ROTHAMSTED RESEARCH

Yields of the Field Experiments 1989

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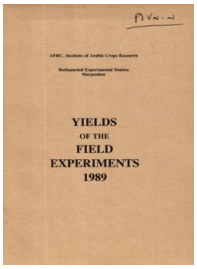

Rotations

Rothamsted Research

Rothamsted Research (1990) *Rotations ;* Yields Of The Field Experiments 1989, pp 34 - 65 **- DOI: https://doi.org/10.23637/ERADOC-1-40**

89/R/RN/1 and 89/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 - Highfield and Fosters.

Sponsor: P.R. Poulton.

The 41st year, old grass, leys, sugar beet, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-88/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (89/R/RN/1)

FOSTERS — A site with little organic matter initially (89/R/RN/2)

ROTATION — Treatments: The experiment originally tested four six-course rotations, with all phases present each year. For many 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 fertilizer, LN = all-grass ley with nitrogen fertilizer, H = 1-year seeds hay, SB = sugar beet, O = s. oats, W = w. wheat, P = potatoes, B = s. barley.

From 1983 the test crops have been W, W, W.

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 unploughed, 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

From 1968 only two phases on each field continued in the six-course rotation (the museum blocks). The four other phases (the new sequence blocks) were used for studies on take-all (Gaeumannomyces graminis) in wheat. These studies ended in 1985 and these phases are no longer included in the experiment.

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89/R/RN/1 and 89/R/RN/2

Additional treatments to 2nd test crop w. wheat:-

Sub plots

FYMRES70 Farmyard manure residues, last applied 1970:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertilizer in 1989 (kg N) as 'Nitram':

0
50
100
150

Standard applications:
2nd Treatment crops:
Lucerne: Manures: (0:18:36) at 630 kg.
All-grass ley: Manures: (0:18:36) at 420 kg. (25:0:16) at 300 kg on two occasions.
Clover-grass ley: Manures: (0:18:36) at 420 kg.
Sugar beet: Manures: (13:13:20) at 1150 kg. Weedkiller: Metamitron at 3.5 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg in 200 l.
2nd Test crop:
W. wheat: Manures: (0:18:36) at 560 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Chlortoluron at 3.5 kg in 200 l.
Reseeded grass and old grass: Manures: (0:18:36) at 420 kg. All-grass half plots: (25:0:16) at 300 kg in spring and after each cut except the last.

Seed: Sugar beet: Monoire, seed spaced 3.8 cm apart in rows 51 cm apart.
W. wheat: Avalon, sown at 180 kg.

Cultivations, etc.:-
2nd Treatment crops:
Lucerne: PK applied: 9 Dec, 1988. First cut: 24 May, 1989. Second cut: 25 Sept (Fosters), 27 Sept (Highfield).
All-grass ley and clover-grass ley: PK applied: 9 Dec, 1988. NK applied to all-grass ley: 10 Apr, 1989 and 26 May. Cut: 24 May, 25 Sept.
Sugar beet: Ploughed: 19 Dec, 1988. NPK applied: 10 Apr, 1989. Spring-tine cultivated twice: 18 Apr. Weedkiller applied, rotary harrowed and harrowed: 2 May. Rolled, seed sown, rolled: 3 May. Insecticide applied: 9 June. Singled: 20 June. Lifted: 21 Nov.
2nd Test crop w. wheat: Glyphosate applied: 1 Oct, 1988. PK applied: 7 Oct. Ploughed: 11 Oct. Rotary harrowed, seed sown: 27 Oct. Chlortoluron applied: 15 Nov. N treatments applied: 18 Apr, 1989. Combine harvested: 7 Aug.
Reseeded grass and old grass: PK applied: 9 Dec, 1988. NK applied to all-grass half plots: 10 Apr, 1989 and 26 May. Cut: 24 May, 25 Sept.

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89/R/RN/1 and 89/R/RN/2

NOTE: Lucerne on Highfield grew poorly and no yields were recorded.

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 2 CUTS	3.29	3.62
MEAN DM%	35.1	36.2
ALL-GRASS LEY		
TOTAL OF 2 CUTS	6.58	6.40
MEAN DM%	36.6	37.1

	FOSTERS
LUCERNE	
TOTAL OF 2 CUTS	6.70
MEAN DM%	31.6

	HIGHFIELD	
OLD GRASS		
TOTAL OF 2 CUTS	C	N
41ST EXPTL YEAR		
BLOCKS 1 & 4	1.96	6.46
BLOCK 2	3.06	6.43
MEAN DM%	35.1	35.2

	HIGHFIELD			FOSTERS	
RESEEDED GRASS					
TOTAL OF 2 CUTS	BLOCKS	C	N	BLOCKS	C	N
41ST EXPTL YEAR	1 & 4	2.24	6.71	1 & 3	3.85	6.28
41ST EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	3.18	6.77	2 & 4	3.83	5.68
MEAN DM%		34.7	35.5		35.0	36.5

SUGAR BEET: TONNES/HECTARE

	HIGHFIELD	FOSTERS
ROOTS WASHED	40.0	36.4
SUGAR PERCENTAGE	17.1	16.7
TOTAL SUGAR	6.85	6.07
TOPS	28.6	29.7

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89/R/RN/1 HIGHFIELD W.WHEAT (2ND TEST CROP)

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	Mean
ROTATION			
LUCERNE	5.96	5.46	5.71
CLOGRA	5.82	5.97	5.90
GRASS	5.99	5.37	5.68
ARABLE	3.94	3.24	3.59
Mean	5.43	5.01	5.22

N	0	50	100	150	Mean
ROTATION					
LUCERNE	4.23	6.10	6.23	6.30	5.71
CLOGRA	4.92	6.16	5.73	6.77	5.90
GRASS	4.54	5.29	6.47	6.42	5.68
ARABLE	1.94	3.28	4.59	4.56	3.59
Mean	3.91	5.21	5.75	6.01	5.22

N	0	50	100	150	Mean
FYMRES70					
NONE	4.10	5.47	5.96	6.18	5.43
FYM	3.71	4.95	5.55	5.85	5.01
Mean	3.91	5.21	5.75	6.01	5.22

	N	0	50	100	150
ROTATION	**FYMRES70**				
LUCERNE	NONE	4.95	6.35	6.49	6.05
	FYM	3.51	5.85	5.96	6.54
CLOGRA	NONE	4.84	6.20	5.56	6.68
	FYM	4.99	6.13	5.90	6.86
GRASS	NONE	4.68	5.69	6.84	6.73
	FYM	4.39	4.89	6.10	6.10
ARABLE	NONE	1.94	3.63	4.94	5.25
	FYM	1.94	2.92	4.24	3.88

GRAIN MEAN DM% 89.0

PLOT AREA HARVESTED 0.00663

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89/R/RN/2 FOSTERS W.WHEAT (2ND TEST CROP)

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	Mean
ROTATION			
LUCERNE	6.06	6.33	6.19
CLOGRA	6.13	6.17	6.15
GRASS	5.27	5.47	5.37
ARABLE	4.37	3.99	4.18
Mean	5.46	5.49	5.48

N	0	50	100	150	Mean
ROTATION					
LUCERNE	5.08	5.95	6.80	6.95	6.19
CLOGRA	4.69	5.54	6.68	7.69	6.15
GRASS	4.63	5.35	5.40	6.12	5.37
ARABLE	2.27	3.78	4.74	5.94	4.18
Mean	4.17	5.15	5.90	6.68	5.48

N	0	50	100	150	Mean
FYMRES70					
NONE	3.97	5.19	5.76	6.91	5.46
FYM	4.36	5.11	6.05	6.44	5.49
Mean	4.17	5.15	5.90	6.68	5.48

N		0	50	100	150
ROTATION	**FYMRES70**				
LUCERNE	NONE	4.98	5.61	6.37	7.27
	FYM	5.18	6.28	7.22	6.64
CLOGRA	NONE	3.99	6.37	6.34	7.81
	FYM	5.39	4.71	7.02	7.57
GRASS	NONE	4.35	5.17	4.49	7.08
	FYM	4.90	5.54	6.31	5.15
ARABLE	NONE	2.56	3.63	5.84	5.47
	FYM	1.98	3.92	3.64	6.42

GRAIN MEAN DM% 88.9

PLOT AREA HARVESTED 0.00663

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

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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.

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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.

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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

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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

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

89/W/RN/4

MARKET GARDEN

Object: The experiment compared the effects of fertilizers and organic manures applied annually in the period 1942 to 1967, on market garden crops. Residual effects of the organic manures were studied in arable crops from 1968 to 1973. From 1974 until 1982 the site was maintained in grass without yields. A new sequence of cropping started in 1983 to study further the residual effects of the organic manures, particularly the availability of metals from sewage sludge - Woburn Lansome I.

Sponsor: S.P. McGrath.

The 48th year, clover.

For previous years see 'Details' 1967 & 1973, 74-80/W/RN/4 and 83-88/W/RN/4.

Design: 2 series each of 4 blocks of 10 plots split, systematically, into 2.

Whole plot dimensions: 8.15 x 5.18.

Treatments:

To Series A, second year white clover after two-year white clover, all combinations of:-

Whole plots

1. **OM RESID** Residues of organic manures:

FYM	Farmyard manure until 1967
SEWAGE	Sewage sludge until 1961
SEW COM	Sewage sludge, composted with straw, until 1961
VEG COM	Vegetable compost until 1962, then farmyard manure until 1967

2. **OM RATE** Rates of organic manures (t per crop):

25
50

EXTRA plus one extra treatment (duplicated):

NONE No organic manures

Sub plots

3. **N RESID** Nitrogen (kg N) per cut in previous years:

0
100

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

89/W/RN/4

To Series B, second year white clover after four-year white clover, all combinations of:-

Whole plots

1. **OM RESID** Residues of organic manures:

FYM	Farmyard manure to whole plots until 1964, to half plots until 1967. Untreated half plots received a balancing dressing in 1974
SEWAGE	Sewage sludge until 1961
SEW COM	Sewage sludge, composted with straw, until 1961
VEG COM	Vegetable compost until 1962, then farmyard manure until 1965

2. **OM RATE** Rates of organic manures (t per crop):

25
50

EXTRA plus one extra treatment (duplicated):

PEAT Peat at 31 t per crop to half plots 1965 to 1967. Untreated half plots received a balancing dressing in 1974.

Sub plots

3. **N RESID** Nitrogen (kg N) per cut in previous years:

0
100

Basal applications:
Series A and B: Manure: Magnesian limestone at 5.0 t.

Cultivations, etc.:- Magnesian limestone applied: 16 Dec, 1988. Cut: 2 June, 1989.

NOTE: Yields were taken only from the **N RESID** 0 plots.

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

89/W/RN/4 WHITE CLOVER SERIES A

1ST AND ONLY CUT (2/6/89) DRY MATTER TONNES/HECTARE

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

OM RESID / **OM RATE**	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	3.59	4.36	3.86	3.82	3.91
50	4.09	4.01	3.75	3.59	3.86
Mean	3.84	4.19	3.80	3.70	3.88

EXTRA NONE 4.17

Grand mean 3.94

*** Standard errors of differences of means ***

OM RESID	**OM RATE**	**OM RESID** **OM RATE**
0.188	0.133	0.265

SED for comparing **EXTRA** NONE with any item in
OM RESID.OM RATE table is 0.230

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.375	9.5

1ST CUT MEAN DM% 12.5

PLOT AREA HARVESTED 0.00052

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89/W/RN/4 WHITE CLOVER SERIES B

1ST AND ONLY CUT (2/6/89) DRY MATTER TONNES/HECTARE

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

OM RESID / **OM RATE**	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	5.07	5.08	5.06	4.94	5.04
50	4.48	5.39	4.67	5.17	4.93
Mean	4.77	5.23	4.87	5.06	4.98

EXTRA PEAT 4.92

Grand mean 4.97

*** Standard errors of differences of means ***

OM RESID	**OM RATE**	**OM RESID** **OM RATE**
0.279	0.198	0.395

SED for comparing **EXTRA** PEAT with any item in
OM RESID.OM RATE table is 0.342

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.559	11.2

1ST CUT MEAN DM% 12.6

PLOT AREA HARVESTED 0.00052

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

89/R/RN/5

ARABLE REFERENCE PLOTS

Object: To study the long-term effects of FYM and N, P and K fertilizers on the yield and mineral content of crops - Great Field IV.

Sponsors: R.J. Darby, M.V. Hewitt.

The 34th year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980; w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 30th year of a rotation on the additional plots (as the initial above rotation for 20 years; w. barley, ley, potatoes, w. wheat, w. oats since 1980). The 33rd year of permanent grass.

For previous years see 58/Bc/1(t), 59/Bc/1(t), 60/B/3(t), 61-64/B/2, 65/B/2(t), 66/B/2(t), 67/B/2, 68/B/3(t) and 69-88/R/RN/5.

Design: 1 block of 12 plots for each crop on original plots. 1 block of 7 plots for each crop on additional plots.

Whole plot dimensions: 2.13 x 2.44.

Treatments: Fertilizers and farmyard manure:

MANURE

Original plots

O
N1
P
N1P
K
N1K
PK
N1PK
N2PK
D
N1PKD
N2PKD

N1, 2 (kg N): 20, 40 (ley): 100, 200 (w. wheat, w. barley and w. oats): 125, 250 (potatoes, and permanent grass) as 'Nitro-Chalk'
P: 63 kg P_2O_5 as superphosphate
K: 250 kg K_2O as muriate of potash
D: 38 tonnes FYM (permanent grass): 100 tonnes (to potatoes only - 50 tonnes to potatoes and kale until 1980): none to other crops

NOTES: (1) All w. wheat on these plots receives a standard dressing of 82 kg MgO as Epsom salts.
(2) Cereals receive 20 kg of N1 and 40 kg of N2 in March, remainder in April.

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89/R/RN/5

Additional plots

MANURE	Fertilizers from 1980 to 1989 and in previous years:
1980-89	Until 1979
O	O
N2PK	N2 PK
N2PKMG	N2 PK MG CA
N2PKS	N2 PK CA S
N2PKMGS	N2 PK MG S
N1PKMGS	N2 PK CA MG S
N3PKMGS	N2 PK CA MG S TE

N: In 1989: N1: 20 kg (ley), 120 kg (w. wheat, w. barley and w. oats), 160 kg (potatoes). N2: 30 kg (ley), 160 kg (w. wheat, w. barley and w. oats), 240 kg (potatoes). N3: 40 kg (ley), 200 kg (w. wheat, w. barley and w. oats), 320 kg (potatoes). Until 1979 N2 = larger rate on original plots in these years. As urea in all years. Cereals receive 40 kg N in March, remainder in April.
P: 126 kg P_2O_5 as potassium dihydrogen phosphate.
K: 251 kg K_2O total. As potassium dihydrogen phosphate (83 kg K_2O) on all PK plots. In addition plots without S receive 168 kg K_2O as potassium chloride, plots with S receive 92 kg K_2O as potassium sulphate plus 76 kg K_2O as potassium chloride. Since 1978 all PK plots receive, in addition to the standard total, 126 kg K_2O for potatoes, applied in autumn as potassium chloride.
MG: 126 kg MgO as magnesium chloride.
CA: 126 kg CaO as calcium carbonate until 1979. In 1980 plots not previously given Ca received calcium carbonate at 7.5 t, except O which was given 5.0 t.
S: 30 kg S supplied by the potassium sulphate.
TE: Trace element mixture which included Mn, Cu, Zn, B, Mo, Ca and Fe.

Standard applications:

Original and additional plots:

All cereals: Weedkillers: Isoproturon at 2.5 kg in 220 l (to wheat and barley). Fluroxypyr at 0.15 kg in 220 l. Fungicides: Prochloraz at 0.56 kg and carbendazim at 0.21 kg in 220 l. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.38 kg in 220 l. Propiconazole at 0.12 kg applied with the pirimicarb. Insecticides: Dimethoate at 0.67 kg in 220 l. Pirimicarb at 0.14 kg. Growth regulators: Chlormequat at 1.6 kg in 220 l (to wheat and oats). Mepiquat chloride at 0.86 kg and 2-chloroethylphosphonic acid at 0.44 kg in 220 l (to barley).

W. wheat: Manures: MgO at 82 kg as Epsom salts.

Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 220 l. Fungicide: Mancozeb at 1.3 kg applied with the insecticide in 220 l. Insecticide: Pirimicarb at 0.14 kg.

Seed: W. wheat: Galahad, sown at 210 kg.
W. barley: Panda, sown at 250 kg.
W. oats: Peniarth, sown at 210 kg.
Potatoes: Cara.
Grass-clover ley: RVP Italian ryegrass and Hungaropoly red clover.

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89/R/RN/5

Cultivations, etc.:-

Original and additional plots:

All cereals: Isoproturon applied (to wheat and barley): 11 Oct, 1988. Dimethoate applied: 21 Oct. First N treatments applied: 8 Mar, 1989. Prochloraz and carbendazim applied, fluroxypyr applied separately: 28 Mar. Growth regulator applied (to wheat and oats): 29 Mar. Second N treatments applied: 10 Apr. Growth regulators applied (to barley): 12 Apr. Carbendazim, maneb and tridemorph applied: 8 May. Propiconazole and pirimicarb applied: 26 May.

W. wheat: P, K, Mg and (to additional plots only) S applied, rotary cultivated, raked level and seed sown: 22 Sept, 1988. Hand harvested: 1 Aug, 1989.

W. barley: P, K and (to additional plots only) Mg and S applied: 15 Sept, 1988. Rotary cultivated, raked level, seed sown and raked in: 16 Sept. Hand harvested: 18 July, 1989.

W. oats: P, K and (to additional plots only) Mg and S applied: 29 Sept, 1988. Rotary cultivated, raked level, seed sown and raked in: 30 Sept. Hand harvested: 19 July, 1989.

Potatoes: FYM applied (to original plots) and plots dug by hand: 22 Nov, 1988. P, K and (to additional plots only) Mg and S applied: 18 Apr, 1989. N applied, rotary cultivated, potatoes planted: 19 Apr. Weedkillers applied: 15 May. Fungicide with insecticide applied: 21 July. Plots given neither FYM nor K on original plots and plot given no fertilizer on additional plots harvested by hand: 22 Aug. Remaining plots harvested by hand: 14 Sept.

Grass-clover ley: Rotary cultivated, raked level, seed sown and raked in: 6 Sept, 1988. P, K and (to additional plots only), Mg and S applied: 9 Dec, 1988. N applied: 8 Mar, 1989. Cut: 10 May, 25 July and 29 Sept.

Permanent grass: FYM, P, K and first N applied: 8 Mar, 1989. Cut, second N applied: 10 May. Cut, third N applied: 25 July. Cut: 29 Sept.

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89/R/RN/5

ORIGINAL PLOTS

TONNES/HECTARE

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

	W. WHEAT:		W. BARLEY:		LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE	GRAIN	STRAW	GRAIN	STRAW				
0	3.49	3.93	2.34	2.06	2.40	0.78	0.25	3.43
N1	2.72	4.42	2.42	2.64	3.59	0.79	0.24	4.62
P	2.47	3.36	4.17	3.04	2.47	0.90	0.23	3.60
N1P	1.94	3.79	4.03	4.82	3.96	0.74	0.21	4.92
K	4.77	5.27	3.25	3.06	2.52	1.03	0.23	3.78
N1K	6.54	7.29	5.16	5.24	2.53	1.43	0.32	4.28
PK	5.86	6.25	4.52	3.38	3.74	1.52	0.90	6.16
N1PK	8.79	9.48	7.77	7.92	4.88	1.16	0.40	6.44
N2PK	8.84	12.06	8.63	8.64	5.98	1.19	0.33	7.50
D	7.96	9.40	5.54	5.28	4.47	1.32	0.33	6.13
N1PKD	9.96	12.94	9.38	9.44	6.10	1.49	0.46	8.05
N2PKD	9.09	14.02	9.13	10.96	6.30	1.59	0.44	8.32
MEAN DM%	84.8	82.9	89.6	90.2	25.1	44.5	38.1	35.9

	W. OATS:		POTATOES:	PERMANENT GRASS : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
			TOTAL				
MANURE	GRAIN	STRAW	TUBERS				
0	3.57	5.42	6.9	0.65	0.71	0.26	1.62
N1	5.29	8.81	9.4	1.07	0.69	0.43	2.18
P	3.31	4.71	12.7	0.39	0.69	0.18	1.26
N1P	5.58	9.13	7.7	1.50	0.78	0.67	2.95
K	1.26	5.50	27.1	0.90	0.89	0.39	2.17
N1K	5.57	9.86	19.2	1.76	1.19	0.56	3.52
PK	4.42	7.04	26.9	1.52	1.66	0.30	3.48
N1PK	6.88	12.39	29.2	1.81	1.51	0.63	3.95
N2PK	6.35	14.29	30.0	2.55	1.24	0.79	4.58
D	6.19	10.89	28.1	2.85	1.46	0.69	5.00
N1PKD	6.77	14.47	37.5	3.34	2.37	1.01	6.72
N2PKD	6.12	16.07	36.3	3.61	2.73	0.97	7.31
MEAN DM%	86.4	55.3	23.9	29.9	45.8	41.5	39.1

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89/R/RN/5

ADDITIONAL PLOTS

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

	W. WHEAT:		W. BARLEY:		W. OATS:		POTATOES:
	GRAIN	STRAW	GRAIN	STRAW	GRAIN	STRAW	TOTAL TUBERS
MANURE							
0	4.17	4.80	3.23	2.57	3.74	5.13	6.7
N2PK	9.48	11.08	9.11	9.82	6.98	13.26	23.6
N2PKMG	10.73	11.81	8.38	8.62	6.26	13.36	32.1
N2PKS	8.99	11.30	7.57	8.40	6.89	14.22	26.9
N2PKMGS	8.08	9.59	9.48	9.12	6.69	12.53	26.7
N1PKMGS	9.34	10.73	8.77	8.73	7.16	13.27	29.0
N3PKMGS	9.06	11.78	9.30	9.46	6.17	12.60	24.8
MEAN DM%	85.3	82.3	90.1	91.0	87.3	64.1	23.2

	LEY : DRY MATTER			
	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE				
0	2.83	1.00	0.28	4.12
N2PK	5.47	1.04	0.32	6.82
N2PKMG	5.73	1.29	0.43	7.45
N2PKS	5.71	1.39	0.40	7.50
N2PKMGS	5.89	1.48	0.48	7.85
N1PKMGS	5.42	1.35	0.55	7.32
N3PKMGS	6.40	1.46	0.43	8.29
MEAN DM%	23.8	45.2	36.0	35.0

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89/R/RN/8

CULTIVATION/WEEDKILLER

Object: To study the long-term effects of different methods of primary cultivation on a sequence of crops; weedkillers were also tested until 1981 - Great Harpenden I.

Sponsor: R. Moffitt.

The 29th year, w. barley.

For previous years see 'Details' 1967 and 1973 and 74-88/R/RN/8.

Design: 2 randomised blocks of 12 plots.

Whole plot dimensions: 12.8 x 12.2.

Treatments: All combinations of:-

Whole plots

1. **CLT CHOP** — Primary cultivations annually; straw chopped since 1985:

PLOUGH	Ploughed: 19 Aug, 1988
ROTA DIG	Cultivated by rotary digger: 19 Aug
DEEPTINE	Deep-tine cultivated, twice: 19 Aug

2. **SUBSOIL[82]** — Subsoiling in September 1982:

NONE	None
CNVNTIAL	Conventional vertical tine
PARAPLOW	'Paraplow'

XTR BURN — plus three extra treatments with straw burnt since 1985, direct drilled until 1984, heavy spring-tine cultivated on 5 Sept, 1988, in addition to basal cultivating, differing in subsoiling in September 1982:

NONE	None
CNVNTIAL	Conventional vertical tine
PARAPLOW	'Paraplow'

NOTES: (1) Straw was chopped on 5 Aug, 1988 and was burnt on XTR BURN on 17 Aug.
(2) The conventional vertical tine subsoiler had tines 76 cm apart and worked at a depth of about 50 cm.
(3) The 'Paraplow' had rigid tines set at a 45 degree angle. The tip of each tine was in line with the attachment of an adjacent tine. The tines were 51 cm apart and worked at a depth of about 38 cm.

Basal applications: Manures: (0:18:36) at 920 kg. 'Nitram' at 480 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Chlortoluron at 3.5 kg in 200 l. Isoproturon at 2.1 kg with mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg in 200 l. Molluscicide: Methiocarb at 0.22 kg.

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89/R/RN/8

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- PK applied: 16 Sept, 1988. Glyphosate applied: 2 Oct. Heavy spring-tine cultivated: 17 Oct. Heavy spring-tine cultivated, spring-tine cultivated: 22 Oct. Seed sown: 23 Oct. Chlortoluron applied: 16 Nov. Molluscicide applied: 30 Jan, 1989. N applied: 14 Apr. Remaining weedkillers applied: 2 May. Combine harvested: 13 July.

GRAIN TONNES/HECTARE

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

SUBSOIL[82] CLT CHOP	NONE	CNVNTIAL	PARAPLOW	Mean
PLOUGH	4.71	4.82	4.52	4.69
ROTA DIG	3.98	3.58	4.05	3.87
DEEPTINE	4.12	4.34	4.50	4.32
Mean	4.27	4.25	4.36	4.29

XTR BURN	NONE	CNVNTIAL	PARAPLOW	Mean
	4.90	5.09	5.49	5.16

Grand mean 4.51

*** Standard errors of differences of means ***

XTR BURN	CLT CHOP SUBSOIL[82]	CLT CHOP SUBSOIL[82]
0.486	0.281	0.281	0.486

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.486	10.8

GRAIN MEAN DM% 80.1

PLOT AREA HARVESTED 0.00280

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

89/W/RN/12

ORGANIC MANURING

Object: To study, from crop yields and soil analyses, the effects of a range of types of organic matter - Woburn, Stackyard B.

Sponsor: P.R. Poulton.

The 25th year, w. wheat, potatoes.

For previous years see 'Details' 1973 and 74-88/W/RN/12.

Design for each crop: 2 blocks of 8 plots split into 6

Whole plot dimensions: 8.53 x 30.5.

Treatments: From 1966 to 1971 the experiment had a preliminary period designed to build up organic matter, derived from different sources. An arable rotation was started on two blocks in 1972 and the remaining two blocks in 1973. After a period of testing the residues built up, a further period of accumulation was started; on two blocks (which included ley sown in 1979) in 1981 and on the other two (which included ley sown in 1980) in 1982. On the first pair leys were ploughed for 1st test crop in 1987, on the second pair for 1st test crop in 1988.

3rd test crop w. wheat, after w.wheat 1987, potatoes 1988, tested all combinations of:

Whole plots

1. **TREATMNT** Previous treatments:

LC 8 GM	Eight-year clover/grass ley until 1986, green manure in the preliminary period
LC 8 PT	As above, peat in the preliminary period
LC 6 LC	Six-year clover/grass ley until 1986, clover/grass ley in the preliminary period
LC 6 LN	As above, grass ley with N in the preliminary period
FYM	Farmyard manure annually 1981 to 1985 and in the preliminary period
STRAW	Straw in both periods
FERT-FYM	Fertilizers only in both periods, rates of P, K and Mg equivalent to amounts in FYM
FERT-STR	Fertilizers only in both periods rates of P, K and Mg equivalent to amounts in straw (+P)

Sub plots

2. **N** Nitrogen fertilizer in 1989 (kg N) as 'Nitro-Chalk':

0
50
100
150
200
250

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89/W/RN/12

2nd test crop potatoes, after w. wheat 1988, tested all combinations of:

Whole plots

1. **TREATMNT** Previous treatments:

LC 8 GM	Eight-year clover/grass ley until 1987, green manure in the preliminary period
LC 8 PT	As above, peat in the preliminary period
LC 6 LC	Six-year clover/grass ley until 1987, clover/grass ley in the preliminary period
LC 6 LN	As above, grass ley with N in the preliminary period
FYM	Farmyard manure annually 1981 to 1986 and in the preliminary period
STRAW	Straw in both periods
FERT-FYM	Fertilizers only in both periods, rates of P, K & Mg equivalent to amounts in FYM
FERT-STR	Fertilizers only in both periods, rates of P, K & Mg equivalent to amounts in straw (+P)

Sub plots

2. **N** Nitrogen fertilizer in 1989 (kg N) as 'Nitram':

0
70
140
210
280
350

Standard applications:

2nd test crop:

Potatoes: Manures: Magnesian limestone at 5.0 t. Kieserite at 680 kg. (0:18:36) at 1380 kg. Weedkiller: Linuron at 1.2 kg in 220 l. Fungicides: Mancozeb at 1.4 kg in 220 l on two occasions and at 2.0 kg in 220 l on two occasions. Fentin hydroxide at 0.28 kg in 220 l. Nematicide: Oxamyl at 5 kg. Desiccant: Dilute sulphuric acid at 280 l.

3rd test crop:

W. wheat: Manures: Magnesian limestone at 5.0 t. (0:18:36) at 560 kg/ha. Mn at 0.096 kg as manganese sulphate in 220 l, applied on two occasions. Weedkillers: Mecoprop at 2.5 kg with bromoxynil at 0.34 kg and clopyralid at 0.07 kg in 220 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 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. Molluscicide: Methiocarb at 0.20 kg, also applied with seed. Nematicide: Carbofuran at 7.5 kg. Growth regulator: Chlormequat chloride at 1.6 kg.

Seed: Potatoes: Pentland Crown dressed 'Seedtect'.
W. wheat: Mercia, sown at 160 kg with methiocarb pellets.

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Cultivations, etc.:-

Potatoes: Magnesian limestone applied: 28 Oct, 1988. Ploughed 9 Dec. Kieserite applied: 3 Jan, 1989. PK applied: 4 Jan. Spring-tine cultivated: 4 May. N applied: 5 May. Nematicide applied: 8 May. Rotary cultivated, seed planted: 9 May. Weedkiller applied: 25 May. Mancozeb applied: 6, 17, 28 July and 16 Aug. Fentin hydroxide applied: 31 Aug. Desiccant applied: 25 Sept. Lifted: 6 Oct.

W. wheat: Ploughed: 27 Oct, 1988. Magnesian limestone applied: 28 Oct. Molluscicide applied: 29 Oct. PK applied, nematicide applied, spring-tine cultivated, seed sown: 31 Oct. Weedkillers applied: 28 Apr, 1989. Mn applied: 29 Apr, 22 May. N applied: 2 May. Prochloraz, carbendazim and growth regulator applied: 17 May. Propiconazole applied: 5 June. Fenpropimorph, carbendazim and maneb applied: 3 July. Combine harvested: 8 Aug.

W.WHEAT

GRAIN TONNES/HECTARE

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

N / TREATMNT	0	50	100	150	200	250	Mean
LC 8 GM	3.00	5.06	6.01	6.92	6.86	6.25	5.68
LC 8 PT	3.06	5.67	5.63	6.84	6.16	6.42	5.63
LC 6 LC	3.07	4.28	6.03	6.46	6.62	6.09	5.43
LC 6 LN	3.20	5.41	6.21	6.97	6.43	7.34	5.93
FYM	2.48	3.64	4.98	5.25	5.99	6.30	4.77
STRAW	2.57	3.52	4.30	5.27	5.46	5.80	4.49
FERT-FYM	1.32	3.31	4.92	4.21	5.24	5.40	4.07
FERT-STR	1.06	2.70	3.65	3.96	4.11	4.56	3.34
Mean	2.47	4.20	5.22	5.73	5.86	6.02	4.92

*** Standard errors of differences of means ***

TREATMNT	N	TREATMNT N
0.437	0.241	0.760

Except when comparing means with the same level(s) of TREATMNT 0.681

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.437	8.9
BLOCK.WP.SP	40	0.681	13.9

GRAIN MEAN DM% 87.7

SUB PLOT AREA HARVESTED 0.00252

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POTATOES

TOTAL TUBERS TONNES/HECTARE

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

N	0	70	140	210	280	350	Mean
TREATMNT							
LC 8 GM	34.2	44.9	48.2	42.8	42.9	45.9	43.2
LC 8 PT	32.9	46.8	50.0	47.5	48.4	50.4	46.0
LC 6 LC	35.3	44.0	49.9	49.5	45.5	46.2	45.1
LC 6 LN	35.1	47.7	51.9	50.4	47.7	46.6	46.5
FYM	32.4	37.5	40.8	42.2	41.3	38.4	38.8
STRAW	27.1	38.8	40.4	42.8	40.9	42.2	38.7
FERT-FYM	22.4	33.7	34.6	37.7	34.6	34.9	33.0
FERT-STR	23.7	37.7	38.6	36.9	40.2	41.7	36.5
Mean	30.4	41.4	44.3	43.7	42.7	43.3	41.0

*** Standard errors of differences of means ***

	TREATMNT	**N**	**TREATMNT N**
	3.61	1.05	4.52

Except when comparing means with the same level(s) of **TREATMNT** 2.98

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	3.61	8.8
BLOCK.WP.SP	40	2.98	7.3

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

N	0	70	140	210	280	350	Mean
TREATMNT							
LC 8 GM	95.6	95.6	95.5	96.1	94.8	96.6	95.7
LC 8 PT	96.4	96.8	96.6	96.4	96.5	96.4	96.5
LC 6 LC	96.0	96.1	97.8	96.5	96.1	97.2	96.6
LC 6 LN	96.7	97.1	97.5	96.7	96.5	95.9	96.7
FYM	93.5	95.6	95.0	96.1	94.9	93.1	94.7
STRAW	95.1	95.3	93.0	92.9	94.9	95.7	94.5
FERT-FYM	90.8	90.9	93.3	93.0	91.6	91.0	91.7
FERT-STR	92.3	96.1	93.2	93.7	95.0	94.8	94.2
Mean	94.5	95.4	95.2	95.2	95.0	95.1	95.1

SUB PLOT AREA HARVESTED 0.00137

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89/W/RN/13

INTENSIVE CEREALS

Object: To study the effects of leys of different duration, following prolonged intensive cereal cropping, on a sequence of arable crops - Woburn Stackyard I.

Sponsor: J. McEwen.

The 24th year, w. wheat and s. wheat.

For previous years see 'Details' 1973 and 74-88/W/RN/13.

Design: 4 randomised blocks of 6 plots split into 6.

Treatments: Until 1977 the experiment tested all phases of the five-course rotation: ley, potatoes, cereal, cereal, cereal and continous cereal. From 1977 to 1980 all phases were cropped with cereal. The experiment was in two halves, one in which the cereal was w. wheat, sown on part of the site of the classical continuous wheat experiment 1877-1954 and one in which the cereal was s. barley, sown on part of the site of the classical continuous barley experiment 1877-1954. From 1981 the experiment was used to establish grass/clover leys of different durations for tests on w. wheat in 1987. Plots not in ley were sown to w. wheat on both halves of the experiment. All leys were ploughed for 1987 and the site sown to w. wheat. This was followed by potatoes in 1988 and by wheat in 1989, testing all combinations of the following treatments:

Whole plots

1. **LEY AGE** Length of ley (until ploughing in summer 1986):

   1 YEAR
   2 YEARS
   3 YEARS
   4 YEARS
   5 YEARS
   6 YEARS

Sub plots

2. **N** Nitrogen fertilizer in 1989 (kg N) as 'Nitram':

   0
   50
   100
   150
   200
   250

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NOTE: Because of an error twelve sub plots from four whole plots were not sown with the rest of the experiment. These had the combinations **LEY AGE** 1 YEAR with **N** 50, 100 and 250, **LEY AGE** 4 YEARS with **N** 50, 100 and 150 and **LEY AGE** 5 YEARS with **N** 0, 50, 100 (from two separate whole plots), 150 and 250. They were sown to w. wheat later on two occasions but failed and were re-sown to s. wheat. Yields from these plots were not recorded. Estimated values were used in the analysis.

Basal applications: Manures: Dolomite at 5 t. (0:18:36) at 556 kg. Manganese at 0.096 kg Mn as a foliar spray in 220 l applied twice. Weedkillers: Mecoprop at 2.5 kg with bromoxynil at 0.34 kg and clopyralid at 0.07 kg in 220 l. Metsulfuron-methyl at 6.0 g in 220 l to s. wheat only. Fungicides: Prochloraz at 0.40 kg with carbendazim at 0.15 kg applied with the growth regulator in 220 l. Propiconazole at 0.12 kg in 220 l. Fenpropimorph at 0.75 kg with maneb at 1.6 kg and carbendazim at 0.25 kg in 220 l. Molluscicide: Methiocarb at 0.20 kg. Nematicide: Carbofuran at 7.5 kg. Growth regulator: Chlormequat chloride at 1.6 kg.

Seed: W. wheat: Mercia, with methiocarb pellets, sown at 165 kg - omitted plots sown at 180 kg.
S. wheat: Alexandria, sown at 180 kg.

Cultivations, etc.:- Ploughed: 28 Oct, 1988. Dolomite applied, methiocarb applied: 29 Oct. PK applied: 31 Oct. Carbofuran applied and cultivated in: 1 Nov. Spike harrowed with crumbler attached, seed sown: 2 Nov. Omitted plots sown: 13 Dec. Omitted plots spring-tine cultivated: 6 Feb, 1989. Omitted plots re-sown: 7 Feb. Omitted plots harrowed and sown to s. wheat: 31 Mar. Mecoprop, bromoxynil and clopyralid applied: 28 Apr. Mn applied: 29 Apr and 22 May. N applied: 3 May. Prochloraz and growth regulator applied: 17 May. Propiconazole applied: 5 June. Metsulfuron-methyl applied to s. wheat: 13 June. Fenpropimorph, maneb and carbendazim applied: 3 July. Combine harvested: 7 Aug.

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89/W/RN/13

GRAIN TONNES/HECTARE

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

N / LEY AGE	0	50	100	150	200	250	Mean
1 YEAR	1.26	2.90	4.71	5.34	5.51	5.43	4.19
2 YEARS	2.22	3.98	5.14	5.30	6.16	6.22	4.84
3 YEARS	2.57	4.46	5.72	5.95	6.63	6.31	5.27
4 YEARS	2.35	4.88	5.47	6.77	6.75	6.89	5.52
5 YEARS	2.52	4.63	5.73	5.87	6.30	6.36	5.23
6 YEARS	3.10	5.18	6.04	6.35	7.15	6.62	5.74
Mean	2.34	4.34	5.47	5.93	6.41	6.30	5.13

*** Standard errors of differences of means ***

LEY AGE	N	LEY AGE N
0.473	0.152	0.583

Except when comparing means with the same level(s) of
LEY AGE 0.373

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.669	13.0
BLOCK.WP.SP	78	0.528	10.3

GRAIN MEAN DM% 87.6

SUB PLOT AREA HARVESTED 0.00165

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