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ROTHAMSTED RESEARCH

The Long Term Experiments

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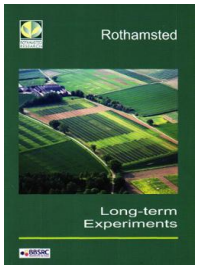

Barnfield

Rothamsted Research

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Clover nodule bacteria and their bacteriophages are abundant. Nodule bacteria for *Vicia* spp. are sparse and those for *Lotus* and medicks absent. Other than Park Grass, with its mixed herbage, this is the only remaining Classical site where only a non-graminaceous crop has been grown. In terms of microbial diversity, its soil provides a potentially valuable contrast with those of Broadbalk and Hoosfield.

The rich kitchen garden soil on which the experiment was established had received much FYM. In 1857, the 0-23cm soil layer contained 10.8 t N ha^{-1}; by 1983 this had declined to 4.5 t N ha^{-1}.

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This was the first of the "Classicals", with treatments applied in spring 1843 for a crop of turnips sown in July. The treatments and cropping, although mainly roots, differed until 1876 when a period of continuous cropping with mangolds was started that lasted until 1959 (sugar beet were also grown, on half-plots, from 1946).

Treatments during the first two years were on long narrow plots, as on Broadbalk. However, the design was modified in 1856 when strips testing minerals and FYM, including FYM + PK, were crossed at right angles by series comparing no N fertiliser with both inorganic and organic forms of N supplying 96 kg ha^{-1}. Before 1968 this was the only Classical in which N was applied with both FYM and FYM + PK fertiliser.

Because yields of continuous roots were declining, perhaps because of increasing numbers of cyst nematodes (*Heterodera schachtii*), the cropping has been progressively modified since 1959 and has included a range of arable crops, with an increased range of N dressings, and grass. From 1977 to 1983 the series that had never received N fertiliser was kept fallow. It was sown to a grass-clover ley in 1984. The remainder has been in grass since 1975.

A feature of the continuous roots and subsequent arable crops was the superiority of yield on soils given FYM, even where large amounts of N were applied in combination with the minerals. This may have been because the extra organic matter had improved soil structure with considerable effect on this field, which is one of the most difficult on the farm to cultivate. Yields of the grass, grown more recently, were also larger on FYM-treated soils, although no FYM was applied after sowing the grass. This was perhaps because more of the N applied to grass on minerals-treated soils was being used to increase soil organic matter. Accordingly, from 1983 to 2000 a range of N dressings (75, 100, 125, 150 kg N ha^{-1} per cut) was tested on the grass. With optimum N, the yields with minerals nearly equalled those from FYM. With neither minerals nor FYM there was no benefit from increasing N above 75 kg ha^{-1}.

No treatments have been applied and no yields taken since 2001

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