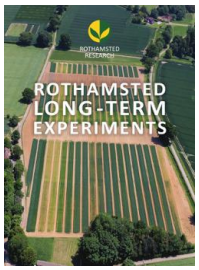
ROTHAMSTED RESEARCH

Guide to the Classical and Other Long-term Experiments, Datasets and Sample Archive



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Uk Environmental Change Network (Ecn)

Rothamsted Research

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the peach–potato aphid (which is responsible for the transmission of potato and sugar beet viruses), has helped us to facilitate optimal timing of control measures and avoid their unnecessary use. It also aids assessment of the likely impact of warmer winters on the flight phenology of this important pest. Data from light traps show that there is a long-term trend towards earlier flight times for some moths. Data from the Rothamsted estate also suggest that there was a big decline in moth populations during the 1950s. An analysis of the national RIS moth dataset also suggests a more recent decline in moth populations across the UK, particularly in southern Britain where declines are dramatic (Fox *et al*, 2013). An update of those trends is being prepared with Butterfly Conservation for the *State of Britain's Larger Moths* report due to be published in 2019 (https//insectsurvey.com/trends).

In 1999, a vertical looking insect radar (VLR) was installed at Rothamsted with a second one in operation at Chilbolton (Hampshire). These are operated by the Rothamsted Radar Entomology Unit in close collaboration with the RIS and are providing important additional long-term data on high-altitude insect behaviour.

UK ENVIRONMENTAL CHANGE NETWORK (ECN)

Rothamsted Research, at its research facilities in Harpenden, Hertfordshire (ECN Rothamsted) and North Wyke, Devon (ECN North Wyke), has been part of the Environmental Change Network (ECN) since its inception in 1992. It manages two of the eleven terrestrial sites (twelve initially) that constitute the ECN. The ECN is supported by fourteen independent government departments and agencies and was established to identify, assess and research environmental change nationally, and provide a basis for European and international collaboration. Its specific objectives are:

- To maintain a selected set of terrestrial and freshwater sites within the UK from which comparable long-term datasets are obtained by means of measurement, at regular intervals, of variables identified as being of major environmental importance.
- To compile, validate and archive datasets for use in identifying environmental change and develop an improved understanding of the causes of change.
- To make these long-term datasets available to researchers.
- To provide, for research purposes, a range of representative sites where there is good instrumentation and reliable information.

All of the ECN sites have well defined monitoring areas but within each there is a designated Target Sampling Site (TSS). At ECN Rothamsted, monitoring is done across the whole of the farm, but focusses on the Park Grass experiment (the designated TSS),

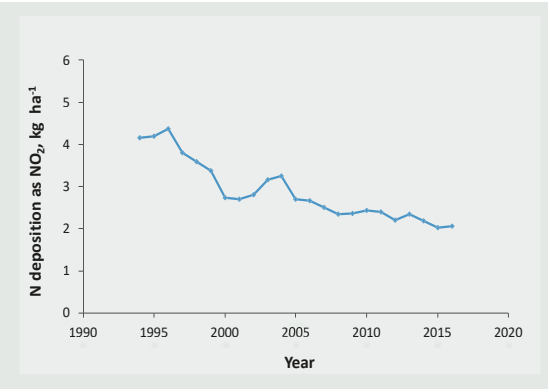

Fig. 17 Rothamsted; mean annual N deposition as NO_2 at Rothamsted Meteorological Station, 1994-2016.

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especially on Plot 3d which has received no fertiliser inputs since the experiment was established in 1856. At North Wyke, the ECN monitoring is split between two areas, the Farm Platform (Figure 18) and Rowden Moor. The North Wyke TSS is a 0.66 ha paddock of permanent grassland on Rowden Moor where no nitrogen fertiliser has been applied since 1984.

The ECN uses well defined and agreed protocols (Sykes *et al*., 1996) for the sampling, measurement and analyses of key physical, chemical and biological variables, indicative of the causes and effects of environmental change; especially atmospheric pollution and climate variables. They are monitored using automated weather stations, bulk rain water collectors and NO_2 diffusion samplers, amongst other things. At ECN Rothamsted we have seen a decrease in the annual mean amount of NO_2 of around 50% (Figure 17); from a maximum of 11.6 µg N m^{-3} (4.4 kg N ha^{-1}) in 1996 to 5.9 µg N m^{-3} (2.2 kg N ha^{-1}) in 2012 (Scott *et al*, 2015). The wet and dry N deposition data from ECN Rothamsted was used to show that the reductions in atmospheric N deposition in recent decades have had positive effects on recovery of some plant species (especially legumes), on the Park Grass experiment (Storkey *et al* 2015; see above).

Further details of the Rothamsted and North Wyke ECN sites together with results from the first 20 years of monitoring can be found in two recent booklets (Scott *et al*., 2015 and Beaumont *et al*., 2016). The ECN network (www.ecn.ac.uk) and resulting datasets (http://data.ecn.ac.uk) are managed and collated by the Central Coordinating Unit, Centre for Ecology and Hydrology.

Rothamsted also hosts environmental monitoring equipment at the Harpenden and North Wyke sites on behalf of the United Kingdom Acidifying and Eutrophying Atmospheric Pollutants (UKEAP) project (http://www.pollutantdeposition.ceh.ac.uk/ukeap) and COSMOS-UK (http://cosmos.ceh.ac.uk/). The latter is a new long-term network monitoring changes in soil moisture using cosmic-ray measurement technologies. Both projects provide freely available data on-line.

NORTH WYKE FARM PLATFORM

Establishment of the North Wyke Farm Platform (NWFP) began in 2010. It is located to the north of Dartmoor National Park, Devon on a ridge at 120 – 180 m above sea level, where the land slopes down on the west to the River Taw and on the east to one of its tributaries, the Cocktree stream. Over a 30-year period from 1982, the mean annual precipitation at the North Wyke site was 1044 mm. A significant feature of the site is the presence of clay-rich subsoils beneath the sub-surface horizons. Below the topsoil layer, the subsoil is highly impermeable to water and is seasonally waterlogged with most excess water leaving by surface and sub-surface lateral flow across the clay layer. This pattern in the movement of water allows for interception by a bounded drainage system and was a key factor in making this farm-scale experiment viable.

The NWFP comprises three farming systems in “farmlets”, each consisting of five component catchments totalling approximately 21 ha per farmlet. The farmlets test, through life cycle analysis, the productivity and environmental sustainability of contrasting temperate grassland beef and sheep systems at appropriate farm and land management scales (Figure 18). These approaches are:

1. Permanent pasture: managed using inorganic fertilisers (Green farmlet).

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