ROTHAMSTED RESEARCH

Yields of the Field Experiments 1984

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84/R/RN/1 and 84/R/RN/2 Ley/ARABLE - Old Grass, Leys, S. Oats, W. Wheat

Rothamsted Research

Rothamsted Research (1985) *84/R/RN/1 and 84/R/RN/2 Ley/ARABLE - Old Grass, Leys, S. Oats, W. Wheat ;* Yields Of The Field Experiments 1984, pp 47 - 56 **- DOI: https://doi.org/10.23637/ERADOC-1-32**

84/R/RN/1 and 84/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, R. J. Gutteridge.

The 36th year, old grass, leys, oats, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-83/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (84/R/RN/1)

FOSTERS — A site with little organic matter initially (84/R/RN/2)

ROTATION — Treatments: The experiment originally tested four six-course rotations, with all phases present each year. For many 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 fertilizer, LN = all-grass ley with nitrogen fertilizer, 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

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.

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84/R/RN/1 and 84/R/RN/2

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 1st and 2nd w. wheats, ploughed thereafter. Treatment crop cycles started after nine previous cereals followed by one fallow. In 1984 yields were taken from 3rd and 4th test crops only.

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

Sub plots

FYMRES70 Farmyard manure residues, last applied 1970:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertilizer in 1984 (kg N) as 'Nitro-Chalk':

0
50
100
150

Additional treatments to 3rd and 4th test crops w. wheat in the new sequence blocks:

Sub plots

N Nitrogen fertilizer in 1984 (kg N) as 'Nitro-Chalk':

0
50
100
150

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84/R/RN/1 and 84/R/RN/2

Standard applications:

3rd Treatment crops in museum blocks:

Lucerne: Manures: (0:18:36) at 630 kg.

All-grass ley: Manures: (0:18:36) at 420 kg. (25:0:16) at 300 kg in spring and after each cut except the last.

Clover-grass ley: Manures: (0:18:36) at 420 kg.

Oats: Manures: (20:10:10) at 350 kg. Weedkillers: 3, 6-dichloropicolinic acid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop (as 'CMPP' at 4.2 l) applied with the fungicide in 250 l. Fungicide: Tridemorph at 0.52 kg.

3rd Test crop wheat in museum blocks and 3rd and 4th test crops wheat in new sequence blocks:

W. wheat: Manures: (0:24:24) at 210 kg. Weedkillers: Glyphosate at 1.4 kg in 250 l. Chlortoluron at 3.5 kg in 250 l. Cyanazine at 0.24 kg and mecoprop at 1.6 kg in 250 l (Highfield), cyanazine at 0.30 kg and mecoprop at 2.0 kg in 250 l (Fosters).

Reseeded grass and old grass: Manures: (0:18:36) at 420 kg. All-grass half plots: (25:0:16) at 300 kg in spring and after each cut except the last.

Seed: S. oats: Trafalgar, sown at 180 kg.
W. wheat: Flanders, sown at 200 kg.

Cultivations, etc.:-

3rd Treatment crops in museum blocks:

Lucerne: PK applied: 21 Nov, 1983. Cut: 11 June, 1984, 18 July. Topped: 10 Sept.

All-grass ley and clover-grass ley: PK applied: 21 Nov, 1983. NK applied to all-grass ley only: 7 Mar, 1984, 4 June. Cut: 30 May, 18 July.

S. oats: Ploughed: 14 Dec, 1983. NPK applied: 16 Mar, 1984. Heavy spring-tine cultivated, rotary harrowed: 20 Mar. Rotary harrowed, seed sown: 21 Mar. Weedkillers and fungicide applied: 23 May. Combine harvested: 30 Aug.

3rd Test crop wheat in museum blocks and 3rd and 4th test crops wheat in new sequence blocks: Glyphosate applied: 20 Sept, 1983. Ploughed: 4 Oct (Fosters), 5 Oct (Highfield). Heavy spring-tine cultivated: 13 Oct (Fosters only). Heavy spring-tine cultivated (Highfield only), PK applied: 17 Oct. Spring-tine cultivated, rotary harrowed, seed sown: 18 Oct. Chlortoluron applied: 20 Oct (Highfield), 21 Oct (Fosters). N applied: 12 Apr, 1984. Cyanazine and mecoprop applied: 14 Apr. Combine harvested: 13 Aug (Fosters), 14 Aug (Highfield).

Re-seeded grass and old grass: PK applied: 21 Nov, 1983. NK applied to all-grass half plots: 7 Mar, 1984, 4 June, 27 July. Cut: 30 May, 18 July, 16 Nov (Highfield), 19 Nov (Fosters).

NOTE: On Highfield 4th test crop wheat three plots were lost because the combine broke down, these plots had treatment combinations

ARABLE/A	ARABLE/A	ARABLE/A
0	50	150

estimated values were used in the analysis.

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84/R/RN/1 AND 84/R/RN/2

MUSEUM BLOCKS

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 2 CUTS	5.77	5.48
MEAN DM%	21.1	25.2
ALL GRASS LEY		
TOTAL OF 2 CUTS	7.32	7.57
MEAN DM%	25.2	24.1
LUCERNE		
TOTAL OF 2 CUTS	6.73	7.69
MEAN DM%	19.5	17.6

OLD GRASS	HIGHFIELD	
TOTAL OF 3 CUTS	C	N
36TH EXPTL YEAR		
BLOCKS 1 & 4	3.85	7.97
BLOCK 2	4.39	8.13
MEAN DM%	21.7	19.8

RESEEDED GRASS

TOTAL OF 3 CUTS

		HIGHFIELD			FOSTERS	
	BLOCKS	C	N	BLOCKS	C	N
36TH EXPTL YEAR	1 & 4	3.84	8.56	1 & 3	5.00	8.44
36TH EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	4.36	8.80	2 & 4	5.61	7.95
MEAN DM%		21.3	20.7		19.7	19.9

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84/R/RN/1 HIGHFIELD

W.WHEAT 3RD TEST CROP - MUSEUM BLOCKS

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	MEAN
SEQUENCE			
LUCERNE	7.11	7.12	7.11
CLOGRA	7.03	7.30	7.17
GRASS	7.05	6.54	6.79
ARABLE	6.11	5.69	5.90
MEAN	6.82	6.66	6.74

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	5.06	6.82	8.34	8.23	7.11
CLOGRA	5.39	7.57	7.43	8.27	7.17
GRASS	5.04	6.20	7.82	8.10	6.79
ARABLE	3.40	6.00	6.78	7.42	5.90
MEAN	4.72	6.65	7.59	8.01	6.74

N	0	50	100	150	MEAN
FYMRES70					
NONE	4.91	6.90	7.53	7.95	6.82
FYM	4.54	6.40	7.66	8.06	6.66
MEAN	4.72	6.65	7.59	8.01	6.74

N		0	50	100	150
FYMRES70	SEQUENCE				
NONE	LUCERNE	5.73	7.30	7.91	7.50
	CLOGRA	5.06	7.54	7.54	7.97
	GRASS	5.30	6.75	7.67	8.46
	ARABLE	3.54	5.99	7.00	7.89
FYM	LUCERNE	4.40	6.34	8.77	8.97
	CLOGRA	5.73	7.59	7.32	8.57
	GRASS	4.78	5.65	7.97	7.75
	ARABLE	3.25	6.00	6.56	6.94

GRAIN MEAN DM% 83.9

PLOT AREA HARVESTED 0.00675

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84/R/RN/2 FOSTERS

W.WHEAT 3RD TEST CROP - MUSEUM BLOCKS

GRAIN TONNES/HECTARE

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

FYMRES70 SEQUENCE	NONE	FYM	MEAN
LUCERNE	6.31	6.46	6.38
CLOGRA	6.10	6.11	6.11
GRASS	5.15	5.74	5.44
ARABLE	5.07	4.85	4.96
MEAN	5.66	5.79	5.72

N SEQUENCE	0	50	100	150	MEAN
LUCERNE	4.72	6.28	6.88	7.65	6.38
CLOGRA	4.34	6.18	6.41	7.50	6.11
GRASS	4.25	4.45	6.42	6.65	5.44
ARABLE	2.84	4.53	5.99	6.50	4.96
MEAN	4.04	5.36	6.42	7.08	5.72

N FYMRES70	0	50	100	150	MEAN
NONE	3.77	5.23	6.56	7.07	5.66
FYM	4.30	5.49	6.29	7.08	5.79
MEAN	4.04	5.36	6.42	7.08	5.72

N		0	50	100	150
FYMRES70	SEQUENCE				
NONE	LUCERNE	4.60	6.15	6.89	7.60
	CLOGRA	4.33	6.40	6.55	7.12
	GRASS	3.50	4.01	6.34	6.73
	ARABLE	2.66	4.34	6.45	6.84
FYM	LUCERNE	4.83	6.42	6.87	7.71
	CLOGRA	4.35	5.96	6.27	7.87
	GRASS	4.99	4.88	6.50	6.57
	ARABLE	3.02	4.71	5.53	6.16

GRAIN MEAN DM% 82.4

PLOT AREA HARVESTED 0.00675

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84/R/RN/1 HIGHFIELD

W.WHEAT 3RD TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	5.06	6.47	8.08	8.57	7.04
CLOGRA	6.00	6.98	8.49	8.68	7.54
GRASS/G	5.57	6.55	8.45	8.46	7.26
ARABLE/A	4.91	5.30	6.74	7.88	6.20
ARABLE/R	5.25	6.87	7.75	8.15	7.01
GRASS/OG	6.63	7.31	7.75	9.26	7.74
MEAN	5.57	6.58	7.88	8.50	7.13

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.261	0.201	0.501
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.493

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.261	3.7
BLOCK.WP.SP	18	0.493	6.9

GRAIN MEAN DM% 83.4

SUB PLOT AREA HARVESTED 0.00322

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84/R/RN/1 HIGHFIELD

W.WHEAT 4TH TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	4.11	5.72	6.56	7.49	5.97
CLOGRA	4.36	5.91	7.41	8.62	6.57
GRASS/G	3.86	5.90	6.65	7.59	6.00
ARABLE/A	3.72	4.70	6.19	6.30	5.23
ARABLE/R	4.68	6.09	7.56	7.98	6.58
GRASS/OG	5.40	6.58	7.59	7.97	6.89
MEAN	4.35	5.82	6.99	7.66	6.21

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.385	0.189	0.557
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.464

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.385	6.2
BLOCK.WP.SP	15	0.464	7.5

GRAIN MEAN DM% 83.6

SUB PLOT AREA HARVESTED 0.00322

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84/R/RN/2 FOSTERS

W.WHEAT 3RD TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	3.74	4.76	5.89	6.41	5.20
CLOGRA	3.69	5.17	5.65	6.48	5.25
GRASS/G	3.84	5.00	6.18	6.46	5.37
ARABLE/A	2.79	3.70	4.99	5.84	4.33
ARABLE/R	3.71	4.71	5.97	6.58	5.24
MEAN	3.56	4.67	5.74	6.35	5.08

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.610	0.149	0.674
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.333

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.610	12.0
BLOCK.WP.SP	15	0.333	6.6

GRAIN MEAN DM% 82.6

SUB PLOT AREA HARVESTED 0.00322

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84/R/RN/2 FOSTERS

W.WHEAT 4TH TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	3.36	4.37	5.20	6.56	4.87
CLOGRA	4.08	5.08	6.44	7.21	5.70
GRASS/G	4.02	4.67	5.56	6.34	5.15
ARABLE/A	3.30	4.31	5.05	6.77	4.86
ARABLE/R	4.56	5.95	6.42	6.97	5.98
MEAN	3.86	4.87	5.74	6.77	5.31

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.401	0.200	0.557
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.446

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.401	7.6
BLOCK.WP.SP	15	0.446	8.4

GRAIN MEAN DM% 82.8

SUB PLOT AREA HARVESTED 0.00322

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