

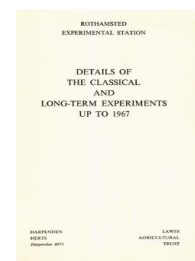
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Six-course Rotation - Rothamsted and Woburn

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SIX-COURSE ROTATION EXPERIMENTS, ROTHAMSTED, LONG HOOS IV AND WOBURN, STACKYARD, SERIES B, 1930-60

These experiments were begun in 1930 on both farms but were not fully established on their permanent sites till 1931.

The purpose was to measure the responses of six crops to several levels of each of the main nutrients N, P, K over a period of years, and to obtain information on the response to fertilisers in different seasons.

The crops of the rotation and the varieties were as follows:

	Rothamsted	Woburn
Sugar beet	Kuhn P till 1941, then Klein E	Kuhn P till 1942, then Klein E
Barley	Plumage Archer	Plumage Archer till 1955, then Herta
Clover	Red till 1936, then Montgomery Red	Red till 1945, Montgomery Red till 1955, then Crimson Clover
Wheat	Yeoman	Yeoman till 1946, Square-head's Master till 1955, then Yeoman
Potatoes	Ally till 1941, then Majestic	Ally till 1941, then Majestic
Rye*	Not specified till 1948, then King II	Not specified till 1948, then King II

In the early years of the experiments catch-crop green manures were grown as follows (dates are those of the succeeding root crops):

Rothamsted, 1932-40, Woburn, 1932-42; mustard for sugar beet
 Rothamsted, 1932, 1934-37, Woburn, 1932-42, 1944, 1945; rye for potatoes.

There were 15 plots in each block divided into three sets of five as follows:

Level	0	1	2	3	4	
Nitrogen series	0.0	0.15	0.3	0.45	0.6	cwt N as sulphate of ammonia
Phosphate series	0.0	0.15	0.3	0.45	0.6	cwt P ₂ O ₅ as superphosphate
Potash series	0.0	0.25	0.5	0.75	1.0	cwt K ₂ O as muriate of potash

The N series had a basal dressing of P and K at their middle levels, and similarly for the other nutrients. All crops received the same scale of fertiliser dressing. For spring-sown crops all fertilisers were applied in the seedbed. For autumn-sown crops, P and K were given in the seedbed, N as a spring top dressing. Clover had its P and K in the seedbed or as autumn top dressing and the N in spring.

* Till 1933 an autumn sown forage mixture of rye, vetches and beans was grown and cut green, but rye for grain was substituted in 1934.

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The manurial treatments rotated on the plots in such a way that in the course of 15 years every plot received each of the 15 treatments. From 1935 ground chalk providing 10 cwt CaO (23 cwt ground chalk from 1958 onwards) was applied before barley and rye. At Woburn no chalk dressing was applied before the barley crops of 1956–58. In 1956 the rates of nitrogen dressings at Woburn were doubled, except for crimson clover which remained unchanged at the rate previously used for late flowering red clover.

In 1959 and 1960 the potato plots at Woburn were split to test 0 v. 2.6 cwt sulphate of magnesia, and in 1959 the yields of the cereals were measured by one combine cut per plot.

Size of plots. Rothamsted, 0.0250; Woburn, 0.0266 acre.

References

For a description of the design of the experiment see *Rep. Rothamsted exp. Stn for 1932*, 131.

For a summary of results to 1948, see *Rep. Rothamsted exp. Stn for 1948*, 90.

For a summary of results 1931–55, see Yates, F. & Patterson, H. D. A note on the six-course rotation experiments at Rothamsted and Woburn. *J. agric. Sci.* (1958) **50**, 102–109.

See also: Glynne, M. D. Eyespot (*Cercospora herpotrichoides*) and other factors influencing yield of wheat in the six-course rotation experiment at Rothamsted (1930–60). *Ann. appl. Biol.* (1963) **51**, 189–214.

TABLE 30

Six-course rotation experiment, Rothamsted Long Hoos IV

Means over 30 years, 1931–60

	Level*				
	0	1	2	3	4
	Barley, grain: cwt				
N	24.5	27.8	30.1	31.5	31.8
P	29.3	29.2	29.6	30.0	29.2
K	29.4	29.9	29.8	29.0	29.6
	† Clover, hay, dry matter: cwt				
N	27.5	28.9	29.2	29.9	30.3
P	28.5	30.1	31.1	28.9	29.1
K	29.9	29.8	29.9	29.5	30.8
	Wheat, grain: cwt				
N	25.5	28.0	27.9	29.2	29.7
P	29.1	29.3	28.4	28.8	28.7
K	28.4	28.7	28.3	28.5	29.0
	Potatoes, total tubers: tons				
N	6.73	7.29	8.10	8.29	8.69
P	7.64	7.87	8.09	8.25	8.27
K	6.79	7.95	8.19	8.56	8.68
	‡ Rye, grain: cwt				
N	20.8	24.6	28.0	29.9	29.8
P	26.8	26.6	27.2	26.4	26.5
K	27.3	25.9	25.9	26.9	26.0
	Sugar beet, total sugar: cwt				
N	31.1	33.3	34.6	35.5	36.5
P	34.8	34.6	34.6	34.8	33.6
K	34.2	34.8	34.6	35.2	35.1

* See text for details.

† Clover crop failed in 1933, 1935, 1954. Means over 27 years only.

‡ Rye, no yields for 1931, 1932, 1933. Means over 27 years only.

SIX-COURSE (ROTHAMSTED & WOBURN)

TABLE 31
Six-course rotation experiment, Woburn Stackyard Field
 Means over 25 years, 1931-55

	Level*				
	0	1	2	3	4
	Barley, grain: cwt				
N	15.0	20.3	23.5	25.1	26.4
P	22.4	24.1	24.0	24.1	23.0
K	22.6	22.6	23.8	23.5	23.0
	Clover, hay, dry matter: cwt				
N	32.8	31.7	30.3	28.0	30.8
P	31.2	30.2	30.6	30.2	32.4
K	29.1	32.0	33.3	31.7	32.4
	Wheat, grain: cwt				
N	10.2	11.3	14.4	16.7	17.7
P	13.8	14.4	13.5	13.3	13.8
K	14.1	13.8	14.1	13.9	13.9
	Potatoes, total tubers: tons				
N	6.24	6.94	7.78	8.45	9.02
P	7.27	7.46	7.88	7.74	7.69
K	7.79	7.57	8.07	7.91	7.78
	Rye, grain: cwt				
N	14.3	17.1	19.6	22.6	24.5
P	20.5	19.5	19.7	19.6	19.6
K	19.7	19.5	19.4	19.8	19.7
	Sugar beet, total sugar: cwt				
N	24.1	27.3	29.3	31.0	32.3
P	30.2	29.8	30.1	30.5	29.3
K	28.1	29.5	30.4	31.2	30.1

* See text for details.

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TABLE 32
Six-course rotation experiment, Woburn Stackyard Field
Means over 5 years, 1956-60

	Level*				
	0	1	2	3	4
Barley, grain, cwt					
N	17.3	27.6	28.6	30.6	34.5
P	30.7	32.3	30.8	31.3	32.0
K	30.3	27.6	31.4	30.3	27.1
†Clover, hay, dry matter: cwt					
N	11.0	14.5	12.9	13.5	16.5
P	14.2	17.4	17.4	18.0	18.8
K	9.7	14.1	12.1	12.2	12.6
Wheat, grain: cwt					
N	6.7	12.8	17.7	23.2	24.9
P	20.3	21.2	20.4	19.4	18.7
K	18.8	17.8	18.6	20.6	20.1
Potatoes, total tubers: tons					
N	5.73	8.33	8.82	10.49	11.17
P	9.75	9.58	9.30	9.81	8.89
K	8.96	9.37	11.13	10.40	9.34
Rye, grain: cwt					
N	14.6	19.8	29.7	33.9	33.0
P	27.9	27.0	27.0	28.2	28.4
K	29.0	28.7	28.2	28.3	27.1
Sugar beet, total sugar: cwt					
N	27.6	36.6	39.5	41.2	41.4
P	38.6	37.7	38.1	40.1	42.9
K	42.0	37.9	36.2	44.3	44.5

* See text for details.

† Clover. Mean over three years only. Crop discarded in 1959 and 1960.

TABLE 33
Six-course rotation experiment, Woburn Stackyard Field
Potatoes, total tubers: tons
Mean over two years, 1959-60

	Level*				
	0	1	2	3	4
Plots not receiving Mg					
N	4.74	7.81	8.68	11.06	10.46
P	9.65	9.06	7.98	9.62	7.70
K	7.96	9.22	10.03	9.20	8.13
Plots receiving Mg					
N	4.36	8.49	10.39	10.74	10.93
P	9.58	9.44	8.14	8.96	8.54
K	9.38	9.60	9.31	10.00	10.56

* See text for details.