Texels n' Technology! How can PLF tools be implemented in meat sheep farming?

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Background & Aims

- Precision Livestock Farming (PLF) tools have been implemented **to improve production, health and welfare** in livestock farming
- TechCare aims to explore different technologies which could be implemented on commercial small ruminant farms
- Welfare concerns in meat sheep were identified as: GI parasitism, mastitis, lameness, nutritional issues and ectoparasitism

Trials

- **50%** of sheep in each trial were wearing "wearable tech" including accelerometers, proximity loggers, and GPS units

2021 & 2022, May to October:

36 ewes + **72** twin lambs

Lamb wearing the "wearable tech collars"

Sheep in the field wearing technology collar (black) and proximity logger (red)

Data collated:

- Clinical data including **FEC**, and **somatic cell counts** on ewes
- **Behavioural** observations
- Welfare assessments/indicators including **mastitis**, **dag**, **lameness** and **body condition** scores

What PLF tools are being tested?

- **Electronical Weigh head/crate**
  - Allows digital collection, monitoring and sharing of weight data from sheep on farm.

- **EID reader**
  - Connected to the electronic weigh head via **Bluetooth**, allows the reading of electronic ID ear tags on sheep.

- **AX3 accelerometers**
  - Collects acceleration data (metres squares per second) 12 x per second at three different dimensions. Allows the identification of "movement" of sheep. ***Much like a fitbit!***

- **Proximity loggers (BLE)**
  - Log the proximity of the sheep to a **gateway**, allows estimation of sheep location at timed intervals.
- **GPS loggers (Igot-U)**
  - Using GPS technology, these allow the **exact** GPS location of sheep in the field to be logged.

Results so far...

- Initial analysis of the weight data collected from ewes and lambs in 2021 and 2022 has been conducted (Figure 1).
- Additional network modelling has been conducted to look for correlations in weight, clinical and welfare assessment data (Figure 2).

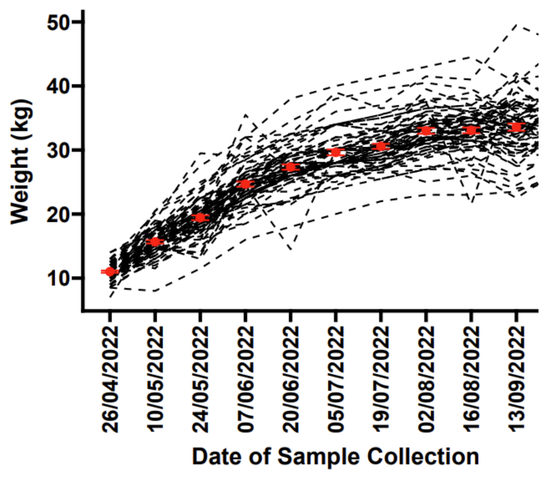

Figure 1. Weight (kg) of lambs (n=72) during the 2022 TechCare trial. *Actual weight shows the weights of the sheep collected by the electronic weigh head over the 3-month trial. The red points show the average weight at each time point +/- se (standard error).*

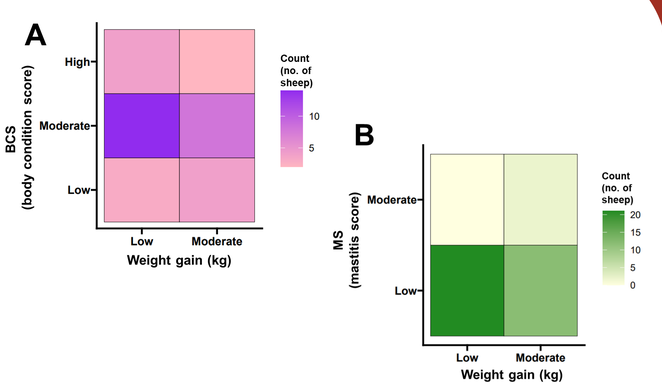

Figure 2. Network modelling of welfare indicators and weight gain in ewes (kg). *The colour of each group is indicative of the number of sheep which fit into each category. (A) The relationship between weight gain and Body Condition Score, (B) The relationship between weight gain and Mastitis Score.*

- Initial analysis of *Axivity accelerometer* data has commenced, analysing "mean acceleration (Mili-G)" at 1-minute epochs (averages) over specified time-points (Figure 3).

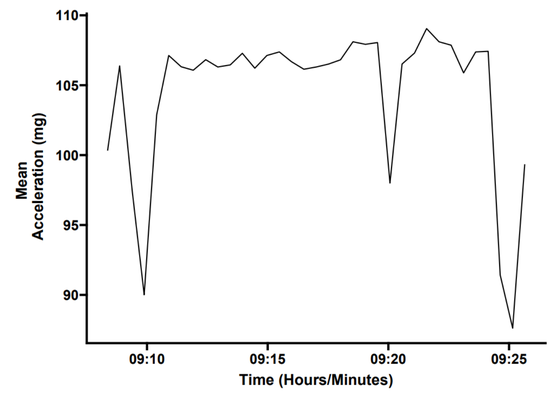

Figure 3. Mean acceleration (Mili-G) of one sheep over a 20-minute period.

- Future work: use visual observations and machine learning to better understand "active" and "inactive" (random forest modelling)

What next?

- Analysis of **individual** weight data **around times of welfare issues to**, to **determine if EID and weight changes can act as an early warning system of welfare challenges**.
- Validation study of the AX3 accelerometers to allow **behavioural observations** to be identified
  - This will include the use of **machine learning** algorithms (random forests) to identify which "movements" are indicative of different behaviours
- Use of AX3 accelerometers to **identify behaviours** such as **itching** in response to sheep scab infestation (ectoparasites)
- **2024** field trial = use of AX3 accelerometers, GPS loggers and proximity loggers **and** weight, clinical and welfare signs

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