# **RRES PRESS RELEASE 15/01/24 Why do we make changes to the long-term experiments at Rothamsted?**

*New paper summarises how the 180 year old studies have benn adapted over the years to makes sure they stay relevant*

The long-term soil and crop studies at Rothamsted are famous as the world’s longest running continuous field experiments. Started from 1843 onwards by the founders of Rothamsted, John Lawes and Henry Gilbert, they are an important resource that has been used extensively to investigate the effects of land management, atmospheric pollution and climate change on soil fertility and the sustainability of crop yields.

Soil and plant samples from the experimental plots have been kept continuously for over 180 years, but whilst the meticulous record keeping and attention to scientific detail have remained constant, the experiments themselves have undergone changes. This may seem counter-intuitive: a great part of the scientific value of long-term experiments (LTEs) has been their unchanging nature. This consistency yields valuable insights into the complexity of farming systems, since by holding so many factors (like location and overall land use) constant, other variables can be more easily investigated.

Nevertheless, some changes are required over time. Sometimes these are necessary to ensure that the experiment is not threatened by factors like acidification or weeds. But often changes are needed so that the experiment remains relevant to current agricultural practice, such as the introduction of new cultivars and the judicious use of pesticides. Now [a new paper, recently published in the European Journal of Agronomy](https://www.sciencedirect.com/science/article/pii/S1161030123003301), sets out what changes have been made and why they were undertaken.

“Changes to the long-term experiments (LTEs) should not be made just for the sake of change or to investigate aspects of management that could be better resolved in a short-term experiment,” says Paul Poulton, the lead author of the paper. “Rather, modifications should only be made after carefully considered discussion, involving scientists from different disciplines.”

This balanced approach can be seen in the oldest experiment at Rothamsted: Broadbalk.  Originally set up to study how the application of differing amounts of nitrogen, phosphorus and potassium affected the growth of winter wheat, over time some considered changes have been made whilst other factors held constant. For instance, some fertiliser and manure treatments have been applied on some plots every year since autumn 1843 (except when sections were fallowed). However, ploughing, drilling and harvesting techniques have changed, chalk has been added, and pesticides used, rotations have been included and up-to-date cultivars have been regularly introduced.

“Despite all of these changes the experiment is still recognizably the same and still serving its original purpose,” says Poulton. “We have concluded from 180 years of experience at Rothamsted that carefully thought-out changes can be extremely beneficial. We have learned that LTEs should not be regarded as static museum exhibits that should never be altered.”

Managers of LTEs should be careful to avoid the temptation to include treatments to address every conceivable issue, say the authors. Some questions are better answered by setting up separate shorter-term experiments. In addition, their limitations must also be recognised. The maintenance of crop production in well-managed field plots is no guarantee that the practices used will be equally robust when applied by farmers at large scale in a wide range of environments with differing soil types. Some processes such as soil erosion, water movement or pathogen spread operate at landscape scale and are not easily reproduced in relatively small plots.

The authors also point out that sometimes the only solution to new challenges is to set up brand new LTEs. As interest in agro-ecological approaches has grown, for instance, Rothamsted set up a new set of rotational experiments six years ago incorporating variable treatments such as no-till and cover crops.

“Such new experiments are easier to adjust to address new agricultural practices but inevitably lack the benefit of continuity within a traditional LTE,” says Poulton. “Nevertheless, the intention from the outset is for these new system-based experiments to be long-term platforms and to be incorporated into Rothamsted’s general LTE portfolio. The two styles of experiment each have their own advantages and limitations, and each is strengthened by the existence of the other.”

Publication

Why Do We Make Changes to the Long-Term Experiments at Rothamsted?

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