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Yields of the Field Experiments 1977

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77/R/CS/200 and 77/W/CS/200 Factors Affecting Yield - Ryegrass, Clover, Lucerne

Rothamsted Research

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77/R/CS/200 and 77/W/CS/200

FACTORS AFFECTING YIELD

Object: To study some of the factors limiting yield of grass, clover and lucerne - Rothamsted (R), Pastures and Woburn (W), Butt Furlong.

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The first year, ryegrass, white clover, lucerne.

Design: Single replicate of 2 plots split into 50. In the first year yields are taken from only 22 sub plots.

Whole plot dimensions: 23.8 x 24.5.

Treatments (for yields 1977): All combinations of:-

Whole plots

- | | |
|------------|---|
| 1. IRRIGTN | Irrigation (basal 75 mm Pastures (R), 63 mm Butt Furlong (W) until 3rd trifoliate leaf stage of clover then treatment): |
| PART | Irrigated to reduce a soil moisture deficit of 50 mm to 25 mm, 30 mm Pastures (R), 50 mm Butt Furlong (W) |
| FULL | Irrigated to reduce a soil moisture deficit of 25 mm to nil, 55 mm Pastures (R), 75 mm Butt Furlong (W) |

Sub plots

- | | |
|-------------|--|
| 2. VARIETY | Varieties and species: |
| S23 | S.23 ryegrass (duplicated) |
| S23/BLAN | S.23 ryegrass + Blanca white clover (duplicated) |
| BLAN | Blanca white clover (quadruplicated) |
| VERTUS | Vertus lucerne (duplicated) |
| 3. PATHCONT | Pathogen control: |
| NONE | None |
| FULL | 'Full' pathogen control |

plus one extra sub plot treatment:

EXTRA

S23/S100 S.23 ryegrass + S.100 white clover (duplicated)

NOTES: (1) Full pathogen control consisted of:- (1) Aldicarb at 10 kg, applied to the seedbed, (2) benomyl foliar spray at 0.5 kg + phorate at 5.0 kg applied as granules, applied after each cut.

(2) Irrigation was applied on the following dates:-

Pastures (R)

31 May	12.5 mm
7 July	12.5 mm
27 July	25 mm
31 July	25 mm
2 Aug	25 mm (IRRIGTN FULL plots only)
5 Aug	30 mm

77/R/CS/200 and 77/W/CS/200

Butt Furlong (W)

1- 2 June	19 mm
1 July	19 mm
12-14 July	25 mm
22-26 July	25 mm (IRRIGTN PART plots), 50 mm (IRRIGTN FULL plots)
2- 3 Aug	25 mm

Standard applications:

Pastures (R) All plots: Manures: Ground chalk at 7.5 tonnes and (0:20:20) at 600 kg. S.23 plots only: 50 kg N as 'Nitro-Chalk' in the seedbed and 25 kg N as 'Nitro-Chalk' after the first two cuts.

Butt Furlong (W) All plots: Manures: (10:24:24) at 500 kg. S.23 plots only 25 kg N as 'Nitro-Chalk' after the first two cuts. Weedkiller: 2, 4-DB at 2.1 kg in 340 l.

Seed: S.23 Perennial ryegrass alone sown at 20 kg.

S.23 Perennial ryegrass sown at 10 kg either with Blanca white clover sown at 4 kg or with S.100 white clover at 4 kg.

Blanca white clover alone, sown at 4 kg.

Lucerne, Vertus, sown at 10 kg, inoculated with Rhizobium.

Cultivations, etc.:-

Pastures (R): Ground chalk applied: 1 Sept, 1976. Ploughed: 16 Sept. Heavy spring-tine cultivated twice: 7 Mar, 1977. PK applied: 13 May. Spring-tine cultivated, harrowed and rolled: 18 May. Seed sown, harrowed in: 20 May. Cut three times: 12 Aug, 12 Sept, 25 Oct. Previous crops: W. Wheat 1975, barley 1976.

Butt Furlong (W): Ploughed: 1 Nov, 1976. Spring-tine cultivated: 7 Mar, 1977. Spring-tine cultivated with crumbler attached four times: 8 Mar, 18 Apr, 25 Apr, 20 May. NPK applied: 25 Apr. Seeds sown, fine-tooth harrowed, rolled: 23 May. Weedkiller applied: 11 July. Hand weeded: 26-28 July. Cut three times: 16 Aug, 15 Sept, 18 Oct. Previous crops: Barley 1975, 1976.

NOTES: (1) Assessments of pests and diseases were made during the season. Nitrogen percentages of crop produce were measured.

(2) 77/W/CS/200

One plot with treatment combinations

IRRIGTN	FULL
VARIETY	VERTUS
PATHCONT	NONE

was affected by erosion early in the year, an estimated value was used in the analysis.

77/R/CS/200 PASTURES (R)

1ST CUT (12/8/77) DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	2.23	1.36	1.25	2.48	1.71
FULL	2.35	1.80	1.44	1.83	1.77
MEAN	2.29	1.58	1.35	2.15	1.74
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	1.66	1.77	1.71		
FULL	1.72	1.82	1.77		
MEAN	1.69	1.79	1.74		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	2.40	2.18	2.29		
S23/BLAN	1.33	1.83	1.58		
BLAN	1.29	1.41	1.35		
VERTUS	2.16	2.15	2.15		
MEAN	1.69	1.79	1.74		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	2.39	2.08		
	S23/BLAN	1.09	1.62		
	BLAN	1.21	1.29		
	VERTUS	2.40	2.56		
FULL	VARIETY				
	S23	2.42	2.28		
	S23/BLAN	1.56	2.03		
	BLAN	1.36	1.53		
	VERTUS	1.91	1.74		
IRRIGTN	PART	FULL	MEAN		
EXTRA S23/S100	1.05	1.06	1.06		

GRAND MEAN 1.68

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	MIN REP MAX-MIN
SED	0.195 0.169	0.124	0.277 0.240	0.175	
TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT			
SED	0.277 0.240 0.196	0.391 0.339 0.277	MIN REP MAX-MIN MAX REP		
	VARIETY				
MAX-MIN	BLAN V ANY OF REMAINDER				
MIN REP	ANY OF REMAINDER				
MAX REP	WITHIN BLAN				

* WITHIN SAME LEVEL OF IRRIGTN ONLY

77/R/CS/200 PASTURES (R)
 2ND CUT (12/9/77) DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	2.13	1.69	1.87	1.38	1.79
FULL	1.94	1.59	1.77	1.27	1.67
MEAN	2.03	1.64	1.82	1.33	1.73
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	1.77	1.81	1.79		
FULL	1.59	1.74	1.67		
MEAN	1.68	1.78	1.73		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	1.99	2.07	2.03		
S23/BLAN	1.56	1.72	1.64		
BLAN	1.75	1.89	1.82		
VERTUS	1.34	1.32	1.33		
MEAN	1.68	1.78	1.73		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	2.11	2.14		
	S23/BLAN	1.59	1.79		
	BLAN	1.86	1.89		
	VERTUS	1.40	1.36		
FULL	S23	1.87	2.01		
	S23/BLAN	1.52	1.65		
	BLAN	1.64	1.89		
	VERTUS	1.27	1.27		
IRRIGTN	PART	FULL	MEAN		
EXTRA S23/S100	1.67	1.72	1.69		

GRAND MEAN 1.72

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	
SED	0.077	0.049	0.109	0.069	MIN REP
	0.067		0.094		MAX-MIN
TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT			
SED	0.109	0.154	MIN REP		
	0.094	0.133	MAX-MIN		
	0.077	0.109	MAX REP		

77/R/CS/200 PASTURES (R)
 3RD CUT (25/10/77) DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	1.49	1.07	0.83	0.21	0.89
FULL	1.59	1.06	0.85	0.22	0.91
MEAN	1.54	1.06	0.84	0.22	0.90
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	0.86	0.92	0.89		
FULL	0.89	0.94	0.91		
MEAN	0.87	0.93	0.90		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	1.56	1.51	1.54		
S23/BLAN	1.01	1.11	1.06		
BLAN	0.80	0.88	0.84		
VERTUS	0.19	0.25	0.22		
MEAN	0.87	0.93	0.90		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	1.54	1.43		
	S23/BLAN	1.04	1.09		
	BLAN	0.78	0.89		
	VERTUS	0.15	0.28		
FULL	VARIETY				
	S23	1.58	1.59		
	S23/BLAN	0.98	1.13		
	BLAN	0.83	0.88		
	VERTUS	0.23	0.21		
IRRIGTN	PATHCONT	NONE	FULL	MEAN	
EXTRA S23/S100	PART	0.93	0.96	0.94	

GRAND MEAN 0.90

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	
SED	0.053	0.033	0.075	0.047	MIN REP
	0.046		0.065		MAX-MIN
TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT			
SED	0.075	0.106	MIN REP		
	0.065	0.091	MAX-MIN		
	0.053	0.075	MAX REP		

77/R/CS/200 PASTURES (R)

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	5.85	4.11	3.96	4.08	4.39
FULL	5.87	4.44	4.06	3.32	4.35
MEAN	5.86	4.28	4.01	3.70	4.37
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	4.28	4.50	4.39		
FULL	4.20	4.50	4.35		
MEAN	4.24	4.50	4.37		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	5.96	5.77	5.86		
S23/BLAN	3.89	4.66	4.28		
BLAN	3.84	4.18	4.01		
VERTUS	3.68	3.71	3.70		
MEAN	4.24	4.50	4.37		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	6.04	5.65		
	S23/BLAN	3.73	4.50		
	BLAN	3.85	4.07		
	VERTUS	3.95	4.20		
FULL	VARIETY				
	S23	5.87	5.88		
	S23/BLAN	4.06	4.81		
	BLAN	3.83	4.30		
	VERTUS	3.41	3.22		
IRRIGTN	PART	FULL	MEAN		
EXTRA S23/S100	3.65	3.74	3.70		

GRAND MEAN 4.31

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	
SED	0.205	0.130	0.290	0.183	MIN REP
	0.178		0.251		MAX-MIN
TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT			
SED	0.190	0.410	MIN REP		
	0.251	0.355	MAX-MIN		
	0.205	0.290	MAX REP		

77/R/CS/200 PASTURES (R)

1ST CUT (12/8/77) DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	26	0.391	23.3

1ST CUT MEAN DM% 13.2

2ND CUT (12/9/77) DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	26	0.154	8.9

2ND CUT MEAN DM% 12.8

3RD CUT (25/10/77) DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	26	0.106	11.7

3RD CUT MEAN DM% 12.6

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	26	0.410	9.5

TOTAL OF 3 CUTS MEAN DM% 12.9

SUB PLOT AREA HARVESTED 0.00038

77/W/CS/200 BUTT FURLONG(W)

1ST CUT (16/8/77) DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	0.38	1.52	1.38	1.29	1.19
FULL	0.66	1.25	1.28	1.03	1.10
MEAN	0.52	1.38	1.33	1.16	1.14
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	1.16	1.22	1.19		
FULL	0.89	1.31	1.10		
MEAN	1.02	1.26	1.14		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	0.26	0.77	0.52		
S23/BLAN	1.32	1.45	1.38		
BLAN	1.18	1.48	1.33		
VERTUS	1.18	1.14	1.16		
MEAN	1.02	1.26	1.14		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	0.31	0.44		
	S23/BLAN	1.45	1.59		
	BLAN	1.25	1.51		
	VERTUS	1.53	1.04		
FULL	VARIETY				
	S23	0.21	1.10		
	S23/BLAN	1.20	1.31		
	BLAN	1.11	1.45		
	VERTUS	0.82	1.25		
IRRIGTN	PART	FULL	MEAN		
EXTRA S23/S100	0.92	0.94	0.93		

GRAND MEAN 1.12

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	
SED	0.125 0.108	0.079	0.177 0.153	0.112	MIN REP MAX-MIN
TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT			
SED	0.177 0.153 0.125	0.250 0.216 0.177	MIN REP MAX-MIN MAX REP		

77/W/CS/200 BUTT FURLONG(W)

2ND CUT (15/9/77) DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	0.75	1.44	1.35	0.61	1.10
FULL	1.02	1.40	1.40	0.83	1.21
MEAN	0.88	1.42	1.37	0.72	1.15
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	1.10	1.10	1.10		
FULL	1.06	1.36	1.21		
MEAN	1.08	1.23	1.15		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	0.55	1.21	0.88		
S23/BLAN	1.39	1.45	1.42		
BLAN	1.33	1.42	1.37		
VERTUS	0.78	0.66	0.72		
MEAN	1.08	1.23	1.15		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	0.55	0.94		
	S23/BLAN	1.49	1.40		
	BLAN	1.38	1.31		
	VERTUS	0.68	0.53		
FULL	VARIETY				
	S23	0.55	1.48		
	S23/BLAN	1.30	1.50		
	BLAN	1.28	1.52		
	VERTUS	0.88	0.78		
IRRIGTN	PART	FULL	MEAN		
EXTRA S23/S100	1.21	1.27	1.24		
GRAND MEAN	1.15				

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	
SED	0.084	0.053	0.119	0.075	MIN REP
	0.073		0.103		MAX-MIN
TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT			
SED	0.119	0.169	MIN REP		
	0.103	0.146	MAX-MIN		
	0.084	0.119	MAX REP		

77/W/CS/200 BUTT FURLONG(W)

3RD CUT (18/10/77) DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	0.56	0.68	0.66	0.20	0.55
FULL	0.72	0.71	0.66	0.16	0.58
MEAN	0.64	0.69	0.66	0.18	0.57
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	0.46	0.64	0.55		
FULL	0.50	0.66	0.58		
MEAN	0.48	0.65	0.57		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	0.38	0.89	0.64		
S23/BLAN	0.65	0.73	0.69		
BLAN	0.61	0.71	0.66		
VERTUS	0.17	0.19	0.18		
MEAN	0.48	0.65	0.57		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	0.36	0.76		
	S23/BLAN	0.62	0.73		
	BLAN	0.57	0.76		
	VERTUS	0.20	0.20		
FULL	S23	0.40	1.03		
	S23/BLAN	0.68	0.73		
	BLAN	0.65	0.67		
	VERTUS	0.13	0.19		
IRRIGTN	PART	FULL	MEAN		
EXTRA S23/S100	0.51	0.59	0.55		

GRAND MEAN 0.56

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	
SED	0.041	0.026	0.058	0.037	MIN REP
	0.036		0.051		MAX-MIN

TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT	
SED	0.058	0.083	MIN REP
	0.051	0.073	MAX-MIN
	0.041	0.058	MAX REP

77/W/CS/200 BUTT FURLONG(W)

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

VARIETY	S23	S23/BLAN	BLAN	VERTUS	MEAN
IRRIGTN					
PART	1.68	3.64	3.39	2.09	2.84
FULL	2.39	3.36	3.34	2.02	2.89
MEAN	2.03	3.50	3.37	2.06	2.86
PATHCONT	NONE	FULL	MEAN		
IRRIGTN					
PART	2.72	2.96	2.84		
FULL	2.45	3.33	2.89		
MEAN	2.59	3.14	2.86		
PATHCONT	NONE	FULL	MEAN		
VARIETY					
S23	1.19	2.88	2.03		
S23/BLAN	3.37	3.63	3.50		
BLAN	3.12	3.61	3.37		
VERTUS	2.13	1.99	2.06		
MEAN	2.59	3.14	2.86		
IRRIGTN	PATHCONT	NONE	FULL		
PART	VARIETY				
	S23	1.22	2.14		
	S23/BLAN	3.56	3.72		
	BLAN	3.20	3.58		
	VERTUS	2.42	1.77		
FULL	VARIETY				
	S23	1.17	3.61		
	S23/BLAN	3.18	3.54		
	BLAN	3.04	3.65		
	VERTUS	1.84	2.21		
IRRIGTN	PART	FULL	MEAN		
EXTRA S23/S100	2.64	2.81	2.72		

GRAND MEAN 2.85

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	VARIETY	PATHCONT	IRRIGTN* VARIETY	IRRIGTN* PATHCONT	MIN REP	MAX-MIN
SED	0.207	0.131	0.293	0.185		
	0.179		0.254			
TABLE	VARIETY PATHCONT	IRRIGTN* VARIETY PATHCONT			MIN REP	MAX-MIN
SED	0.293	0.414				
	0.254	0.359				
	0.207	0.293				

77/W/CS/200 BUTT FURLONG(W)

1ST CUT (16/8/77) DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	25	0.250	22.2

1ST CUT MEAN DM% 12.7

2ND CUT (15/9/77) DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	25	0.169	14.5

2ND CUT MEAN DM% 13.7

3RD CUT (18/10/77) DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	25	0.083	14.6

3RD CUT MEAN DM% 15.5

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP.SP	25	0.414	14.5

TOTAL OF 3 CUTS MEAN DM% 14.0

SUB PLOT AREA HARVESTED 0.00038