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Yields of the Field Experiments 1988

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

Rothamsted Research

Rothamsted Research (1989) *88/W/RN/3 Ley/ARABLE - Leys, S. Barley, W. Beans, W. Wheat* ; Yields Of The Field Experiments 1988, pp 39 - 47 - DOI: <https://doi.org/10.23637/ERADOC-1-43>

88/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 51st year, leys, w. beans, w. wheat, s. barley.

For previous years see 'Details' 1967 & 1973 and 74-87/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

LN1 to LN3 = three year grass ley with N, 1st year to 3rd year, LC = clover/grass ley no N, BE = beans (s. oats until 1980), F = fallow

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

LLN	LN, LN, LN, LN, LN, LN, LN, LN, W, B
LLC	LC, LC, LC, LC, LC, LC, LC, LC, W, B

LLN1 to LLN8 = eight year grass ley with N, first year to eighth year, similarly for LLC

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. FYMRES62 Farmyard manure residues, last applied 1962:

NONE	None
FYM	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

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1/2 plots

2. **FYMRES66** Farmyard manure residues, last applied 1966:

NONE None
 FYM 38 tonnes on each occasion

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 1965 to 1st and 6th year leys, 1964 to 2nd and 7th year leys, 1963 to 3rd and 8th year leys, 1962 to 4th year leys, 1966 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	0	0
LC	0	0
AF	155	120
AB	265	275

Ex-alternating rotations

LN 8 ploughed for w. wheat	0	0
LN 8 not ploughed	0	0
LC 8 ploughed for w. wheat	0	0
LC 8 not ploughed	95	40

Standard applications:-

Grass ley and clover/grass ley, 1st year: Manures: (0:18:36) at 420 kg. N at 76 kg to grass ley and 50 kg to clover/grass as 'Nitram'. Weedkiller: Glyphosate at 1.4 kg in 200 l.
 Grass ley; 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: (0:18:36) at 560 kg. (25:0:16) at 300 kg in spring and after each cut except the last.
 Clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: (0:18:36) at 560 kg. K₂O at 40 kg as muriate of potash in spring and after each cut except the last.
 S. barley, 1st and 2nd treatment crops: Manures: (20:10:10) at 400 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l, to 1st treatment crop only. Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 1.8 kg in 220 l. Fungicide: Tridemorph at 0.52 kg in 220 l.

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Standard applications:-

- W. beans, 3rd treatment crop: Weedkillers: Propyzamide at 0.85 kg in 200 l. Simazine at 0.85 kg in 200 l. Fungicide: Chlorothalonil at 1.5 kg in 220 l. Insecticide: Deltamethrin at 0.075 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 400 l.
- Fallow, 1st treatment year only: Weedkiller: Glyphosate at 1.4 kg in 200 l.
- W. wheat, 1st test crop: Manures: (0:24:24) at 260 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Isoproturon at 2.1 kg with mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 220 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 220 l. Insecticide: Carbofuran at 7.5 kg.
- S. barley, 2nd test crop: Manures: (0:24:24) at 260 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Clopyralid at 0.07 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 220 l. Fungicide: Tridemorph at 0.52 kg in 220 l. Insecticide: Carbofuran at 7.5 kg.

- Seed:** Grass ley: Climax timothy at 19 kg and meadow fescue at 19 kg, mixture sown at 39 kg.
- Clover/grass ley: Climax timothy at 19 kg, meadow fescue at 16 kg and Huia white clover at 4.7 kg, mixture sown at 39 kg.
- S. barley: Klaxon, sown at 150 kg.
- W. beans: Bourdon, dressed thiram and thiabendazole, sown at 250 kg.
- W. wheat: Mercia, sown at 190 kg.

Cultivations, etc.:-

Treatment crops:

- Grass ley and clover/grass ley, 1st year: Glyphosate applied: 22 Sept, 1987. Ploughed: 23 Feb, 1988. Rolled: 1 Mar. Manures applied: 25 Apr. Spring-tine cultivated, grass ley only: 18 May. Spike harrowed with crumbler attached, seed sown, rolled: 24 May. Topped: 19 July. Cut: 13 Sept.
- Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Corrective K applied to 4th year only: 13 Nov, 1987. (0:18:36) applied: 10 Feb, 1988. Topped and produce removed: 17 Feb. Chain harrowed: 8 Mar. N K applied to grass ley, K applied to grass/clover ley: 18 Mar and 30 June. Cut: 16 June and 13 Sept.
- S. barley, 1st and 2nd treatment crops: Glyphosate applied to 1st year only: 22 Sept, 1987. Ploughed: 23 Feb, 1988. Rolled: 1 Mar. NPK applied, rotary harrowed with crumbler attached, seed sown: 2 Mar. Clopyralid, bromoxynil and mecoprop applied: 20 May. Fungicide applied: 27 May. Combine harvested: 18 Aug.
- W. beans, 3rd treatment crop: Seed broadcast, ploughed: 25 Nov, 1987. Propyzamide applied: 10 Dec. Simazine applied: 15 Dec. Insecticide applied: 5 May, 1988. Fungicide applied: 15 June. Desiccant applied: 6 Sept. Combine harvested: 10 Sept.
- Fallow, 1st and 2nd treatment years: Glyphosate applied to 1st year only: 22 Sept, 1987. Ploughed: 23 Feb, 1988. Rolled: 1 Mar. Spring-tine cultivated: 18 May and 20 July.

Test crops:

- W. wheat, 1st test crop: Glyphosate applied: 22 Sept, 1987. Ploughed: 5 Oct. PK applied: 22 Oct. Insecticide applied, rotary harrowed with crumbler attached, seed sown, harrowed: 23 Oct. Corrective K applied: 13 Nov. Isoproturon, mecoprop, ioxynil and bromoxynil applied, N treatments applied: 27 Apr, 1988. Fungicides applied: 22 June. Combine harvested: 26 Aug.

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Cultivations, etc.:-

Test crops:

S. barley, 2nd test crop: Glyphosate applied: 22 Sept, 1987.
 Ploughed: 23 Feb, 1988. Rolled: 1 Mar. Insecticide applied, PK applied, spike harrowed with crumbler attached, seed sown: 2 Mar.
 N treatments applied: 7 Mar. Clopyralid, bromoxynil and mecoprop applied: 6 May. Fungicide applied: 27 May. Combine harvested: 18 Aug.

LEYS

1ST CUTTING OCCASION (16/6/88) DRY MATTER TONNES/HECTARE

***** Tables of means *****

FYM RES	NONE	FYM	Mean
LEY			
LC1	*	*	*
LC2	5.31	6.50	5.91
LC3	6.13	5.43	5.78
LN1	*	*	*
LN2	7.61	7.60	7.60
LN3	7.12	6.48	6.80
LLC1	*	*	*
LLC2	6.05	6.65	6.35
LLC3	6.46	5.74	6.10
LLC4	6.78	5.54	6.16
LLC5	6.74	7.55	7.14
LLC6	6.97	7.03	7.00
LLC7	6.62	5.12	5.87
LLC8	6.32	5.61	5.97
LLN1	*	*	*
LLN2	7.42	7.14	7.28
LLN3	7.17	6.74	6.96
LLN4	5.63	5.42	5.53
LLN5	6.90	6.93	6.92
LLN6	7.85	7.15	7.50
LLN7	8.00	8.78	8.39
LLN8	7.60	7.82	7.71
Mean	6.82	6.63	6.72

1ST CUT MEAN DM% 22.3

88/W/RN/3

LEYS

2ND CUTTING OCCASION (13/9/88) DRY MATTER TONNES/HECTARE

***** Tables of means *****

FYM RES	NONE	FYM	Mean
LEY			
LC1	2.42	2.05	2.23
LC2	3.19	3.25	3.22
LC3	3.09	3.72	3.40
LN1	3.00	3.41	3.20
LN2	3.18	3.11	3.14
LN3	3.82	4.23	4.02
LLC1	4.29	4.22	4.26
LLC2	3.13	3.52	3.33
LLC3	2.84	3.13	2.99
LLC4	6.45	4.63	5.54
LLC5	3.40	4.20	3.80
LLC6	2.88	4.22	3.55
LLC7	1.71	2.26	1.98
LLC8	3.36	3.84	3.60
LLN1	4.61	4.67	4.64
LLN2	3.42	3.63	3.53
LLN3	3.47	4.18	3.82
LLN4	2.86	3.03	2.95
LLN5	3.31	3.43	3.37
LLN6	5.60	4.75	5.17
LLN7	4.08	4.54	4.31
LLN8	4.59	4.51	4.55
Mean	3.58	3.75	3.66

2ND CUT MEAN DM% 27.8

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LEYS

TOTAL OF 2 CUTTING OCCASIONS DRY MATTER TONNES/HECTARE

***** Tables of means *****

FYM RES	NONE	FYM	Mean
LEY			
LC1	2.42	2.05	2.23
LC2	8.50	9.75	9.13
LC3	9.22	9.16	9.19
LN1	3.00	3.41	3.20
LN2	10.78	10.71	10.75
LN3	10.94	10.71	10.83
LLC1	4.29	4.22	4.26
LLC2	9.18	10.18	9.68
LLC3	9.30	8.87	9.08
LLC4	13.23	10.17	11.70
LLC5	10.13	11.75	10.94
LLC6	9.85	11.26	10.55
LLC7	8.33	7.38	7.85
LLC8	9.68	9.45	9.56
LLN1	4.61	4.67	4.64
LLN2	10.85	10.77	10.81
LLN3	10.64	10.92	10.78
LLN4	8.49	8.45	8.47
LLN5	10.21	10.37	10.29
LLN6	13.45	11.91	12.68
LLN7	12.08	13.32	12.70
LLN8	12.19	12.33	12.26
Mean	9.15	9.17	9.16

TOTAL OF 2 CUTTING OCCASIONS MEAN DM% 24.9

PLOT AREA HARVESTED 0.00200

88/W/RN/3

WINTER WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

***** Tables of means *****

FYMRES62	NONE	FYM	Mean		
ROTATION					
LN 8	6.29	6.59	6.44		
LN 3	5.75	6.26	6.01		
LC 8	7.25	6.31	6.78		
LC 3	6.82	7.24	7.03		
AF	5.84	5.62	5.73		
AB	5.20	5.92	5.56		
Mean	6.19	6.32	6.26		
N	0	70	140	210	Mean
ROTATION					
LN 8	4.34	6.73	7.46	7.23	6.44
LN 3	4.01	6.77	7.12	6.14	6.01
LC 8	5.26	7.87	6.94	7.06	6.78
LC 3	5.68	7.39	7.54	7.51	7.03
AF	3.09	6.60	6.63	6.61	5.73
AB	2.98	6.28	6.77	6.20	5.56
Mean	4.23	6.94	7.07	6.79	6.26
N	0	70	140	210	Mean
FYMRES62					
NONE	4.29	6.90	7.01	6.55	6.19
FYM	4.16	6.98	7.13	7.03	6.32
Mean	4.23	6.94	7.07	6.79	6.26
ROTATION	N	0	70	140	210
	FYMRES62				
LN 8	NONE	4.13	6.52	7.49	7.02
	FYM	4.55	6.93	7.42	7.44
LN 3	NONE	3.94	6.14	6.89	6.05
	FYM	4.08	7.40	7.34	6.22
LC 8	NONE	6.04	8.57	6.99	7.41
	FYM	4.48	7.17	6.88	6.72
LC 3	NONE	5.41	7.27	7.42	7.19
	FYM	5.96	7.52	7.65	7.84
AF	NONE	3.39	6.93	6.70	6.32
	FYM	2.79	6.27	6.55	6.89
AB	NONE	2.84	6.01	6.59	5.35
	FYM	3.12	6.56	6.95	7.05

GRAIN MEAN DM% 82.6

PLOT AREA HARVESTED 0.00251

88/W/RN/3

SPRING BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

***** Tables of means *****

FYMRES66	NONE	FYM	Mean
ROTATION			
LN 8	4.86	4.37	4.61
LN 3	4.52	4.28	4.40
LC 8	4.44	4.26	4.35
LC 3	4.41	4.33	4.37
AF	3.49	4.01	3.75
AB	3.60	4.04	3.82
Mean	4.22	4.21	4.22

	N	0	60	120	180	Mean
ROTATION						
LN 8		3.93	4.90	5.00	4.63	4.61
LN 3		3.91	4.65	4.54	4.50	4.40
LC 8		3.92	4.70	4.33	4.45	4.35
LC 3		3.78	4.59	4.92	4.19	4.37
AF		2.01	3.64	4.70	4.64	3.75
AB		2.30	4.11	4.43	4.44	3.82
Mean		3.31	4.43	4.65	4.47	4.22

	N	0	60	120	180	Mean
FYMRES66						
NONE		3.27	4.41	4.59	4.61	4.22
FYM		3.35	4.45	4.71	4.34	4.21
Mean		3.31	4.43	4.65	4.47	4.22

		N	0	60	120	180
ROTATION						
LN 8	FYMRES66	NONE	4.13	4.59	5.37	5.36
		FYM	3.73	5.21	4.62	3.91
LN 3	FYMRES66	NONE	4.06	4.79	4.56	4.66
		FYM	3.76	4.52	4.51	4.33
LC 8	FYMRES66	NONE	3.69	5.20	4.61	4.26
		FYM	4.16	4.21	4.04	4.64
LC 3	FYMRES66	NONE	3.69	4.83	4.85	4.28
		FYM	3.88	4.34	4.99	4.10
AF	FYMRES66	NONE	1.76	3.32	4.07	4.81
		FYM	2.27	3.96	5.33	4.47
AB	FYMRES66	NONE	2.30	3.75	4.10	4.26
		FYM	2.30	4.47	4.77	4.61

GRAIN MEAN DM% 84.1

PLOT AREA HARVESTED 0.00251