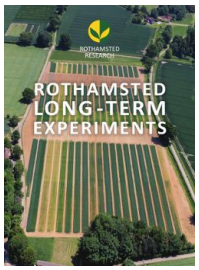
ROTHAMSTED RESEARCH

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

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## At Woburn

### Rothamsted Research

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## At Woburn

Experiments at Woburn began in 1876 under the auspices of the Royal Agricultural Society of England. The principle aim was to test the residual manurial value of two contrasting feedstuffs fed to animals in covered yards or on the land. Rothamsted took over the management of the farm in the 1920s. In contrast to the silty clay loam at Rothamsted, which, typically, contains 20-40% clay, much of the soil at Woburn is a sandy loam containing about 8-14% clay (Catt *et al*,1977, 1980). It is much more difficult to maintain or increase SOM on this soil, and several of the long-term experiments at Woburn were established to study the effects on yield and SOM of including grass leys and applying organic amendments in arable rotations.

### The Woburn Ley-arable Experiment

The Ley-arable experiment was started in 1938 to compare the effects of rotations with or without grass or grass-clover leys on the yield of two arable test crops and on SOM. Soils at Woburn that have been in continuous arable cropping since 1876 contain about 0.8-0.9 % C, and % C is still declining, slowly; soils which have alternated between 3-year leys and 2-years arable since 1938 contain about 1.2 % C (Figure 12).

Changes in the amounts of C in the soil over > 70 years have been modelled. In the rotation where the ley was originally grazed (Ln3), only about 5% of the estimated C input was retained in the soil; in the other rotations > 98% of the input was lost (Johnston *et al*.,2017). Typically, where no fertiliser N is applied, yields of test crops are greater following the grass leys than

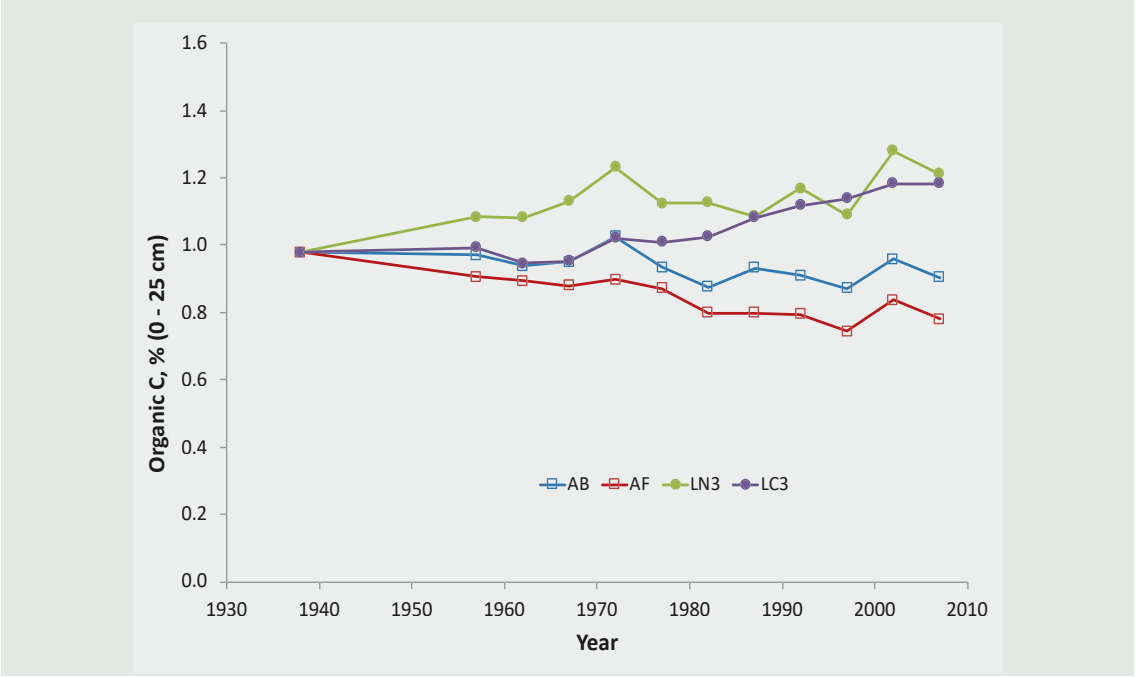


Fig. 12 Woburn Ley-arable; changes % organic C in the top-soil (0-25 cm), 1938-2009. Treatments are: (AB) continuous arable; (AF) continuous arable with root crops or fallows; (LN3) 3-year grazed grass/clover (later grass + N) leys + 2-years arable; (LC3) 3-year lucerne (later grass/clover) leys + 2-years arable.



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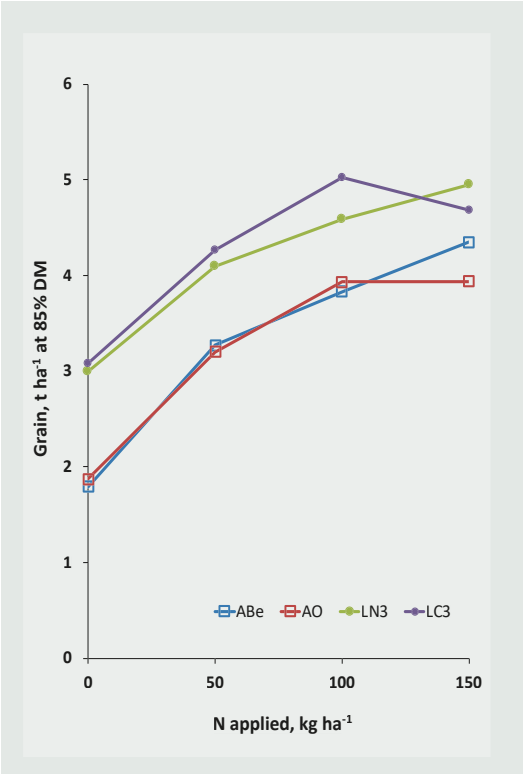


Fig. 13 Woburn Ley-arable; mean yields of winter rye, 2011-2015. Data are yields of the 2nd Test crop after: (ABe) beans in continuous arable rotation [previously AB]; (AO) oats in continuous arable rotation [previously AF]; (LN3) 3-year grass ley + N; (LC3) 3-year grass/clover ley.

in the continuous arable sequence because more N is available from the mineralisation of SOM. Following grass-clover leys, yield is increased further because of the extra N being made available from the breakdown of the leguminous residues. Even in the second cereal after the leys have been ploughed-in a larger yield is often achieved, with less fertiliser N, compared with continuous arable cropping (Figure 13).

## The Woburn Organic Manuring Experiment

The Woburn Organic Manuring experiment was started in 1964 to test the effects of different types of organic matter inputs on crop yields and SOM. Initially, six organic treatments (grass or grass/clover leys and arable crops with FYM, peat, straw or green manures) were compared with arable crops receiving fertilisers only. Arable crops were then grown in rotation with an eight-level N test from 1973 to 1980, to assess the effects of the organic amendments. During this period, no organic manures were applied. There was another treatment phase from 1981-1986, when further organic manures were applied. Again, SOM increased with the organic treatments and the grass leys but continued to decline slowly where only fertilisers were applied. This treatment phase was followed by another test phase, 1987-1994, when six rates of N were tested on arable crops, and no further organic manures were applied. From 1995-2002 arable test cropping continued but only two rates of N were tested. In 2003 another treatment phase started. All plots, except for the permanent grass-clover leys (and beans when grown) were split to test six rates of N on arable crops grown in rotation. Currently, the experiment contains 32 plots divided into four blocks. Of these, 28 are in a five-course arable rotation (Wheat, Maize/Cover Crop, Rye, S. Barley/Cover Crop, Beans) with different organic amendments (FYM, Straw, Compost, None). The remaining four plots continue in permanent grass/clover, without N. The arable plots are split so that N can be applied in spring at six rates for all crops, except beans which receive no N. Yields are recorded each year and soils are taken every 5 years.



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