ROTHAMSTED RESEARCH

Yields of the Field Experiments 1980

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80/W/RN/3 Ley/ARABLE

Rothamsted Research

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80/W/RN/3

LEY/ARABLE

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

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The 43rd year, leys, s. barley, s. oats, w. wheat.

For previous years see 'Details' 1967 & 1973 and 74-79/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 (ALT)

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, O, W, B
AB	(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:

ALT LN	LN, LN, LN, LN, LN, LN, LN, LN, W, B
ALT LC	LC, 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). Initially some of the long term leys are ploughed up in less than eight years ALT LN, ALT LC, depending on the starting point in relation to the test crop, to ensure that ultimately eight-year leys will be available for each test crop period.

Yields are taken only from the test crops.

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

1. ROTATION — Rotations:

   ALT LN 3
   LN 3
   ALT LC 3
   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 fertiliser (kg N):

   0
   63
   126
   189

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

whole plots

1. ROTATION — Rotations:

   ALT LN 3
   LN 3
   ALT LC 3
   LC 3
   AF
   AB

1/2 plots

2. FYMRES63 — Farmyard manure residues, last applied 1963:

   NONE — None
   FYM — 38 tonnes on each occasion

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1/8 plots

3. N Nitrogen fertiliser (kg N):

0
50
100
150

Corrective K dressings (kg K_2O) 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	138	113
LC	0	0
AF	326	289
AB	251	276
Ex-alternating rotations		
ALT LN ploughed for w. wheat	38	75
ALT LN not ploughed	50	63
ALT LC ploughed for w. wheat	113	13
ALT LC not ploughed	75	0

Standard applications:-

Grass ley and Clover/grass ley, 1st year: Manures: (0:14:28) at 540 kg. N at 75 kg as 'Nitro-Chalk' to grass ley only. Weedkillers: Paraquat at 0.84 kg ion in 450 l. Mecoprop at 2.5 l in 280 l to grass ley only.

Grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5 t to 5th year only. (0:14:28) at 540 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 5 t to 5th year only, (0:14:28) at 540 kg. K_2O at 48 kg in spring and after the first cut.

S. barley, 1st and 2nd treatment crops: (20:10:10) at 400 kg, combine drilled. Weedkillers: Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.5 l) in 280 l. Fungicides: Tridemorph at 0.53 kg in 280 l. Ethirimol (as 'Milgo E' at 1.3 l) in 280 l.

S. oats: 3rd treatment crop: (20:10:10) at 400 kg, combine drilled. Weedkillers: Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.5 l) in 280 l.

W. wheat: 1st test crop: (0:20:20) at 310 kg, combine drilled. Weedkiller: Chlortoluron 3.6 kg in 250 l. Nematicide: Aldicarb at 10 kg.

S. barley: 2nd test crop: (0:20:20) at 300 kg, combine drilled. Weedkillers: Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.5 l) in 280 l. Fungicides: Tridemorph at 0.53 kg in 280 l. Ethirimol (as 'Milgo E' at 1.3 l) in 280 l. Nematicide: Aldicarb at 10 kg.

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Varieties: 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: Georgie, dressed with ethirimol, sown at 160 kg.
S. oats: Manod, sown at 170 kg.
W. wheat: Flanders, sown at 200 kg.

Cultivations, etc.:- Treatment crops:

Grass ley and clover/grass ley, 1st year: Ploughed: 8 Nov, 1979. Heavy spring-tine cultivated: 29 Feb, 1980. Spring-tine cultivated with crumbler attached: 3 Mar, 16 Apr. PK applied, N applied to grass ley only, seeds sown: 17 Apr. Topped: 9 June. Paraquat applied because of poor germination: 26 June. Rotary cultivated, spring-tine cultivated with crumbler attached: 30 June-2 July. Spring-tine cultivated with crumbler attached, seeds resown: 11 July. Mecoprop applied to grass ley only: 18 Aug. Topped: 9 Sept.

Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Magnesian limestone applied to 5th year only: 31 Oct, 1979. PK applied: 14 Jan, 1980. Corrective K applied to 4th year only: 28 Feb. NK applied to grass ley, K applied to clover/grass ley: 11 Mar, 31 July. 3rd and 8th year cut 23 July, 8 Sept. Remainder cut: 23 July, 18 Sept.

S. barley: 1st and 2nd treatment crops: Ploughed: 8 Nov, 1979. Heavy spring-tine cultivated: 29 Feb. Spring-tine cultivated with crumbler attached: 3 Mar. Seed sown: 4 Mar. Weedkiller applied: 8 May. Tridemorph applied: 13 May. Ethirimol applied: 5 June. Combine harvested: 20 Aug.

S. oats: 3rd treatment crop: Ploughed after barley: 8 Nov, 1979. Ploughed after fallow: 29 Nov. Heavy spring-tine cultivated: 29 Feb, 1980. Spring-tine cultivated with crumbler attached, seed sown: 24 Mar. Weedkiller applied: 8 May. Combine harvested: 28 Aug.

Fallow: 1st and 2nd treatment years: Ploughed: 8 Nov, 1979. Heavy spring-tine cultivated: 29 Feb, 1980, 7 Aug. Spring-tine cultivated with crumbler attached, 1st year only: 3 Mar, 16 Apr. Rotary cultivated: 29 July.

Test Crops:

W. wheat, 1st test crop: Ploughed after ley: 14 Aug, 1979. Ploughed after oats: 17 Sept. Corrective K applied: 4 Oct. Aldicarb applied, rotary cultivated, seed sown: 6 Oct. Weedkiller applied: 9 Oct. N applied: 14 Apr, 1980. Combine harvested: 26 Aug.

S. barley, 2nd test crop: Paraquat applied: 15 Sept, 1979. Magnesian limestone applied: 31 Oct. Ploughed: 8 Nov. Heavy spring-tine cultivated: 29 Feb, 1980. Aldicarb applied, rotary cultivated, seed sown: 4 Mar. N applied: 24 Mar. Weedkillers applied: 8 May. Tridemorph applied: 13 May. Ethirimol applied: 5 June. Combine harvested: 20 Aug.

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BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES63	NONE	FYM	MEAN
ROTATION			
ALT LN 3	6.33	6.35	6.34
LN 3	6.84	6.78	6.81
ALT LC 3	6.90	7.00	6.95
LC 3	6.82	6.91	6.86
AF	4.90	5.06	4.98
AB	4.17	4.65	4.41
MEAN	5.99	6.12	6.06

N	0	50	100	150	MEAN
ROTATION					
ALT LN 3	3.95	6.11	7.32	7.97	6.34
LN 3	4.91	6.95	7.69	7.69	6.81
ALT LC 3	4.70	6.71	8.20	8.19	6.95
LC 3	4.54	6.68	8.00	8.24	6.86
AF	1.86	4.28	6.50	7.28	4.98
AB	2.29	4.08	5.12	6.14	4.41
MEAN	3.71	5.80	7.14	7.59	6.06

N	0	50	100	150	MEAN
FYMRES63					
NONE	3.65	5.79	6.93	7.61	5.99
FYM	3.77	5.82	7.35	7.56	6.12
MEAN	3.71	5.80	7.14	7.59	6.06

N		0	50	100	150
ROTATION	FYMRES63				
ALT LN 3	NONE	3.98	6.07	7.32	7.94
	FYM	3.92	6.16	7.32	8.01
LN 3	NONE	5.11	7.01	7.26	7.98
	FYM	4.71	6.89	8.12	7.41
ALT LC 3	NONE	4.67	6.80	8.12	8.01
	FYM	4.72	6.63	8.28	8.37
LC 3	NONE	4.41	6.85	7.69	8.32
	FYM	4.67	6.50	8.30	8.16
AF	NONE	1.58	4.07	6.34	7.62
	FYM	2.15	4.50	6.66	6.94
AB	NONE	2.15	3.93	4.81	5.79
	FYM	2.44	4.22	5.43	6.49

GRAIN MEAN DM% 82.1

PLOT AREA HARVESTED 0.00260

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WINTER WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES64	NONE	FYM	MEAN
ROTATION			
ALT LN 3	6.00	6.54	6.27
LN 3	5.53	5.47	5.50
ALT LC 3	6.64	7.15	6.89
LC 3	6.84	6.98	6.91
AF	4.80	4.46	4.63
AB	5.13	4.92	5.02
MEAN	5.82	5.92	5.87

N	0	63	126	189	MEAN
ROTATION					
ALT LN 3	3.70	6.54	7.45	7.39	6.27
LN 3	2.99	5.59	6.62	6.79	5.50
ALT LC 3	4.19	7.24	8.00	8.15	6.89
LC 3	4.72	7.44	7.69	7.79	6.91
AF	1.41	4.64	6.15	6.32	4.63
AB	2.22	5.12	6.23	6.52	5.02
MEAN	3.21	6.10	7.02	7.16	5.87

N	0	63	126	189	MEAN
FYMRES64					
NONE	3.06	6.01	6.90	7.32	5.82
FYM	3.36	6.18	7.15	7.00	5.92
MEAN	3.21	6.10	7.02	7.16	5.87

N		0	63	126	189
ROTATION	FYMRES64				
ALT LN 3	NONE	3.25	6.14	7.41	7.22
	FYM	4.16	6.95	7.48	7.56
LN 3	NONE	2.85	5.76	6.46	7.03
	FYM	3.13	5.42	6.78	6.55
ALT LC 3	NONE	3.93	6.69	7.92	8.00
	FYM	4.46	7.79	8.07	8.30
LC 3	NONE	5.08	7.42	7.27	7.59
	FYM	4.37	7.46	8.11	7.98
AF	NONE	1.13	4.85	6.15	7.08
	FYM	1.69	4.43	6.16	5.57
AB	NONE	2.09	5.22	6.18	7.01
	FYM	2.34	5.02	6.28	6.02

GRAIN MEAN DM% 84.2

PLOT AREA HARVESTED 0.00260

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