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ROTHAMSTED
RESEARCH

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



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Electronic Rothamsted Archive (E-ra)

Rothamsted Research

Rothamsted Research (2018 - reprinted 2019) *Electronic Rothamsted Archive (E-ra)* ; Guide To The Classical And Other Long-Term Experiments, Datasets And Sample Archive, pp 49 - 50 - **DOI:** <https://doi.org/10.23637/ROTHAMSTED-LONG-TERM-EXPERIMENTS-GUIDE-2018>

Scientists at Southampton Oceanography Centre analysed samples of herbage from the Park Grass experiment over a 50-year period to measure concentrations of plutonium and uranium. They were able to detect the effects of, and distinguish between, nuclear bomb tests carried out by the US, USSR, UK and France, and show that plutonium contamination from weapons testing in the Nevada Desert in 1952/3 reached Northern Europe (Warneke *et al.*, 2002). Such measurements have only become possible in recent years with the development of more sophisticated analytical techniques.

There are written and electronic records of samples that have been archived and, increasingly, information on the samples is being stored electronically in the Electronic Rothamsted Archive (see below).

ELECTRONIC ROTHAMSTED ARCHIVE (e-RA)

Data from the most important Classical experiments are accessible from the electronic Rothamsted Archive (e-RA), which is a permanent managed database for secure storage and dissemination of data, plus accompanying meteorological records and associated documentation. Users can query the password-protected database, via an internet application, <http://www.era.rothamsted.ac.uk/>.

e-RA currently holds records of yields, species composition, weeds, diseases, crop nutrient contents, grain quality and soil properties for four 'Classical' experiments: Broadbalk (both wheat and other crops in the rotations); Hoosfield Spring Barley; Park Grass; Hoosfield Alternate Wheat and Fallow, and also the two

Wilderness Sites (Broadbalk and Geescroft). Daily meteorological data are held for Rothamsted (since 1853), Woburn (since 1928) and Broom's Barn (since 1982). Importantly, e-RA also contains a wealth of background information about the experiments, including plans, soil maps, details of fertiliser and manure treatments, management, photos, methods of analysis, site details and case studies. These metadata are vital to fully understanding the experiments, and ensuring that the results are correctly interpreted. The e-RA curators assist users by providing support in data selection, and ensuring they have all necessary background information.

Commonly requested data, published with a Creative Commons Licence and citable with DOIs, are available from the e-RA website as Open Access summary charts and tables; no password is required. These include mean long-term crop yields (Figures 1 and 7), long-term changes in soil organic carbon (Figure 4) and Park Grass species numbers (Figure 6). There is also a dedicated section for schools, with simple sub-sets of meteorological data.

A comprehensive searchable bibliography is included, containing over 1500 references relating to the long-term experiments, including details of over 500 publications by Lawes and Gilbert. Many of Rothamsted's historical documents are being made available through eRAdoc, an online repository for documents relating to the LTEs <http://www.era.rothamsted.ac.uk/eradoc>. These include Annual Reports, Yield Books, Guides and plans containing important information about the LTEs. These are being given DOIs so that they can be readily accessed and cited and many are available as searchable pdfs, with manually curated Tables of Contents.

Requests for e-RA data from the scientific community have been increasing steadily,

with over 800 requests from 30 different countries since monitoring began in 2010. Data from the long-term experiments, both current and historic, has been used in over 170 publications since 2010.

Future developments include the addition of data from other Rothamsted long-term experiments; including the Highfield Ley-arable Experiment. In addition, the increased adoption of FAIR data principles (Wilkinson *et al*, 2016) with persistent identifiers, structurally improved metadata, vocabularies and visualisation tools, will enable this unique resource to be discovered and even more widely used by the international scientific community. For more details, see Perryman *et al*. (2018).

THE ROTHAMSTED INSECT SURVEY (RIS)

Between 1933 and 1937 and again between 1946 and 1950 the larger (macro) moths were recorded in a light trap run at the edge of Barnfield, one of Rothamsted's Classical experiments. In 1960 a trap of identical design was placed at the same site, immediately producing information on long-term changes



Light trap on edge of Barnfield

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in farmland moth populations. This provides the only quantitative insect data that compares populations before and after the important period around the Second World War, when many agricultural practices were changing rapidly. Between 1960 and 1970 a national network of Rothamsted-style light traps was developed that has continued ever since.



Suction trap

Currently, there are about 80 such traps in operation, most of which are run by volunteers throughout the UK, from which all macro-moths are identified and counted on a daily basis. The light trap dataset, including records derived from decommissioned traps, now includes information from 500 sites, many of which have moth record data that extend to a decade or more.