



The North Wyke Farm Platform, a UK national capability for research into sustainability of temperate agricultural grassland management: progress and developments

Paul Harris, Jennifer Dungait, Bruce Griffith Griffith, Anita Shepherd, Hadewij Sint, Martin Blackwell, Laura Cardenas, Adrian Collins, Keith Goulding, Michael Lee, and Robert Orr

Rothamsted Research, North Wyke, Okehampton, Devon, EX20 2SB, UK paul.harris@rothamsted.ac.uk; jennifer.dungait@rothamsted.ac.uk; bruce.griffith@rothamsted.ac.uk; anita.shepherd@rothamsted.ac.uk; hadewij.sint@rothamsted.ac.uk; martin.blackwell@rothamsted.ac.uk; laura.cardenas@rothamsted.ac.uk; adrian.collins@rothamsted.ac.uk; keith.goulding@rothamsted.ac.uk; michael.lee@rothamsted.ac.uk; robert.orr@rothamsted.ac.uk

The North Wyke Farm Platform (NWFP) at Rothamsted Research in the South-West of England, is a large, farm-scale experiment for collaborative research, training and knowledge exchange in agro-environmental sciences; with the aim of addressing agricultural productivity and ecosystem responses to different management practices. The 63 ha NWFP site, captures the spatial and/or temporal data necessary to develop a better understanding of the dynamic processes and underlying mechanisms that can be used to model how agricultural grassland systems respond to different management inputs. Here, via beef and sheep production, the underlying principle is to manage each of three farmlets (each consisting of five man-made, hydrologically-isolated sub-catchments) in three contrasting ways: (i) improvement through use of mineral fertilizers; (ii) improvement through use of legumes; and (iii) improvement through innovation.

The connectivity between the timing and intensity of the different management operations, together with the transport of nutrients and potential pollutants from the NWFP is evaluated using various data collection and data modelling exercises. The primary data collection strategy involves the use of a ground-based, wireless sensor network, where in each of the fifteen sub-catchments, water characteristics such as flow, turbidity and chemistry are measured at a flume laboratory that captures the sub-catchment's water drainage (via a system of directed French drains). This sensor network also captures: precipitation, soil moisture and soil temperature data for each sub-catchment; greenhouse gas data across key subsets of the fifteen sub-catchments; and meteorological data (other than precipitation) at a single site only (representative of the NWFP site, as a whole).

Such high temporal resolution data sets (but with limited spatial resolution) are coupled with a secondary data collection strategy, for high spatial resolution data sets (but with limited temporal resolution). These latter data sets include (multi-spectral and hyper-spectral) remote sensing data, together with more traditional field studies that provide information on soils nutrients and biodiversity. Both the primary and secondary data collection strategies are complemented by a dedicated geodatabase for the geographical layout of the NWFP site that includes soil class and LiDAR data. All described data collections are relatable to farm field event and farm animal data sets, so that key research objectives can be met. We describe all such NWFP data sets and introduce some of the data modelling opportunities that are possible. All data sets will at some point be freely available to download from a dedicated web-site.