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Yields of the Field Experiments 1978

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

Rothamsted Research

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78/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 14th year, old grass.

For previous years see 'Details' 1973 and 74-77/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

78/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 annually since 1977
 (34)67 33.6 kg P in 1965, none 1966-1976, 67.2 kg P annually since 1977
3. K Potassium (kg K) as potassium chloride:
 (56) 56 56 kg K in 1965, none 1966-1976, 56 kg K annually since 1977
 (336)336 336 kg K in 1965, none 1966-1976, 336 kg K annually since 1977

Cultivations, etc.:— Test P and K applied: 15 Dec, 1977. N applied: 28 Feb, 1978, 9 June, 31 June. Cut: 9 June, 31 June, 30 Oct.

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

EXCLUDING EXTRA TREATMENTS

1ST CUT (9/6/78) DRY MATTER TONNES/HETAϕNNES/HECTARE

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

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	2.85	4.23	4.09	3.98	3.79
67.2	2.97	5.54	5.49	5.07	4.77
MEAN	2.91	4.89	4.79	4.52	4.28
K	0	112	224	448	MEAN
NPERCUT					
33.6	3.17	3.93	4.17	3.88	3.79
67.2	3.02	5.11	5.48	5.45	4.77
MEAN	3.09	4.52	4.83	4.67	4.28
K	0	112	224	448	MEAN
P					
0.0	2.39	3.42	2.93	2.90	2.91
16.8	3.62	5.07	5.71	5.14	4.89
33.6	3.22	5.10	5.71	5.12	4.79
67.2	3.14	4.48	4.96	5.51	4.52
MEAN	3.09	4.52	4.83	4.67	4.28
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	2.86	3.35	2.52	2.67
	16.8	3.33	4.53	4.74	4.34
	33.6	3.02	4.30	4.79	4.24
	67.2	3.46	3.55	4.63	4.27
67.2	0.0	1.92	3.50	3.34	3.12
	16.8	3.92	5.61	6.68	5.94
	33.6	3.42	5.91	6.64	6.00
	67.2	2.81	5.41	5.29	6.75

1ST CUT MEAN DM% 23.5

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

EXCLUDING EXTRA TREATMENTS

2ND CUT (25/7/78) DRY MATTER TONNES/HECTARE

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

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	1.59	1.47	1.32	1.36	1.43
67.2	1.60	2.11	2.10	2.16	1.99
MEAN	1.60	1.79	1.71	1.76	1.71
K	0	112	224	448	MEAN
NPERCUT					
33.6	1.26	1.41	1.48	1.59	1.43
67.2	1.36	2.19	2.28	2.15	1.99
MEAN	1.31	1.80	1.88	1.87	1.71
K	0	112	224	448	MEAN
P					
0.0	1.36	1.79	1.69	1.55	1.60
16.8	1.20	2.08	1.97	1.92	1.79
33.6	1.27	1.47	2.12	1.97	1.71
67.2	1.41	1.85	1.74	2.04	1.76
MEAN	1.31	1.80	1.88	1.87	1.71
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	1.42	1.64	1.52	1.79
	16.8	1.12	1.61	1.52	1.63
	33.6	1.09	1.09	1.53	1.57
	67.2	1.41	1.29	1.35	1.38
67.2	0.0	1.29	1.95	1.87	1.31
	16.8	1.27	2.55	2.41	2.22
	33.6	1.46	1.85	2.71	2.37
	67.2	1.42	2.41	2.12	2.69

2ND CUT MEAN DM% 17.5

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

EXCLUDING EXTRA TREATMENTS

3RD CUT (30/10/78) DRY MATTER TONNES/HECTARE

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

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	1.57	1.36	1.37	1.47	1.44
67.2	1.81	2.02	1.80	2.07	1.93
MEAN	1.69	1.69	1.59	1.77	1.68
K	0	112	224	448	MEAN
NPERCUT					
33.6	1.13	1.42	1.75	1.47	1.44
67.2	1.27	2.03	2.59	1.81	1.93
MEAN	1.20	1.72	2.17	1.64	1.68
K	0	112	224	448	MEAN
P					
0.0	0.81	1.99	2.24	1.72	1.69
16.8	1.38	1.46	2.22	1.70	1.69
33.6	1.04	1.83	1.80	1.68	1.59
67.2	1.57	1.62	2.43	1.47	1.77
MEAN	1.20	1.72	2.17	1.64	1.68
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	0.99	1.38	2.19	1.73
	16.8	1.43	1.44	1.11	1.44
	33.6	1.05	1.45	1.72	1.26
	67.2	1.04	1.41	1.98	1.45
67.2	0.0	0.63	2.60	2.29	1.71
	16.8	1.32	1.48	3.33	1.95
	33.6	1.03	2.20	1.87	2.11
	67.2	2.10	1.82	2.89	1.49

3RD CUT MEAN DM% 33.3

78/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	6.02	7.06	6.78	6.81	6.66
67.2	6.38	9.67	9.39	9.30	8.69
MEAN	6.20	8.37	8.08	8.05	7.68
K	0	112	224	448	MEAN
NPERCUT					
33.6	5.56	6.76	7.40	6.95	6.66
67.2	5.65	9.33	10.36	9.42	8.69
MEAN	5.60	8.04	8.88	8.18	7.68
K	0	112	224	448	MEAN
P					
0.0	4.56	7.21	6.86	6.17	6.20
16.8	6.20	8.61	9.89	8.76	8.37
33.6	5.53	8.40	9.63	8.78	8.08
67.2	6.12	7.95	9.13	9.02	8.05
MEAN	5.60	8.04	8.88	8.18	7.68
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	5.27	6.37	6.23	6.20
	16.8	5.89	7.57	7.37	7.41
	33.6	5.15	6.84	8.04	7.07
	67.2	5.91	6.25	7.95	7.11
67.2	0.0	3.85	8.05	7.49	6.14
	16.8	6.51	9.65	12.41	10.11
	33.6	5.91	9.96	11.22	10.48
	67.2	6.33	9.64	10.30	10.93

TOTAL OF 3 CUTS MEAN DM% 24.4

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

EXTRA TREATMENTS

1ST CUT (9/6/78) DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	4.99	4.45	4.72
67.2	5.27	5.74	5.51
MEAN	5.13	5.09	5.11

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	4.47	4.97	4.72
67.2	5.17	5.84	5.51
MEAN	4.82	5.41	5.11

K	(56)56	(336)336	MEAN
P			
(34)34	4.78	5.48	5.13
(34)67	4.85	5.34	5.09
MEAN	4.82	5.41	5.11

1ST CUT MEAN DM% 22.9

2ND CUT (25/7/78) DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	1.51	1.41	1.46
67.2	1.80	1.65	1.73
MEAN	1.66	1.53	1.59

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	1.43	1.49	1.46
67.2	1.64	1.81	1.73
MEAN	1.53	1.65	1.59

K	(56)56	(336)336	MEAN
P			
(34)34	1.62	1.69	1.66
(34)67	1.45	1.61	1.53
MEAN	1.53	1.65	1.59

2ND CUT MEAN DM% 17.9

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

EXTRA TREATMENTS

3RD CUT (30/10/78) DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	1.95	1.33	1.64
67.2	2.11	2.46	2.28
MEAN	2.03	1.90	1.96

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	1.32	1.97	1.64
67.2	1.69	2.88	2.28
MEAN	1.50	2.42	1.96

K	(56)56	(336)336	MEAN
P			
(34)34	1.49	2.57	2.03
(34)67	1.52	2.27	1.90
MEAN	1.50	2.42	1.96

3RD CUT MEAN DM% 33.4

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	8.45	7.18	7.82
67.2	9.18	9.86	9.52
MEAN	8.82	8.52	8.67

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	7.21	8.43	7.82
67.2	8.50	10.53	9.52
MEAN	7.86	9.48	8.67

K	(56)56	(336)336	MEAN
P			
(34)34	7.89	9.74	8.82
(34)67	7.82	9.21	8.52
MEAN	7.86	9.48	8.67

TOTAL OF 3 CUTS MEAN DM% 24.4

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

EXCLUDING EXTRA TREATMENTS

1ST CUT (9/6/78) DRY MATTER TONNES/HECTARE

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

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	4.76	4.70	4.67	4.27	4.60
67.2	6.88	6.59	6.75	6.22	6.61
MEAN	5.82	5.65	5.71	5.24	5.61
K	0	112	224	448	MEAN
NPERCUT					
33.6	4.55	4.59	4.78	4.49	4.60
67.2	6.66	6.35	6.88	6.56	6.61
MEAN	5.60	5.47	5.83	5.52	5.61
K	0	112	224	448	MEAN
P					
0.0	5.79	5.57	6.04	5.88	5.82
16.8	5.55	5.61	6.08	5.35	5.65
33.6	5.78	5.81	5.75	5.51	5.71
67.2	5.28	4.90	5.44	5.35	5.24
MEAN	5.60	5.47	5.83	5.52	5.61
NPERCUT	K	0	112	224	448
	P				
33.6	0.0	4.77	4.66	4.94	4.67
	16.8	4.42	5.07	4.86	4.46
	33.6	4.63	4.62	4.89	4.55
	67.2	4.38	4.02	4.43	4.26
67.2	0.0	6.82	6.49	7.14	7.09
	16.8	6.69	6.15	7.30	6.23
	33.6	6.93	7.00	6.62	6.47
	67.2	6.18	5.79	6.45	6.44

1ST CUT MEAN DM% 24.1

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

EXCLUDING EXTRA TREATMENTS

2ND CUT (25/7/78) DRY MATTER TONNES/HECTARE

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

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	1.90	1.79	1.86	1.76	1.83
67.2	2.71	2.73	2.77	2.61	2.70
MEAN	2.30	2.26	2.32	2.19	2.27
K	0	112	224	448	MEAN
NPERCUT					
33.6	1.85	1.90	1.71	1.84	1.83
67.2	2.81	2.61	2.96	2.43	2.70
MEAN	2.33	2.26	2.34	2.14	2.27
K	0	112	224	448	MEAN
P					
0.0	2.07	2.20	2.49	2.46	2.30
16.8	2.17	2.18	2.38	2.29	2.26
33.6	2.75	2.37	2.35	1.80	2.32
67.2	2.33	2.28	2.14	1.99	2.19
MEAN	2.33	2.26	2.34	2.14	2.27
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	1.93	1.94	1.74	1.99
	16.8	1.70	1.65	1.73	2.06
	33.6	1.87	2.18	1.66	1.72
	67.2	1.88	1.85	1.73	1.59
67.2	0.0	2.21	2.46	3.23	2.93
	16.8	2.64	2.70	3.04	2.52
	33.6	3.62	2.56	3.03	1.88
	67.2	2.78	2.72	2.55	2.39

2ND CUT MEAN DM% 16.1

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

EXCLUDING EXTRA TREATMENTS

3RD CUT (30/10/78) DRY MATTER TONNES/HECTARE

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

P	0.0	16.8	33.6	67.2	MEAN
NPERCUT					
33.6	1.39	1.17	1.28	1.00	1.21
67.2	1.93	1.99	1.83	1.89	1.91
MEAN	1.66	1.58	1.56	1.44	1.56
K	0	112	224	448	MEAN
NPERCUT					
33.6	1.24	1.19	1.27	1.14	1.21
67.2	1.68	1.98	1.97	2.00	1.91
MEAN	1.46	1.58	1.62	1.57	1.56
K	0	112	224	448	MEAN
P					
0.0	1.71	1.56	1.80	1.57	1.66
16.8	1.35	1.40	1.71	1.84	1.58
33.6	1.50	1.70	1.46	1.55	1.56
67.2	1.27	1.67	1.52	1.31	1.44
MEAN	1.46	1.58	1.62	1.57	1.56
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	1.49	1.43	1.53	1.11
	16.8	1.31	0.74	1.38	1.25
	33.6	1.32	1.43	1.27	1.11
	67.2	0.84	1.15	0.92	1.09
67.2	0.0	1.93	1.68	2.07	2.04
	16.8	1.40	2.06	2.05	2.44
	33.6	1.69	1.97	1.65	2.00
	67.2	1.71	2.20	2.12	1.53

3RD CUT MEAN DM% 32.3

78/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	8.05	7.65	7.82	7.03	7.64
67.2	11.52	11.31	11.35	10.71	11.22
MEAN	9.78	9.48	9.58	8.87	9.43
K	0	112	224	448	MEAN
NPERCUT					
33.6	7.64	7.68	7.77	7.46	7.64
67.2	11.15	10.94	11.81	10.99	11.22
MEAN	9.39	9.31	9.79	9.23	9.43
K	0	112	224	448	MEAN
P					
0.0	9.57	9.33	10.33	9.91	9.78
16.8	9.08	9.18	10.17	9.48	9.48
33.6	10.03	9.88	9.56	8.87	9.58
67.2	8.89	8.86	9.10	8.65	8.87
MEAN	9.39	9.31	9.79	9.23	9.43
	K	0	112	224	448
NPERCUT	P				
33.6	0.0	8.18	8.03	8.21	7.76
	16.8	7.43	7.46	7.96	7.77
	33.6	7.82	8.23	7.83	7.38
	67.2	7.10	7.02	7.08	6.94
67.2	0.0	10.95	10.63	12.45	12.06
	16.8	10.73	10.91	12.39	11.20
	33.6	12.24	11.53	11.30	10.35
	67.2	10.67	10.70	11.13	10.36

TOTAL OF 3 CUTS MEAN DM% 24.4

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

EXTRA TREATMENTS

1ST CUT (9/6/78) DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	4.96	5.17	5.06
67.2	7.26	7.29	7.27
MEAN	6.11	6.23	6.17

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	4.82	5.30	5.06
67.2	7.19	7.36	7.27
MEAN	6.00	6.33	6.17

K	(56)56	(336)336	MEAN
P			
(34)34	6.13	6.09	6.11
(34)67	5.88	6.58	6.23
MEAN	6.00	6.33	6.17

1ST CUT MEAN DM% 22.8

2ND CUT (25/7/78) DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	2.06	1.67	1.87
67.2	2.94	2.92	2.93
MEAN	2.50	2.30	2.40

K	(56)56	(336)336	MEAN
NPERCUT			
33.6	1.78	1.96	1.87
67.2	3.03	2.83	2.93
MEAN	2.40	2.39	2.40

K	(56)56	(336)336	MEAN
P			
(34)34	2.73	2.27	2.50
(34)67	2.08	2.51	2.30
MEAN	2.40	2.39	2.40

2ND CUT MEAN DM% 15.4

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

EXTRA TREATMENTS

3RD CUT (30/10/78) DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	1.42	1.31	1.37
67.2	2.01	1.78	1.89
MEAN	1.71	1.54	1.63
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	1.30	1.43	1.37
67.2	1.79	1.99	1.89
MEAN	1.55	1.71	1.63
K	(56)56	(336)336	MEAN
P			
(34)34	1.79	1.64	1.71
(34)67	1.31	1.78	1.54
MEAN	1.55	1.71	1.63

3RD CUT MEAN DM% 31.5

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

P	(34)34	(34)67	MEAN
NPERCUT			
33.6	8.44	8.15	8.30
67.2	12.21	11.99	12.10
MEAN	10.32	10.07	10.20
K	(56)56	(336)336	MEAN
NPERCUT			
33.6	7.90	8.70	8.30
67.2	12.01	12.18	12.10
MEAN	9.95	10.44	10.20
K	(56)56	(336)336	MEAN
P			
(34)34	10.64	10.00	10.32
(34)67	9.26	10.87	10.07
MEAN	9.95	10.44	10.20

TOTAL OF 3 CUTS MEAN DM% 24.4

PLOT AREA HARVESTED 0.00086