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Rothamsted - the Classical Experiments

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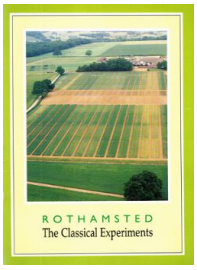

Garden Clover

Rothamsted Research

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is one of the most difficult to cultivate well. Yields of the grass grown subsequently were also larger on FYM-treated soils, although FYM was not applied again after sowing the grass. This was perhaps because more of the N applied to grass on fertilizer-treated soils was being used to increase soil organic matter. Accordingly since 1983 a range of nitrogen dressings (75, 100, 125, 150 kg N ha^{-1} per cut) has been tested on the grass. Yields in the period 1983 to 1990 showed a large benefit from FYM residues and from PK Mg but with optimum N the yields from the fertilizer nearly equalled those from FYM (Fig. 2). With neither fertilizers nor FYM there was no benefit from increasing N above 75 kg ha^{-1}.

AGDELL

This was the only Classical in which crops were grown in rotation. From 1848 to 1951 three different manurial combinations (none, PKNaMg and NPKNaMg plus rape cake.castor meal) were applied to the root crops of two four-course rotations. The rotations differed only in their third course — roots, barley, fallow or legume, wheat. There were only six plots and only one course of the rotation was present each year. The roots were turnips or swedes, the legume clover or beans. From 1920 club-root (*Plasmodiophora brassicae*) became progressively more damaging to the root crop especially on the NPKNaMg plots as a result of increasing acidity. By 1948 the produce was too small to weigh and the four-course rotation ceased in 1951. The soil acidity was subsequently corrected and the plots were then used to evaluate the P and K residues accumulated up to 1951. During this first period the original six plots were halved and two levels of soil organic matter were established. Subsequently crop responses were related both to fresh P and K and to amounts in the soil. The experiment ended in 1990.

GARDEN CLOVER

The Garden Clover, pleasantly situated in the formal garden of the Manor House, has some claim to be the first micro-plot experiment. It is the simplest of the Classical Experiments, with (until 1956) only one plot, and that unmanured. Lawes, interested in the repeated growing of the same crop on the same land, found that red clover, however often resown on farmland, soon failed to give a useful yield. In 1854 he laid down this small plot in his garden. Yields were very large for the first 10 years averaging about 10 t dry matter ha^{-1}, probably because the soil was very rich in nutrients and because the soil-borne pests and diseases of clover were absent. Average crops were obtained over the next 30 years but thereafter yields showed a marked decline and there were several complete failures.

Between 1956 and 1972 the plot was sub-divided and a sequence of tests made of potassium, molybdenum, formalin, nitrogen and magnesium. N, K and Mg all increased yields, molybdenum and formalin did not. With N, P, K and Mg

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yields of about 6 t dry matter ha^{-1} were obtained in the year of sowing. The crop was usually severely damaged during the winter by clover-rot (*Sclerotinia trifoliorum*) and was resown each spring. From 1973 to 1982 basal N, P, K and Mg were applied (corrective dressings were given to sub-plots which did not receive K and Mg in years of tests) and by 1975 the plot had returned to reasonable uniformity.

Between 1976 and 1978 aldicarb was tested (clover cyst nematode, *Heterodera trifolii*, was known to be present) and the variety Hungaropoly, believed resistant to clover-rot, was compared with the standard susceptible variety S.123. The combination of aldicarb with Hungaropoly gave yields up to 8 t dry matter ha^{-1} but winter survival remained poor.

The plot then grew Hungaropoly only, with basal aldicarb, and tested benomyl applied during autumn and winter. This treatment gave almost complete winter survival and a mean yield in 1980-82 of 16.6 t dry matter ha^{-1}, the largest yield in the history of the experiment.

In 1983 basal nitrogen fertilizer was withdrawn to measure N fixation in its absence. In 1989 basal aldicarb was also withdrawn. In that year the crop gave a mean yield of just over 10 t dry matter ha^{-1}, despite an exceptionally dry summer, but then died for reasons that are not clear. It was resown to Hungaropoly in 1990. It continues to receive basal P, K and Mg but the test of benomyl has ceased.

Clover nodule bacteria and the bacteriophages are abundant. Nodule bacteria for *Vicia* are sparse and those for *Lotus* and medicks absent.

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