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## Yields of the Field Experiments 1977

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### 77/W/RN/3 Ley/ARABLE - Leys, Barley, Oats ,wheat

#### Rothamsted Research

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77/W/RN/3

LEY/ARABLE

Object: To compare the effects on soil fertility of rotations with or without leys - Woburn Stackyard D.

Sponsors: K. Evans, A.E. Johnston, F.G.W. Jones, G.A. Salt.

The 40th year, leys, barley, oats, wheat.

For previous years see 'Details' 1967 & 1973 and 74-76/W/RN/3.

Design: 5 series of 8 plots, split for treatments other than rotations.

Whole plot dimensions: 8.53 x 40.7.

Treatments: All phases of four five-course rotations were originally present:

#### ROTATION

LEY	Clover/grass ley:	L, L, L, P, W
CLO	All legume ley:	SA, SA, SA, P, W until 1971 then CL, CL, CL P, W

A	Arable with roots:	P, R, C, P, W until 1971 then P, B, B, P, W
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A H	Arable with hay:	P, R, H, P, W until 1971 then P, B, H, P, W
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P = potatoes, R = rye, C = carrots, W = wheat, B = barley, H = hay,  
L = clover/grass ley, SA = sainfoin ley, CL = red clover ley

Rotations themselves followed different cycles:

On four plots in each block the rotations were repeated (PER)

On four plots in each block arable rotations alternated each five years with ley rotations (ALT)

From 1976 all the rotations were changed on all phases except for the first and second test crops in 1976:

(Previous LEY) LN, LN, LN, W, B  
(Previous CLO) LC, LC, LC, W, B  
(Previous A) F, F, O, W, B  
(Previous A H) B, B, O, W, B

LN = grass ley with N, LC = clover/grass ley no N, O = oats, F = fallow

Plots hitherto in alternating rotations were changed to test eight-year leys:

LN, LN, LN, LN, LN, LN, LN, LN, W, B  
LC, LC, LC, LC, LC, LC, LC, LC, W, B

The new scheme started by sowing these new leys in spring 1976 on four phases and in spring 1977 on the fifth phase (2nd test crop in 1976). The long-term leys will be ploughed up after five to eight years initially depending on starting point in relation to test crop.

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Treatments to first test crop wheat and second test crop barley:

ROT CYCL        Combinations of rotations and cycles defined above

LEY PER

CLO PER

A PER

A ALT

A H PER

A H ALT

Yields are taken from first and second test crops only.

Additional treatments to first test crop, wheat:-

1/2 plots

1. FYMRES67    Farmyard manure residues, last applied 1967:

NONE        None

FYM        38 tonnes on each occasion

1/8 plots

2. N        Nitrogen fertiliser (kg N):

0

63

126

189

Additional treatments to second test crop, barley:-

1/2 plots

1. FYMRES66    Farmyard manure residues, last applied 1966:

NONE        None

FYM        38 tonnes on each occasion

1/8 plots

2. N        Nitrogen fertiliser (kg N):

0

50

100

150

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Corrective K dressings (kg K20), as muriate of potash, applied to first test crop wheat.

Continuous rotations	No FYM half plots	FYM half plots
Ley	50	0
Clover	80	100
Arable with hay	113	113
Arable	188	151
Alternating rotations (last two rotations in order)		
Ley/Arable	113	126
Sainfoin/Arable	126	126
Ley/Arable with hay	100	0
Sainfoin/Arable with hay	63	0

Standard applications:-

- Grass ley and Clover/grass ley, 1st year: Manures: (0:14:28) at 540 kg. N at 70 kg as 'Nitro-Chalk'. Weedkiller: Glyphosate at 1.7 kg in 280 l.
- Grass ley, 2nd, 3rd, 4th and 5th years: Manures: Magnesian limestone at 5 t to 2nd year only. (25:0:16) at 300 kg in spring, and at 400 kg after the first cut. Weedkiller: Paraquat at 0.84 kg ion in 280 l to 3rd, 4th and 5th years only.
- Clover/grass ley, 2nd, 3rd, 4th and 5th years: Manures: Magnesian limestone at 5 t to 2nd year only. K20 at 48 kg in spring and after topping in July. Weedkiller: Paraquat at 0.84 kg ion in 280 l to 3rd, 4th and 5th years only.
- Barley: Manures: 1st and 2nd treatment crops: (20:14:14) at 400 kg. 2nd test crop: Magnesian limestone at 5 t, (0:20:20) at 300 kg. Weedkillers: Paraquat at 0.84 kg ion in 280 l. 2nd test crop only: Glyphosate at 1.7 kg in 280 l. 2nd test crop: Nematicide: Aldicarb at 10 kg.
- Oats: Manures: (20:14:14) at 400 kg. Weedkillers: Paraquat at 0.84 kg ion in 280 l, Glyphosate at 1.7 kg in 280 l.
- Winter wheat: Manures: (0:20:20) at 300 kg combine drilled. Weedkillers: Paraquat at 0.84 kg ion in 280 l. Ioxynil at 0.53 kg plus mecoprop at 1.6 kg in 220 l. Insecticide: Pirimicarb at 0.14 kg in 270 l. Nematicide: Aldicarb at 10 kg.
- Fallow: Weedkillers: Glyphosate at 1.7 kg in 280 l (1st year fallow). Paraquat at 0.84 kg ion in 280 l (2nd year fallow).

- Varieties: Grass ley: Timothy S48 15 kg, Meadow fescue S215 19 kg, sown at 34 kg.  
 Clover/grass: Timothy S48 20 kg, Meadow fescue S215 16 kg, Huia white clover 4 kg, sown at 40 kg.  
 Barley: Julia, dressed with ethirimol, sown at 160 kg.  
 Oats: Manod, sown at 200 kg.  
 Winter wheat: Cappelle, sown at 210 kg.



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Cultivations, etc.:— Treatment crops:

Grass ley and clover/grass ley, 1st year: Subsoiled, tines 140 cm apart, 50 cm deep: 7 Sept, 1976. Glyphosate applied: 24 Sept. Ploughed: 1 Nov. Spring-tine cultivated: 10 Mar, 1977. PK applied, N applied to grass ley only: 25 Apr. Spring-tine cultivated with crumbler attached, seeds sown: 18 May. Cut: 23 Sept.

Grass ley and clover/grass ley, 2nd year: Resown by hand: 13 Oct, 1976. NK applied to grass ley and K applied to clover/grass ley: 7 Apr, 1977. Grass ley cut: 1 July. K applied to clover/grass ley: 19 July. NK applied to grass ley: 21 July. Grass ley and clover/grass ley cut: 22 Sept.

Grass ley and clover/grass ley, 3rd year: Magnesian limestone applied: 6 Sept, 1976. Weedkiller applied: 8 Oct. Resown by hand: 13 Oct. NK applied to Grass ley and K applied to clover/grass ley: 7 Apr, 1977. Grass ley cut: 1 July. K applied to clover/grass ley: 19 July. NK applied to grass ley: 21 July. All leys cut: 22 Sept.

Grass leys and clover/grass leys, 4th and 5th years: Weedkiller applied: 8 Oct, 1976. Resown by hand: 13 Oct. NK applied to grass leys and K applied to clover/grass leys: 7 Apr, 1977. Grass leys cut: 1 July. K applied to clover/grass leys: 19 July. NK applied to grass leys: 21 July. All leys cut: 23 Sept.

Barley: 1st and 2nd treatment crops: Subsoiled, tines 140 cm apart, 50 cm deep: 7 Sept, 1976 (1st treatment crop only). Glyphosate applied: 24 Sept. Ploughed 1st treatment crop: 1 Nov, 2nd treatment crop: 9 Nov. Spring-tine cultivated: 10 Mar, 1977. Rotary cultivated, seed sown: 8 Apr. NPK applied: 12 Apr. Ioxynil plus mecoprop applied: 19 May. Combine harvested: 30 Aug.

Oats: 3rd treatment crop: Glyphosate applied: 24 Sept, 1976. Paraquat applied: 8 Oct. Ploughed: 9 Nov. Spring-tine cultivated: 10 Mar, 1977. Rotary cultivated, seed sown: 8 Apr. NPK applied: 12 Apr. Ioxynil plus mecoprop applied: 19 May. Combine harvested: 3 Sept.

Fallow, 1st treatment year: Subsoiled, tines 140 cm apart, 50 cm deep: 7 Sept, 1976. Glyphosate applied: 24 Sept. Ploughed: 1 Nov. Spring-tine cultivated twice: 10 Mar, 1977, 30 June. Rotary cultivated twice: 17 June, 16 Aug.

Fallow, 2nd treatment year: Paraquat applied: 24 Sept, 1976. Ploughed: 9 Nov. Spring-tine cultivated twice: 10 Mar, 1977, 30 June. Rotary cultivated twice: 17 June, 16 Aug.

Test crops:

Winter wheat, 1st test crop: Paraquat applied: 8 Oct, 1976. Ploughed: 8 Nov. Corrective K applied: 11 Nov. Aldicarb applied, rotary cultivated, seed sown: 24 Nov. N applied: 14 Apr. Ioxynil plus mecoprop applied: 15 May. Insecticide applied: 11 July. Combine harvested: 7 Sept.

Barley, 2nd test crop: Magnesian limestone applied: 6 Sept, 1976. Glyphosate applied: 24 Sept. Paraquat applied: 8 Oct. Ploughed: 9 Nov. Spring-tine cultivated: 10 Mar, 1977. Aldicarb applied, rotary cultivated, seed sown: 8 Apr. N applied: 12 Apr. Weedkiller applied: 19 May. Combine harvested: 30 Aug.

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BARLEY 2ND TEST CROP

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

GRAIN TONNES/HECTARE

ROT CYCL	LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT	MEAN	
FYMRES66								
NONE	4.35	4.56	3.63	4.07	4.22	4.24	4.18	
FYM	4.13	4.52	3.54	3.89	4.24	4.25	4.09	
N								
0	3.09	3.17	0.52	1.39	1.85	2.45	2.08	
50	4.72	4.78	3.79	4.18	4.58	4.16	4.37	
100	4.72	5.32	4.77	5.18	5.23	5.12	5.06	
150	4.44	4.89	5.27	5.17	5.25	5.25	5.04	
MEAN	4.24	4.54	3.59	3.98	4.23	4.25	4.14	
FYMRES66								
ROT CYCL		LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT	
N								
NONE		0	3.11	3.14	0.83	1.46	1.92	2.37
		50	4.60	4.91	3.93	4.13	4.61	4.16
		100	5.01	5.18	4.69	5.30	5.12	5.22
		150	4.70	5.00	5.06	5.40	5.22	5.21
FYM		0	3.07	3.20	0.21	1.31	1.78	2.53
		50	4.84	4.66	3.64	4.23	4.55	4.16
		100	4.43	5.45	4.84	5.07	5.34	5.03
		150	4.17	4.77	5.48	4.94	5.28	5.28

GRAIN MEAN DM% 82.7

STRAW TONNES/HECTARE

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

ROT CYCL	LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT	MEAN	
FYMRES66								
NONE	2.79	3.31	2.16	2.29	2.46	2.44	2.58	
FYM	2.86	3.68	2.02	2.12	2.45	2.90	2.67	
N								
0	1.51	1.70	0.31	0.53	0.73	1.13	0.98	
50	3.11	3.24	2.09	2.01	2.39	2.36	2.53	
100	3.37	4.64	2.88	3.12	3.31	3.49	3.47	
150	3.32	4.40	3.08	3.18	3.41	3.70	3.51	
MEAN	2.83	3.50	2.09	2.21	2.46	2.67	2.63	
FYMRES66								
ROT CYCL		LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT	
N								
NONE		0	1.51	1.63	0.35	0.59	0.54	1.06
		50	2.96	3.07	2.15	2.01	2.45	2.15
		100	3.65	4.36	3.00	3.14	3.30	3.16
		150	3.04	4.19	3.15	3.43	3.56	3.40
FYM		0	1.51	1.78	0.26	0.47	0.91	1.20
		50	3.25	3.41	2.04	2.01	2.32	2.57
		100	3.09	4.92	2.77	3.09	3.33	3.83
		150	3.60	4.62	3.01	2.93	3.25	4.00

STRAW MEAN DM% 83.4 SUB PLOT AREA HARVESTED 0.00260



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WINTER WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

ROT CYCL	LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT	MEAN
FYMRES67							
NONE	4.13	4.34	4.05	4.14	3.82	3.87	4.06
FYM	4.03	4.08	3.71	4.29	4.32	3.83	4.04
N							
0	2.78	3.35	2.31	2.72	2.64	2.58	2.73
63	4.42	3.88	3.79	4.49	4.65	3.74	4.16
126	5.16	4.75	4.93	5.26	4.89	4.60	4.93
189	3.97	4.86	4.48	4.38	4.12	4.48	4.38
MEAN	4.08	4.21	3.88	4.21	4.07	3.85	4.05

	ROT CYCL	LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT
FYMRES67							
N							
NONE	0	2.68	3.11	2.22	2.42	2.22	2.57
	63	4.49	4.14	3.99	4.74	4.12	3.73
	126	5.13	4.72	5.08	5.40	5.21	4.36
	189	4.22	5.39	4.90	4.01	3.75	4.81
FYM							
	0	2.87	3.58	2.40	3.02	3.06	2.58
	63	4.34	3.63	3.59	4.25	5.18	3.75
	126	5.20	4.79	4.78	5.11	4.56	4.84
	189	3.72	4.32	4.05	4.76	4.49	4.16

GRAIN MEAN DM% 80.4

STRAW TONNES/HECTARE

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

ROT CYCL	LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT	MEAN
FYMRES67							
NONE	3.33	3.65	2.52	3.05	3.49	3.23	3.21
FYM	4.14	3.88	2.12	3.06	3.92	2.62	3.29
N							
0	1.91	2.61	1.43	1.91	1.94	1.81	1.93
63	4.03	3.35	2.36	3.50	3.25	2.77	3.21
126	4.87	4.68	2.71	3.73	4.88	3.62	4.08
189	4.14	4.41	2.80	3.08	4.75	3.52	3.78
MEAN	3.74	3.76	2.32	3.06	3.71	2.93	3.25

	ROT CYCL	LEY PER	CLO PER	A PER	A ALT	A H PER	A H ALT
FYMRES67							
N							
NONE	0	1.42	2.12	1.34	1.56	1.40	2.09
	63	3.61	3.35	2.61	3.80	2.88	3.19
	126	4.39	4.36	3.06	4.36	4.61	3.99
	189	3.91	4.76	3.09	2.48	5.09	3.67
FYM							
	0	2.40	3.10	1.51	2.26	2.48	1.53
	63	4.44	3.36	2.11	3.21	3.63	2.34
	126	5.36	5.00	2.35	3.10	5.15	3.25
	189	4.37	4.05	2.50	3.69	4.40	3.37

STRAW MEAN DM% 67.1 SUB PLOT AREA HARVESTED 0.00260