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Yields of the Field Experiments 1985

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85/R/RN/1 and 85/R/RN/2 Ley Arable - Old Grass, Leys, W. Wheat

Rothamsted Research

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85/R/RN/1 and 85/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.

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The 37th year, old grass, leys, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-84/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD A site with much organic matter initially (ploughed out from permanent grass) (85/R/RN/1)

FOSTERS A site with little organic matter initially (85/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. Potatoes were not grown after 1982; the test crops were W, W, W thereafter.

RESEDED 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

85/R/RN/1 and 85/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 RESEDED)	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 1985 yields were taken from 4th test crops only.

Additional treatments to 1st 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 fertilizer in 1985 (kg N) as 'Nitro-Chalk' (27.5% N):

0
50
100
150

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

Sub plots

N Nitrogen fertilizer in 1985 (kg N) as 'Nitro-Chalk' (27.5% N):

0
50
100
150

85/R/RN/1 and 85/R/RN/2

Standard applications:

1st Treatment crops in museum blocks:

Lucerne: Manures: (0:20:20) at 380 kg. Weedkillers: Glyphosate at 1.4 kg in 250 l. Dinoseb at 1.0 kg in 500 l.

All-grass ley and 1-year hay: Manures: (0:14:28) at 540 kg.

'Nitro-Chalk' (27.5% N) at 270 kg. (25:0:16) at 300 kg.

Weedkillers: Glyphosate at 1.4 kg in 250 l. 2, 4-DB, MCPA and benazolin (as 'Legumex Extra' at 7.0 l) in 500 l.

Clover-grass ley: Manures: (0:14:28) at 540 kg. Weedkillers:

Glyphosate at 1.4 kg in 250 l. 2, 4-DB, MCPA and benazolin (as 'Legumex Extra' at 7.0 l) in 500 l.

1st Test crop wheat in museum blocks and 4th test crop wheat in new sequence blocks:

W. wheat: Manures: (0:24:24) at 210 kg. Weedkillers: Glyphosate at 1.4 kg in 500 l (after leys in museum blocks only).

Isoproturon at 1.5 kg with mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 500 l.

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: Lucerne: Vertus, sown at 31 kg.

All-grass ley: Meadow Fescue S.215 (17 kg), and Timothy Climax (17 kg), mixture sown at 34 kg.

Clover-grass ley: Meadow Fescue S.215 (15 kg), Timothy Climax (18 kg) and white clover Huia (4 kg), mixture sown at 37 kg.

1-year hay: RVP Italian Ryegrass, sown at 25 kg.

W. wheat: Flanders, sown at 190 kg.

Cultivations, etc.:-

1st Treatment crops in museum blocks:

Lucerne, all-grass ley, clover-grass ley and 1-year hay:

Glyphosate applied: 11 Oct, 1984. Ploughed: 21 Nov. Spring-tine cultivated: 4 Apr, 1985.

Lucerne: PK applied: 29 Apr, 1985. Rotary harrowed, rolled:

30 Apr. Seed sown: 7 May. Dinoseb applied: 20 June. Cut: 5 Sept, 4 Nov.

All-grass ley, 1-year hay and clover-grass ley: PK applied: 29 Apr, 1985. N applied (except to clover-grass ley): 29 Apr. Rotary harrowed, seed broadcast and harrowed in: 30 Apr. 'Legumex Extra' applied: 17 June. Cut: 25 July. NK applied (except to clover-grass ley): 29 July. Cut: 4 Nov.

1st Test crop wheat in museum blocks and 4th test crop wheat in new sequence blocks:

Glyphosate applied (to 1st Test crop only):

13 Aug, 1984. Ploughed: 25 Sept (4th Test crop on Fosters

only), 2 Oct (1st Test crop on Highfield and Fosters), 3 Oct

(4th Test crop on Highfield only). Spring-tine cultivated:

5 Oct, (Fosters), 17 Oct (Highfield). PK applied: 1 Nov

(Fosters), 2 Nov (Highfield). Rotary harrowed, seed sown:

2 Nov. Isoproturon, mecoprop, bromoxynil and ioxynil applied:

17 Apr, 1985. N treatments applied: 18 Apr. Combine

harvested: 28 Aug.

Reseeded grass and old grass: PK applied: 11 Dec, 1984. NK

applied to all-grass half plots: 29 Mar, 1985, 31 May, 29 July.

Cut: 29 May (Fosters), 30 May (Highfield), 25 July, 4 Nov

(Highfield), 5 Nov (Fosters).

85/R/RN/1 AND 85/R/RN/2 MUSEUM BLOCKS

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD		FOSTERS			
CLOVER-GRASS LEY						
TOTAL OF 2 CUTS	5.61		4.50			
MEAN DM%	27.0		29.1			
ALL-GRASS LEY						
TOTAL OF 2 CUTS	8.60		6.29			
MEAN DM%	29.2		32.2			
HAY						
TOTAL OF 2 CUTS	7.60		7.25			
MEAN DM%	28.1		32.0			
LUCERNE						
TOTAL OF 2 CUTS	4.31		4.62			
MEAN DM%	22.0		22.8			
OLD GRASS						
	HIGHFIELD					
TOTAL OF 3 CUTS	C		N			
37TH EXPTL YEAR						
BLOCKS 1 & 4	7.59		11.53			
BLOCK 2	6.81		10.30			
MEAN DM%	25.2		26.7			
RESEEDED GRASS						
TOTAL OF 3 CUTS						
	HIGHFIELD		FOSTERS			
	BLOCKS	C	N	BLOCKS	C	N
37TH EXPTL YEAR	1 & 4	7.20	11.65	1 & 3	7.30	11.29
37TH EXPTL YEAR (SEEDED 1949 RESEDED 1973)	2 & 3	6.52	13.79	2 & 4	7.58	10.40
MEAN DM%		24.4	27.0		21.5	25.1

85/R/RN/1 HIGHFIELD

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES68	NONE	FYM	MEAN
SEQUENCE			
LUCERNE	6.27	6.49	6.38
CLOGRA	6.19	5.96	6.08
GRASS	5.16	5.49	5.33
ARABLE	5.45	5.69	5.57
MEAN	5.77	5.91	5.84

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	6.29	6.76	6.43	6.04	6.38
CLOGRA	5.92	6.38	6.23	5.78	6.08
GRASS	4.17	5.82	5.44	5.89	5.33
ARABLE	3.81	5.68	6.67	6.11	5.57
MEAN	5.05	6.16	6.19	5.95	5.84

N	0	50	100	150	MEAN
FYMRES68					
NONE	4.89	6.02	6.09	6.08	5.77
FYM	5.21	6.30	6.29	5.83	5.91
MEAN	5.05	6.16	6.19	5.95	5.84

SEQUENCE	N	0	50	100	150
LUCERNE	FYMRES68				
	NONE	5.78	6.62	6.29	6.40
CLOGRA	FYM	6.81	6.90	6.56	5.69
	NONE	6.04	6.31	6.34	6.08
GRASS	FYM	5.79	6.46	6.11	5.47
	NONE	4.03	5.42	5.21	6.00
ARABLE	FYM	4.31	6.22	5.67	5.77
	NONE	3.69	5.74	6.53	5.84
	FYM	3.93	5.62	6.82	6.39

GRAIN MEAN DM% 82.9

PLOT AREA HARVESTED 0.00663

85/R/RN/2 FOSTERS

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES68 SEQUENCE	NONE	FYM	MEAN
LUCERNE	6.78	7.07	6.93
CLOGRA	6.60	6.62	6.61
GRASS	5.76	5.89	5.83
ARABLE	5.72	6.03	5.88
MEAN	6.21	6.40	6.31

SEQUENCE	N	50	100	150	MEAN
LUCERNE	6.60	7.21	6.94	6.96	6.93
CLOGRA	6.08	6.81	6.98	6.56	6.61
GRASS	4.58	5.80	6.56	6.37	5.83
ARABLE	4.01	5.94	6.61	6.95	5.88
MEAN	5.32	6.44	6.77	6.71	6.31

FYMRES68	N	50	100	150	MEAN
NONE	4.98	6.66	6.57	6.64	6.21
FYM	5.65	6.22	6.97	6.78	6.40
MEAN	5.32	6.44	6.77	6.71	6.31

SEQUENCE	FYMRES68	N	0	50	100	150
LUCERNE	NONE	6.13	7.28	7.08	6.63	
	FYM	7.07	7.14	6.80	7.28	
CLOGRA	NONE	5.93	7.16	6.38	6.92	
	FYM	6.23	6.47	7.58	6.20	
GRASS	NONE	4.10	6.29	6.61	6.04	
	FYM	5.05	5.30	6.51	6.70	
ARABLE	NONE	3.77	5.91	6.23	6.97	
	FYM	4.24	5.97	6.99	6.93	

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00663

85/R/RN/1 HIGHFIELD

W.WHEAT 4TH TEST CROP

GRAIN TONNES/HECTARE

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

SEQUENCE	N	0	50	100	150	MEAN
LUCERNE		3.72	5.92	6.72	6.59	5.74
CLOGRA		3.75	6.34	7.21	6.90	6.05
GRASS/G		3.86	5.82	7.05	6.53	5.82
ARABLE/A		2.99	5.29	6.09	6.33	5.18
ARABLE/R		4.33	5.88	6.99	6.92	6.03
GRASS/OG		4.44	5.93	6.55	6.93	5.96
MEAN		3.85	5.86	6.77	6.70	5.80

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.231	0.110	0.327
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: SEQUENCE			0.268

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.231	4.0
BLOCK.WP.SP	18	0.268	4.6

GRAIN MEAN DM% 83.4

SUB PLOT AREA HARVESTED 0.00325

85/R/RN/2 FOSTERS

W.WHEAT 4TH TEST CROP

GRAIN TONNES/HECTARE

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

SEQUENCE	N	0	50	100	150	MEAN
LUCERNE		3.55	5.24	6.13	6.66	5.39
CLOGRA		3.01	5.40	6.58	6.45	5.36
GRASS/G		3.56	5.10	6.52	6.60	5.44
ARABLE/A		2.78	4.63	5.70	6.04	4.79
ARABLE/R		3.77	5.61	6.25	6.16	5.45
MEAN		3.33	5.19	6.23	6.38	5.29

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

TABLE	SEQUENCE	N	SEQUENCE
			N
SED	0.117	0.128	0.274
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.287

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

STRATUM	DF	SE	CV%
BLOCK.WP.SP	15	0.287	5.4
GRAIN MEAN DM%	82.2		
SUB PLOT AREA HARVESTED	0.00325		