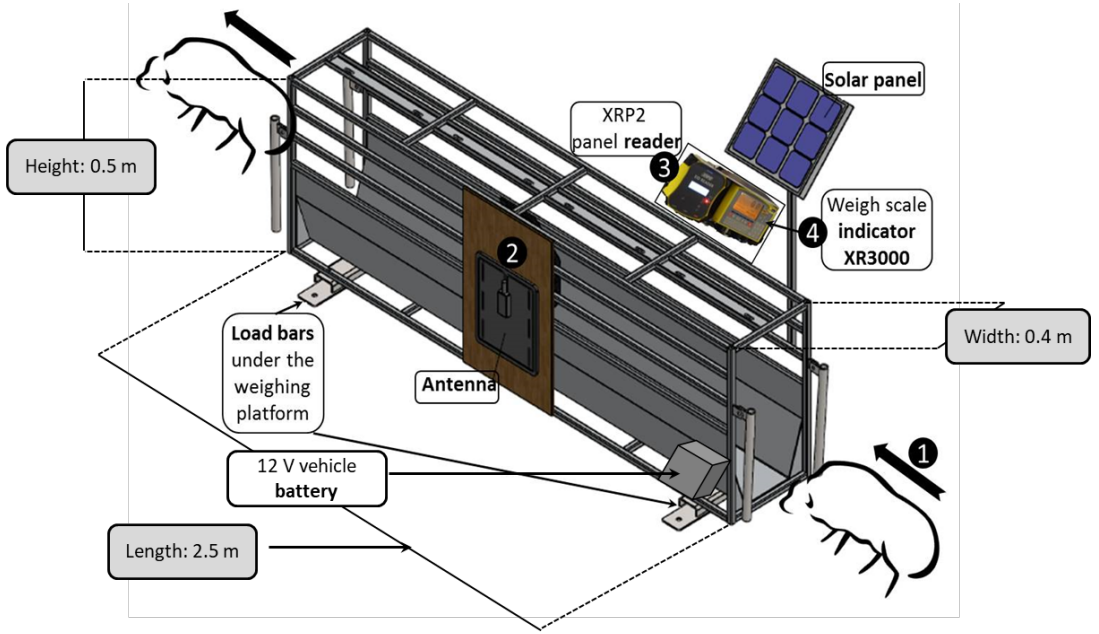
# A **Walk-over-Weighing (WoW)** prototype: alternative to the Gold standard method (static scale)

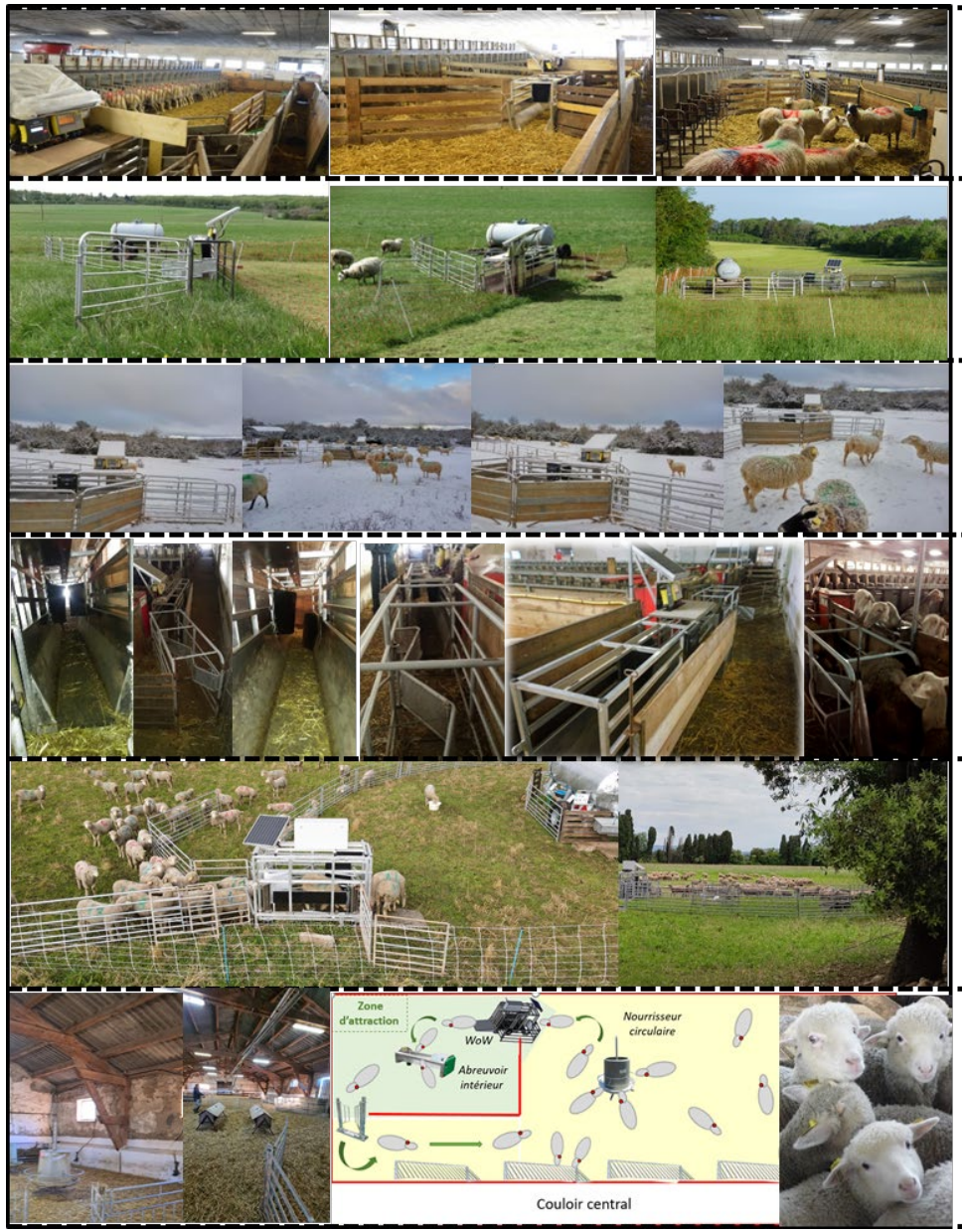
- ✓ To **overcome constraints** affecting the frequent **weighing** of animals (time consuming, labour intensive, stress on both the animals and the operator), and
- ✓ To **automatize** this farm **operation**

1) The animal **crosses voluntarily**, stimulated by the **attraction zone**
2) The **antenna** reads its **ID** and sends it to the **reader** (XRP2)
3) The reader **saves the passage** in a file and sends it to the **indicator**
4) The **indicator** records the **ID**, **BW**, **date**, **time** of passage in a CSV file to be further interpreted and used for decision makings




https://www.youtube.com/watch?v=te0mXY3Yum0&t=19s

# **Feasibility** of using the system **has been demonstrated** in a large spectrum of conditions




**Indoor**: adult ewes (*Romane* breed)

**Outdoor** (spring): rotational **grazing** (*Romane* ewelambs)

**Outdoor** (winter): extensive **grazing** (rangeland; adult *Romane* flock)

**Indoor**: dairy ewes (*Lacaune*) at exit race of **milking parlour**

**Outdoor** (spring): rotational **grazing** (*Mérinos d'Arles* ewelambs)

**Indoor**: fattening lambs (*Mérinos d'Arles* breed)

# Tested using **different research questions**

*Animal* (2018), **12:6**, pp 1174–1181 © The Animal Consortium 2017
doi:10.1017/S1751731117002609

animal

## An assessment of Walk-over-Weighing to estimate short-term individual forage intake in sheep

E. González-García[1†], P. de Oliveira Golini[2], P. Hassoun[1], F. Bocquier[1,3], D. Hazard[4], L. A. González[5], A. B. Ingham[6], G. J. Bishop-Hurley[6] and P. L. Greenwood[7,8]

J. Dairy Sci. 104:5675–5688
https://doi.org/10.3168/jds.2020-19075


## Measuring liveweight changes in lactating dairy ewes with an automated walk-over-weighing system

**E. González-García,[1]* M. Alhamada,[1] H. Nascimento,[2] D. Portes,[3] G. Bonnafe,[3] C. Allain,[3] I. Llach,[1] P. Hassoun,[1] J. M. Gautier,[4] and S. Parisot[3]**
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Computers and Electronics in Agriculture 153 (2018) 226–238

Contents lists available at ScienceDirect

Computers and Electronics in Agriculture

journal homepage: www.elsevier.com/locate/compag

Original papers

## A mobile and automated walk-over-weighing system for a close and remote monitoring of liveweight in sheep

E. González-García[a,*], M. Alhamada[a], J. Pradel[b], S. Douls[b], S. Parisot[b], F. Bocquier[c], J.B. Menassol[c], I. Llach[d], L.A. González[e]

animal - open space 2 (2023) 100032

Contents lists available at ScienceDirect

animal - open space

journal homepage: www.elsevier.com/locate/anopes

Research article

## Evaluating a Walk-over-Weighing system for the automatic monitoring of growth in postweaned *Mérinos d'Arles* ewe lambs under Mediterranean grazing conditions

E. Leroux[a], I. Llach[b], G. Besche[c], J.-D. Guyonneau[c], D. Montier[c], P.-M. Bouquet[d], I. Sanchez[e], E. González-García[b,*]

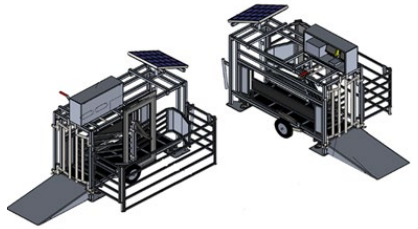
doi:10.1017/S1751731117002609.
doi: 10.3168/jds.2020-19075.
doi.org/10.1016/j.anopes.2022.100032
https://patre.reussir.fr/actualites/un-couloir-de-pesee-automatique-valide-par-l-inra:WRZ847TU.html

# Automatic livestock weighing animals in the farm

- ✓ The **ambition now** is to use it in routine, whatever the system or animal category
- ✓ To **strengthen individual monitoring** without human intervention
- ✓ To **develop Early Warning Systems** (EWS) using **liveweight** (LW) **changes** as a proxy
- ✓ Besides, little is known about LW **dynamics of females during pregnancy** (key physiological stage), which is more critical under rangeland conditions

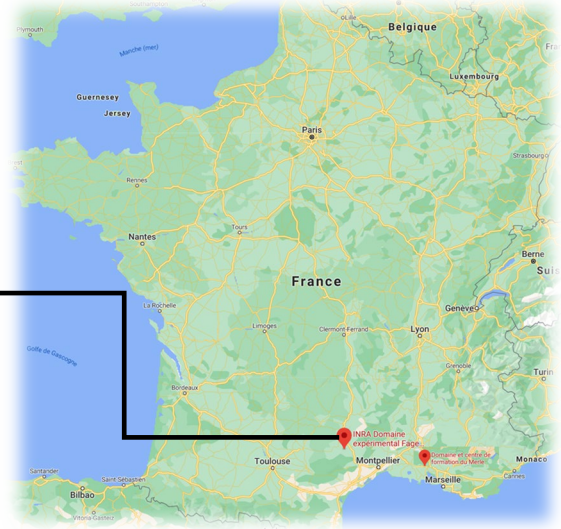
# Objective

- To **evaluate the feasibility** of the **long-term use** of the WoW with the **whole flock**
- To establish a fine (daily) **individual monitoring** of the **LW progress** of all females during one sensitive full physiological stage period (e.g. **full pregnancy**)



# Materials and methods

- *Location*: The trial was carried out in the **rangeland of *La Fage*** INRAE experimental farm (43°54'54.52''N; 3°05'38.11''E; https://uef.isc.inrae.fr/)
- *Animals*: **all reproductive females** from the *Romane* meat flock was used




- **Extensive** (fully **outdoor**, «Caussse du Larzac» rangeland)
- Highly **prolific** breed; **natural suckling** system

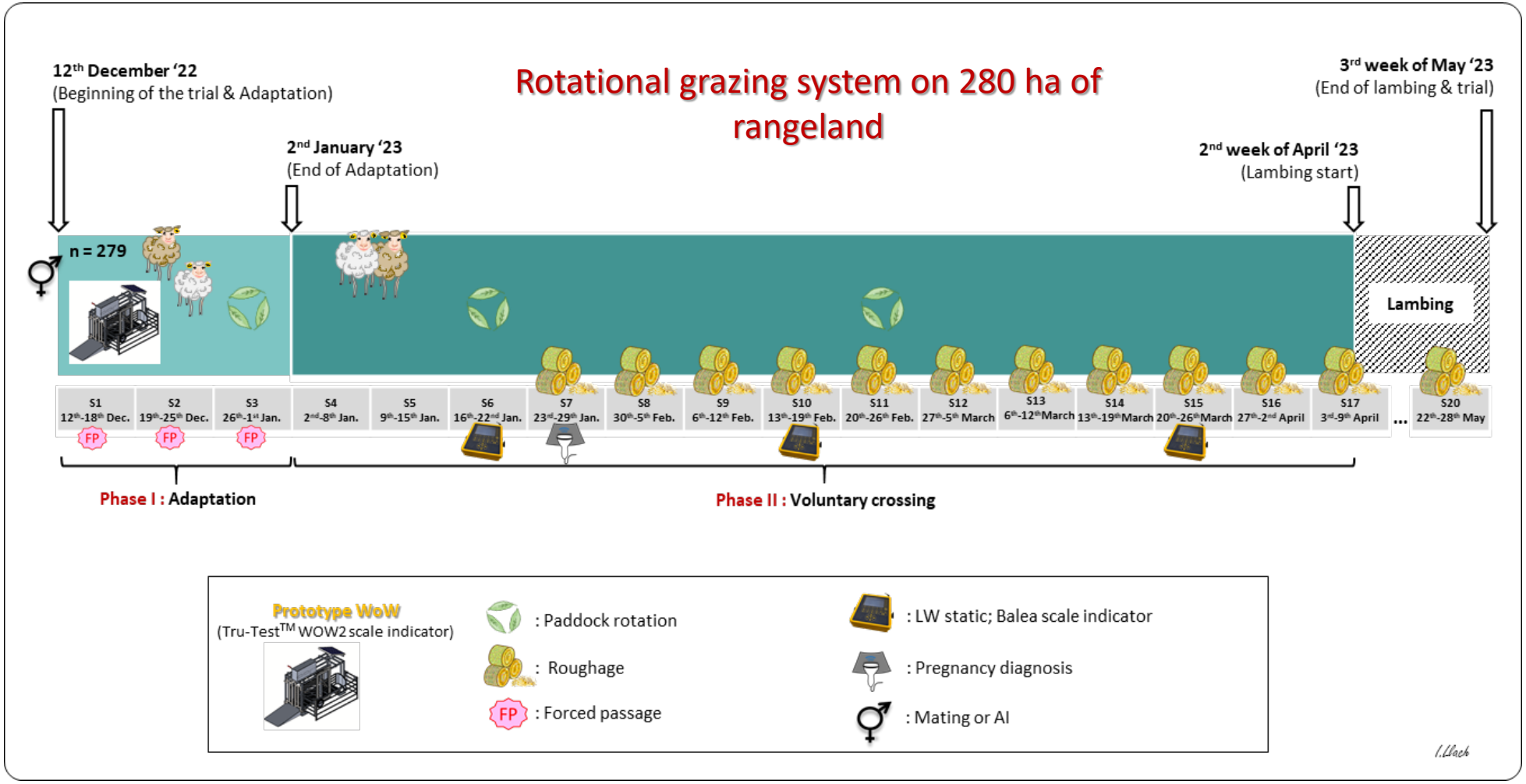
→ Including 279 ewes (77 primiparous, **PRIM** and 202 multiparous, **MULT**) of 1.6 and 4.4 years old and weighing 45.1 (±4.8 kg) and 53.1 (±8.9 kg), respectively

| | PRIM | MULT | TOTAL |
|---|---|---|---|
| ***Number of ewes*** | *77* | *202* | *279* |
| **Average age** (y; mo) | 1.6 (±0.0) | 4.4 (±1.2) | 3.6 (±1.6) |
| **Average LW** (kg) | 45.1 (±4.80) | 56.3 (±8.09) | 53.1 (±8.90) |

# Materials and methods

*Period*:
During one **full pregnancy** (from early pregnancy – December- to lambing – May-)

*Experimental schedule*:
**Two** successive **periods** (**Adaptation** –two weeks - and **Voluntary crossing** – until late April)



# Materials and methods

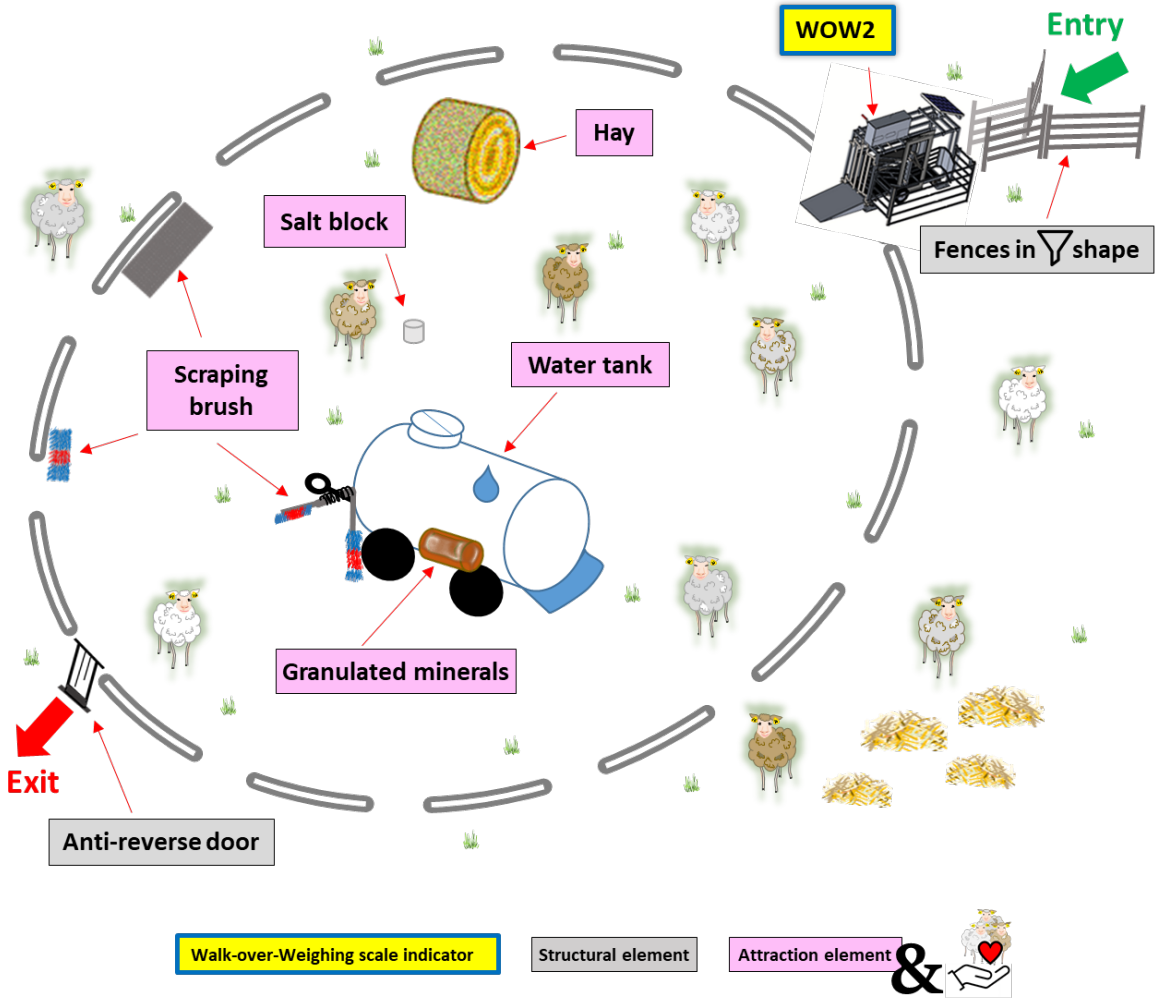
*Pregnancy diagnosis*:

- Performed (*Easi-Scan Linear* portable scanner) at **middle** of the pregnancy (January 25th; ~72 ± 8 d)
- To determine **success** (ewes empty), litter **size**, to detect **anomalies**

# Materials and methods

*Monitored variables*:

- Flock:
  - **Litter size** at mid-pregnancy and at lambing
  - Lamb **sex** at lambing
  - Individual **LW progress** of ewes (with the WoW)
- **Long-term feasibility** of using the WoW in routine with the full flock
  - % ewes crossing voluntary the platform
  - Reliability of daily, individual LW data collected



# Materials and methods

***Data processing***:

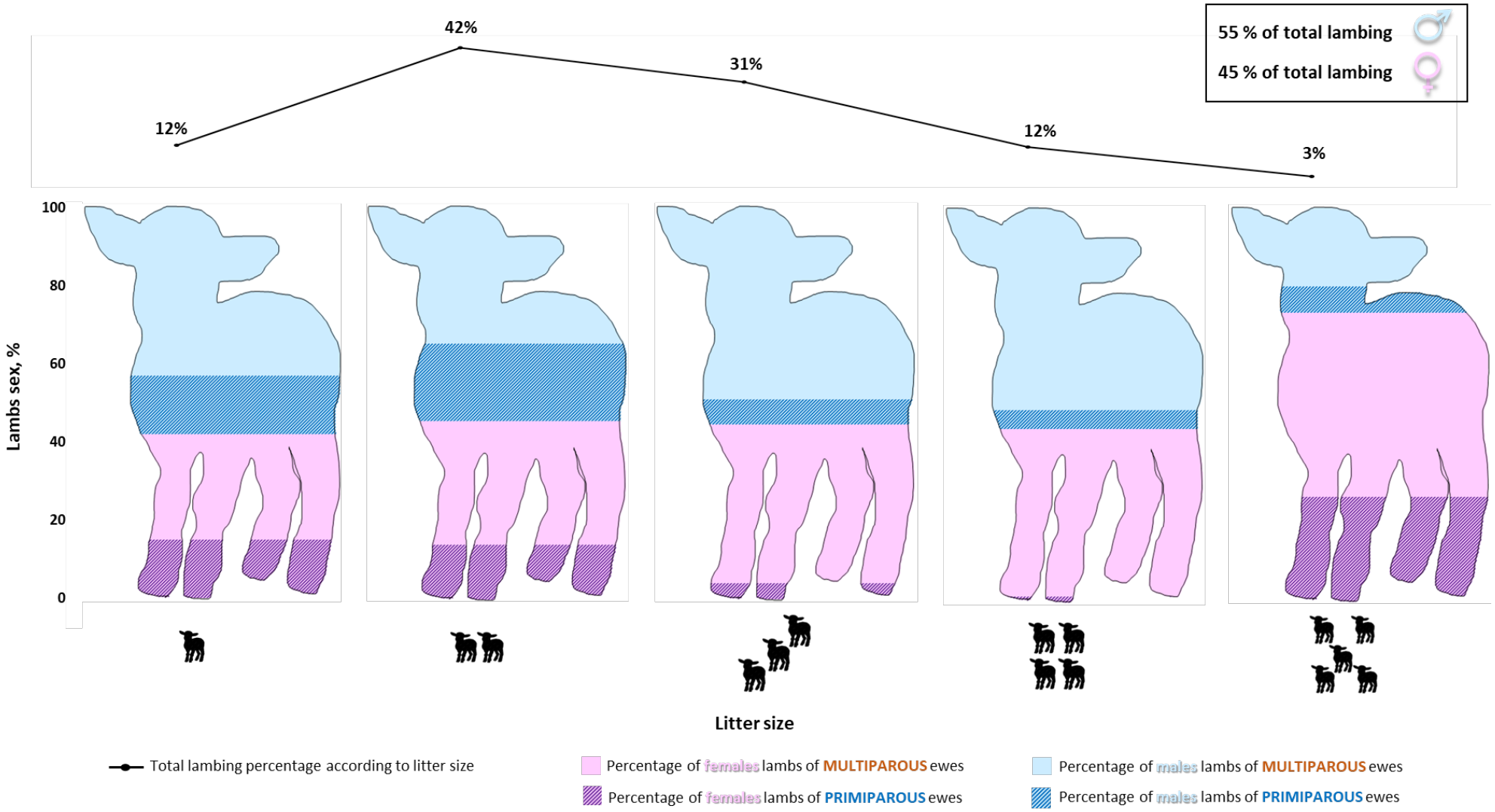
- Raw dataset **outliers** were automatically **filtered** by using our free **web app ORIOLE** (https://oriole.sk8.inrae.fr/)
  - The **final** (clean) **dataset** was **contrasted** with other **relevant** individual **information available** *e.g.* pregnancy diagnosis, litter size, lamb sex at lambing

**R-Shiny** (Automatic filtering outliers from raw database): **ORIOLE**: a web application for the automatic filtering of outliers was built and is online (https://oriole.sk8.inrae.fr/)

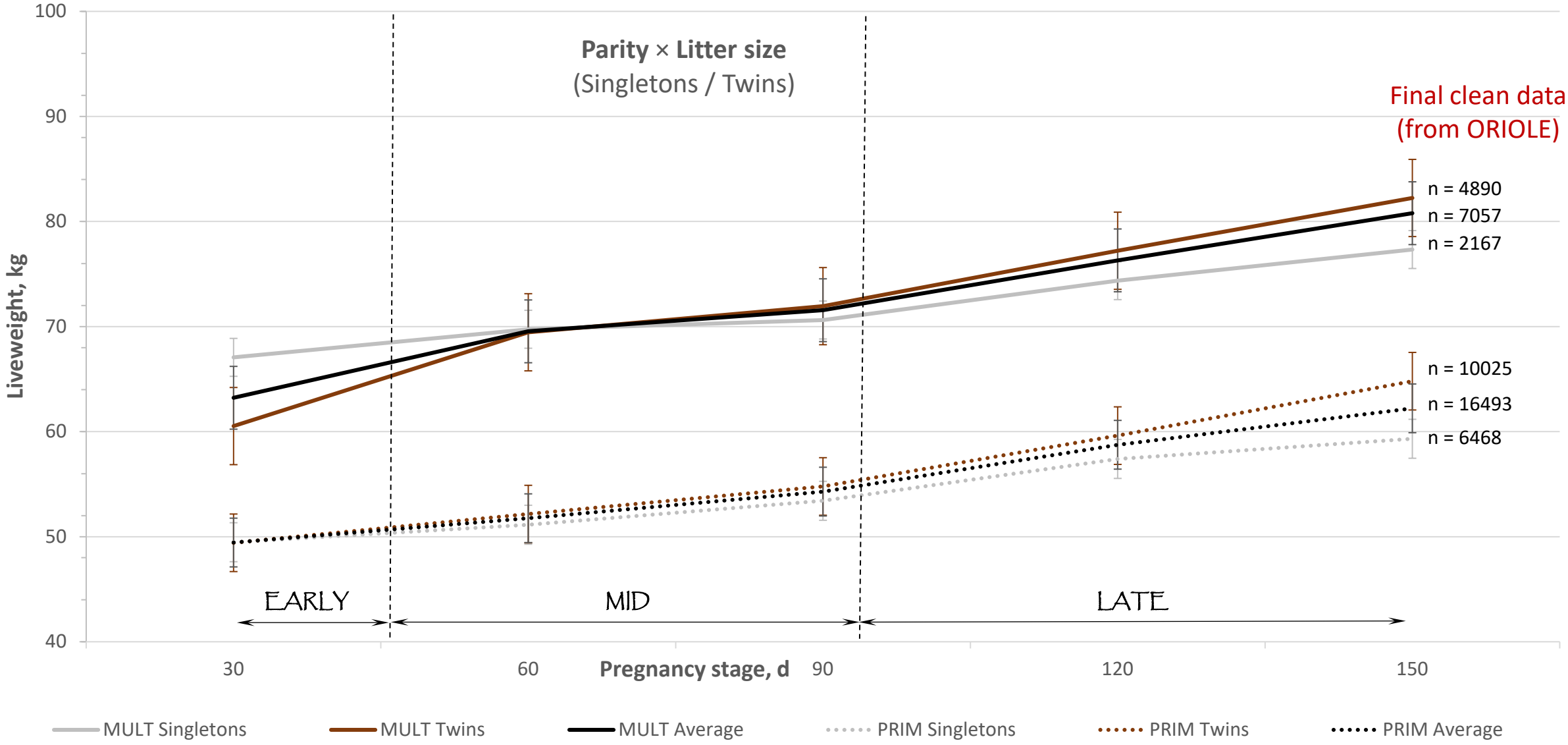
# Results: Pregnancy features (diagnosed *vs.* actual litter size at lambing)

| Item | Numbers of ewes | % of total ewes | Numbers of ewes | % as expected<br>% Unexpected |
|---|---|---|---|---|
| **Correct** (LS = to predicted) | 203 | *73* | 213 | 76 |
| **Correct** (but aborted) | 2 | *1* | | |
| **Correct** (empty ewes) | 8 | *3* | | |
| **Incorrect** (Lower LS than predicted) | 34 | *12* | 66 | 24 |
| **Incorrect** (Higher LS than predicted) | 23 | *8* | | |
| **Incorrect** (Diagnosed as empty, but LS= 1) | 1 | *0,4* | | |
| **Incorrect** (Diagnosed as empty, but LS= 2) | 5 | *2* | | |
| **Incorrect** (Diagnosed as empty, but LS= 3) | 3 | *1* | | |
| **Total of ewes** | **279** | ***100*** | **279** | |

# Results: Litter size and lamb sex, according to the ewes' parity

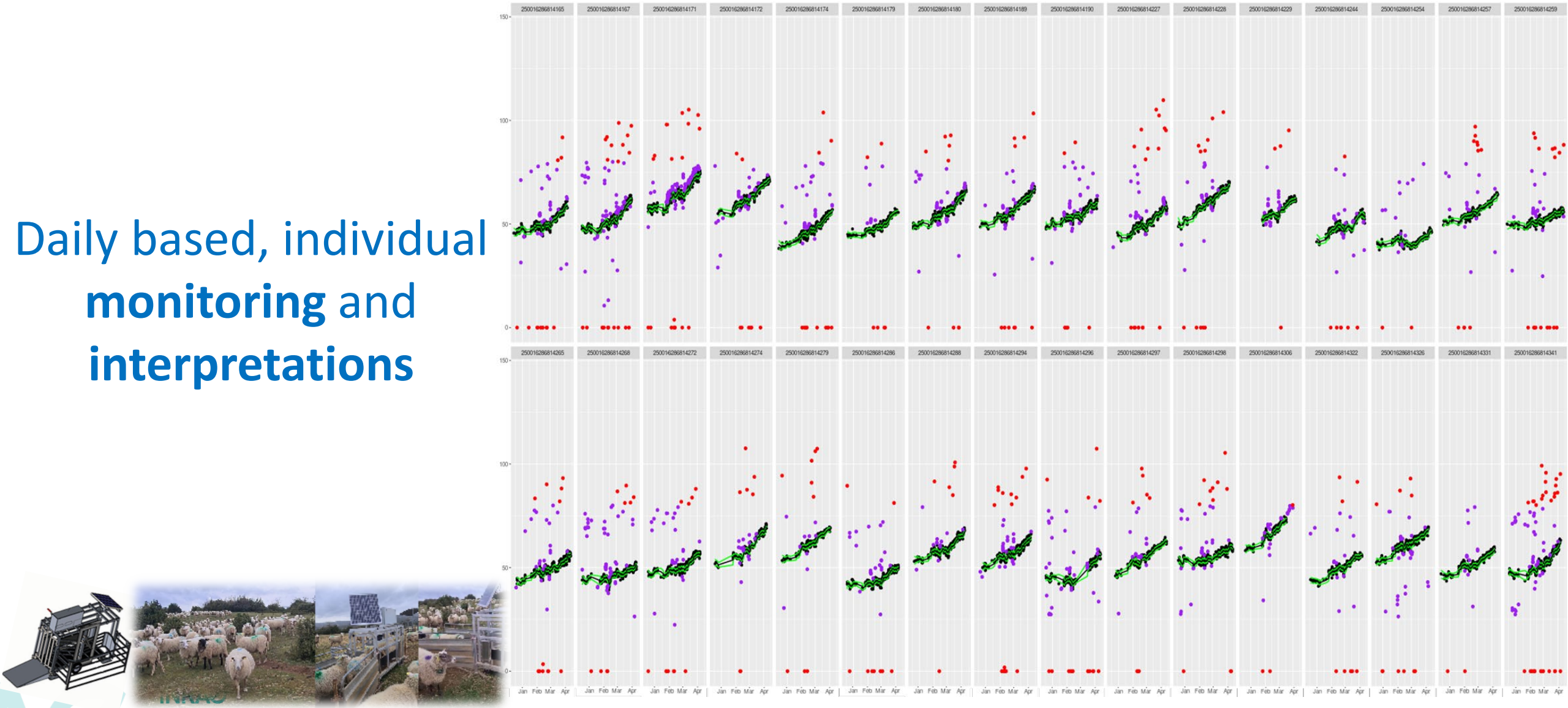


# Results: LW progress of PRIM & MULT ewes bearing SING or MULT litters



# Results: Individual LW progress of ewes (ORIOLE output)

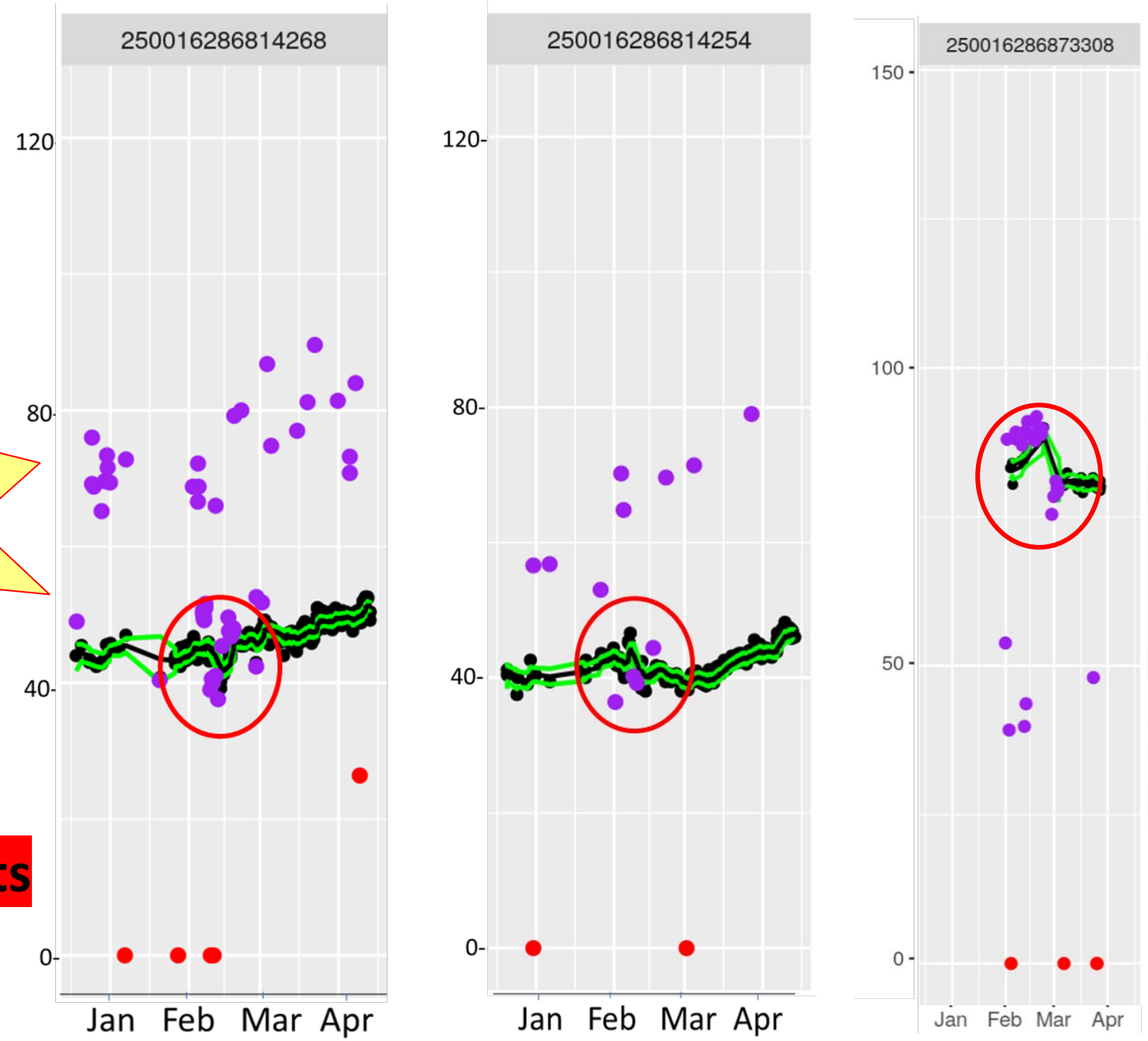
Daily based, individual **monitoring** and **interpretations**



# Results

**EWS** are now possible

**Abortion events**




# Conclusions

- ✓ Constant ewes' **LW progress** was **easily followed** by the WoW, making possible to detect anomalies *e.g.* abortions or individual presence/absence at a given precise date
- ✓ The infrastructure is **ideal for making further deep, physiological interpretations** such as fetus growth rate in function of litter size, lamb' sex, relationship with LW at lambing etc.
- ✓ Also, for contributing to the **development of early warning systems** helping to decision makings during such critical physiological stages in the farm and beyond
- ✓ The routine work still **in progress**, evaluating successive pregnancy periods and other physiological stages



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TECH CARE

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INRAE

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Thank you!!