OVERVIEW AND HYPOTHESES

CORE REMIT

The core remit of the platform is the comparison of treatments using a farm systems approach. The core hypothesis reflects this via the calculation of "sustainability metrics" that can accurately predict the long-term performance of each treatment - economically, environmentally and socially.

Metrics are directly calculated from the platform's fine resolution data collections; and are carefully chosen to be transferrable to other farming systems, across the UK and the world. In this way, outputs from the platform directly influence sustainable land use both nationally and internationally.

A critical over-arching challenge concerns approaches for reliably detecting the impacts of the treatments per se, in the context of natural hydro-climatic variability and inherent limitations of the platform design itself. The acknowledgment of spatio-temporal effects in the system is critical, either advancing science through a direct understanding of such dynamic processes or determining a *sufficient* observational scale so that a given hypothesis can be reliably tested, independent of such effects. Static spatial confounders also exert an influence, such as topography, soil class, and the physical layout of the fields.

PAST, CURRENT AND PLANNED TREATMENTS

The platform currently consists of three pasture-based livestock farming systems, each consisting of five component catchments over 21 ha. Catchments comprise single or multiple fields, that are heavily monitored to provide fine resolution data on all inputs, outputs and events.

The timeline of each system's treatment are as follows:

- **From April 2011 to March 2013**, all three pasture-based livestock farming systems were as one (permanent pasture) with no separate treatments in operation. This is the baseline period.

- **From April 2013 to September 2015**, two of three systems gradually transitioned into the first post-baseline phase, one re-sown with high sugar grasses (red system), the other re-sown with high sugar grass, white clover mix (blue system). The remaining (green) system continued as permanent pasture and will always do so, for long-term monitoring.

- **From September 2015 to April 2019**, the first post-baseline phase is in full operation across all three livestock farming systems and pasture treatments.

- **From April 2019**, the first post-baseline phase will embark on a transition to a second post-baseline phase, where the blue system transitions to a diverse multi-functional pasture, while the red system transitions to an arable system growing human edible crops. Given the red system will transition to an arable system, the livestock linked to this system will be housed representing a fourth (brown) system (or treatment) for evaluation of more intensive finishing and fine resolution monitoring.

SELECTED TREATMENT HYPOTHESES

Hypotheses associated with the baseline period include:

- Emissions to water under best practice lowland grazing farming will still exceed intrinsic losses as driven by soil type and slope.
- Emissions to water under best practice lowland grazing farming will still exceed some environmental thresholds for aquatic biology.
- Animal performance will be benchmarked within typical UK production levels (sheep and beef)

Hypotheses associated with the first post-baseline period include:

- The re-seeding of permanent grassland with varieties that increase C sequestration and improve animal nutrition provide more sustainable grassland systems.
- The use of clover in pasture-based livestock production offers a high-risk high-return option for both commercial producers and the natural environment.
- Re-seeding of permanent pasture will provide greater returns in terms of animal performance than permanent pasture and in concert, reduce emission intensity.

Hypotheses associated with the second post-baseline period include:

- In agro-ecological zones where the geographical environment does not suit human-edible crop production, farming systems without livestock are unsustainable - economically, environmentally and socially.
- Intensive housed finishing of cattle provides more sustainable outputs than extended grazing systems – economically, environmentally and socially.
- Multi-functional swards with no in-organic fertilisation can deliver comparable sustainable returns – economically, environmentally and socially.