ROTHAMSTED RESEARCH

Yields of the Field Experiments 1981

Full Table of Content

81/R/RN/1 and 81/R/RN/2 Ley Arable - Old Grass, Leys, S. Oats, Potatoes, S. Beans, S. Barley, W. Wheat

Rothamsted Research

Rothamsted Research (1982) *81/R/RN/1 and 81/R/RN/2 Ley Arable - Old Grass, Leys, S. Oats, Potatoes, S. Beans, S. Barley, W. Wheat ;* Yields Of The Field Experiments 1981, pp 47 - 58 **- DOI: https://doi.org/10.23637/ERADOC-1-35**

81/R/RN/1 and 81/R/RN/2

LEY ARABLE

Object: To study the effects of three-year leys on the fertility of the soil as measured by a sequence of three arable test crops. From 1968, continuous w. wheat was grown on some blocks after the three test crops to study the build-up and decline of take-all (Gaeumannomyces graminis) after the different cropping sequences. From 1977 new crop sequences were introduced on these blocks - Highfield and Fosters.

Sponsors: A.E. Johnston, D.B. Slope.

The 33rd year, old grass, leys, s. oats, potatoes, s. beans, s. barley, w. wheat.

For previous years see 'Details' 1967 & 1973 and 74-80/R/RN/1&2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (81/R/RN/1)

FOSTERS — A site with little organic matter initially (81/R/RN/2)

ROTATION — Treatments: The experiment originally tested four six-course rotations, with all phases present each year. In recent years these rotations were:-

	Treatment crops	Test crops
LUCERNE	LU, LU, LU	W, P, B
CLOGRA	LC, LC, LC	W, P, B
GRASS	LN, LN, LN,	W, P, B
ARABLE	H, SB, O,	W, P, B

LU = lucerne, LC = clover-grass ley, no nitrogen fertiliser, LN = all-grass ley with much nitrogen fertiliser, H = 1-year seeds hay, SB = sugar beet, O = s. oats, W = w. wheat, P = potatoes, B = s. barley.

From 1968 the order of test crops was changed to P, W, B except for those phases that had already started the sequence W, P, B.

From 1975 the s. barley test crop was changed to w. wheat.

RESEEDED — On both fields in the first three years other plots were sown with long-term reseeded grass

OLDGRASS — On Highfield plots of the old turf were left initially unploughed, for comparison with the three-year leys

In 1962 and 1963 some of the old and reseeded grass plots were divided for management identical to:-

C — Clover-grass ley
N — All-grass ley

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1 and 81/R/RN/2

From 1963 (reseeded) and 1968 (old grass) some grass plots were ploughed and cropped with the same test crops as above, thereafter these plots followed the ARABLE rotation. In 1973 some of these plots were returned to reseeded grass.

From 1968 only two phases on each field continued in the original six-course rotation (the museum blocks). The four other phases (the new sequence blocks) were sown to w. wheat every year at the end of the test-crop cycle. In 1977, 1978, 1979 and 1980 one phase, fallowed in the previous year started new sequences of treatment cropping:

SEQUENCE		Treatment crops	Test crops
LUCERNE	(previously LUCERNE)	LU, LU, LU	W, W, W, W
CLOGRA	(previously CLOGRA)	LC, LC, LC	W, W, W, W
GRASS/G	(previously GRASS)	R, R, R	W, W, W, W
ARABLE/A	(previously ARABLE)	O, P, BE	W, W, W, W
ARABLE/R	(previously RESEEDED)	B, B, W	W, W, W, W
GRASS/OG	(previously OLDGRASS)	R, R, R	W, W, W, W

R = ryegrass, BE = s. beans. Other symbols as above. All ploughed at the end of the treatment crop cycle except GRASS/OG - direct drilled to w. wheat. Treatment crop cycles start after nine previous cereals followed by one fallow. In treatment years yields are taken only from s. barley and w. wheat.

Additional treatments to 3rd test crop w. wheat in the museum blocks:-

Sub plots

FYMRES68 Farmyard manure residues, last applied 1968:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertiliser in 1981 (kg N as 'Nitro-Chalk'):

0
50
100
150

Additional treatments to 1st & 2nd test crops w. wheat in the new sequence blocks:

Sub plots

N Nitrogen fertiliser in 1981 (kg N as 'Nitro-Chalk'):

0
50
100
150

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1 and 81/R/RN/2

Standard applications:
- Museum blocks:
  - 3rd Treatment crops:
    - Lucerne: Manures: (0:14:28) at 810 kg.
    - All-grass ley and clover-grass ley: Manures: (0:14:28) at 540 kg.
    - All grass-ley only: Manures: (25:0:16) at 300 kg in spring and after each cut except the last.
    - Oats: Manures: (20:10:10) at 350 kg, combine drilled. Weedkillers: Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 2.5 l) in 250 l, applied with the fungicide. Fungicide: Tridemorph at 0.53 kg.
  - 3rd Test crop:
    - Wheat: (0:20:20) at 250 kg, combine drilled. Weedkillers: Glyphosate at 1.5 l in 900 l. Chlortoluron at 5.6 l in 250 l. Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.7 l) in 250 l.
    - Reseeded grass and old grass: Manures: (0:14:28) at 540 kg. All-grass half plots: (25:0:16) at 300 kg in spring and after each cut except the last.

- New sequence blocks:
  - 2nd Treatment crops:
    - Lucerne: Manures: (0:14:28) at 720 kg.
    - Clover-grass ley and ryegrass: (0:14:28) at 720 kg. (25:0:16) at 300 kg in spring, and, to ryegrass only, after each cut except the last.
    - Potatoes: Manures: (10:10:15+4.5 Mg) at 1960 kg. Weedkiller: Metribuzin at 0.98 kg in 220 l. Fungicide: Mancozeb at 1.4 kg in 250 l applied six times, with insecticide on the first five occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: BOV at 170 l.
    - S. barley: Manures: (20:10:10) at 350 kg, combine drilled. Weedkillers: Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 2.5 l) in 250 l, applied with the fungicide. Fungicide: Tridemorph at 0.53 kg.
  - 3rd Treatment crops:
    - Lucerne: Manures: (0:14:28) at 720 kg.
    - Clover-grass ley and ryegrass: Manures: (0:14:28) at 720 kg. (25:0:16) at 300 kg in spring, and, to ryegrass only, after each cut except the last.
    - S. beans: Weedkiller: Simazine at 1.2 kg in 250 l. Fungicide: Benomyl at 0.55 kg in 250 l, applied with the pirimicarb. Insecticides: Phorate at 2.2 kg, combine drilled. Pirimicarb at 0.14 kg.
    - W. wheat: Manures: (0:20:20) at 250 kg, combine drilled. 'Nitro-Chalk' at 380 kg. Weedkillers: Chlortoluron at 5.6 l in 250 l. Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.7 l) in 250 l.
  - 1st Test crops:
    - W. wheat:
    - After all sequences: Manures: (0:20:20) at 250 kg, combine drilled. Weedkillers: Chlortoluron at 5.6 l in 250 l. Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.7 l) in 250 l.
    - After GRASS/OG: Weedkillers: Glyphosate at 1.5 kg in 220 l.

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1 and 81/R/RN/2

2nd Test crops:
W. wheat: Manures: (0:20:20) at 250 kg, combine drilled.
Weedkillers: Glyphosate at 1.5 kg in 900 l. Chlortoluron at 5.6 l in 250 l. Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.7 l) in 250 l.

Seed:
Museum blocks:
Oats: Peniarth, sown at 190 kg.
Wheat: Flanders, sown at 200 kg.
New sequence blocks:
Potatoes: Pentland Crown.
S. barley: Georgie, sown at 160 kg.
S. beans: Minden, sown at 260 kg.
W. wheat: Flanders, sown at 200 kg.

Cultivations, etc.:-
Museum blocks:
3rd Treatment crops:
Lucerne: PK applied: 20 Nov, 1980. Cut: 4 June, 1981, 10 Aug, 6 Nov.
All-grass ley and clover-grass ley: PK applied: 20 Nov, 1980. NK applied to all-grass half plots only: 27 Mar, 1981, 8 June, 10 Aug. Cut: 3 June, (Highfield only), 4 June (Fosters only), 5 Aug, 3 Nov.
Oats: Ploughed: 30 Dec, 1980. Spring-tine cultivated: 18 Feb, 1981. Seed sown: 19 Feb. Rolled: 10 Apr. Weedkiller applied: 12 May. Combine harvested: 18 Aug.
3rd Test crops:
Wheat: Glyphosate applied: 4 Sept, 1980. Ploughed: 2 Oct. Spring-tine cultivated twice: 3 Oct, 4 Oct. Seed sown: 8 Oct. Chlortoluron applied: 13 Oct. N applied: 15 Apr, 1981. 'Brittox' applied: 22 Apr. Combine harvested: 24 Aug (Fosters only), 25 Aug (Highfield only).
Reseeded grass and old grass: PK applied: 20 Nov, 1980. NK applied to all grass half-plots only: 27 Mar, 1981, 8 June, 10 Aug. Cut: 3 June (Highfield only), 4 June (Fosters only), 5 Aug, 10 Aug.
New sequence blocks:
2nd Treatment crops:
Lucerne: PK applied: 20 Nov, 1980. Cut: 4 June, 1981, 5 Aug (Fosters only), 7 Aug (Highfield only), 6 Nov.
Clover-grass ley and ryegrass: PK applied: 20 Nov, 1980. NK to ryegrass plots only: 27 Mar, 1981, 8 June, 10 Aug. Cut: 4 June, 5 Aug (Fosters only), 7 Aug (Highfield only), 6 Nov.

Potatoes: Ploughed: 20 Nov, 1980. NPK + Mg applied, spike rotary cultivated, planted: 24 Apr, 1981. Weedkiller applied: 1 June. Fungicide applied: 22 June, 1 July, 13 July, 27 July, 11 Aug and 24 Aug. Haulm mechanically destroyed: 12 Sept. Desiccant applied: 25 Sept. Lifted: 6 Oct.
S. barley: Ploughed: 20 Nov, 1980. Spring-tine cultivated: 18 Feb, 1981. Seed sown: 19 Feb. Weedkillers applied: 12 May. Combine harvested: 18 Aug.

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1 and 81/R/RN/2

3rd Treatment crops:
Lucerne: PK applied: 20 Nov, 1981. Cut: 4 June, 1981, 5 Aug (Fosters only), 7 Aug (Highfield only).
Clover-grass ley and ryegrass: PK applied: 20 Nov, 1980. NK applied: 27 Mar, 1981. NK applied to ryegrass only plots: 8 June. Cut: 4 June, 5 Aug (Fosters only), 7 Aug (Highfield only).
S. beans: Chisel ploughed twice: 30 Dec, 1980. Spring-tine cultivated: 18 Feb, 1981. Seed sown: 19 Feb. Weedkiller applied: 9 Apr. Fungicide applied: 18 June. Combine harvested: 8 Sept.
W. wheat: Ploughed: 2 Oct, 1980. Spring-tine cultivated: 4 Oct. Seed sown: 8 Oct. Chlortoluron applied: 13 Oct. N applied: 15 Apr, 1981. 'Brittox' applied: 22 Apr. Combine harvested: 24 Aug (Fosters only), 25 Aug (Highfield only).

1st Test crops:
W. wheat:
After lucerne, clover-grass ley and ryegrass (except GRASS/OG): Ploughed: 4 Aug, 1980, (Fosters only), 5 Aug (Highfield only). Disc harrowed twice: 21 Aug, 12 Sept. Spring-tine cultivated twice: 2 Oct, 4 Oct. Seed sown: 8 Oct.
After GRASS/OG: Glyphosate applied: 7 Aug, 1980. Seed direct drilled, and disc harrowed in: 8 Oct.
After w. wheat and s. beans: Ploughed: 2 Oct. Spring-tine cultivated: 4 Oct. Seed sown: 8 Oct.
Subsequent operations to all sequences: Chlortoluron applied: 13 Oct. N applied: 15 Apr, 1981. 'Brittox' applied: 22 Apr. Combine harvested: 24 Aug (Fosters only), 25 Aug (Highfield only).

2nd Test crop:
W. wheat:
All sequences except GRASS/OG: Glyphosate applied: 4 Sept, 1980. Ploughed: 2 Oct (Fosters only), 3 Oct (Highfield only). Spring-tine cultivated: 4 Oct. Seed sown: 8 Oct.
GRASS/OG only: Glyphosate applied: 4 Sept. Seed direct drilled & harrowed in: 8 Oct.
Subsequent operations to all sequences: Chlortoluron applied: 13 Oct. N applied: 15 Apr, 1981. 'Brittox' applied: 22 Apr. Combine harvested: 24 Aug (Fosters only), 25 Aug (Highfield only).

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1 AND 81/R/RN/2

MUSEUM BLOCKS

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 3 CUTS	6.03	7.16
MEAN DM%	22.9	22.5
ALL GRASS LEY		
TOTAL OF 3 CUTS	12.69	12.36
MEAN DM%	24.2	24.4
LUCERNE		
TOTAL OF 3 CUTS	11.6	12.2
MEAN DM%	20.9	20.4

OLD GRASS

TOTAL OF 3 CUTS

	HIGHFIELD	
	C	N
33RD EXPTL YEAR		
BLOCKS 1 & 4	5.71	10.83
BLOCK 2	4.60	11.45
MEAN DM%	23.0	20.8

RESEEDED GRASS

TOTAL OF 3 CUTS

	HIGHFIELD			FOSTERS		
	BLOCKS	C	N	BLOCKS	C	N
33RD EXPTL YEAR	1 & 4	5.85	11.45	1 & 3	7.58	12.34
33RD EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	7.36	12.59	2 & 4	6.88	11.86
MEAN DM%		21.2	22.2		20.8	22.6

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1

WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

N SEQUENCE	0	50	100	150	MEAN
LUCERNE	6.87	7.26	6.89	6.25	6.82
CLOGRA	4.93	5.78	5.77	5.83	5.58
GRASS/G	4.51	6.03	5.87	6.03	5.61
ARABLE/A	5.91	7.08	6.87	6.89	6.69
ARABLE/R	5.06	5.88	5.84	6.09	5.72
GRASS/OG	4.52	5.97	5.87	5.62	5.49
MEAN	5.30	6.33	6.18	6.12	5.98

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.288	0.151	0.431
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.370

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.288	4.8
BLOCK.WP.SP	18	0.370	6.2

GRAIN MEAN DM% 83.0

SUB PLOT AREA HARVESTED 0.00322

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1

WHEAT 2ND TEST CROP

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	5.17	6.80	7.50	7.07	6.64
CLOGRA	5.73	7.00	7.14	7.35	6.81
GRASS/G	6.10	6.99	7.51	7.31	6.98
ARABLE/A	5.12	6.93	7.49	7.41	6.74
ARABLE/R	5.41	6.69	7.32	7.40	6.70
GRASS/OG	5.51	6.35	6.93	6.47	6.32
MEAN	5.51	6.80	7.31	7.17	6.70

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.382	0.133	0.474
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.325

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.382	5.7
BLOCK.WP.SP	18	0.325	4.9

GRAIN MEAN DM% 82.4

SUB PLOT AREA HARVESTED 0.00322

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/1

WHEAT 3RD TEST CROP

GRAIN TONNES/HECTARE

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

ROTATION / FYMRES68	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
NONE	5.64	6.53	6.38	5.89	6.11
FYM	5.79	6.69	6.68	5.77	6.23
MEAN	5.72	6.61	6.53	5.83	6.17

N / FYMRES68	0	50	100	150	MEAN
NONE	4.32	6.52	6.83	6.78	6.11
FYM	5.03	6.48	6.79	6.64	6.23
MEAN	4.67	6.50	6.81	6.71	6.17

N / ROTATION	0	50	100	150	MEAN
LUCERNE	4.39	5.84	6.71	5.94	5.72
CLOGRA	5.39	7.09	7.04	6.94	6.61
GRASS	5.43	6.96	6.62	7.11	6.53
ARABLE	3.48	6.09	6.88	6.86	5.83
MEAN	4.67	6.50	6.81	6.71	6.17

FYMRES68 / N / ROTATION	0	50	100	150
NONE / LUCERNE	3.83	5.97	6.71	6.07
CLOGRA	4.77	7.41	7.17	6.76
GRASS	4.87	6.88	6.48	7.30
ARABLE	3.80	5.80	6.98	7.00
FYM / LUCERNE	4.96	5.71	6.70	5.81
CLOGRA	6.01	6.76	6.90	7.11
GRASS	5.99	7.04	6.76	6.91
ARABLE	3.17	6.39	6.79	6.72

GRAIN MEAN DM% 80.2

PLOT AREA HARVESTED 0.00663

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/2

WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	8.52	8.48	8.58	8.77	8.59
CLOGRA	7.19	7.73	8.32	8.30	7.88
GRASS/G	5.92	7.01	7.72	8.28	7.23
ARABLE/A	5.68	7.47	7.56	8.69	7.35
ARABLE/R	5.42	6.55	7.07	7.39	6.61
MEAN	6.55	7.45	7.85	8.29	7.53

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.400	0.141	0.484
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.315

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.400	5.3
BLOCK.WP.SP	15	0.315	4.2

GRAIN MEAN DM% 79.5

SUB PLOT AREA HARVESTED 0.00322

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/2

WHEAT 2ND TEST CROP

GRAIN TONNES/HECTARE

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

N SEQUENCE	0	50	100	150	MEAN
LUCERNE	5.29	7.39	7.99	8.35	7.25
CLOGRA	5.76	7.85	8.00	8.75	7.59
GRASS/G	6.22	7.82	8.10	8.09	7.56
ARABLE/A	4.52	6.01	7.37	7.97	6.47
ARABLE/R	5.07	6.30	7.89	7.95	6.80
MEAN	5.37	7.07	7.87	8.22	7.13

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.172	0.106	0.268
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.237

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.172	2.4
BLOCK.WP.SP	15	0.237	3.3

GRAIN MEAN DM% 79.0

SUB PLOT AREA HARVESTED 0.00322

https://doi.org/10.23637/ERADOC-1-35

81/R/RN/2

WHEAT 3RD TEST CROP

GRAIN TONNES/HECTARE

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

ROTATION	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
FYMRES68					
NONE	6.56	7.01	7.02	6.29	6.72
FYM	6.67	7.07	7.12	6.34	6.80
MEAN	6.62	7.04	7.07	6.31	6.76

N	0	50	100	150	MEAN
FYMRES68					
NONE	4.91	6.77	7.41	7.78	6.72
FYM	4.96	6.59	7.64	8.00	6.80
MEAN	4.94	6.68	7.53	7.89	6.76

N	0	50	100	150	MEAN
ROTATION					
LUCERNE	5.21	6.41	7.29	7.55	6.62
CLOGRA	5.33	7.07	7.75	8.00	7.04
GRASS	5.20	6.88	7.92	8.28	7.07
ARABLE	4.00	6.38	7.14	7.74	6.31
MEAN	4.94	6.68	7.53	7.89	6.76

	N	0	50	100	150
FYMRES68	ROTATION				
NONE	LUCERNE	4.97	6.46	7.11	7.68
	CLOGRA	5.47	7.09	7.77	7.71
	GRASS	4.71	7.47	7.65	8.26
	ARABLE	4.50	6.08	7.11	7.46
FYM	LUCERNE	5.46	6.35	7.47	7.42
	CLOGRA	5.20	7.06	7.74	8.29
	GRASS	5.68	6.30	8.19	8.29
	ARABLE	3.50	6.67	7.17	8.01

GRAIN MEAN DM% 78.3

PLOT AREA HARVESTED 0.00663

https://doi.org/10.23637/ERADOC-1-35