ROTHAMSTED RESEARCH

Yields of the Field Experiments 1985

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

Rothamsted Research

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85/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 48th year, leys, s. barley, s. beans, w. wheat.

For previous years see 'Details' 1967 & 1973 and 74-84/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

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

LN 8	LN, LN, LN, LN, LN, LN, LN, LN, W, B
LC 8	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).

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. FYMRES64 — Farmyard manure residues, last applied 1964:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

3. N — Nitrogen fertilizer (kg N) as 'Nitro-Chalk' (27.5% N):

   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

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1/2 plots

2. FYMRES63 Farmyard manure residues, last applied 1963:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

3. N Nitrogen fertilizer (kg N) as 'Nitro-Chalk' (27.5% N):

0
60
120
180

Treatments to leys:

FYM RES	Farmyard manure residues
NONE	None
FYM	38 tonnes on each occasion, last applied 1962 to 1st and 6th year leys, 1966 to 2nd and 7th year leys, 1965 to 3rd and 8th year leys, 1964 to 4th year leys, 1963 to 5th year leys

Corrective K dressings (kg K20) 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	326	364
LC	151	176
AF	653	628
AB	678	740
Ex-alternating rotations		
LN 8 ploughed for w. wheat	188	213
LN 8 not ploughed	301	289
LC 8 ploughed for w. wheat	264	0
LC 8 not ploughed	176	138

Standard applications:-

Grass ley and clover/grass ley, 1st year: Manures: (0:18:36) at 410 kg. N at 50 kg as 'Nitro-Chalk' (27.5% N) to grass ley only.

Grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 7.5 t to 5th year only. (0:18:36) at 410 kg. (25:0:16) at 300 kg in spring and after the first cut.

Clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 7.5 t to 5th year only. (0:18:36) at 410 kg. K20 at 48 kg as muriate of potash in spring and after the first cut.

S. barley, 1st and 2nd treatment crops: Manures: (20:10:10) at 400 kg. Weedkillers: Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l.

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Standard applications:

S. beans: 3rd treatment crop: Manures: (0:24:24) at 170 kg.
W. wheat: 1st test crop: Manures: (0:20:20) at 310 kg.
Weedkillers: Glyphosate at 1.5 kg in 280 l. Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l. Nematicide: Aldicarb at 10 kg. Fungicides: Propiconazole on two occasions, at 0.25 kg in 250 l on the first occasion, at 0.12 kg on the second with 'Septal'. Carbendazim with maneb (as 'Septal' at 2.5 kg) in 250 l with propiconazole.
S. barley, 2nd test crop: Manures: Magnesian limestone at 7.5 t. (0:24:24) at 260 kg. Weedkillers: Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 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 17 kg, Huia white clover at 4 kg, mixture sown at 39 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 190 kg.

NOTE: S. beans failed and were resown at the same rate but again failed because of bird damage.

Cultivations, etc.:- Treatment crops:
Grass ley and clover/grass ley, 1st year: Ploughed: 13 Dec, 1984. Spring-tine cultivated with crumbler attached: 18 Mar, 1985. PK applied, N applied to grass ley only: 24 Apr. Spring-tine cultivated, seeds sown: 1 May. Hand hoed: 17 June. Cut: 12 Nov.
Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Corrective K applied to 4th year only: 19 Oct, 1984. Magnesian limestone applied to 5th year only: 23 Oct. PK applied: 6 Feb, 1985. NK applied to grass ley: 12 Mar, 22 July. K applied to clover/grass ley: 12 Mar, 24 July. Chain harrowed: 12 Apr. 1st cut, all plots: 8 July. 2nd cut (3rd and 8th years): 26 Sept. 2nd cut (2nd, 4th, 5th, 6th and 7th years): 11 Nov.
S. barley, 1st and 2nd treatment crops: Ploughed: 13 Dec, 1984. Spring-tine cultivated with crumbler attached, NPK applied, rotary harrowed, seed sown: 18 Mar, 1985. Mecoprop with bromoxynil and ioxynil applied: 16 May. Combine harvested: 27 Aug.
Fallow, 1st and 2nd treatment years: Ploughed: 13 Dec, 1984. Spring-tine cultivated with crumbler attached: 18 Mar, 1985. Spring-tine cultivated: 1 May. Cultivated with thistlebar: 1 May, 26 July. Deep-tine cultivated: 17 June. Rotary cultivated: 30 Sept.
S. beans, 3rd treatment crop: Ploughed: 13 Dec, 1984. PK applied: 12 Mar, 1985. Spring-tine cultivated with crumbler attached: 18 Mar. Seed sown with rotary cultivator and drill combination: 3 Apr. Seed resown with rotary cultivator and drill combination: 29 Apr. Rotary cultivated: 17 June.

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Test crops:

W. wheat, 1st test crop: Glyphosate applied to leys: 1 Oct, 1984. Ploughed: 18 Oct. Corrective K applied: 19 Oct. PK applied: 22 Oct. Power harrowed: 24 Oct. Aldicarb applied, power harrowed, seed sown: 30 Oct. N applied: 19 Apr, 1985. Mecoprop with bromoxynil and ioxynil applied: 16 May. Propiconazole applied: 17 June. Propiconazole with 'Septal' applied: 2 July. Combine harvested: 2 Sept.

S. barley, 2nd test crop: Magnesian limestone applied: 23 Oct, 1984. Ploughed: 13 Dec. PK applied: 12 Mar, 1985. Spring-tine cultivated with crumbler attached, aldicarb applied, rotary harrowed, seed sown: 18 Mar. N applied: 28 Mar. Mecoprop with bromoxynil and ioxynil applied: 16 May. Combine harvested: 27 Aug.

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LEYS

1ST CUTTING OCCASION DRY MATTER TONNES/HECTARE

FYM RES / LEY	NONE	FYM	MEAN
LC1	0.00	0.00	0.00
LC2	6.20	5.94	6.07
LC3	6.60	6.43	6.52
LN1	0.00	0.00	0.00
LN2	7.92	6.81	7.36
LN3	7.61	7.09	7.35
LLC1	0.00	0.00	0.00
LLC2	6.55	5.82	6.19
LLC3	5.55	5.46	5.50
LLC4	5.78	6.14	5.96
LLC5	7.21	6.79	7.00
LLC6	6.76	8.37	7.57
LLC7	6.74	7.47	7.11
LLC8	6.40	7.30	6.85
LLN1	0.00	0.00	0.00
LLN2	7.17	7.84	7.51
LLN3	6.64	7.74	7.19
LLN4	6.05	6.57	6.31
LLN5	7.43	7.62	7.53
LLN6	7.72	8.16	7.94
LLN7	7.53	8.82	8.17
LLN8	6.73	6.61	6.67
MEAN	6.81	7.06	6.93

1ST CUT MEAN DM% 30.6

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2ND CUTTING OCCASION DRY MATTER TONNES/HECTARE

FYM RES LEY	NONE	FYM	MEAN
LC1	4.63	4.08	4.36
LC2	3.16	2.91	3.04
LC3	2.82	3.02	2.92
LN1	4.05	3.43	3.74
LN2	3.80	5.01	4.40
LN3	2.69	3.35	3.02
LLC1	4.00	5.13	4.56
LLC2	3.83	3.77	3.80
LLC3	2.70	3.40	3.05
LLC4	5.53	4.28	4.91
LLC5	4.74	3.13	3.93
LLC6	4.32	3.24	3.78
LLC7	2.81	2.34	2.57
LLC8	2.79	3.27	3.03
LLN1	3.90	4.09	3.99
LLN2	4.83	5.18	5.00
LLN3	2.81	3.16	2.98
LLN4	3.12	3.95	3.53
LLN5	5.30	4.72	5.01
LLN6	4.70	4.72	4.71
LLN7	3.02	3.32	3.17
LLN8	2.48	2.71	2.60
MEAN	3.73	3.74	3.73

2ND CUT MEAN DM% 30.1

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TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

FYM RES LEY	NONE	FYM	MEAN
LC1	4.63	4.08	4.36
LC2	9.36	8.85	9.11
LC3	9.42	9.45	9.44
LN1	4.05	3.43	3.74
LN2	11.72	11.82	11.77
LN3	10.30	10.45	10.38
LLC1	4.00	5.13	4.56
LLC2	10.38	9.59	9.98
LLC3	8.25	8.86	8.56
LLC4	11.31	10.42	10.87
LLC5	11.95	9.91	10.93
LLC6	11.08	11.61	11.35
LLC7	9.55	9.81	9.68
LLC8	9.19	10.57	9.88
LLN1	3.90	4.09	3.99
LLN2	12.01	13.02	12.51
LLN3	9.45	10.90	10.18
LLN4	9.17	10.52	9.84
LLN5	12.74	12.33	12.53
LLN6	12.42	12.89	12.65
LLN7	10.55	12.14	11.34
LLN8	9.21	9.32	9.27
MEAN	9.30	9.51	9.41

TOTAL OF 2 CUTS MEAN DM% 30.4

PLOT AREA HARVESTED 0.00204

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S.BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES63	NONE	FYM	MEAN
ROTATION			
LN 8	5.73	5.56	5.64
LN 3	4.82	5.60	5.21
LC 8	5.54	5.60	5.57
LC 3	5.08	5.07	5.07
AF	4.81	4.91	4.86
AB	4.00	3.83	3.91
MEAN	4.99	5.10	5.04

N	0	60	120	180	MEAN
ROTATION					
LN 8	5.26	6.47	5.79	5.07	5.64
LN 3	4.88	5.60	6.22	4.15	5.21
LC 8	4.78	6.26	5.84	5.40	5.57
LC 3	4.56	5.75	4.96	5.02	5.07
AF	2.11	5.53	6.25	5.55	4.86
AB	1.21	4.23	4.94	5.27	3.91
MEAN	3.80	5.64	5.67	5.08	5.04

N	0	60	120	180	MEAN
FYMRES63					
NONE	3.68	5.79	5.53	4.98	4.99
FYM	3.91	5.49	5.80	5.18	5.10
MEAN	3.80	5.64	5.67	5.08	5.04

N		0	60	120	180
ROTATION	FYMRES63				
LN 8	NONE	5.65	6.38	5.98	4.90
	FYM	4.86	6.55	5.59	5.24
LN 3	NONE	4.52	5.82	4.92	4.00
	FYM	5.23	5.37	7.52	4.29
LC 8	NONE	4.62	6.26	6.02	5.27
	FYM	4.93	6.26	5.66	5.53
LC 3	NONE	4.35	6.03	5.16	4.76
	FYM	4.77	5.48	4.76	5.28
AF	NONE	2.01	5.71	6.16	5.36
	FYM	2.21	5.34	6.33	5.75
AB	NONE	0.93	4.53	4.95	5.58
	FYM	1.49	3.93	4.94	4.96

GRAIN MEAN DM% 83.4

PLOT AREA HARVESTED 0.00251

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WINTER WHEAT

GRAIN TONNES/HECTARE

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

FYMRES64	NONE	FYM	MEAN
ROTATION			
LN 8	7.14	6.85	7.00
LN 3	7.67	7.06	7.36
LC 8	8.11	7.63	7.87
LC 3	7.65	7.86	7.75
AF	6.17	6.03	6.10
AB	6.39	5.94	6.17
MEAN	7.19	6.89	7.04

N	0	70	140	210	MEAN
ROTATION					
LN 8	4.07	6.98	8.39	8.55	7.00
LN 3	4.24	7.26	8.26	9.69	7.36
LC 8	4.44	8.08	8.76	10.19	7.87
LC 3	4.97	7.64	9.57	8.84	7.75
AF	2.03	5.46	7.72	9.20	6.10
AB	2.39	5.90	7.76	8.62	6.17
MEAN	3.69	6.89	8.41	9.18	7.04

N	0	70	140	210	MEAN
FYMRES64					
NONE	3.78	7.03	8.52	9.43	7.19
FYM	3.60	6.75	8.30	8.93	6.89
MEAN	3.69	6.89	8.41	9.18	7.04

N	FYMRES64	0	70	140	210
ROTATION					
LN 8	NONE	4.10	7.14	8.56	8.76
	FYM	4.05	6.81	8.21	8.33
LN 3	NONE	4.33	7.02	8.33	10.99
	FYM	4.15	7.50	8.19	8.38
LC 8	NONE	4.48	8.56	8.68	10.70
	FYM	4.39	7.61	8.83	9.67
LC 3	NONE	5.25	7.37	9.39	8.58
	FYM	4.68	7.92	9.74	9.09
AF	NONE	1.89	5.68	7.80	9.30
	FYM	2.16	5.24	7.63	9.09
AB	NONE	2.60	6.39	8.35	8.23
	FYM	2.17	5.41	7.17	9.00

GRAIN MEAN DM% 83.2

PLOT AREA HARVESTED 0.00251

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