Exhaustion Land Experiment plans and fertilizer treatments, Phases I & II, 1856-1939

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Description: Plans and details of the fertilizer treatments and total nutrients applied to the Rothamsted Exhaustion Land Experiment, Phase I (1856-1901) and Phase II (1902-1939).

- **Page 1:** Cover page
- **Page 2:** Experiment overview, 1856-present day
- **Page 3:** Experiment plan Phases I and II
- **Page 4:** Total nutrients applied, Phase I

Site: R/EX/4. Hoos Field, Rothamsted Experimental Farm, Rothamsted Research, West Common, Harpenden, Hertfordshire, AL5 2JQ, UK. Latitude 51.812883, Longitude -0.375931

Derived from:

- Rothamsted Experimental Station (1970) *Details of the Classical and Long-Term Experiments up to 1967*, Rothamsted Experimental Station, Lawes Agricultural Trust, Harpenden UK **DOI:** 10.23637/ERADOC-1-192
- Rothamsted (1991) *Guide to the Classical Field Experiments*, Rothamsted Experimental Station, Lawes Agricultural Trust, Harpenden UK **DOI:** 10.23637/ERADOC-1-189
- Johnston, A. E. and Poulton, P. R.(1977) "Yields on the Exhaustion Land and changes in NPK content of the soils due to cropping and manuring, 1852-1975", Rothamsted Experimental Station Annual Report for 1976, Part 2, (53-85) **DOI**: 10.23637/ERADOC-1-34447
- Johnston, A.**E,** Poulton P.R, White, R.P & Macdonald, A.J. (2016). *Determining the longer term decline in plant-available soil phosphorus from short-term measured values*, **Soil Use & Management, DOI**: 10.1111/sum.12253
- Poulton, P.R, Johnston, A.E. and White, R.P. (2013) *Plant-available soil phosphorus. Part 1: the response of winter wheat and spring barley to Olsen P on a silty clay loam*. **Soil Use & Management, DOI:** 10.1111/j.1475-2743.2012.00450.x

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Exhaustion Land Experiment overview

Phase I[a]

Plot numbers 'Smiths Wheat' experiment, 1856-1875

5	4	3	2	1	5	4	3	2	1
Nil	Nil	N	NPKNaMg	PKNaMg	Nil	Nil	N	NPKNaMg	PKNaMg

Plot numbers Potato experiment, 1876-1901

1	3	5	7	9	2	4	6	8	10
Nil	FYM	N	NPKNaMg	P	Nil	FYM	N*	N*PKNaMg	PKNaMg

Phase II

Unfertilized 1902-1939

Phase III

PK residues (Basal N) 1940-1975

All main plots divided into 4 sub-plots in 1976 with 4 N rates

PK residues (Rates of N) 1976-1985

Phase IV

1986-2006

"P Test"

Rates of P (Basal K & N) 1986-92

No fresh P (Basal K & N) 1993-99

Maintenance P (Basal K & N) 2000- (except P0 plots)

PK residues (Rates of N) 1986-91

"K Test"

K residues (Basal P & N) 1992-2006

Phase V

2007-

"P Test"

Maintenance P (Basal K & N) 2000- (except P0 plots)

P witheld from residual P plots (P1) since 2016

"K Test"

Rates of K (Basal P & N) 2007-

Cropping: 1856-1875 winter wheat; 1876-1901 potatoes.
Spring barley most years 1902-1991, fallow in 1920, 1967 & 1975.
Winter wheat since 1992 (except 2001 when w wheat failed so re-sown to spring wheat)

[a]Phase 1 originally five plots, divided into 10 in 1876 and renumbered.

Exhaustion Land Experiment Plan

1856-1901 **Phase I** **↗ N**

1902-1939 **Phase II** **Plot No.**

Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	1856-1875
Plot 10	**Plot 8**	**Plot 6**	**Plot 4**	**Plot 2**	1876-1975
W wheat (1856-1875) PKNaMg	W wheat (1856-1875) NPKNaMg	W wheat (1856-1875) N	W wheat (1856-1875) Nil	W wheat (1856-1875) Nil	
Potatoes (1876-1901) PKNaMg	Potatoes (1876-1901) N*PKNaMg	Potatoes (1876-1901) N*	Potatoes (1876-1901) FYM (N*P)	Potatoes (1876-1901) Nil (FYM)	
Cereals (1902-39) Nil	Cereals (1902-39) Nil	Cereals (1902-39) Nil	Cereals (1902-39) Nil	Cereals (1902-39) Nil	

Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	1856-1875
Plot 9	**Plot 7**	**Plot 5**	**Plot 3**	**Plot 1**	1876-1975
W wheat (1856-1875) PKNaMg	W wheat (1856-1875) NPKNaMg	W wheat (1856-1875) N	W wheat (1856-1875) Nil	W wheat (1856-1875) Nil	
Potatoes (1876-1901) P	Potatoes (1876-1901) NPKNaMg	Potatoes (1876-1901) N	Potatoes (1876-1901) FYM (P)	Potatoes (1876-1901) Nil	
Cereals (1902-39) Nil	Cereals (1902-39) Nil	Cereals (1902-39) Nil	Cereals (1902-39) Nil	Cereals (1902-39) Nil	

(not to scale)

Annual Treatments per hectare, 1856-1901:

Nil : No fertilizer or manure
FYM : 35 of farmyard manure since 1876
Nil (FYM) : FYM 1876-1881, no fertilizer or manure 1882-1901
FYM (P) : FYM plus P until 1882, FYM only 1883-1901
FYM (N*P) : FYM plus N* and P until 1881, FYM plus P 1882, FYM only 1883-1901
N : 96 kg N as ammonium salts (ammonium sulphate & ammonium chloride)
N* : 96 kg N as sodium nitrate
P : 34 kg P (as superphosphate 1876-96, from basic slag 1897-1901)
K : 137 kg K as potassium sulphate (91 kg K 1859-74)
Na : 16 kg Na as sodium sulphate
Mg : 11 kg Mg as magnesium sulphate

1902-1939: No fertilizer or manure applied, cereals grown most years

Previous cropping:

1852-1855 The 'Lois Weedon' plots, which tested different methods of husbandry.
No fertilizer or manure applied to the whole experimental area, w wheat grown.

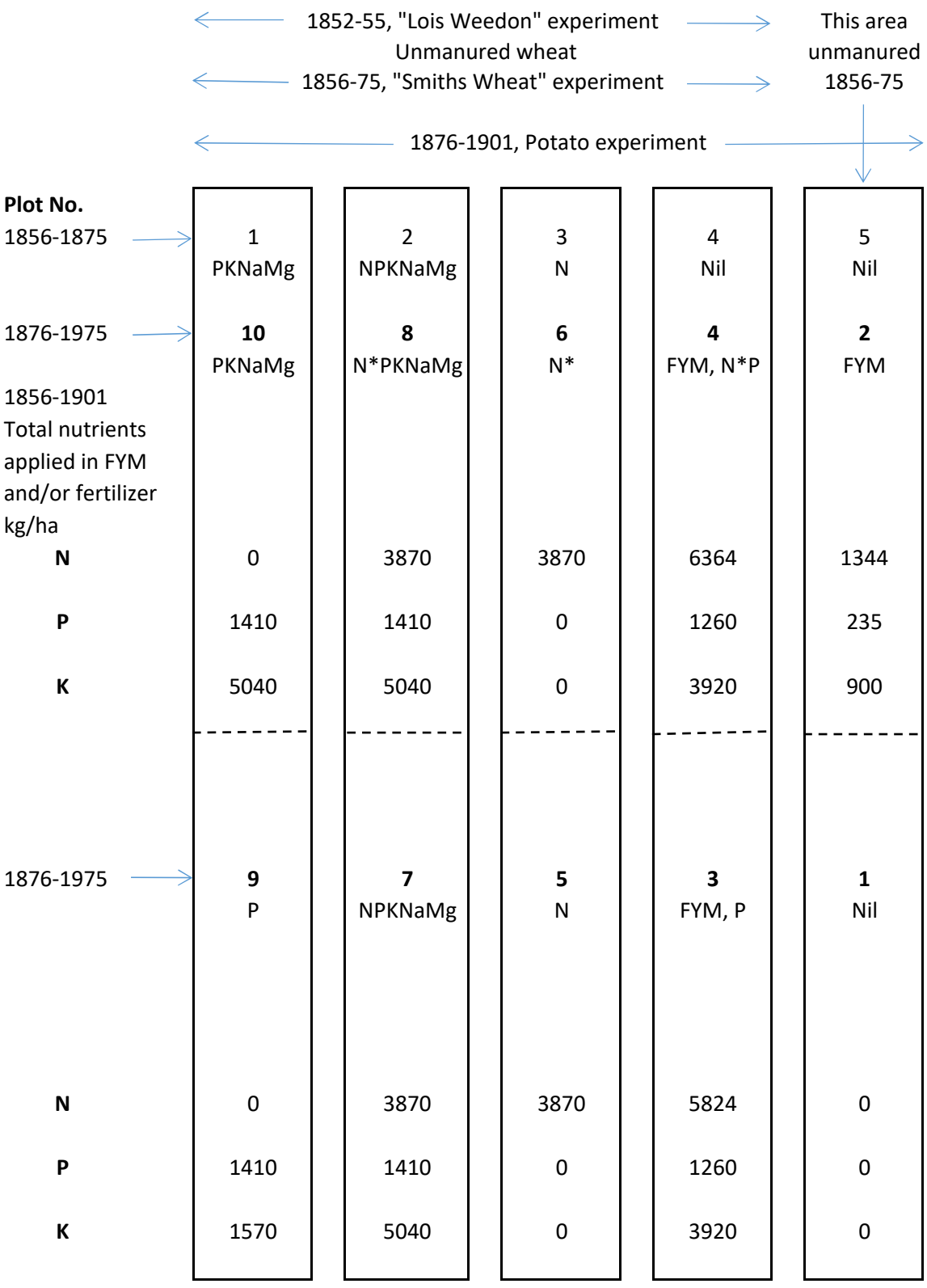
Plot size: 1876-1892 0.081 hectare
1893-1901 0.067 hectare

In 1893 paths were added between the plots reducing the cropped area.

R/EX/4 Exhaustion Land experiment

↗ N

Experimental layout and total nutrients applied, Phase I



(not to scale)