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Yields of the Field Experiments 1984

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84/W/RN/3 Ley/ARABLE - Leys, S. Barley, S. Beans, W. Wheat

Rothamsted Research

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84/W/RN/3

LEY/ARABLE

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

Sponsor: A.E. Johnston.

The 47th year, leys, s. barley, s. beans, w. wheat.

For previous years see 'Details' 1967 & 1973 and 74-83/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
A H	Arable with hay:	P, R, H, P, W until 1971 then P, B, H, P, W

P = potatoes, R = w. rye, C = carrots, W = w. wheat, B = s. 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

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

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

LN 3	(Previous LEY) LN, LN, LN, W, B
LC 3	(Previous CLO) LC, LC, LC, W, B
AF	(Previous A) F, F, BE, W, B
AB	(Previous A H) B, B, BE, W, B

LN = grass ley with N, LC = clover/grass ley no N, BE = s. beans (s. oats until 1980), F = fallow

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

LN 8	LN, LN, LN, LN, LN, LN, LN, W, B
LC 8	LC, LC, LC, LC, LC, LC, LC, W, B

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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).

Yields are taken only from the leys and the test crops.

Treatments to first test crop w. wheat, all combinations of:

Whole plots

1. ROTATION

Rotations:

LN 8
LN 3
LC 8
LC 3
AF
AB

1/2 plots

2. FYMRES63

Farmyard manure residues, last applied 1963:

NONE
FYM

None
38 tonnes on each occasion

1/8 plots

3. N

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

0
70
140
210

Treatments to second test crop s. barley, all combinations of:

Whole plots

1. ROTATION

Rotations:

LN 8
LN 3
LC 8
LC 3
AF
AB

1/2 plots

2. FYMRES62

Farmyard manure residues, last applied 1962:

NONE
FYM

None
38 tonnes on each occasion

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1/8 plots

3. N Nitrogen fertilizer (kg N) as 'Nitro-Chalk':

0
60
120
180

Treatments to leys:

FYM RES	Farmyard manure residues
NONE	None
FYM	38 tonnes on each occasion, last applied 1966 to 1st year leys, 1965 to 2nd year leys, 1964 to 3rd year leys, 1963 to 4th year leys, 1962 to 5th year leys.

Corrective K dressings (kg K₂O) as muriate of potash, applied to first test crop w. wheat and long-term leys in the wheat block:

Continuous rotations	No FYM half plots	FYM half plots
LN	452	527
LC	301	364
AF	665	640
AB	653	753

Ex-alternating rotations

LN 8 ploughed for w. wheat	489	326
LN 8 not ploughed	351	289
LC 8 ploughed for w. wheat	75	0
LC 8 not ploughed	289	376

Standard applications:-

Grass ley and clover/grass, 1st year: Manures: (0:18:36) at 420 kg. N at 75 kg as 'Nitro-Chalk' to grass ley only. Weedkiller: MCPB at 2.1 kg in 250 l.

Grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 t to 5th year only. (0:18:36) at 410 kg. (25:0:16) at 300 kg in spring and after the first cut. Weedkillers: MCPA with MCPB (as 'Trifolextra' at 7.0 l) in 250 l to 2nd year only.

Clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 t to 5th year only. (0:18:36) at 410 kg. K₂O at 48 kg as muriate of potash in spring and after the first cut. Weedkillers: MCPA with MCPB (as 'Trifolex-tra' at 7.0 l) in 250 l to 2nd year only.

S. barley, 1st and 2nd treatment crops: Manures: (20:10:10) at 400 kg. Weedkillers: 3, 6-dichloropicolinic acid at 0.07 kg with bromoxynil octanoate at 0.34 kg and mecoprop at 2.1 kg in 250 l. Fungicide: Tridemorph at 0.52 kg in 250 l.

S. beans: 3rd treatment crop: Manures: (0:20:20) at 200 kg.

W. wheat, 1st test crop: Manures: (0:20:20) at 310 kg. Weedkillers: Glyphosate at 1.8 kg in 280 l. Chlortoluron at 3.5 kg in 250 l. Nematicide: Aldicarb at 10 kg.

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S. barley, 2nd test crop: Manures: Magnesial limestone at 5.0 t. (0:20:20) at 310 kg. Weedkillers: 3, 6-dichloropicolinic acid at 0.07 kg bromoxynil octanoate at 0.34 kg and mecoprop at 2.1 kg in 250 l. Fungicide: Tridemorph at 0.52 kg in 250 l. Nematicide: Aldicarb at 10 kg.

Seed: Grass ley: Climax timothy at 17 kg, meadow fescue at 17 kg, mixture sown at 34 kg.
Clover/grass ley: Climax timothy at 18 kg, meadow fescue at 15 kg, Huia white clover at 4 kg, mixture sown at 37 kg.
S. barley: Triumph, dressed with triadimenol and fuberidazole, sown at 160 kg.
S. beans: Minden, sown at 270 kg.
W. wheat: Avalon, sown at 200 kg.

Cultivations, etc.:— Treatment crops:

Grass ley and clover/grass ley, 1st year: Ploughed: 3 Oct, 1983.
Spring-tine cultivated: 21 Mar, 1984. PK applied, N applied to grass ley only: 6 Apr. Rotary harrowed, seeds sown: 10 Apr. Weedkiller applied: 1 Aug. Cut: 24 July, 10 Sept.

Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Weedkiller applied to 2nd year only: 22 Sept, 1983. Magnesial limestone applied to 5th year only: 30 Sept. Corrective K applied to 4th year only: 4 Oct. PK applied: 15 Nov. NK applied to grass ley, K applied to clover/grass ley: 13 Mar, 1984, 20 June. Cut: 11 June, 10 Sept, and 13 Dec (except 3rd and 8th years ploughed before w. wheat).

S. barley, 1st and 2nd treatment crops: Ploughed: 30 Sept, 1983.
Spring-tine cultivated, NPK applied, rotary harrowed, seed sown: 21 Mar, 1984. Weedkillers applied: 24 May. Fungicide applied: 15 June. Combine harvested: 15 Aug.

Fallow, 1st and 2nd treatment years: Ploughed: 30 Sept, 1983.
Spring-tine cultivated: 21 Mar, 1984. Rotary cultivated: 28 June. Cultivated with thistlebar: 10 Aug.

S. beans, 3rd treatment crop: Ploughed: 30 Sept, 1983. Spring-tine cultivated, PK applied: 21 Mar, 1984. Seed sown: 23 Mar. Combine harvested: 24 Aug.

Test crops:

W. wheat, 1st test crop: Glyphosate applied to leys: 22 Sept, 1983. Ploughed: 30 Sept. Corrective K applied: 4 Oct. PK and aldicarb applied, spring-tine cultivated with crumbler attached, seed sown: 5 Oct. Chlortoluron applied: 6 Oct. N applied: 9 Apr, 1984. Combine harvested: 21 Aug.

S. barley, 2nd test crop: Magnesial limestone applied: 30 Sept, 1983. Ploughed: 3 Oct. Spring-tine cultivated, PK and aldicarb applied, seed sown: 21 Mar, 1984. N applied: 23 Mar. Weedkillers applied: 24 May. Fungicide applied: 15 June. Combine harvested: 15 Aug.

84/W/RN/3

LEYS

1ST CUT (11/6/84, OR 24/7/84 FOR 1ST YEAR LEYS) DRY MATTER TONNES/HECTARE

FYM RES	NONE	FYM	MEAN
LEY			
LC1	0.38	0.36	0.37
LC2	4.36	5.30	4.83
LC3	4.20	4.25	4.23
LN1	0.66	0.89	0.78
LN2	6.86	7.00	6.93
LN3	3.68	4.43	4.06
LLC1	0.64	0.79	0.72
LLC2	4.63	5.14	4.88
LLC3	4.33	4.28	4.30
LLC4	4.96	4.75	4.85
LLC5	7.10	7.05	7.08
LLC6	5.59	5.84	5.71
LLC7	5.39	4.91	5.15
LLC8	3.96	3.39	3.67
LLN1	0.64	0.92	0.78
LLN2	7.10	7.53	7.31
LLN3	4.81	5.27	5.04
LLN4	5.12	4.81	4.97
LLN5	5.35	5.16	5.26
LLN6	5.97	5.93	5.95
LLN7	6.35	6.68	6.52
LLN8	4.72	5.62	5.17
MEAN	4.40	4.56	4.48

1ST CUT MEAN DM% 16.7

84/W/RN/3

LEYS

2ND CUT (10/9/84) DRY MATTER TONNES/HECTARE

FYM RES	NONE	FYM	MEAN
LEY			
LC1	1.04	1.25	1.15
LC2	0.54	0.71	0.62
LC3	0.52	0.65	0.58
LN1	0.85	0.87	0.86
LN2	2.68	2.54	2.61
LN3	1.31	0.85	1.08
LLC1	1.91	1.77	1.84
LLC2	1.04	1.02	1.03
LLC3	0.56	0.55	0.55
LLC4	0.74	1.14	0.94
LLC5	1.68	1.97	1.82
LLC6	1.87	1.85	1.86
LLC7	0.78	0.78	0.78
LLC8	0.20	0.27	0.24
LLN1	0.64	1.17	0.90
LLN2	2.27	2.16	2.21
LLN3	1.08	1.86	1.47
LLN4	1.24	1.15	1.19
LLN5	2.51	2.56	2.54
LLN6	3.31	3.16	3.23
LLN7	1.97	2.02	1.99
LLN8	0.82	1.24	1.03
MEAN	1.34	1.43	1.39

2ND CUT MEAN DM% 22.0

84/W/RN/3

LEYS

3RD CUT (13/12/84) DRY MATTER TONNES/HECTARE

FYM RES	NONE	FYM	MEAN
LEY			
LC1	0.20	0.32	0.26
LC2	0.10	0.14	0.12
LC3	0.00	0.00	0.00
LN1	0.22	0.23	0.23
LN2	0.29	0.17	0.23
LN3	0.00	0.00	0.00
LLC1	0.11	0.27	0.19
LLC2	0.14	0.14	0.14
LLC3	0.08	0.18	0.13
LLC4	0.10	0.27	0.19
LLC5	0.03	0.04	0.03
LLC6	0.02	0.04	0.03
LLC7	0.07	0.13	0.10
LLC8	0.00	0.00	0.00
LLN1	0.09	0.18	0.14
LLN2	0.10	0.12	0.11
LLN3	0.05	0.04	0.05
LLN4	0.04	0.03	0.03
LLN5	0.03	0.06	0.04
LLN6	0.03	0.03	0.03
LLN7	0.05	0.10	0.07
LLN8	0.00	0.00	0.00
MEAN	0.10	0.14	0.12

3RD CUT MEAN DM% 13.6

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LEYS

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

FYM RES LEY	NONE	FYM	MEAN
LC1	1.62	1.93	1.77
LC2	5.00	6.15	5.57
LC3	4.72	4.90	4.81
LN1	1.73	1.99	1.86
LN2	9.83	9.71	9.77
LN3	4.99	5.28	5.14
LLC1	2.65	2.83	2.74
LLC2	5.80	6.30	6.05
LLC3	4.97	5.01	4.99
LLC4	5.80	6.15	5.98
LLC5	8.81	9.06	8.93
LLC6	7.48	7.73	7.60
LLC7	6.24	5.82	6.03
LLC8	4.16	3.66	3.91
LLN1	1.37	2.27	1.82
LLN2	9.47	9.80	9.64
LLN3	5.93	7.17	6.55
LLN4	6.40	5.98	6.19
LLN5	7.89	7.78	7.84
LLN6	9.31	9.12	9.21
LLN7	8.37	8.80	8.58
LLN8	5.53	6.86	6.19
MEAN	5.82	6.10	5.96

TOTAL OF 3 CUTS MEAN DM% 24.4

PLOT AREA HARVESTED 0.00183

84/W/RN/3

BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES62 ROTATION	NONE	FYM	MEAN		
LN 8	6.65	6.68	6.67		
LN 3	6.73	6.63	6.68		
LC 8	6.89	7.10	6.99		
LC 3	6.61	6.82	6.72		
AF	5.81	6.19	6.00		
AB	5.54	5.32	5.43		
MEAN	6.37	6.46	6.41		
N ROTATION	0	60	120	180	MEAN
LN 8	6.17	7.22	6.74	6.54	6.67
LN 3	5.25	6.94	7.60	6.92	6.68
LC 8	6.28	7.56	6.83	7.30	6.99
LC 3	5.47	7.33	7.72	6.35	6.72
AF	3.50	6.57	6.88	7.07	6.00
AB	3.62	5.27	6.58	6.23	5.43
MEAN	5.05	6.81	7.06	6.74	6.41
N FYMRES62	0	60	120	180	MEAN
NONE	4.93	6.67	7.11	6.78	6.37
FYM	5.16	6.95	7.01	6.69	6.46
MEAN	5.05	6.81	7.06	6.74	6.41
N ROTATION FYMRES62	0	60	120	180	
LN 8 NONE	6.18	6.73	6.73	6.98	
LN 8 FYM	6.17	7.70	6.76	6.09	
LN 3 NONE	5.15	7.05	7.59	7.14	
LN 3 FYM	5.36	6.84	7.61	6.70	
LC 8 NONE	6.00	7.09	7.42	7.05	
LC 8 FYM	6.55	8.03	6.24	7.56	
LC 3 NONE	5.18	7.18	7.70	6.40	
LC 3 FYM	5.76	7.48	7.75	6.30	
AF NONE	3.38	6.55	6.30	7.02	
AF FYM	3.62	6.59	7.46	7.12	
AB NONE	3.71	5.46	6.91	6.07	
AB FYM	3.53	5.08	6.25	6.40	

GRAIN MEAN DM% 84.4

PLOT AREA HARVESTED 0.00251

84/W/RN/3

WINTER WHEAT

GRAIN TONNES/HECTARE

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

FYMRES63 ROTATION	NONE	FYM	MEAN
LN 8	8.66	8.18	8.42
LN 3	8.92	7.41	8.17
LC 8	9.26	9.52	9.39
LC 3	10.19	9.13	9.66
AF	8.35	7.50	7.92
AB	7.02	6.66	6.84
MEAN	8.73	8.07	8.40

ROTATION	N 0	70	140	210	MEAN
LN 8	5.46	8.68	9.20	10.33	8.42
LN 3	4.92	7.66	9.75	10.35	8.17
LC 8	7.51	9.66	11.04	9.36	9.39
LC 3	7.18	11.06	10.52	9.88	9.66
AF	4.28	8.94	9.12	9.35	7.92
AB	3.66	6.56	7.74	9.41	6.84
MEAN	5.50	8.76	9.56	9.78	8.40

FYMRES63	N 0	70	140	210	MEAN
NONE	5.69	8.98	9.91	10.35	8.73
FYM	5.31	8.54	9.21	9.21	8.07
MEAN	5.50	8.76	9.56	9.78	8.40

ROTATION	FYMRES63	N 0	70	140	210
LN 8	NONE	5.61	8.55	9.67	10.80
	FYM	5.32	8.81	8.72	9.87
LN 3	NONE	5.16	7.56	11.10	11.87
	FYM	4.67	7.76	8.39	8.83
LC 8	NONE	7.13	9.34	10.67	9.92
	FYM	7.89	9.97	11.41	8.81
LC 3	NONE	8.37	11.87	10.28	10.22
	FYM	6.00	10.24	10.75	9.54
AF	NONE	4.02	10.14	9.58	9.67
	FYM	4.54	7.74	8.66	9.04
AB	NONE	3.85	6.41	8.18	9.63
	FYM	3.46	6.70	7.30	9.18

GRAIN MEAN DM% 89.1

PLOT AREA HARVESTED 0.00251