# *DEVELOPMENT AND VALIDATION OF ANIMAL-BASED WELFARE INDICATORS FOR A PRECISION LIVESTOCK FARMING APPROACH TO IMPROVING THE WELFARE OF SMALL RUMINANTS*

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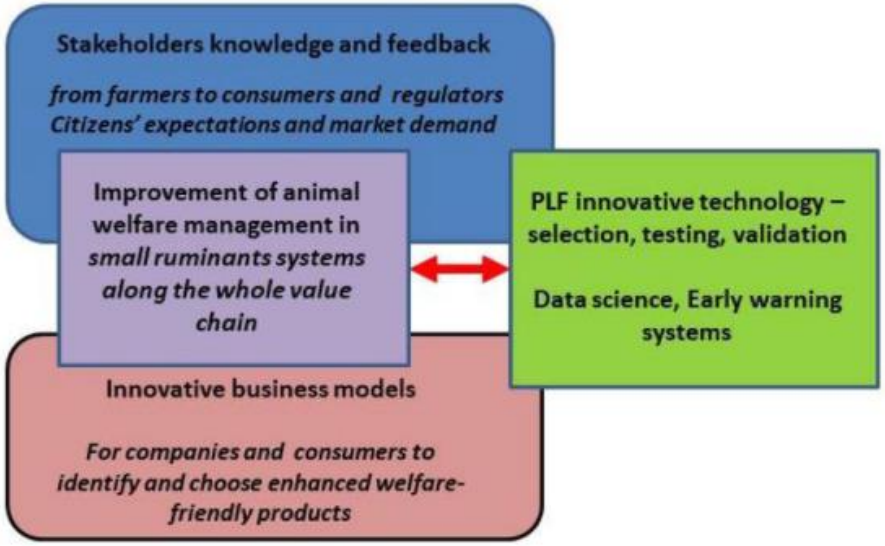
# Context




- 2 PhD's funded by TechCare
- Aimee Walker working on "*Adopting Precision Livestock Farming Technologies to Improve Small Ruminant Management and Welfare in Grazing Systems*"
- UK extensive meat sheep farming systems

# Research Objectives

Overarching objective:

to identify animal-based welfare indicators that can be measured by PLF technology

To identify early behavioural differences between diseased sheep and healthy sheep

To identify at which point in the development of the disease the behavioural change occurs

To test whether these behavioural differences can act as early indicators of disease that can be measured by PLF technology.

# Background

- Sheep in extensive conditions face unique challenges

- Welfare risks include:
  - Prolonged hunger
  - Pain due to management procedures
  - Neonatal disorders
  - Disease: lameness, parasitism, mastitis (EFSA, 2014)

- How do we monitor and assess these risks?

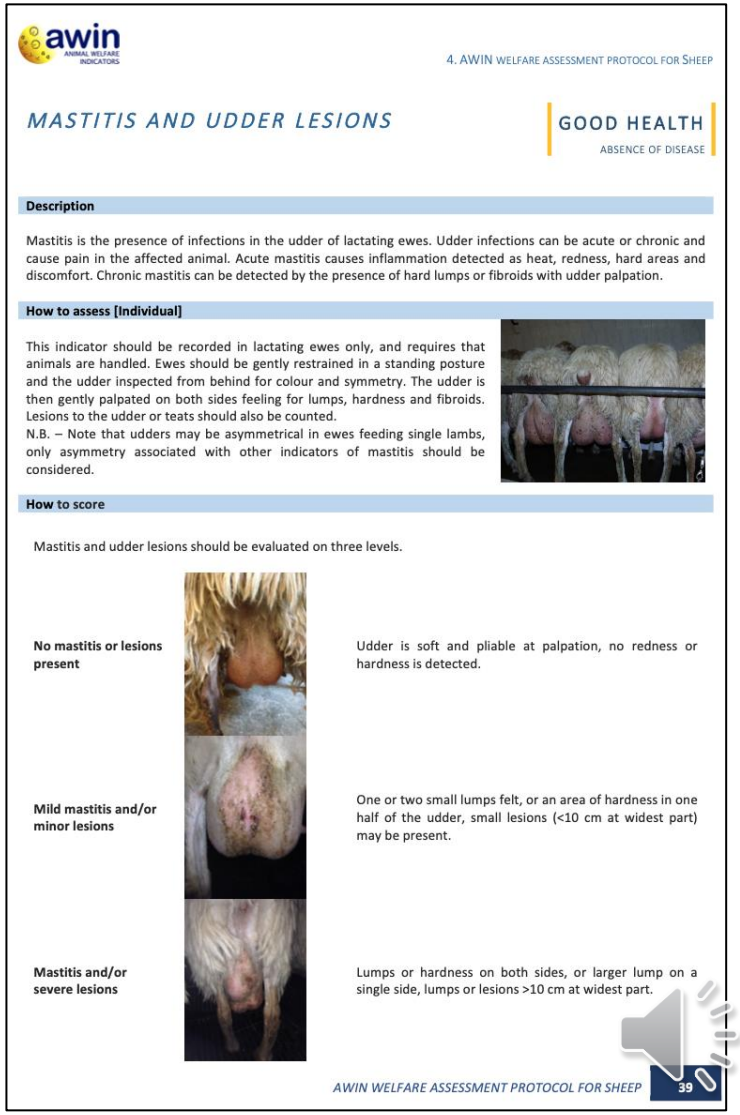
# Welfare Indicators

- Resource-based/input-based,
  - Ex: food and water availability, bedding.
- They are valid factors that contribute to welfare, but they offer limited information
- High variability of environment that sheep are kept in make them impractical

| STANDARDS | HOW YOU WILL BE MEASURED |
|---|---|
| **AIM: Safe, comfortable and hygienic housing for all livestock, including youngstock and those close to giving birth** | |
| HF.a<br>**Housing must be constructed and maintained to provide a safe and secure environment for livestock (Revised)** | ■ Housing secure to prevent straying/ escape<br>■ No sharp edges, projections or other hazards<br>■ Electrical installations inaccessible to livestock |
| HF.b<br>**Housing must be appropriately and effectively ventilated** | ■ Well ventilated housing (minimal high humidity, no build-up of odours and a comfortable temperature)<br>■ Livestock not indicating signs of heat stress or exposed to draughts/ extreme cold |

# Animal-based measures (ABMs)

- Ex: Fleece quality, lameness
- Inform us on the effect of the resources available
- Tell us about the welfare state of the animal
- Valid and robust (EFSA, 2012)
- AWIN developed a list of ABMs for sheep in their welfare assessment protocol



awin ANIMAL WELFARE INDICATORS

4. AWIN WELFARE ASSESSMENT PROTOCOL FOR SHEEP

MASTITIS AND UDDER LESIONS

GOOD HEALTH
ABSENCE OF DISEASE

**Description**

Mastitis is the presence of infections in the udder of lactating ewes. Udder infections can be acute or chronic and cause pain in the affected animal. Acute mastitis causes inflammation detected as heat, redness, hard areas and discomfort. Chronic mastitis can be detected by the presence of hard lumps or fibroids with udder palpation.

**How to assess [Individual]**

This indicator should be recorded in lactating ewes only, and requires that animals are handled. Ewes should be gently restrained in a standing posture and the udder inspected from behind for colour and symmetry. The udder is then gently palpated on both sides feeling for lumps, hardness and fibroids. Lesions to the udder or teats should also be counted.
N.B. – Note that udders may be asymmetrical in ewes feeding single lambs, only asymmetry associated with other indicators of mastitis should be considered.

**How to score**

Mastitis and udder lesions should be evaluated on three levels.

| | | |
|---|---|---|
| **No mastitis or lesions present** | | Udder is soft and pliable at palpation, no redness or hardness is detected. |
| **Mild mastitis and/or minor lesions** | | One or two small lumps felt, or an area of hardness in one half of the udder, small lesions (<10 cm at widest part) may be present. |
| **Mastitis and/or severe lesions** | | Lumps or hardness on both sides, or larger lump on a single side, lumps or lesions >10 cm at widest part. |

AWIN WELFARE ASSESSMENT PROTOCOL FOR SHEEP 39

# Precision Livestock Farming

Def: the management of livestock production using the principles and technology of process engineering (Wathes et al. 2008)

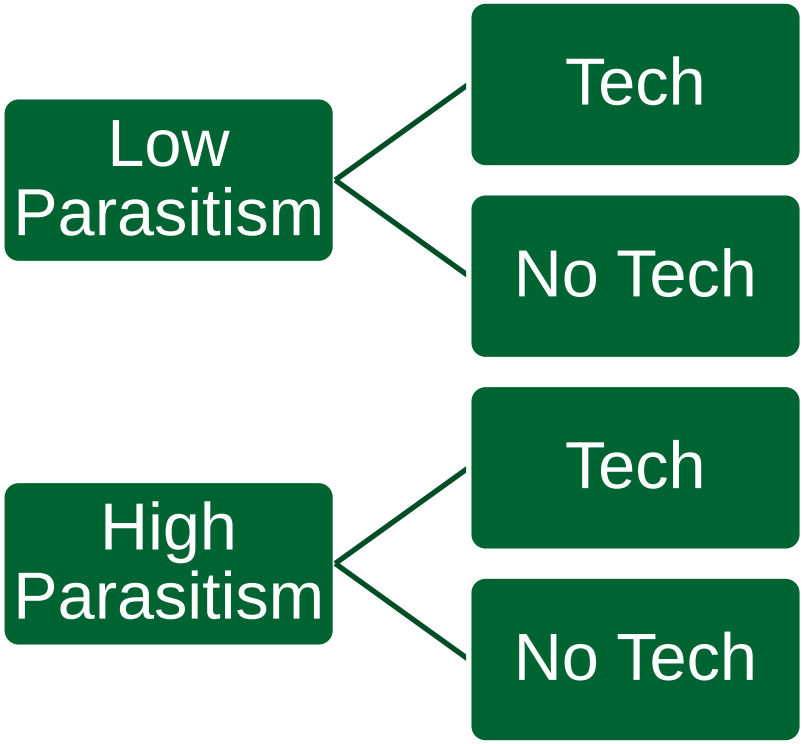
- Studies using PLF for ruminant health have spiked since 2015.
- There is still a lack of commercially available products for sheep producers
- Opportunities to centre innovation around welfare

Barwick et al. 2018

# Firth Mains Study

- Ewes and lambs facing natural GI parasite infection on pasture while wearing PLF technology
- Hypotheses:
  - Differences in ABMs arise between infected and non-infected sheep over the course of natural infection
  - Accelerometer and proximity logger data will reflect behavioural differences

# Experimental Design




- 24 ewes, 48 lambs
- Behavioural observations during Nematodirus and Strongyle parasitism peaks
- Gathered and sampled every two weeks

# Behavioural observations

- Scan sampling
  - Behaviour,
  - L-E & L-L distance
  - Ewe nearest neighbour
  - Lameness

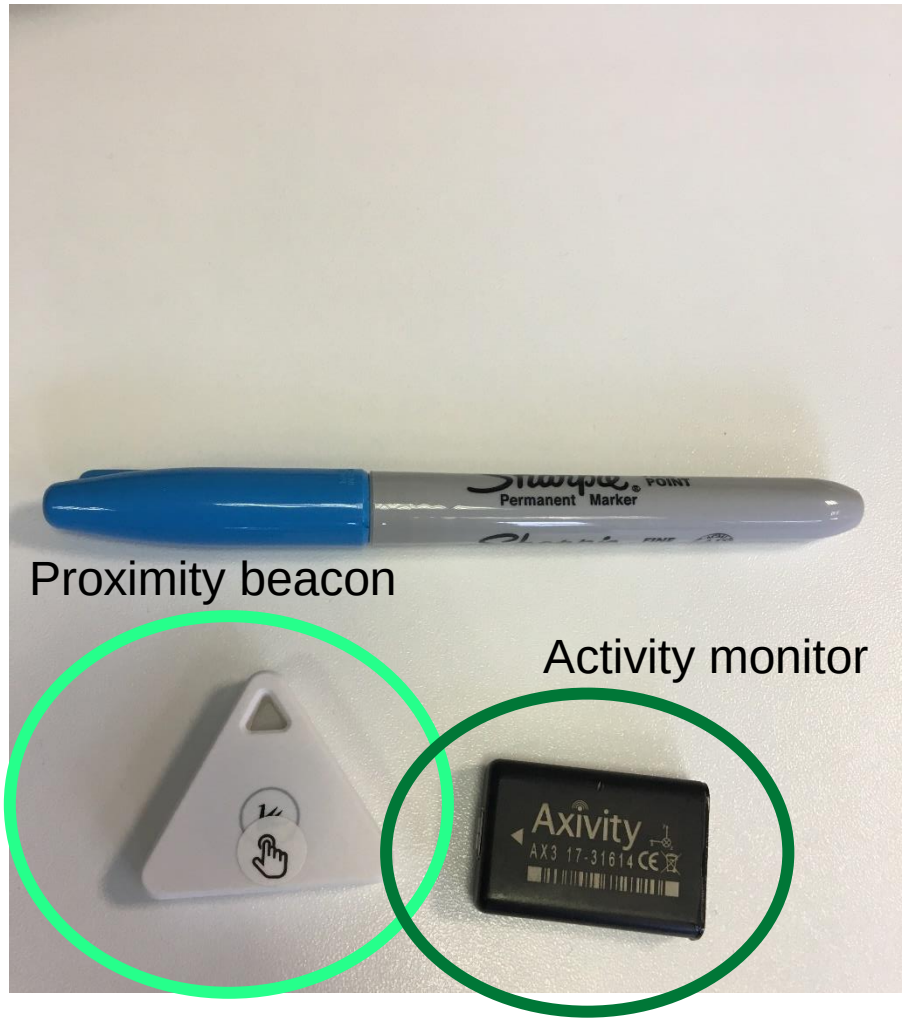
- Behaviour sampling
  - Social play
  - Locomotor play
  - Sucking events

- Qualitative Behaviour Assessment

# Sampling and scoring

- Gathered fortnightly
- BCS, weight, mastitis score, faecal soiling score
- Direct faecal sample, Venal blood sample
- Dosing with Oramec
- FECs performed within 48 hours at MRI

# PLF Technology in the study

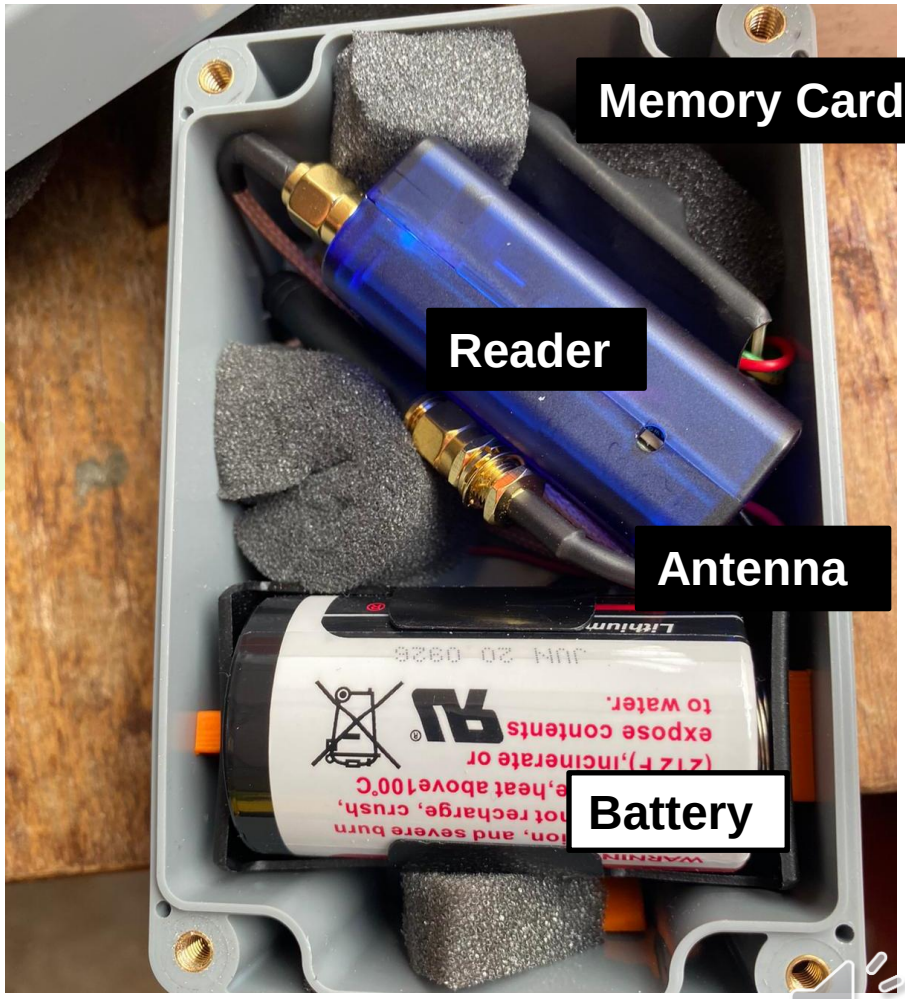



- Ewe collars
- Lamb collars
- Custom made
- Fixed readers on fenceposts

# Ewe collars

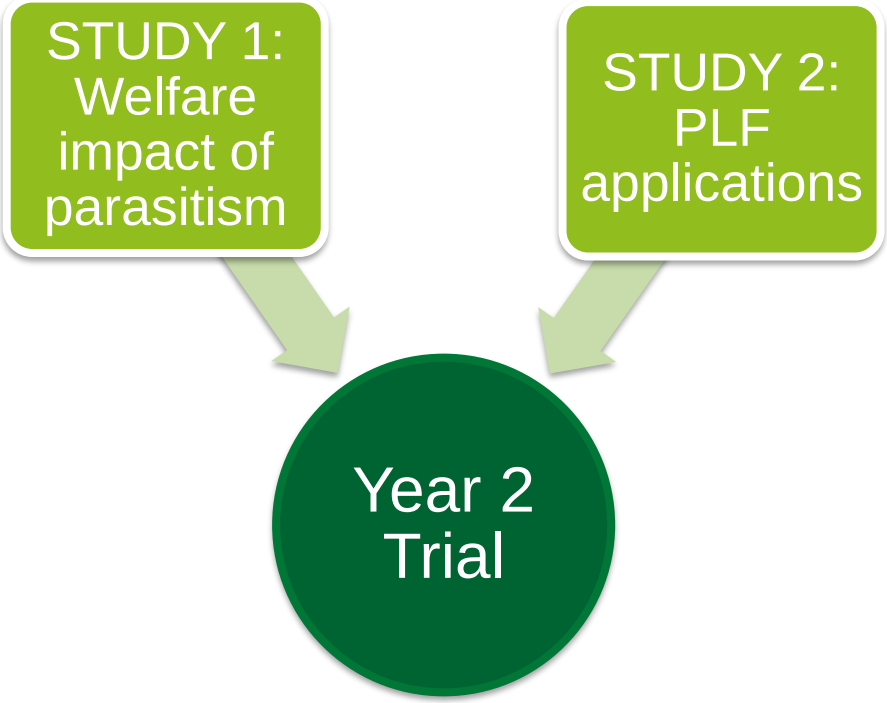
# Lamb collars


# Fixed readers



# Next Steps

- Second observation phase
- Data analysis
- Planning next study

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