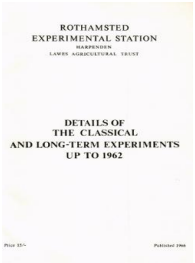
Details of the Classical and Long-term Experiments Up to 1962



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Park Grass- Hay

Rothamsted Research

Rothamsted Research (1966) *Park Grass- Hay ;* Details Of The Classical And Long-Term Experiments Up To 1962, pp 22 - 26 **- DOI: https://doi.org/10.23637/ERADOC-1-191**

HAY, THE PARK GRASS PLOTS, 1856 ONWARDS

The Park has probably been in grass for some centuries. There is no record of any seed having been sown. The herbage has been cut for hay each year since manurial treatments were first applied in 1856. The management of the aftermath following the first hay cut in each season varied in the early years of the experiment. It was grazed by sheep in the years 1856 to 1872 except for 1866 and 1870. In 1866, 1870, 1873, 1874, 1876, 1884, 1885, 1887 the aftermath was mown but not removed from the plots. In all other years the produce of the second and sometimes third cut has been carted and weighed either as hay or green.

Table 11

Manures applied per acre, 1856 onwards unless otherwise stated.

	Treatment									
Plot	D tons	P P_2O_5 lb. (2)	K K_2O lb. (3)	Na lb. (4)	Mg lb.	Si lb.	N N lb. (1)	N N lb.	F cwt.	Notes
1	-	-	-	-	-	-	43(N_1)	-	-	(5)
2	-	-	-	-	-	-	-	-	-	(6)
3	-	-	-	-	-	-	-	-	-	
4-1	-	65	-	-	-	-	-	-	-	(19)
4-2	-	65	-	-	-	-	86(N_2)	-	-	(19)
5-1	-	-	-	-	-	-	-	-	-	(7)
5-2	-	65	245	-	-	-	-	-	-	(7)
6	-	65	245	100	100	-	-	-	-	(8)(19)
7	-	65	245	100	100	-	-	-	-	
8	-	65	-	100	100	-	-	-	-	(9)(19)
9	-	65	245	100	100	-	86(N_2)	-	-	
10	-	65	-	100	100	-	86(N_2)	-	-	(9)
11-1	-	65	245	100	100	-	129(N_3)	-	-	(10)(19)
11-2	-	65	245	100	100	400	129(N_3)	-	-	(10)(11)
12	-	-	-	-	-	-	-	-	-	
13	14	-	-	-	-	-	-	-	-	(12)
	-	-	-	-	-	-	-	-	6	
14	-	65	245	100	100	-	-	86(N_2)	-	(13)
15	-	65	245	100	100	-	-	-	-	(14)
16	-	65	245	100	100	-	-	43(N_1)	-	(15)
17	-	-	-	-	-	-	-	43(N_1)	-	(15)
18	-	-	245	100	100	-	86(N_2)	-	-	(16)
19	14	-	-	-	-	-	-	-	-	(17)
20	14	-	-	-	-	-	-	-	-	(18)
	-	33	49	-	-	-	-	26(N)	-	

Plot areas: For manuring mostly 0.5 acre and 0.25 acre, a few 0.17 and 0.12 acre. Most plots are divided into halves to test lime.

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Treatments: D: farmyard manure, P: superphosphate, K: sulphate of potash, Na: sulphate of soda, Mg: sulphate of magnesia, Si: silicate of soda, N: sulphate of ammonia, N': nitrate of soda, F: fish guano.

Notes:

(1) Until 1916 the ammonia nitrogen was supplied as a mixture of equal parts of ammonium sulphate and ammonium chloride. Since 1917 only ammonium sulphate was used.
(2) Until 1888 the phosphate was made from 200 lb. bone ash and 100 lb. sulphuric acid per acre, then superphosphate. 1897-1902 basic slag.
(3) Until 1878 the standard dressing of sulphate of potash was 147 lb. K_2O per acre, it was then raised to 245 lb. K_2O.
(4) Until 1863 plots 7, 9, 11-1, 11-2, 13, 14, 16 had 200 lb. sulphate of soda.
(5) Until 1863 14 tons dung also.
(6) Until 1863 14 tons dung only.
(7) After ammonium salts 86 lb. N until 1897.
(8) After ammonium salts 86 lb. N until 1868.
(9) Since 1862 147 lb. K_2O as sulphate of potash; 200 lb. sulphate of soda; 100 lb. sulphate of magnesia; 65 lb. P_2O_5. From 1864-1904 the dressing of sulphate of soda was 250 lb.. (500 lb. 1862-1863).
(10) Until 1881 the ammonium salts were applied at 172 lb. N except in 1859-1861 when the dose was 86 lb.
(11) The silicate dressing began when plot 11 was divided in 1862 and from 1862-1870 equal parts of calcium and sodium silicate were used.
(12) Until 1897 complete fertiliser as plot 9 with 2000 lb. per acre of cut wheat straw in addition. From 1898-1904 as plot 9, no straw. The dung has been applied once every 4 years starting 1905 and the fish meal once every 4 years starting 1907. Since 1959 the fish meal dressing has been standardised at 0.5cwt. N per acre (approximately 6cwt. meal).
(13) Since 1858.
(14) Since 1876. Nitrate of soda 86 lb. N 1858-1875.
(15) Since 1858.
(16) Since 1905. From 1865-1904 P, K, Na, Mg, Si, and N equal to the amounts contained in 1 ton of hay.
(17) Every 4th year since 1905. From 1872-1904 65 lb. P_2O_5; 142 lb. K_2O; and 43 lb. N as nitrate of soda.
(18) Dung every 4th year since 1905, fertilisers in intervening years. From 1872-1904 superphosphate 65 lb. P_2O_5 and potassium nitrate, supplying approximately 43 lb. N and 142 lb. K_2O.
(19) Sawdust at 18cwt. per acre was applied to plots 6, 8, 10 until 1862, and on plot 4 until 1858.

Liming: The first liming was done in 1881, when a strip 11 yards wide on the North side of plots 1-13 received 27cwt. chalk per acre. In 1883-1884 the plots were halved, one half having 18cwt. burnt lime per acre. In 1887-1888 the other halves of the plots were similarly treated. Plots 11-1 and 11-2 received a double dose on these occasions. In 1903 a regular liming scheme was started on the South halves of plots 1 to 4-2, 7 to 11-2, 13, 16. The dressing was 2000 lb. ground lime per acre every 4 years (missing 1911). In 1920 plots 14, 15, and 17 came into this scheme, all dressings being increased by one quarter to allow for the extra year, and plots 18,

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PARK GRASS

Table 12

Hay - The Park Grass Plots, 1920 - 1959

Dry matter; cwt per acre

Plot	Treatment Symbols	8-year Means 1920 - 27 Not Limed 1st crop	1920 - 27 Not Limed Total	1920 - 27 Limed 1st crop	1920 - 27 Limed Total	1928 - 35 Not Limed 1st crop	1928 - 35 Not Limed Total	1928 - 35 Limed 1st crop	1928 - 35 Limed Total	1936 - 43 Not Limed 1st crop	1936 - 43 Not Limed Total	1936 - 43 Limed 1st crop	1936 - 43 Limed Total
1	N_1	13.6	20.9	15.7	21.3	11.7	15.7	15.1	18.4	6.1	10.8	12.4	16.2
2	O	10.3	15.7	12.1	16.2	11.3	14.6	11.6	14.3	7.3	10.6	8.4	11.1
3	O	8.8	12.8	9.6	13.2	9.7	12.4	9.6	11.8	6.5	9.2	7.9	10.6
4-1	P	13.0	17.7	11.8	15.8	13.8	17.1	10.9	12.8	9.4	12.7	8.9	11.7
4-2	N_2P	15.5	19.6	24.4	31.9	14.6	17.5	27.3	31.7	10.6	15.7	21.5	26.2
5-1	O	8.6	12.1	-	-	9.4	12.4	-	-	6.3	9.5	-	-
5-2	PK	15.1	20.9	-	-	15.5	19.9	-	-	12.8	18.3	-	-
6	PKNaMg	20.1	28.0	-	-	20.5	26.0	-	-	18.6	25.5	-	-
7	PKNaMg	20.0	28.2	24.3	31.2	21.8	27.7	27.8	34.6	19.3	28.3	24.3	31.8
8	PNaMg	13.4	19.4	11.3	16.2	15.3	19.9	12.1	16.2	12.8	17.9	10.5	14.6
9	N_2PKNaMg	26.2	35.6	38.7	48.6	32.9	39.9	45.0	52.3	26.2	36.2	33.3	41.8
10	N_2PNaMg	19.7	26.6	29.8	38.6	21.2	26.0	32.5	38.6	14.6	21.6	27.1	34.0
11-1	N_3PKNaMg	31.4	45.4	43.4	55.4	35.2	47.6	47.1	55.8	22.9	40.0	38.1	50.6
11-2	N_3PKNaMgSi	38.7	50.8	44.1	57.2	40.0	53.7	47.8	59.7	30.7	48.7	40.3	55.8
12	O	11.5	15.7	-	-	11.2	14.8	-	-	8.4	13.1	-	-
13	D; F	30.6	39.5	27.5	35.8	34.0	41.8	31.4	37.8	25.2	35.9	20.8	28.6
14	N_2'PKNaMg	39.4	49.5	35.9	43.0	42.7	52.1	41.8	47.9	36.6	45.9	34.7	41.7
15	PKNaMg	21.8	29.7	18.5	25.1	21.2	27.1	21.4	25.3	14.1	19.6	19.9	24.8
16	N_1'PKNaMg	27.5	34.9	26.7	33.6	31.1	37.1	26.7	31.4	25.4	32.0	25.6	31.4
17	N_1'	16.4	22.4	18.4	24.1	16.4	20.5	20.0	23.0	12.9	17.3	15.9	18.8
18	N_2KNaMg	16.2	27.2	25.8*	36.6*	17.6	23.8	32.3*	38.7*	7.9	16.3	18.2*	21.3*
				23.0+	31.7+			26.0+	31.3+			16.9+	20.5+
19	D	20.6	28.4	17.9*	23.9*	21.4	28.2	18.7*	23.5*	19.8	27.3	18.6*	24.5*
				18.8+	24.9+			20.5+	25.5+			19.4+	26.0+
20	D; N´PK	26.3	34.9(1)	25.7*	33.0*	31.6	38.0	28.8*	34.2*	26.9	34.4	23.7*	29.8*
				29.7+	37.1+			30.4+	36.0+			25.0+	31.4+

* Heavy Liming + Light Liming (1) Excluding second crop 1925

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Table 12 (continued)

Dry matter; cwt per acre

Plot	Treatment Symbols	8-year Means 1944 - 51 Not Limed 1st crop	Not Limed Total	Limed 1st crop	Limed Total	1952 - 59 Not Limed 1st crop	Not Limed Total	Limed 1st crop	Limed Total	40-year Means 1920 - 59 Not Limed 1st crop	Not Limed Total	Limed 1st crop	Limed Total
1	N_1	5.1	9.1	12.5	15.3	5.5	11.5	15.0	23.3	8.4	13.6	14.1	18.9
2	O	8.7	11.8	9.3	12.0	9.5	15.5	12.7	20.5	9.4	13.6	10.8	14.8
3	O	7.8	10.8	9.2	11.3	8.3	13.9	12.2	18.0	8.2	11.8	9.7	13.0
4-1	P	11.5	14.6	11.6	15.4	14.9	23.2	15.3	24.1	12.5	17.1	11.7	15.9
4-2	N2P	8.5	11.3	20.3	24.2	10.2	17.9	24.4	32.9	11.9	16.4	23.6	29.4
5-1	O	4.9	6.5	-	-	6.7	11.9	-	-	7.2	10.5	-	-
5-2	PK	11.0	15.9	-	-	17.5	27.1	-	-	14.4	20.4	-	-
6	PKNaMg	20.3	29.0	-	-	23.5	35.5	-	-	20.6	28.8	-	-
7	PKNaMg	18.7	27.4	29.0	36.9	22.6	34.1	29.5	41.8	20.5	29.2	27.0	35.3
8	PNaMg	15.8	22.3	11.2	15.1	18.1	27.8	15.3	23.9	15.1	21.5	12.1	17.2
9	N_2PKNaMg	26.1	38.0	29.4	35.0	23.7	36.4	36.0	46.6	27.0	37.2	36.5	44.9
10	N_2PNaMg	14.9	22.9	23.4	28.5	13.7	23.8	29.0	37.7	16.8	24.2	28.4	35.5
11-1	N_3PKNaMg	23.9	42.7	40.1	49.5	21.9	45.0	40.8	56.5	27.1	44.2	41.9	53.6
11-2	N_3PKNaMgSi	31.0	48.2	40.9	52.6	29.6	52.3	47.8	69.2	34.0	50.8	44.2	58.9
12	O	9.0	13.2	-	-	10.6	18.3	-	-	10.1	15.0	-	-
13	D;F	21.8	30.0	26.0	33.6	27.3	40.9	25.8	40.1	27.7	37.6	26.3	35.2
14	N_2'PKNaMg	34.2	44.7	32.8	39.7	39.1	55.2	39.2	53.7	38.4	49.5	36.9	45.2
15	PKNaMg	14.7	22.0	18.5	22.6	18.6	27.6	28.8	42.4	18.1	25.2	21.4	28.0
16	$N_1'^1$PKNaMg	22.1	29.3	24.8	30.9	28.5	40.7	33.8	49.7	26.9	34.8	27.5	35.4
17	N_1'	13.4	18.7	15.3	19.9	16.9	26.6	18.8	29.4	15.2	21.1	17.7	23.0
18	N_2KNaMg	7.9	13.2	19.8*	24.0*	8.7	17.4	20.6*	27.8*	11.7	19.6	23.3*	29.7*
				17.7+	22.5+			20.2+	29.1+			20.8+	27.0+
19	D	20.6	28.3	20.5*	26.5*	24.8	36.9	23.5*	35.2*	21.4	29.8	19.9*	26.7*
				22.2+	27.8+			25.8+	38.7+			21.4+	28.6+
20	D; N^1PK	26.8	34.2	28.4*	34.5*	29.3	42.4	30.2*	42.8*	28.2	36.8(1)	27.4*	34.8*
				28.3+	35.7+			28.8+	42.0+			28.4	36.4+

* Heavy Liming + Light Liming (1) Excluding 2nd Crop 1925

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19, 20 were each divided into three sections one being left unlimed and the other two limed every 4 years:-

Plot 18	6	1 and	35	cwt.	ground	lime	per	acre.
19	2	8 and	5	"	"	"	"	"
20	2	5 and	5	"	"	"	"	"

In 1956 the lime used contained a high proportion of calcium carbonate and it was decided that in future the whole dressing should be applied as calcium carbonate equivalent to 2000 lb.CaO per acre.

Harvesting: For many years all operations were done by hand The mowing machine was first used for the first cut in 1901 though it had been used for the second cut since 1881. The first cut was made into hay and weighed as such until 1959; the second cut is weighed green and yields are calculated from the dry matter figures. In 1959 a flail type forage harvester was compared with the ordinary cutter-bar machine on the first cut on parts of plots 1, 7, 11-1, and 13. The tabulated yields for this crop refer to hay made in the usual way. The second cut on all plots in 1959 was estimated entirely by forage harvester, taking two cuts per plot except plots 5 to 10, 13, 18 which had four cuts. From 1960 yields of both cuts have been estimated from 2 or 4 cuts by the forage harvester; at the first cutting the remainder of each plot is cut by mower and made into hay on the plot but at the second cutting the whole produce is cut by forage harvester and carried green.

Further details of manuring: Memoranda of the Field Experiments, 1901, pp. 20-23.

Yields and botanical composition: Brenchley, W.E. The Park Grass plots at Rothamsted. Revised by K. Warington. Harpenden: Rothamsted Experimental Station. 1958.

Brenchley, W.E.(1924). Manuring for hay. Rothamsted Monographs on Agricultural Science. London: Longmans, Green & Co.

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