

The Importance of Herbicides in UK Wheat: Long-Term Experiment Results

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The Broadbalk field, at the Rothamsted Research Center, in Harpenden, UK, is thought to have been in arable cropping for many centuries prior to 1843. The first experimental crop of winter wheat was sown in autumn of that year and harvested in 1844[1]. Every year since then, wheat has been sown and harvested on all or part of the field. The primary objective has been to investigate the relative importance of the plant nutrients on crop yield and to compare the effects of the inorganic salts with those of farmyard manure [2]. The Broadbalk experiments were not designed for studies on weeds. Weeds were eliminated as efficiently as possible, so that they did not compromise the results of crop and soil fertility studies, which were the primary interests [2].

Until the first World War, the experiment had been hand-weeded. Lack of labor during World War I and after made hand-weeding impossible, and by the early 1920s, weeds were recognized as a major problem [2]. To control weeds, the experiment was divided into five sections and one section was bare-fallowed each year [1]. During the fallow year, no crop was grown and the ground was ploughed to reduce weed populations for the following four years when wheat would again be planted. Fallowing involved plowing at least twice, often three times, and occasionally four times a year. In addition, fallowed plots were harrowed or tine cultivated two to four times a year. Yields recovered. Herbicides (MCPA) were first tested in 1957 and from 1964 have been applied to all sections with the exception of the current Section 8.

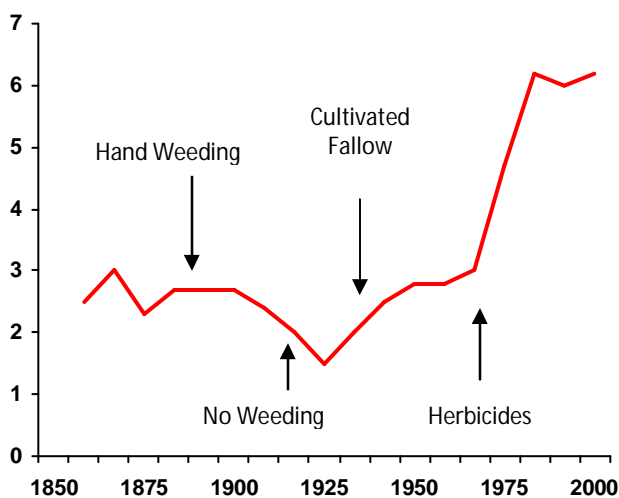


Figure 1: Rothamsted Research: Broadbalk Wheat Yield (Tons/Ha)

Figure 1 summarizes the wheat yields and major farm management changes between 1843 and 2000[2]. The decline in yield between 1900 and 1925 was almost certainly due to increasing competition from weeds [2]. The marked increase in yields after 1968 was a consequence of the use of newer varieties, growing wheat in rotation, and better weed control after the introduction of herbicides [2]. The scale of the reductions in wheat yield caused by uncontrolled weeds can be demonstrated by comparing the results from sections of Broadbalk from 1985 to 2000. The absence of herbicides resulted in a substantially greater mean yield loss (44%), than the absence of fungicides and insecticides (11%)[2].

References

1. Rothamsted Research. 2006. *Guide to the Classical and other Long-term Experiments, Datasets and Sample Archive*. Rothamsted, UK.
2. Moss, S. R., et al. 2004. The Broadbalk long-term experiment at Rothamsted: what has it told us about weeds? *Weed Science*. 52:864-873.