

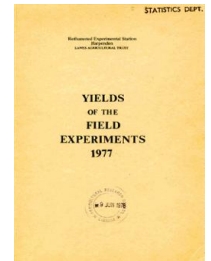
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77/R/CS/14 N P K to Old Grass - Old Grass

Rothamsted Research

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77/R/CS/14

NPK TO OLD GRASS

Object: To study the effects of a range of P and K levels on yields of permanent pasture on sites with much or little P and K in the soil - Park Grass Old Plots 5/1 and 5/2.

Sponsor: A.E. Johnston.

The 13th year, old grass.

For previous years see 'Details' 1973 and 74-76/R/CS/14.

Design: On each site: A single replicate of 2 x 4 x 4 in 2 blocks of 16 plots each, with 2 x 2 x 2 additional plots.

Whole plot dimensions: 1.83 x 10.1.

Treatments:

The experiment is duplicated on sites differing in previous history:-
PLOT

5/1NORES	Park Grass Plot 5/1: No P or K
5/2PKRES	Park Grass Plot 5/2: Superphosphate to supply 34 kg P, sulphate of potash to supply 224 kg K, annually 1898-1964

On each site, all combinations of:-

1. NPERCUT Nitrogen fertiliser (kg N for each cut):

33.6
67.2

2. P Phosphate (kg P) as superphosphate annually:

0.0
16.8
33.6
67.2

3. K Potassium (kg K) as potassium chloride annually:

0
112
224
448

77/R/CS/14

together with extra treatments, all combinations of:

1. NPERCUT Nitrogen fertiliser (kg N for each cut):
 33.6
 67.2
2. P Phosphate (kg P) as superphosphate:
 (34)34 33.6 kg P in 1965, none 1966-1976, 33.6 kg P 1977
 (34)67 33.6 kg P in 1965, none 1966-1976, 67.2 kg P 1977
3. K Potassium (kg K) as potassium chloride:
 (56) 56 56 kg K in 1965, none 1966-1976, 56 kg K 1977
 (336)336 336 kg K in 1965, none 1966-1976, 336 kg K 1977

Basal applications: Weedkiller: 2,4-D ('M.A.C. 2,4-D' at 4.9 l in 340 l).

Cultivations, etc.:— Test P and K applied: 2 Dec, 1976. N applied: 14 Mar, 1977, 27 May, 26 July. Cut: 26 May, 25 July, 2 Nov. Weedkiller applied: 24 June.

77/R/CS/14 PLOT 5/1 NORES

EXCLUDING EXTRA TREATMENTS

1ST CUT (26/5/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	0.79	1.87	2.11	1.87	1.66
67.2	1.06	3.02	3.66	3.20	2.73
MEAN	0.92	2.44	2.88	2.54	2.20
K	0	112	224	448	MEAN
NPERCUT					
33.6	1.10	1.88	1.89	1.76	1.66
67.2	1.18	2.98	3.32	3.46	2.73
MEAN	1.14	2.43	2.60	2.61	2.20
K	0	112	224	448	MEAN
P					
0.0	0.72	1.04	0.93	1.01	0.92
16.8	1.49	2.87	2.77	2.63	2.44
33.6	1.29	3.20	3.43	3.52	2.88
67.2	1.08	2.50	3.28	3.28	2.54
MEAN	1.14	2.43	2.60	2.61	2.20
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	0.80	0.73	0.74	0.90
	16.8	1.26	2.10	1.91	2.20
	33.6	1.11	2.87	2.41	2.04
	67.2	1.25	1.80	2.50	1.92
67.2	0.0	0.63	1.35	1.12	1.13
	16.8	1.72	3.64	3.63	3.07
	33.6	1.46	2.72	4.46	5.01
	67.2	0.92	3.20	4.06	4.64

1ST CUT MEAN DM% 22.7

77/R/CS/14 PLOT 5/1 NORES

EXCLUDING EXTRA TREATMENTS

2ND CUT (25/7/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	2.39	2.58	2.48	2.55	2.50
67.2	2.62	3.06	3.20	3.44	3.08
MEAN	2.50	2.82	2.84	2.99	2.79
K	0	112	224	448	MEAN
NPERCUT					
33.6	2.03	2.48	2.62	2.85	2.50
67.2	2.40	3.22	3.41	3.30	3.08
MEAN	2.22	2.85	3.01	3.07	2.79
K	0	112	224	448	MEAN
P					
0.0	1.38	2.66	3.07	2.89	2.50
16.8	2.39	2.85	3.12	2.92	2.82
33.6	2.63	2.76	2.95	3.01	2.84
67.2	2.47	3.13	2.90	3.47	2.99
MEAN	2.22	2.85	3.01	3.07	2.79
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	1.39	2.13	2.81	3.21
	16.8	2.31	2.73	2.53	2.74
	33.6	2.36	2.47	2.39	2.68
	67.2	2.07	2.61	2.75	2.76
67.2	0.0	1.37	3.19	3.33	2.57
	16.8	2.47	2.97	3.72	3.10
	33.6	2.89	3.04	3.52	3.35
	67.2	2.86	3.66	3.06	4.18

2ND CUT MEAN DM% 24.6

77/R/CS/14 PLOT 5/1 NORES

EXCLUDING EXTRA TREATMENTS

3RD CUT (2/11/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	1.99	2.07	1.61	1.96	1.91
67.2	2.00	2.57	2.04	2.44	2.26
MEAN	1.99	2.32	1.82	2.20	2.08

K	0	112	224	448	MEAN
NPERCUT					
33.6	1.57	1.64	2.31	2.12	1.91
67.2	1.60	2.51	2.66	2.27	2.26
MEAN	1.58	2.08	2.48	2.19	2.08

K	0	112	224	448	MEAN
P					
0.0	1.42	1.88	2.52	2.15	1.99
16.8	1.72	2.17	2.65	2.75	2.32
33.6	1.24	2.21	2.00	1.85	1.82
67.2	1.96	2.04	2.77	2.03	2.20
MEAN	1.58	2.08	2.48	2.19	2.08

	K	0	112	224	448
NPERCUT	P				
33.6	0.0	1.20	1.60	2.99	2.16
	16.8	2.02	2.01	2.09	2.17
	33.6	1.24	1.56	1.92	1.72
	67.2	1.80	1.39	2.23	2.41
67.2	0.0	1.63	2.17	2.05	2.13
	16.8	1.42	2.32	3.21	3.34
	33.6	1.24	2.86	2.08	1.97
	67.2	2.11	2.70	3.30	1.64

3RD CUT MEAN DM% 21.8

77/R/CS/14 PLOT 5/1 NORES

EXCLUDING EXTRA TREATMENTS

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	5.16	6.52	6.19	6.37	6.06
67.2	5.67	8.65	8.90	9.08	8.08
MEAN	5.42	7.58	7.55	7.73	7.07
K	0	112	224	448	MEAN
NPERCUT					
33.6	4.70	6.00	6.82	6.73	6.06
67.2	5.18	8.71	9.38	9.03	8.08
MEAN	4.94	7.35	8.10	7.88	7.07
K	0	112	224	448	MEAN
P					
0.0	3.52	5.58	6.52	6.05	5.42
16.8	5.60	7.89	8.54	8.31	7.58
33.6	5.15	8.27	8.39	8.38	7.55
67.2	5.51	7.68	8.95	8.78	7.73
MEAN	4.94	7.35	8.10	7.88	7.07
NPERCUT	K	0	112	224	448
	P				
33.6	0.0	3.39	4.45	6.54	6.27
	16.8	5.58	6.85	6.52	7.11
	33.6	4.71	6.91	6.72	6.44
	67.2	5.12	5.79	7.48	7.09
67.2	0.0	3.64	6.71	6.50	5.83
	16.8	5.61	8.94	10.56	9.51
	33.6	5.60	9.62	10.05	10.33
	67.2	5.89	9.56	10.42	10.46

TOTAL OF 3 CUTS MEAN DM% 23.0

PLOT AREA HARVESTED 0.00086

77/R/CS/14 PLOT 5/1 NORES

EXTRA TREATMENTS

1ST CUT (26/5/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	2.24	1.78	2.01
67.2	2.38	2.84	2.61
MEAN	2.31	2.31	2.31

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	2.10	1.93	2.01
67.2	2.25	2.97	2.61
MEAN	2.17	2.45	2.31

K	(56)56	(336)336	MEAN
P			
(34)34	2.09	2.54	2.31
(34)67	2.26	2.36	2.31
MEAN	2.17	2.45	2.31

1ST CUT MEAN DM% 24.4

2ND CUT (25/7/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	3.27	2.49	2.88
67.2	3.44	3.30	3.37
MEAN	3.35	2.90	3.13

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	2.46	3.29	2.88
67.2	3.46	3.28	3.37
MEAN	2.96	3.29	3.13

K	(56)56	(336)336	MEAN
P			
(34)34	3.04	3.67	3.35
(34)67	2.89	2.91	2.90
MEAN	2.96	3.29	3.13

2ND CUT MEAN DM% 25.2

77/R/CS/14 PLOT 5/1 NORES

EXTRA TREATMENTS

3RD CUT (2/11/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	2.32	2.33	2.32
67.2	3.07	3.44	3.25
MEAN	2.69	2.89	2.79
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	2.00	2.65	2.32
67.2	3.04	3.46	3.25
MEAN	2.52	3.06	2.79
K	(56)56	(336)336	MEAN
P			
(34)34	2.36	3.02	2.69
(34)67	2.68	3.09	2.89
MEAN	2.52	3.06	2.79

3RD CUT MEAN DM% 23.0

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	7.82	6.60	7.21
67.2	8.89	9.59	9.24
MEAN	8.36	8.09	8.23
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	6.56	7.87	7.21
67.2	8.76	9.71	9.24
MEAN	7.66	8.79	8.23
K	(56)56	(336)336	MEAN
P			
(34)34	7.49	9.22	8.36
(34)67	7.83	8.36	8.09
MEAN	7.66	8.79	8.23

TOTAL OF 3 CUTS MEAN DM% 24.2

PLOT AREA HARVESTED 0.00086

77/R/CS/14 PLOT 5/2 PKRES

EXCLUDING EXTRA TREATMENTS

1ST CUT (26/5/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	2.64	2.55	2.40	1.98	2.39
67.2	4.68	4.74	4.66	4.18	4.57
MEAN	3.66	3.65	3.53	3.08	3.48
K	0	112	224	448	MEAN
NPERCUT					
33.6	2.37	2.55	2.29	2.37	2.39
67.2	4.54	4.73	4.64	4.34	4.57
MEAN	3.46	3.64	3.47	3.35	3.48
K	0	112	224	448	MEAN
P					
0.0	3.36	3.98	3.82	3.48	3.66
16.8	3.48	3.80	3.52	3.78	3.65
33.6	3.81	3.84	3.51	2.96	3.53
67.2	3.17	2.94	3.01	3.21	3.08
MEAN	3.46	3.64	3.47	3.35	3.48
K	0	112	224	448	
P					
0.0	2.35	2.98	2.66	2.58	
16.8	2.37	2.54	2.63	2.67	
33.6	2.48	2.78	2.08	2.24	
67.2	2.27	1.88	1.81	1.99	
0.0	4.37	4.98	4.99	4.38	
16.8	4.59	5.06	4.42	4.88	
33.6	5.13	4.91	4.95	3.67	
67.2	4.08	3.99	4.22	4.43	

1ST CUT MEAN DM% 20.3

77/R/CS/14 PLOT 5/2 PKRES

EXCLUDING EXTRA TREATMENTS

2ND CUT (25/7/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	2.92	2.66	2.80	2.77	2.79
67.2	3.59	3.74	3.71	3.81	3.71
MEAN	3.26	3.20	3.26	3.29	3.25
K	0	112	224	448	MEAN
NPERCUT					
33.6	2.75	2.85	2.88	2.67	2.79
67.2	3.83	3.43	3.72	3.87	3.71
MEAN	3.29	3.14	3.30	3.27	3.25
K	0	112	224	448	MEAN
P					
0.0	3.28	2.90	3.44	3.40	3.26
16.8	3.34	2.98	3.21	3.29	3.20
33.6	3.18	3.47	3.27	3.11	3.26
67.2	3.36	3.23	3.28	3.29	3.29
MEAN	3.29	3.14	3.30	3.27	3.25
NPERCUT	K	0	112	224	448
	P				
33.6	0.0	2.73	2.95	3.02	2.98
	16.8	2.80	2.63	2.75	2.48
	33.6	2.50	3.07	2.92	2.71
	67.2	2.98	2.76	2.84	2.50
67.2	0.0	3.83	2.86	3.85	3.82
	16.8	3.88	3.32	3.67	4.10
	33.6	3.86	3.66	3.62	3.50
	67.2	3.75	3.70	3.72	4.07

2ND CUT MEAN DM% 26.9

77/R/CS/14 PLOT 5/2 PKRES

EXCLUDING EXTRA TREATMENTS

3RD CUT (2/11/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	2.02	1.72	1.96	1.94	1.91
67.2	2.58	2.79	2.52	2.77	2.66
MEAN	2.30	2.26	2.24	2.36	2.29

K	0	112	224	448	MEAN
NPERCUT					
33.6	1.98	2.05	1.83	1.78	1.91
67.2	2.91	2.55	2.55	2.64	2.66
MEAN	2.45	2.30	2.19	2.21	2.29

K	0	112	224	448	MEAN
P					
0.0	2.32	2.63	2.15	2.10	2.30
16.8	2.55	2.19	2.29	1.99	2.26
33.6	2.27	2.31	2.04	2.34	2.24
67.2	2.65	2.08	2.28	2.41	2.36
MEAN	2.45	2.30	2.19	2.21	2.29

	K	0	112	224	448
NPERCUT	P				
33.6	0.0	1.98	2.45	1.73	1.92
	16.8	1.68	1.69	1.74	1.78
	33.6	1.97	2.18	1.87	1.82
	67.2	2.30	1.89	1.97	1.61
67.2	0.0	2.66	2.81	2.56	2.27
	16.8	3.42	2.69	2.83	2.21
	33.6	2.56	2.44	2.20	2.87
	67.2	3.01	2.27	2.59	3.20

3RD CUT MEAN DM% 21.2

77/R/CS/14 PLOT 5/2 PKRES

EXCLUDING EXTRA TREATMENTS

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	7.58	6.94	7.15	6.70	7.09
67.2	10.85	11.27	10.89	10.76	10.94
MEAN	9.22	9.10	9.02	8.73	9.02
K	0	112	224	448	MEAN
NPERCUT					
33.6	7.10	7.45	7.00	6.82	7.09
67.2	11.29	10.72	10.91	10.85	10.94
MEAN	9.20	9.09	8.95	8.83	9.02
K	0	112	224	448	MEAN
P					
0.0	8.97	9.52	9.40	8.98	9.22
16.8	9.38	8.96	9.02	9.06	9.10
33.6	9.25	9.62	8.82	8.40	9.02
67.2	9.19	8.25	8.58	8.90	8.73
MEAN	9.20	9.09	8.95	8.83	9.02
NPERCUT	K	0	112	224	448
	P				
33.6	0.0	7.06	8.39	7.41	7.48
	16.8	6.85	6.86	7.12	6.93
	33.6	6.95	8.03	6.86	6.77
	67.2	7.54	6.53	6.62	6.10
67.2	0.0	10.87	10.65	11.40	10.47
	16.8	11.90	11.07	10.92	11.19
	33.6	11.55	11.21	10.77	10.04
	67.2	10.83	9.96	10.53	11.71

TOTAL OF 3 CUTS MEAN DM% 22.8

PLOT AREA HARVESTED 0.00086

77/R/CS/14 PLOT 5/2 PKRES

EXTRA TREATMENTS

1ST CUT (26/5/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	2.96	2.65	2.80
67.2	4.77	5.25	5.01
MEAN	3.86	3.95	3.91
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	2.74	2.87	2.80
67.2	5.02	5.00	5.01
MEAN	3.88	3.93	3.91
K	(56)56	(336)336	MEAN
P			
(34)34	3.94	3.79	3.86
(34)67	3.82	4.08	3.95
MEAN	3.88	3.93	3.91

1ST CUT MEAN DM% 20.1

2ND CUT (25/7/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	3.09	2.72	2.90
67.2	4.04	3.62	3.83
MEAN	3.56	3.17	3.37
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	2.67	3.13	2.90
67.2	3.54	4.12	3.83
MEAN	3.11	3.63	3.37
K	(56)56	(336)336	MEAN
P			
(34)34	3.38	3.74	3.56
(34)67	2.83	3.51	3.17
MEAN	3.11	3.63	3.37

2ND CUT MEAN DM% 27.0

77/R/CS/14 PLOT 5/2 PKRES

EXTRA TREATMENTS

3RD CUT (2/11/77) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	1.90	2.03	1.96
67.2	2.61	2.75	2.68
MEAN	2.25	2.39	2.32
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	1.87	2.06	1.96
67.2	2.79	2.57	2.68
MEAN	2.33	2.31	2.32
K	(56)56	(336)336	MEAN
P			
(34)34	2.40	2.11	2.25
(34)67	2.26	2.52	2.39
MEAN	2.33	2.31	2.32

3RD CUT MEAN DM% 21.3

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS *****

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	7.95	7.39	7.67
67.2	11.41	11.62	11.52
MEAN	9.68	9.51	9.59
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	7.28	8.06	7.67
67.2	11.35	11.69	11.52
MEAN	9.32	9.87	9.59
K	(56)56	(336)336	MEAN
P			
(34)34	9.72	9.64	9.68
(34)67	8.91	10.11	9.51
MEAN	9.32	9.87	9.59

TOTAL OF 3 CUTS MEAN DM% 22.8

PLOT AREA HARVESTED 0.00086