The Rothamsted Long-term Experiments: A National Capability

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Agro-ecological research began at Rothamsted in 1843 when the first of the “Classical” experiments was established by Lawes and Gilbert. Some of these experiments continue today and form part of the Rothamsted Long-Term Experiments. Most were located at Rothamsted Experimental Farm (330 ha), but later, other experiments were established at Woburn Experimental Farm (78 ha), 40 km north of Rothamsted.

Fig 1. Broadbalk

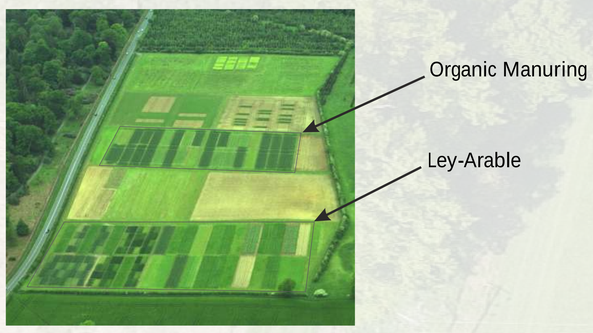

Fig 3. Woburn Ley-Arable and Organic Manuring Experiments.

Fig 4. The Rothamsted Sample Archive

Today there are 16 long-term experiments. Two of the best known are the Broadbalk Wheat Experiment (Fig 1) and the Park Grass Continuous Hay Experiment (Fig 2). The latter is the principal site at Rothamsted in the UK Environmental Change Network (ECN[b]).

Two long-term experiments at Woburn (Fig 3) examine the effects of organic manures and ley-arable rotations on soil organic matter dynamics and fertility. Areas of abandoned arable land (Wildernesses) established at Rothamsted in the 1880’s have also provided a valuable resource for research.

Plant and soil samples dating back to the 1840’s are stored in the Rothamsted Sample Archive (Fig 4). The Archive houses about 300,000 samples of dried plant and soil samples from many of the past and present experiments.

Data from the long-term experiments are stored in the Electronic Rothamsted Archive (e-RA, Fig 5). Archived samples and data are available to researchers in the UK and abroad. They form the basis of several publications each year.

Fig 2. Park Grass

e-RA Rothamsted Archive

e-RA provides access to high quality curated data for:

- Broadbalk (from 1844)
- Park Grass (from 1856)
- Hoosfield Barley (from 1852)
- Meteorological data for Rothamsted, Woburn and Brooms Barn (from 1853)
- The Alternate Wheat and Fallow (from 1856)

It also contains a comprehensive bibliography of related publications.

Fig 5. The Electronic Rothamsted Archive (e-RA[c])

Initial research focussed on the value of fertilisers and manures for crop production, but, over time, the experiments were modified to include the use of lime, herbicides, fungicides and new crop varieties to ensure they remain relevant to current agricultural issues, whilst maintaining their long-term integrity (Fig 6).

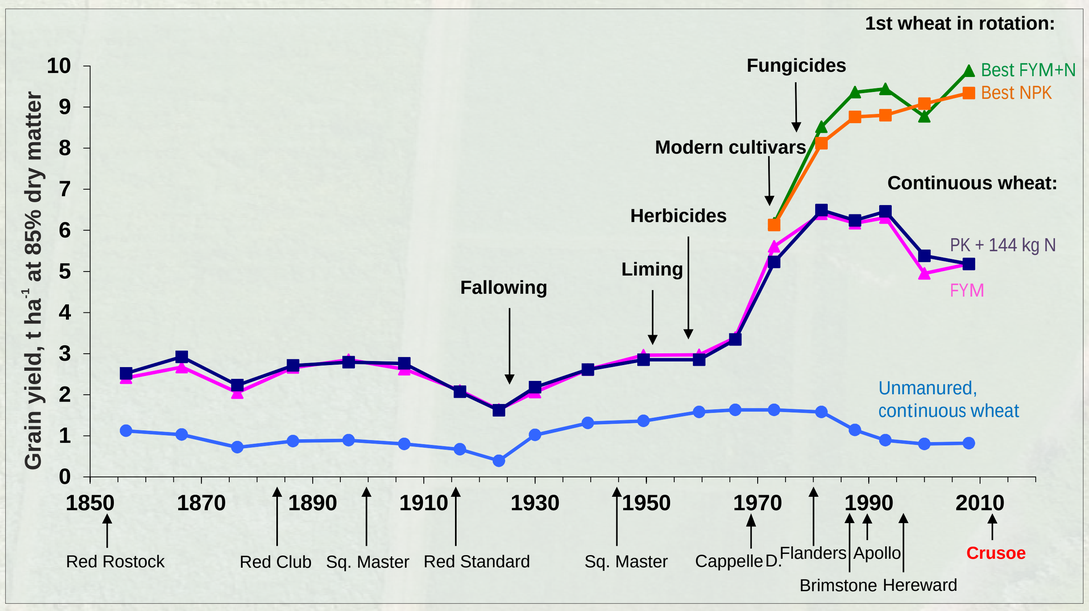

Fig 6. Broadbalk: yields, varieties and changes

Recent areas of research interest include:

- Crop pathogen diversity and atmospheric sulphur deposition
- Wheat gene expression in relation to different manuring regimes on Broadbalk
- Effects of increasing atmospheric CO_2 on water use efficiency of semi-natural grassland
- Sequencing the metagenome of the soil microbial population on Park Grass
- Development of the Roth C soil organic matter model to include the turnover of sub-soil organic matter

Currently, work is underway to examine changes in plant species diversity in response to changes in N fertiliser inputs on Park Grass. Whilst the uses of the long-term experiments in decades to come cannot be predicted with certainty, provided they are well maintained, they will continue to be an invaluable scientific resource for future generations.

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