ROTHAMSTED RESEARCH

Yields of the Field Experiments 1979

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79/R/RN/1 and 79/R/RN/2 Ley Arable - Old Grass, Leys, Potatoes, Wheat, Beans, Oats, Barley

Rothamsted Research

Rothamsted Research (1980) *79/R/RN/1 and 79/R/RN/2 Ley Arable - Old Grass, Leys, Potatoes, Wheat, Beans, Oats, Barley ;* Yields Of The Field Experiments 1979, pp 45 - 55 **- DOI: https://doi.org/10.23637/ERADOC-1-45**

79/R/RN/1 and 79/R/RN/2

LEY ARABLE

Object: To study the effects of three-year leys on the fertility of the soil as measured by a sequence of three arable test crops. From 1968, continuous wheat was grown on some blocks after the three test crops to study the build-up and decline of take-all (Gaeumannomyces graminis) after the different cropping sequences. From 1977 new crop sequences were introduced on these blocks - Highfield and Fosters.

Sponsors: A.E. Johnston, D.B. Slope.

The 31st year, old grass, leys, oats, potatoes, beans, barley, wheat.

For previous years see 'Details' 1967 & 1973 and 74-78/R/RN/1&2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (79/R/RN/1)

FOSTERS — A site with little organic matter initially (79/R/RN/2)

ROTATION — Treatments: The experiment originally tested four six-course rotations, with all phases present each year. In recent years these rotations were:-

	Treatment crops	Test crops
LUCERNE	LU, LU, LU,	W, P, B
CLOGRA	LC, LC, LC,	W, P, B
GRASS	LN, LN, LN,	W, P, B
ARABLE	H, SB, O,	W, P, B

LU = lucerne, LC = clover-grass ley, no nitrogen fertiliser, LN = all-grass ley with much nitrogen fertiliser, H = 1-year seeds hay, SB = sugar beet, O = oats, W = wheat, P = potatoes, B = barley.

From 1968 the order of test crops was changed to P, W, B except for those phases that had already started the sequence W, P, B.

From 1975 the barley test crop was changed to wheat.

RESEEDED — On both fields in the first three years other plots were sown with long-term reseeded grass

OLDGRASS — On Highfield plots of the old turf were left initially un-ploughed, for comparison with the three-year leys

In 1962 and 1963 some of the old and reseeded grass plots were divided for management identical to:-

C — Clover-grass ley
N — All-grass ley

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From 1963 (reseeded) and 1968 (old grass) some grass plots were ploughed and cropped with the same test crops as above, thereafter these plots followed the ARABLE rotation. In 1973 some of these plots were returned to reseeded grass.

From 1968 only two phases on each field continued in the original six-course rotation (the museum blocks). The four other phases (the new sequence blocks) were sown to wheat every year at the end of the test-crop cycle. In 1977, 1978 and 1979 one phase, fallowed in the previous year started a new sequence of treatment cropping. In 1979 the remaining phase was fallowed prior to introducing the new sequences in 1980. The new sequences are:

SEQUENCE		Treatment crops	Test crops
LUCERNE	(previously LUCERNE)	LU, LU, LU	W, W, W, W
CLOGRA	(previously CLOGRA)	LC, LC, LC	W, W, W, W
GRASS/G	(previously GRASS)	R, R, R	W, W, W, W
ARABLE/A	(previously ARABLE)	O, P, BE	W, W, W, W
ARABLE/R	(previously RESEEDED)	B, B, W	W, W, W, W
GRASS/OG	(previously OLDGRASS)	R, R, R	W, W, W, W

R = ryegrass, BE = beans. Other symbols as above. All ploughed at the end of the treatment crop cycle except GRASS/OG - direct drilled to wheat. Treatment crop cycles start after nine previous cereals followed by one fallow. In treatment years yields are taken only from barley and wheat.

Additional treatments to 1st test crop potatoes in the original rotation:-

Sub plots

FYMRES68 Farmyard manure residues, last applied 1968:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N 79 Nitrogen fertiliser (kg N as 'Nitro-Chalk'):

0
80
160
240

Standard applications:
Museum blocks:
1st Treatment crops:
All-grass ley and clover-grass ley: (0:14:28) at 540 kg. Weedkillers: Glyphosate at 1.5 kg in 220 l, paraquat at 0.70 kg ion in 220 l, MCPA at 0.26 kg and MCPB at 1.6 kg in 220 l.
All-grass ley only: 'Nitro-Chalk' at 290 kg.
Lucerne: Manures: (0:20:20) at 380 kg. Weedkillers: Glyphosate at 1.5 kg in 220 l, paraquat at 0.70 kg ion, 2,4-DB at 1.8 kg in 220 l.

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1-year seeds hay: Manures: (0:14:28) at 540 kg. 'Nitro-Chalk' at 290 kg. Weedkillers: Paraquat at 0.70 kg ion. MCPA at 0.26 kg and MCPB at 1.6 kg in 220 l.

1st Test crop:

Potatoes: Manures: (0:20:20) at 1500 kg. Weedkillers: Paraquat at 0.42 kg ion with linuron at 1.1 kg in 220 l. Fungicide: Mancozeb at 1.3 kg in 220 l applied four times with and twice without pirimicarb. Insecticides: Phorate granules (at planting) at 1.7 kg, pirimicarb at 0.14 kg. Haulm desiccant: Undiluted BOV at 170 l.

Reseeded grass and Old grass: Manures: (0:14:28) at 540 kg.

All-grass half plots: Manures: (25:0:16) at 300 kg in spring, and after each cut except the last.

New sequence blocks:

1st Treatment crops:

All crops: Manures: Chalk at 8.7 t, Highfield only.

Lucerne: Manures: (0:14:28) at 720 kg. Weedkillers: 2,4-DB at 1.8 kg in 220 l.

Clover-grass ley: Manures: (0:14:28) at 720 kg (25:0:16) at 300 kg. Weedkillers: MCPA at 0.26 kg with MCPB at 1.6 kg in 220 l.

Ryegrass: Manures: (0:14:28) at 720 kg. (25:0:16) at 300 kg. Weedkillers: MCPA at 0.26 kg with MCPB at 1.6 kg in 220 l.

Oats and Barley: Manures: (20:14:14) at 350 kg, combine drilled. Weedkillers: Bromoxynil and ioxynil (as 'Oxytril CM' at 1.4 kg) with mecoprop at 1.7 kg in 220 l. Fungicide (to barley only): Tridemorph at 0.53 kg in 220 l.

2nd Treatment crops:

Lucerne: Manures: (0:14:28) at 720 kg. Weedkillers: Propyzamide at 0.70 kg in 220 l.

Clover-grass ley and Ryegrass: Manures: (0:14:28) at 720 kg. (25:0:16) at 300 kg in spring, repeated (ryegrass only) after each cut except the last.

Potatoes: Manures: (13:13:20) at 1500 kg. Weedkillers: Paraquat at 0.42 kg ion with linuron at 1.1 kg in 220 l. Fungicide: Mancozeb at 1.3 kg in 220 l applied four times with and twice without pirimicarb. Insecticides: Phorate granules (at planting) at 1.7 kg, pirimicarb at 0.14 kg. Haulm desiccant: Undiluted BOV at 170 l.

Barley: Manures: (20:14:14) at 350 kg, combine drilled. Weedkillers: Bromoxynil and ioxynil (as 'Oxytril CM' at 1.4 kg) with mecoprop at 1.7 kg in 220 l. Fungicide: Tridemorph at 0.53 kg in 220 l.

3rd Treatment crops:

Lucerne: Manures: (0:14:28) at 720 kg. Weedkillers: Propyzamide at 0.70 kg in 220 l.

Clover-grass ley and Ryegrass: Manures: (0:14:28) at 720 kg. (25:0:16) at 300 kg in spring, repeated (ryegrass only) after each cut except the last.

Beans: Insecticide: Pirimicarb at 0.14 kg in 220 l, applied twice.

Wheat: Manures: (0:20:20) at 250 kg, combine drilled. 'Nitro-Chalk' at 380 kg. Weedkillers: Mecoprop at 2.5 kg with isoproturon at 2.1 kg in 220 l.

Preparatory crops:

Fallow: Weedkillers: Diquat at 0.59 kg ion in 220 l.

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Seed:

Museum blocks:

All-grass ley: Meadow Fescue S215 at 17 kg. Timothy Erecta RvP at 17 kg. Mixture sown at 34 kg.

Clover-grass ley: Meadow Fescue S215 at 18 kg. Timothy Erecta RvP at 15 kg. New Zealand White Clover Huia at 4 kg. Mixture sown at 37 kg.

Lucerne: Vertus, sown at 28 kg.

1-year seeds hay: Italian Ryegrass RvP sown at 25 kg (both sowings).

Potatoes: Pentland Crown.

New Sequences:

Lucerne: Vertus, sown at 28 kg.

Clover-grass leys: Meadow Fescue S215 at 18 kg. Timothy Erecta RvP at 15 kg. New Zealand White Clover Huia at 4 kg. Mixture sown at 37 kg.

Ryegrass: S24, sown at 22 kg.

Oats: Manod, sown at 200 kg.

Barley: Porthos, sown at 160 kg.

Potatoes: Pentland Crown.

Beans: Minden, sown at 210 kg.

Wheat: Flanders, sown at 190 kg.

Cultivations, etc.:-

Museum blocks:

All-grass ley and clover-grass ley: Glyphosate applied: 20 Nov, 1978. Ploughed: 20 Dec. Paraquat applied: 6 June, 1979. N and PK applied, rotary harrowed twice, seed sown: 8 June. MCPA and MCPB applied: 11 July. Topped: 18 July. Cut for yield once: 27 Sept.

Lucerne: Glyphosate applied: 20 Nov, 1978. Ploughed: 20 Dec. Paraquat applied: 6 June, 1979. PK applied, rotary harrowed twice, seed sown: 8 June. 2,4-DB applied: 11 July. Topped: 31 July. Cut for yield once: 15 Nov.

1-year seeds hay: Ploughed: 30 Oct, 1978. Disc harrowed (and, Highfield only, rotary harrowed): 31 Oct. Seed sown: 3 Nov. Crop failed, heavy spring-tine cultivated twice: 17 May, 1979. Paraquat applied: 6 June. N and PK applied, rotary harrowed twice, seed sown: 8 June. MCPA and MCPB applied: 11 July. Topped: 18 July. Cut for yield once: 27 Sept.

Potatoes: Ploughed: 20 Dec, 1978. Disc harrowed: 10 May, 1979. PK applied: 14 May. Test N applied, spike rotary cultivated, seed planted: 16 May. Weedkillers applied: 4 June. Grubbed: 18 June (Highfield) and 20 June (Fosters). Rotary ridged: 22 June. Fungicide applied with insecticide four times: 26 June, 5 July, 20 July and 3 Aug. Fungicide applied alone: 15 Aug and 4 Sept. Haulm pulverized: 14 Sept. BOV applied: 21 Sept. Lifted: 9 Oct.

Reseeded Grass and Old Grass: PK applied: 14 Nov, 1978. NK applied (to all-grass half plots only): 8 Mar, 1979, 14 June and 27 July. Cut three times: 4 June, 23 July and 27 Sept.

New sequence blocks:

1st Treatment Crops:

All crops: Chalk applied (Highfield only): 10 Nov, 1978. Ploughed: 19 Dec. Spring-tine cultivated: 23 Apr, 1979.

Lucerne: PK applied, rotary harrowed twice, seed sown: 8 June. 2,4-DB applied: 11 July. Topped: 31 July. Cut: 19 Nov.

Clover-grass ley: PK applied, rotary harrowed twice, seed sown: 8 June. MCPA and MCPB applied: 11 July. Topped: 18 July. NK applied: 20 July. Cut: 27 Sept.

Ryegrass: NK and PK applied: 7 June. Rotary harrowed twice, seed sown: 8 June. MCPA and MCPB applied: 11 July. Topped: 18 July. Cut: 27 Sept.

Oats and barley: Barley sown: 23 Apr. Oats sown: 27 Apr. Weedkillers applied: 5 June. Fungicide applied (Barley only): 12 June. Barley combine harvested: 1 Sept. Oats combine harvested: 6 Sept.

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2nd Treatment crops:

Lucerne: PK applied: 14 Nov, 1978. Weedkiller applied: 18 Dec. Cut: 12 June, 1979, 26 July, 19 Nov.

Clover-grass ley and ryegrass: PK applied: 14 Nov, 1978. Spring NK applied: 8 Mar, 1979. Cut: 6 June, 26 July, 27 Sept. NK applied, to ryegrass only: 14 June, 27 July.

Potatoes: Ploughed: 18 Dec, 1978. Spring-tine cultivated (Fosters only): 19 Apr, 1979. Spring-tine cultivated: 23 Apr. NPK applied: 14 May. Spike rotary cultivated, seed planted: 16 May. Weedkillers applied: 4 June. Grubbed: 18 June (Highfield), 20 June (Fosters). Rotary ridged: 22 June. Fungicide applied with insecticide: 26 June, 5 July, 20 July, 3 Aug. Fungicide applied: 15 Aug, 4 Sept. Haulm pulverized: 14 Sept. BOV applied: 21 Sept. Lifted: 16 Oct.

Barley: Ploughed: 18 Dec, 1978 (Fosters) 21 Dec, (Highfield). Spring-tine cultivated: 19 Apr, 1979 (Fosters), 23 Apr (Highfield). Seed sown: 23 Apr. Weedkillers applied: 5 June. Fungicide applied: 12 June. Combine harvested: 1 Sept.

3rd Treatment Crops:

Lucerne: PK applied: 14 Nov, 1978. Weedkiller applied: 18 Dec. Cut: 12 June, 27 July. Topped: 17 Aug.

Clover-grass ley and ryegrass: PK applied: 14 Nov, 1978. NK applied: 8 Mar, 1979. Cut: 6 June, 26 July. NK applied (to ryegrass only): 14 June. Topped: 17 Aug.

Beans: Ploughed (Highfield only) Deep tine cultivated (Fosters only): 20 Dec, 1978. Spring-tine cultivated (Fosters only): 19 Apr, 1979. Rotary harrowed, seed sown: 23 Apr. Tractor hoed: 6 June. Insecticide applied: 22 June, 12 July. Combine harvested: 20 Sept.

Wheat: Ploughed: 16 Oct, 1978. Rotary harrowed, seed sown: 17 Oct. N applied: 3 May, 1979. Weedkillers applied: 9 May. Combine harvested: 29 Aug.

Preparatory area:

Fallow: Ploughed: 18 Dec, 1978 (Fosters only), 20 Dec (Highfield). Heavy spring-tine cultivated (Highfield only): 17 May, 1979. Rotary cultivated: 18 May, 12 June, 29 June. Cultivated with thistle bar: 2 Aug. Weedkiller applied: 14 Sept. Spring-tine cultivated: 3 Oct. Deep tine cultivated: 30 Oct.

NOTE: In July wheat and barley on the New Sequence blocks were sampled for take-all and Phialophora.

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79/R/RN/1 AND 79/R/RN/2

MUSEUM BLOCKS

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
1ST AND ONLY CUT	2.16	2.40
MEAN DM%	22.9	15.6
ALL GRASS LEY		
1ST AND ONLY CUT	3.55	2.94
MEAN DM%	20.6	18.6
HAY		
1ST AND ONLY CUT	3.16	2.83
MEAN DM%	20.7	19.5

OLD GRASS

TOTAL OF 3 CUTS

	HIGHFIELD	
	C	N
31ST EXPTL YEAR		
BLOCKS 1 & 4	4.34	9.53
BLOCK 2	4.29	10.45
MEAN DM%	20.3	24.4

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RESEEDED GRASS

TOTAL OF 3 CUTS

		HIGHFIELD			FOSTERS	
	BLOCKS	C	N	BLOCKS	C	N
31ST EXPTL YEAR	1 & 4	4.55	10.05	1 & 3	6.00	10.07
31ST EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	5.49	10.43	2 & 4	5.76	9.02
MEAN DM%		23.6	23.3		19.9	20.8

NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

BARLEY

	HIGHFIELD	FOSTERS
	5.77	5.24
MEAN DM%	83.7	83.9

WHEAT

	HIGHFIELD	FOSTERS
	4.56	5.28
MEAN DM%	85.3	85.7

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79/R/RN/1 HIGHFIELD

POTATOES

TOTAL TUBERS TONNES/HECTARE

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

ROTATION FYMRES68	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
NONE	39.5	44.9	39.0	29.9	38.3
FYM	40.1	44.9	39.0	27.0	37.7
MEAN	39.8	44.9	39.0	28.4	38.0

N 79 FYMRES68	0	80	160	240	MEAN
NONE	32.7	37.1	41.1	42.3	38.3
FYM	29.3	39.3	42.4	40.0	37.7
MEAN	31.0	38.2	41.8	41.1	38.0

N 79 ROTATION	0	80	160	240	MEAN
LUCERNE	36.3	42.3	41.6	39.1	39.8
CLOGRA	40.3	45.3	46.0	47.9	44.9
GRASS	33.6	36.8	42.8	42.7	39.0
ARABLE	13.8	28.4	36.7	34.9	28.4
MEAN	31.0	38.2	41.8	41.1	38.0

FYMRES68	N 79 ROTATION	0	80	160	240
NONE	LUCERNE	38.2	40.4	40.4	39.1
	CLOGRA	39.4	45.6	47.9	46.8
	GRASS	33.4	36.2	43.5	42.9
	ARABLE	19.9	26.3	32.7	40.6
FYM	LUCERNE	34.5	44.3	42.7	39.0
	CLOGRA	41.2	45.0	44.2	49.1
	GRASS	33.8	37.4	42.2	42.5
	ARABLE	7.7	30.5	40.6	29.2

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79/R/RN/1 HIGHFIELD

POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

ROTATION	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
FYMRES68					
NONE	95.8	96.2	96.3	94.4	95.7
FYM	95.7	96.4	95.6	89.8	94.4
MEAN	95.8	96.3	96.0	92.1	95.0

N 79	0	80	160	240	MEAN
FYMRES68					
NONE	95.6	95.4	95.8	95.8	95.7
FYM	90.6	95.7	96.3	94.9	94.4
MEAN	93.1	95.5	96.1	95.3	95.0

N 79	0	80	160	240	MEAN
ROTATION					
LUCERNE	96.1	95.7	96.3	94.9	95.8
CLOGRA	95.9	96.5	96.3	96.3	96.3
GRASS	96.5	95.5	96.2	95.6	96.0
ARABLE	84.0	94.4	95.5	94.6	92.1
MEAN	93.1	95.5	96.1	95.3	95.0

	N 79	0	80	160	240
FYMRES68	ROTATION				
NONE	LUCERNE	95.5	96.5	95.6	95.5
	CLOGRA	96.7	95.8	95.8	96.4
	GRASS	96.8	95.5	97.7	95.2
	ARABLE	93.4	93.8	94.3	96.2
FYM	LUCERNE	96.6	95.0	97.1	94.3
	CLOGRA	95.1	97.3	96.8	96.2
	GRASS	96.2	95.6	94.7	96.0
	ARABLE	74.5	95.0	96.7	93.0

PLOT AREA HARVESTED 0.00353

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79/R/RN/2 FOSTERS

POTATOES

TOTAL TUBERS TONNES/HECTARE

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

ROTATION FYMRES68	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
NONE	34.8	36.2	31.8	26.9	32.4
FYM	36.4	37.3	34.5	29.9	34.5
MEAN	35.6	36.8	33.1	28.4	33.5

N 79 FYMRES68	0	80	160	240	MEAN
NONE	26.4	35.0	32.7	35.5	32.4
FYM	29.2	35.6	38.0	35.2	34.5
MEAN	27.8	35.3	35.4	35.3	33.5

N 79 ROTATION	0	80	160	240	MEAN
LUCERNE	31.5	37.7	35.4	37.6	35.6
CLOGRA	33.9	38.5	37.9	36.8	36.8
GRASS	27.5	36.3	35.7	33.1	33.1
ARABLE	18.5	28.7	32.5	33.8	28.4
MEAN	27.8	35.3	35.4	35.3	33.5

FYMRES68	N 79 ROTATION	0	80	160	240
NONE	LUCERNE	30.5	36.7	34.2	37.7
	CLOGRA	33.7	38.9	35.1	37.0
	GRASS	25.6	36.3	31.6	33.6
	ARABLE	15.8	28.2	30.0	33.6
FYM	LUCERNE	32.5	38.8	36.7	37.5
	CLOGRA	34.0	38.0	40.6	36.7
	GRASS	29.3	36.2	39.8	32.6
	ARABLE	21.1	29.3	35.1	34.1

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79/R/RN/2 FOSTERS

POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

ROTATION / FYMRES68	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
NONE	95.2	95.4	95.3	94.6	95.1
FYM	95.2	94.3	95.3	94.4	94.8
MEAN	95.2	94.8	95.3	94.5	95.0

N 79 / FYMRES68	0	80	160	240	MEAN
NONE	95.1	94.9	95.4	95.0	95.1
FYM	94.1	95.4	94.8	94.9	94.8
MEAN	94.6	95.1	95.1	95.0	95.0

N 79 / ROTATION	0	80	160	240	MEAN
LUCERNE	94.9	94.9	95.4	95.7	95.2
CLOGRA	94.5	95.2	95.2	94.5	94.8
GRASS	95.1	96.0	95.4	94.7	95.3
ARABLE	93.9	94.4	94.5	95.1	94.5
MEAN	94.6	95.1	95.1	95.0	95.0

FYMRES68 / ROTATION	N 79	0	80	160	240
NONE	LUCERNE	94.4	94.7	95.5	96.3
	CLOGRA	95.9	94.8	96.5	94.3
	GRASS	95.4	96.0	95.4	94.6
	ARABLE	94.7	94.3	94.4	94.9
FYM	LUCERNE	95.4	95.1	95.3	95.0
	CLOGRA	93.1	95.7	93.8	94.6
	GRASS	94.8	96.1	95.5	94.7
	ARABLE	93.0	94.5	94.7	95.4

PLOT AREA HARVESTED 0.00353

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