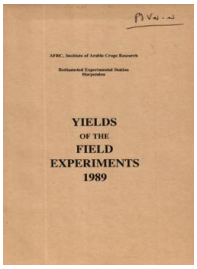
ROTHAMSTED RESEARCH

Yields of the Field Experiments 1989

Full Table of Content



89/W/RN/3 Ley Arable - Leys, S. Barley, W. Beans, W. Wheat

Rothamsted Research

Rothamsted Research (1990) *89/W/RN/3 Ley Arable - Leys, S. Barley, W. Beans, W. Wheat ;* Yields Of The Field Experiments 1989, pp 39 - 47 **- DOI: https://doi.org/10.23637/ERADOC-1-40**

89/W/RN/3

LEY/ARABLE

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

Sponsors: A.E. Johnston, P.R. Poulton.

The 52nd year, leys, w. beans, w. wheat, s. barley.

For previous years see 'Details' 1967 & 1973 and 74-88/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

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

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. **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 'Nitram':

   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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89/W/RN/3

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 'Nitram':

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 and 6th year leys, 1965 to 2nd and 7th year leys, 1964 to 3rd and 8th 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	115	85
LC	0	0
AF	185	110
AB	335	280
Ex-alternating rotations		
LN 8 ploughed for w. wheat	0	0
LN 8 not ploughed	70	0
LC 8 ploughed for w. wheat	0	0
LC 8 not ploughed	0	0

Standard applications:-

Grass ley and clover/grass ley, 1st year: Manures: Magnesian limestone at 5.0 t. (0:18:36) at 420 kg. N at 76 kg to grass ley and 50 kg to clover/grass as 'Nitram'.

Grass ley; 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 t to 5th and 6th years only. (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: Magnesian limestone at 5.0 t to 5th and 6th years only. K2O at 54 kg as muriate of potash in spring and after each cut except the last.

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

Standard applications:-

S. barley, 1st and 2nd treatment crops: Manures: Magnesian limestone at 5.0 t to 1st treatment crop only. (20:10:10) at 400 kg. Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with mecoprop at 2.1 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 220 l.

W. beans: 3rd treatment crop: Manures: (0:24:24) at 170 kg. Weedkiller: Simazine at 0.85 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l. Pirimicarb at 0.14 kg in 220 l.

Fallow, 1st and 2nd treatment years: Manure: Magnesian limestone at 5.0 t to 1st year only.

W. wheat, 1st test crop: Manures: (0:24:24) at 260 kg. Manganese at 0.096 kg Mn as a foliar spray in 220 l. Weedkillers: Glyphosate at 1.4 kg in 220 l. Bromoxynil at 0.34 kg and clopyralid at 0.07 kg with mecoprop at 2.5 kg in 220 l. Fungicides: Carbendazim at 0.15 kg and prochloraz at 0.40 kg applied with the growth regulator in 220 l. Propiconazole at 0.12 kg in 220 l. Fenpropimorph at 0.75 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticide: Carbofuran at 7.5 kg. Growth regulator: Chlormequat chloride at 1.6 kg.

S. barley, 2nd test crop: Manures: Magnesian limestone at 5.0 t. (0:24:24) at 260 kg. Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with mecoprop at 2.1 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 220 l. Insecticide: Carbofuran at 7.5 kg.

Seed: Grass ley: Climax timothy at 15 kg and meadow fescue at 15 kg, mixture sown at 30 kg.

Clover/grass ley: Climax timothy at 15 kg, meadow fescue at 12 kg and Huia white clover at 3.4 kg, mixture sown at 30 kg.

S. barley: Klaxon, sown at 160 kg.

W. beans: Bourdon, dressed thiram and thiabendazole, sown at 250 kg.

W. wheat: Mercia, mixed with methiocarb pellets, sown at 165 kg.

Cultivations, etc.:-

Treatment crops:

Grass ley and clover/grass ley, 1st year: Magnesian limestone applied: 29 Nov, 1988. Ploughed: 14 Dec. PK and N applied: 12 May, 1989. Rotary harrowed with crumbler attached, rolled, spike harrowed with crumbler attached, seed sown, rolled: 15 May. Topped: 11 July. Cut: 20 Nov.

Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Magnesian limestone applied, 5th and 6th year only: 29 Nov, 1988. Topped: 12 Dec. Corrective K applied to 4th year only: 29 Dec. NK applied to grass ley, K applied to grass/clover ley: 13 Mar, 1989 and 16 June. Cut: 5 June and 20 Nov (8th year leys were cut only on the first occasion).

S. barley, 1st and 2nd treatment crops: Magnesian limestone applied to 1st treatment only: 29 Nov, 1988. Ploughed: 15 Dec. NPK applied: 8 Mar, 1989. Rotary harrowed with crumbler attached, seed sown: 14 Mar. Weedkillers applied: 19 May. Fungicides applied: 5 June. Combine harvested: 16 Aug.

W. beans, 3rd treatment crop: PK applied, seed broadcast: 22 Nov, 1988. Ploughed: 23 Nov. Weedkiller applied: 29 Nov. Deltamethrin applied: 17 May, 1989. Pirimicarb applied: 22 June. Combine harvested: 22 Aug.

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

Cultivations, etc.:-

Fallow, 1st and 2nd treatment years: Magnesian limestone applied, 1st year only: 29 Nov, 1988. Ploughed: 15 Dec. Spring-tine cultivated: 15 May, 1989 and 28 June. Shallow cultivated with thistle bar: 11 July and 2 Aug.

Test crops:

W. wheat, 1st test crop: Glyphosate applied: 19 Oct, 1988. Ploughed: 28 Oct. PK applied, carbofuran applied, spring-tine cultivated with crumbler attached, seed sown: 31 Oct. Corrective K applied: 29 Dec. N applied: 18 Apr, 1989. Bromoxynil, clopyralid and mecoprop applied: 28 Apr. Carbendazim, prochloraz and growth regulator applied: 17 May. Manganese applied: 22 May. Propiconazole applied: 5 June. Fenpropimorph, carbendazim and maneb applied: 3 July. Combine harvested: 7 Aug.

S. barley,2nd test crop: Magnesian limestone applied: 29 Nov, 1988. Ploughed: 15 Dec. PK applied: 8 Mar, 1989. Carbofuran applied, rotary harrowed with crumbler attached, seed sown: 14 Mar. N applied: 20 Mar. Weedkillers applied: 19 May. Fungicides applied: 5 June. Combine harvested: 16 Aug.

LEYS

1ST CUTTING OCCASION (5/6/89) DRY MATTER TONNES/HECTARE

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

FYM RES / LEY	NONE	FYM	Mean
LC1	*	*	*
LC2	3.34	3.96	3.65
LC3	4.18	4.46	4.32
LN1	*	*	*
LN2	6.88	5.84	6.36
LN3	3.84	4.41	4.13
LLC1	*	*	*
LLC2	4.91	5.11	5.01
LLC3	6.05	4.65	5.35
LLC4	4.21	3.89	4.05
LLC5	6.24	5.80	6.02
LLC6	5.64	6.27	5.96
LLC7	3.93	4.94	4.44
LLC8	4.39	4.30	4.35
LLN1	*	*	*
LLN2	6.94	5.87	6.41
LLN3	4.82	4.83	4.83
LLN4	5.10	5.26	5.18
LLN5	3.61	3.49	3.55
LLN6	6.35	5.69	6.02
LLN7	4.57	5.99	5.28
LLN8	5.67	6.68	6.17
Mean	5.04	5.08	5.06

1ST CUT MEAN DM% 26.6

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

LEYS

2ND CUTTING OCCASION (20/11/89) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	0.88	0.62	0.75
LC2	0.32	0.30	0.31
LC3	0.00	0.00	0.00
LN1	0.45	0.39	0.42
LN2	1.10	0.82	0.96
LN3	0.00	0.00	0.00
LLC1	1.19	0.91	1.05
LLC2	0.38	0.46	0.42
LLC3	0.76	0.28	0.52
LLC4	0.93	1.30	1.11
LLC5	0.90	0.63	0.76
LLC6	0.88	1.06	0.97
LLC7	0.46	0.54	0.50
LLC8	0.00	0.00	0.00
LLN1	0.73	0.76	0.75
LLN2	1.08	0.99	1.03
LLN3	0.86	1.20	1.03
LLN4	0.96	1.95	1.46
LLN5	0.87	1.09	0.98
LLN6	2.02	1.64	1.83
LLN7	1.20	1.24	1.22
LLN8	0.00	0.00	0.00
Mean	0.73	0.74	0.73

2ND CUT MEAN DM% 23.7

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89/W/RN/3

LEYS

TOTAL OF 2 CUTTING OCCASIONS DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	0.88	0.62	0.75
LC2	3.66	4.27	3.97
LC3	4.18	4.46	4.32
LN1	0.45	0.39	0.42
LN2	7.98	6.66	7.32
LN3	3.84	4.41	4.13
LLC1	1.19	0.91	1.05
LLC2	5.30	5.57	5.43
LLC3	6.81	4.94	5.87
LLC4	5.14	5.19	5.16
LLC5	7.14	6.42	6.78
LLC6	6.52	7.33	6.93
LLC7	4.38	5.48	4.93
LLC8	4.39	4.30	4.35
LLN1	0.73	0.76	0.75
LLN2	8.02	6.86	7.44
LLN3	5.68	6.03	5.86
LLN4	6.06	7.21	6.64
LLN5	4.48	4.58	4.53
LLN6	8.36	7.33	7.85
LLN7	5.77	7.23	6.50
LLN8	5.67	6.68	6.17
Mean	4.85	4.89	4.87

TOTAL OF 2 CUTTING OCCASIONS MEAN DM% 24.4

PLOT AREA HARVESTED 0.00204

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89/W/RN/3

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES66	NONE	FYM	Mean
ROTATION			
LN 8	4.73	5.18	4.95
LN 3	5.71	5.35	5.53
LC 8	5.60	5.92	5.76
LC 3	5.87	5.96	5.92
AF	5.00	4.35	4.68
AB	3.21	4.01	3.61
Mean	5.02	5.13	5.07

N	0	70	140	210	Mean
ROTATION					
LN 8	3.77	5.58	5.56	4.91	4.95
LN 3	4.04	5.94	6.10	6.04	5.53
LC 8	4.91	6.69	6.39	5.06	5.76
LC 3	5.45	6.28	6.12	5.81	5.92
AF	2.80	4.92	5.17	5.82	4.68
AB	1.16	3.94	4.58	4.74	3.61
Mean	3.69	5.56	5.65	5.40	5.07

N	0	70	140	210	Mean
FYMRES66					
NONE	3.65	5.32	5.90	5.21	5.02
FYM	3.73	5.80	5.40	5.58	5.13
Mean	3.69	5.56	5.65	5.40	5.07

N		0	70	140	210
ROTATION	FYMRES66				
LN 8	NONE	3.46	5.45	5.65	4.36
	FYM	4.08	5.70	5.48	5.46
LN 3	NONE	4.23	5.31	7.04	6.23
	FYM	3.86	6.57	5.16	5.84
LC 8	NONE	4.47	6.15	6.72	5.07
	FYM	5.35	7.24	6.06	5.04
LC 3	NONE	5.83	6.22	5.80	5.64
	FYM	5.07	6.34	6.44	5.98
AF	NONE	2.99	5.59	5.63	5.80
	FYM	2.61	4.26	4.71	5.84
AB	NONE	0.91	3.20	4.58	4.14
	FYM	1.42	4.68	4.58	5.34

GRAIN MEAN DM% 89.3

PLOT AREA HARVESTED 0.00251

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

S.BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES62	NONE	FYM	Mean
ROTATION			
LN 8	3.17	3.52	3.34
LN 3	3.53	3.19	3.36
LC 8	3.48	3.10	3.29
LC 3	3.13	3.24	3.19
AF	3.18	3.21	3.20
AB	2.61	2.58	2.59
Mean	3.18	3.14	3.16

N	0	60	120	180	Mean
ROTATION					
LN 8	2.69	3.42	3.64	3.62	3.34
LN 3	2.42	3.41	3.84	3.77	3.36
LC 8	2.70	3.50	3.48	3.48	3.29
LC 3	2.49	3.15	3.57	3.54	3.19
AF	1.58	3.71	3.64	3.87	3.20
AB	1.37	3.14	3.20	2.66	2.59
Mean	2.21	3.39	3.56	3.49	3.16

N	0	60	120	180	Mean
FYMRES62					
NONE	2.14	3.49	3.59	3.51	3.18
FYM	2.28	3.29	3.54	3.47	3.14
Mean	2.21	3.39	3.56	3.49	3.16

N		0	60	120	180
ROTATION	FYMRES62				
LN 8	NONE	2.35	3.40	3.28	3.63
	FYM	3.04	3.45	4.00	3.60
LN 3	NONE	2.56	3.48	4.04	4.01
	FYM	2.28	3.33	3.63	3.53
LC 8	NONE	2.80	3.80	3.60	3.70
	FYM	2.60	3.20	3.36	3.25
LC 3	NONE	2.53	3.08	3.58	3.34
	FYM	2.45	3.21	3.56	3.73
AF	NONE	1.44	3.69	3.70	3.90
	FYM	1.72	3.73	3.57	3.83
AB	NONE	1.15	3.48	3.32	2.47
	FYM	1.59	2.80	3.08	2.84

GRAIN MEAN DM% 85.6

PLOT AREA HARVESTED 0.00251

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