



Novel Resilience traits to improve health and welfare (WP 2)

Task 2.2 Survival of foetus and young animals

IDELE, INRAE, SRUC, TEAGASC, RDF, CAPGENES, TEXELS

Final meeting, Toledo (Spain)
(22-23 May 2023)



> Lamb and kid survival - France (1/3)

Objective: analyse lamb and kid mortality rates

Animal resources :

Dairy goat: **8,267 kids** recorded from **4,506 kidding** (2 breeds, 6 commercial farms, measured during 2 to 4 years)

Dairy sheep : **33,827 lambs** recorded from **21,632 lambing** (3 breeds, 15 commercial farms, measured during 3 years)

Meat sheep : **9,857 lambs** recorded from **6,015 lambing** (3 breeds, 16 commercial farms, measured during 1 to 4 years)

Key results: ➤ Dairy goat: **6.59% of perinatal mortality** (stillbirth + mortality in the 12 first hours)

➤ Dairy sheep: **4.98% of stillbirth mortality**

➤ Meat sheep: **6.59% of mortality** (stillbirth + mortality in the 20 first days)

➤ Variability depending on :

- **breed** (DG from 3.99% to 14.98%; DS from 3.89% to 5.14%; MS from 4.01 to 5.35%)

- **litter size** (DG from LS1: 4.67% to LS4 and +: 20.42%, DS from LS1:4.54% to 15.99%, MS from LS1 2.90% to 10.11%)

- **flock** (DG from 2.41% to 10.71%; DS from 2.67% to 7.08%; MS from 1.11 to 12.03%)

Novelty : ➤ description of young mortality rate in commercial farms with a large number of animals

➤ difficulties/limits to record exhaustive mortality data

Recommendations for UE: selection may be studied as a potential strategy to improve survival of young animals

> Lamb survival - Ireland (2/3)

Objective: Estimate genetic (co)variances for lamb survival based on alternative trait definitions that considered differences in mating type (commercial v pedigree) and litter size (single v multiples)

Animal resources : 53,654 lamb survival records from 20,135 lambing events (6 breeds, 391 commercial & pedigree flocks, measured from 2011 to 2016)

Key results:

- Mean incidence of **perinatal mortality 10.7%** (ranged from 7.52% (commercial) to 11.80% (purebred))
- **Direct heritability 2%** (ranged from 1% purebred to 9% commercial)
- **Maternal heritability 1%**
- Genetic correlation for mortality between:
 - singleton and multiple litters 0.44
 - Commercial and purebred litter 0.05

Novelty : ➤ first description of genetic variance for mortality by litter size or mating type
➤ significant re-ranking between environments was detected for lamb mortality (across different mating types and litter sizes)

Recommendations for UE: genetic selection is one potential strategy to improve lamb survival

➤ Lamb survival linked to ewe performance - UK (3/3)

Objective : Assess genetic parameters for foetal and lamb loss, lambs reared and pregnancy scan with ewe body condition score and their changes across reproductive cycle.

Animal resources : **8,335** Scottish Blackface ewes and 14K – 25K records / trait [UK, 2 experimental farms] (**linked to D 2.4**)

Key results:

Traits	H ²
Foetal loss (pregnancy scan to lambing)	9%
Lamb loss (birth-weaning)	2%
Lambs weaned	6%
Pregnancy scan result	9%

Permanent environment (dam) effects
0 – 6%

- Novelty:**
- New understanding of genetic determinism of foetal loss.
 - New study assessing links between lifetime performance as assessed by body condition score and their changes linked to foetal and lamb survival to weaning.
 - Genetic parameters reported for lifetime mobilisation of body tissue linked to lambing success.

Recommendations for EU: **Routine assessment of ewe body condition score may be a potential strategy to improve ewe resilience and enhance foetal and lamb survival in extensive systems .**
→ **Over-fat animals conceive and have fewer lambs during their lifetime.**

TASK 2.2: Survival of foetus and young animals

> Lamb vigour (France) (1/2)

Objective: analyse lamb vigour and relationships with lamb survival (Meat sheep)

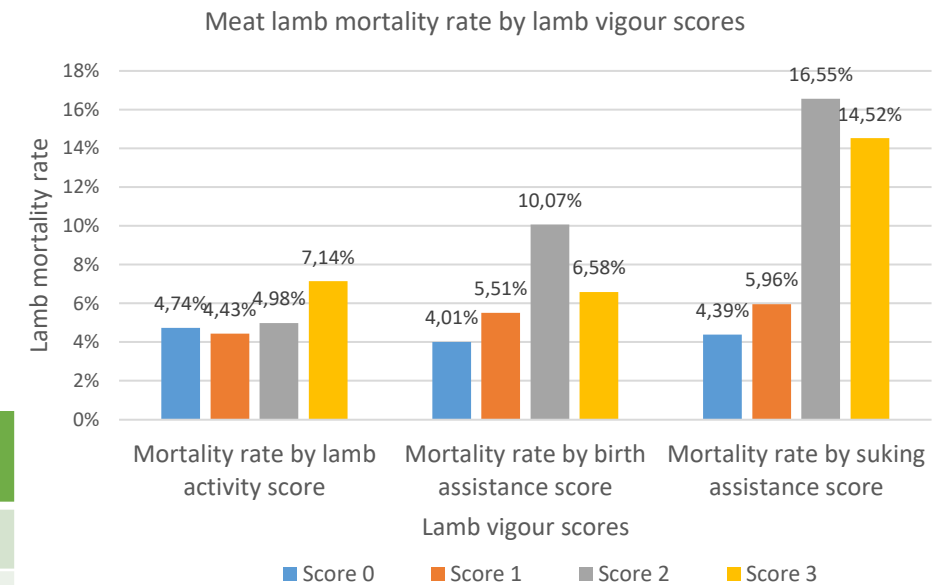
Animal resources :

- **9,800 lambs** recorded for birth assist, lamb activity at birth and suckling assist [8,678 with a birth weight; 16 commercial farms, measured during 4 years (from 1 to 4)]
- **3 breeds** (Blanche Massif Central, Mouton Vendéen, Rouge de l'Ouest)
- Each trait recorded on a **4-level grid from 0 to 3** (favourable to unfavourable)

Key results:

- Frequencies of lamb vigour traits varied between breeds
- Mortality increased with unfavourable scores

	Easy birth	Active lambs	Easy suckling	Birth weight
BMC	93.40%	98.99%	97.05%	4.71kg ±0.98
VDN	96.27%	88.10%	99.32%	4.17kg ±0.95
RO	98.36%	98.02%	98.34%	4.31kg ±1.05



Novelty : ➤ description of lamb vigour traits in commercial farms

TASK 2.2: Survival of foetus and young animals

> Lamb vigour(Ireland) (2/2)

Objective: estimate genetic (co)variance for novel lambing traits (lamb vigour and mothering ability)

Animal resources : **58,161 lamb** vigour recordings (and other lambing traits) [701 flocks, measured from 2018 to 2022]

Key results:

Score	Description	Lamb vigour	Mothering ability
1	Very poor	2.02	0.90
2	Poor	1.72	1.82
3	Average	12.47	10.99
4	Good	39.99	36.05
5	Very good	43.80	50.24

Heritability

Lamb Vigour:

Direct = 12%; Maternal = 3%

Mothering ability:

Direct= 7%

- Novelty :**
- Genetic parameters for novel lambing traits
 - Both traits included in the Irish national genetic evaluations in 2023

Recommendations for UE: **Novel vigour and lambing traits can help improve genetic selection on lamb mortality, increase animal welfare and reduce labour inputs**

➤ Lethal mutations - France

Objective: search for homozygous haplotype deficiency (HHD) by reverse genetic screening and identification of associated recessive deleterious/lethal mutations in French dairy sheep and goat.

Animal resources : 48,729 dairy sheep (Lacaune, Manech Tête Rousse, Manech Tête Noire, Basco-Béarnaise, Corse) and 7,028 dairy goats (Alpine, Saanen) genotyped in the framework of genomic selection.

Key results:

- 15 independent HHD in 3 different sheep breeds (LAC, MTR, BB).
- 12 candidate mutations identified by whole genome sequencing of heterozygous HHD carriers.
- 3 proven as lethal mutations.

Novelty:

- Loss-of-function mutation in *CCDC65* leading to respiratory distress and lamb mortality before weaning.
- Loss-of-function mutation in *MMUT* leading to metabolic default and lamb mortality in the first 24H after birth.
- Loss-of-function mutation in *SLC33A1* leading to embryonic loss and lamb mortality in the first 5 days after birth.

Recommendations for EU: **identification of recessive lethal mutations and their management in selection schemes to improve fertility and lamb welfare and survival.**

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Thank you for your attention

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