ROTHAMSTED RESEARCH

Yields of the Field Experiments 1985

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Rotations

Rothamsted Research

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85/R/RN/1 and 85/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 w. 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, R.J. Gutteridge.

The 37th year, old grass, leys, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-84/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (85/R/RN/1)

FOSTERS — A site with little organic matter initially (85/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 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 s. barley test crop was changed to w. wheat. Potatoes were not grown after 1982; the test crops were W, W, W thereafter.

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

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85/R/RN/1 and 85/R/RN/2

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 w. wheat every year at the end of the test-crop cycle. In 1977, 1978, 1979, and 1980 one phase, fallowed in the previous year, started new sequences of treatment cropping:

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 = s. beans. Other symbols as above. All ploughed at the end of the treatment crop cycle except GRASS/OG - direct drilled to 1st and 2nd w. wheats, ploughed thereafter. Treatment crop cycles started after nine previous cereals followed by one fallow. In 1985 yields were taken from 4th test crops only.

Additional treatments to 1st test crop w. wheat in the museum blocks:-

Sub plots

FYMRES68 Farmyard manure residues, last applied 1968:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertilizer in 1985 (kg N) as 'Nitro-Chalk' (27.5% N):

0
50
100
150

Additional treatments to 4th test crops w. wheat in the new sequence blocks:

Sub plots

N Nitrogen fertilizer in 1985 (kg N) as 'Nitro-Chalk' (27.5% N):

0
50
100
150

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85/R/RN/1 and 85/R/RN/2

Standard applications:
1st Treatment crops in museum blocks:
Lucerne: Manures: (0:20:20) at 380 kg. Weedkillers: Glyphosate at 1.4 kg in 250 l. Dinoseb at 1.0 kg in 500 l.
All-grass ley and 1-year hay: Manures: (0:14:28) at 540 kg. 'Nitro-Chalk' (27.5% N) at 270 kg. (25:0:16) at 300 kg. Weedkillers: Glyphosate at 1.4 kg in 250 l. 2, 4-DB, MCPA and benazolin (as 'Legumex Extra' at 7.0 l) in 500 l.
Clover-grass ley: Manures: (0:14:28) at 540 kg. Weedkillers: Glyphosate at 1.4 kg in 250 l. 2, 4-DB, MCPA and benazolin (as 'Legumex Extra' at 7.0 l) in 500 l.
1st Test crop wheat in museum blocks and 4th test crop wheat in new sequence blocks:
W. wheat: Manures: (0:24:24) at 210 kg. Weedkillers: Glyphosate at 1.4 kg in 500 l (after leys in museum blocks only). Isoproturon at 1.5 kg with mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 500 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: Lucerne: Vertus, sown at 31 kg.
All-grass ley: Meadow Fescue S.215 (17 kg), and Timothy Climax (17 kg), mixture sown at 34 kg.
Clover-grass ley: Meadow Fescue S.215 (15 kg), Timothy Climax (18 kg) and white clover Huia (4 kg), mixture sown at 37 kg.
1-year hay: RVP Italian Ryegrass, sown at 25 kg.
W. wheat: Flanders, sown at 190 kg.

Cultivations, etc.:-
1st Treatment crops in museum blocks:
Lucerne, all-grass ley, clover-grass ley and 1-year hay: Glyphosate applied: 11 Oct, 1984. Ploughed: 21 Nov. Spring-tine cultivated: 4 Apr, 1985.
Lucerne: PK applied: 29 Apr, 1985. Rotary harrowed, rolled: 30 Apr. Seed sown: 7 May. Dinoseb applied: 20 June. Cut: 5 Sept, 4 Nov.
All-grass ley, 1-year hay and clover-grass ley: PK applied: 29 Apr, 1985. N applied (except to clover-grass ley): 29 Apr. Rotary harrowed, seed broadcast and harrowed in: 30 Apr. 'Legumex Extra' applied: 17 June. Cut: 25 July. NK applied (except to clover-grass ley): 29 July. Cut: 4 Nov.
1st Test crop wheat in museum blocks and 4th test crop wheat in new sequence blocks: Glyphosate applied (to 1st Test crop only): 13 Aug, 1984. Ploughed: 25 Sept (4th Test crop on Fosters only), 2 Oct (1st Test crop on Highfield and Fosters), 3 Oct (4th Test crop on Highfield only). Spring-tine cultivated: 5 Oct, (Fosters), 17 Oct (Highfield). PK applied: 1 Nov (Fosters), 2 Nov (Highfield). Rotary harrowed, seed sown: 2 Nov. Isoproturon, mecoprop, bromoxynil and ioxynil applied: 17 Apr, 1985. N treatments applied: 18 Apr. Combine harvested: 28 Aug.
Reseeded grass and old grass: PK applied: 11 Dec, 1984. NK applied to all-grass half plots: 29 Mar, 1985, 31 May, 29 July. Cut: 29 May (Fosters), 30 May (Highfield), 25 July, 4 Nov (Highfield), 5 Nov (Fosters).

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85/R/RN/1 AND 85/R/RN/2 MUSEUM BLOCKS

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 2 CUTS	5.61	4.50
MEAN DM%	27.0	29.1
ALL-GRASS LEY		
TOTAL OF 2 CUTS	8.60	6.29
MEAN DM%	29.2	32.2
HAY		
TOTAL OF 2 CUTS	7.60	7.25
MEAN DM%	28.1	32.0
LUCERNE		
TOTAL OF 2 CUTS	4.31	4.62
MEAN DM%	22.0	22.8

OLD GRASS

TOTAL OF 3 CUTS	HIGHFIELD C	HIGHFIELD N
37TH EXPTL YEAR		
BLOCKS 1 & 4	7.59	11.53
BLOCK 2	6.81	10.30
MEAN DM%	25.2	26.7

RESEEDED GRASS

TOTAL OF 3 CUTS

	HIGHFIELD			FOSTERS		
	BLOCKS	C	N	BLOCKS	C	N
37TH EXPTL YEAR	1 & 4	7.20	11.65	1 & 3	7.30	11.29
37TH EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	6.52	13.79	2 & 4	7.58	10.40
MEAN DM%		24.4	27.0		21.5	25.1

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85/R/RN/1 HIGHFIELD

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES68 SEQUENCE	NONE	FYM	MEAN
LUCERNE	6.27	6.49	6.38
CLOGRA	6.19	5.96	6.08
GRASS	5.16	5.49	5.33
ARABLE	5.45	5.69	5.57
MEAN	5.77	5.91	5.84

N SEQUENCE	0	50	100	150	MEAN
LUCERNE	6.29	6.76	6.43	6.04	6.38
CLOGRA	5.92	6.38	6.23	5.78	6.08
GRASS	4.17	5.82	5.44	5.89	5.33
ARABLE	3.81	5.68	6.67	6.11	5.57
MEAN	5.05	6.16	6.19	5.95	5.84

N FYMRES68	0	50	100	150	MEAN
NONE	4.89	6.02	6.09	6.08	5.77
FYM	5.21	6.30	6.29	5.83	5.91
MEAN	5.05	6.16	6.19	5.95	5.84

N	0	50	100	150
SEQUENCE FYMRES68				
LUCERNE NONE	5.78	6.62	6.29	6.40
FYM	6.81	6.90	6.56	5.69
CLOGRA NONE	6.04	6.31	6.34	6.08
FYM	5.79	6.46	6.11	5.47
GRASS NONE	4.03	5.42	5.21	6.00
FYM	4.31	6.22	5.67	5.77
ARABLE NONE	3.69	5.74	6.53	5.84
FYM	3.93	5.62	6.82	6.39

GRAIN MEAN DM% 82.9

PLOT AREA HARVESTED 0.00663

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85/R/RN/2 FOSTERS

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES68	NONE	FYM	MEAN
SEQUENCE			
LUCERNE	6.78	7.07	6.93
CLOGRA	6.60	6.62	6.61
GRASS	5.76	5.89	5.83
ARABLE	5.72	6.03	5.88
MEAN	6.21	6.40	6.31

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	6.60	7.21	6.94	6.96	6.93
CLOGRA	6.08	6.81	6.98	6.56	6.61
GRASS	4.58	5.80	6.56	6.37	5.83
ARABLE	4.01	5.94	6.61	6.95	5.88
MEAN	5.32	6.44	6.77	6.71	6.31

N	0	50	100	150	MEAN
FYMRES68					
NONE	4.98	6.66	6.57	6.64	6.21
FYM	5.65	6.22	6.97	6.78	6.40
MEAN	5.32	6.44	6.77	6.71	6.31

N		0	50	100	150
SEQUENCE	FYMRES68				
LUCERNE	NONE	6.13	7.28	7.08	6.63
	FYM	7.07	7.14	6.80	7.28
CLOGRA	NONE	5.93	7.16	6.38	6.92
	FYM	6.23	6.47	7.58	6.20
GRASS	NONE	4.10	6.29	6.61	6.04
	FYM	5.05	5.30	6.51	6.70
ARABLE	NONE	3.77	5.91	6.23	6.97
	FYM	4.24	5.97	6.99	6.93

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00663

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85/R/RN/1 HIGHFIELD

W.WHEAT 4TH TEST CROP

GRAIN TONNES/HECTARE

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

N SEQUENCE	0	50	100	150	MEAN
LUCERNE	3.72	5.92	6.72	6.59	5.74
CLOGRA	3.75	6.34	7.21	6.90	6.05
GRASS/G	3.86	5.82	7.05	6.53	5.82
ARABLE/A	2.99	5.29	6.09	6.33	5.18
ARABLE/R	4.33	5.88	6.99	6.92	6.03
GRASS/OG	4.44	5.93	6.55	6.93	5.96
MEAN	3.85	5.86	6.77	6.70	5.80

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.231	0.110	0.327
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.268

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.231	4.0
BLOCK.WP.SP	18	0.268	4.6

GRAIN MEAN DM% 83.4

SUB PLOT AREA HARVESTED 0.00325

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85/R/RN/2 FOSTERS

W.WHEAT 4TH TEST CROP

GRAIN TONNES/HECTARE

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

N / SEQUENCE	0	50	100	150	MEAN
LUCERNE	3.55	5.24	6.13	6.66	5.39
CLOGRA	3.01	5.40	6.58	6.45	5.36
GRASS/G	3.56	5.10	6.52	6.60	5.44
ARABLE/A	2.78	4.63	5.70	6.04	4.79
ARABLE/R	3.77	5.61	6.25	6.16	5.45
MEAN	3.33	5.19	6.23	6.38	5.29

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.117	0.128	0.274
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.287

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP.SP	15	0.287	5.4

GRAIN MEAN DM% 82.2

SUB PLOT AREA HARVESTED 0.00325

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85/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 48th year, leys, s. barley, s. beans, w. wheat.

For previous years see 'Details' 1967 & 1973 and 74-84/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

LN = grass ley with N, LC = clover/grass ley no N, BE = s. beans (s. oats until 1980), F = fallow

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

LN 8	LN, LN, LN, LN, LN, LN, LN, LN, W, B
LC 8	LC, LC, LC, LC, LC, LC, LC, LC, W, B

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. FYMRES64 — Farmyard manure residues, last applied 1964:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

3. N — Nitrogen fertilizer (kg N) as 'Nitro-Chalk' (27.5% N):

   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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85/W/RN/3

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 'Nitro-Chalk' (27.5% N):

0
60
120
180

Treatments to leys:

FYM RES	Farmyard manure residues
NONE	None
FYM	38 tonnes on each occasion, last applied 1962 to 1st and 6th year leys, 1966 to 2nd and 7th year leys, 1965 to 3rd and 8th year leys, 1964 to 4th year leys, 1963 to 5th year leys

Corrective K dressings (kg K20) 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	326	364
LC	151	176
AF	653	628
AB	678	740
Ex-alternating rotations		
LN 8 ploughed for w. wheat	188	213
LN 8 not ploughed	301	289
LC 8 ploughed for w. wheat	264	0
LC 8 not ploughed	176	138

Standard applications:-

Grass ley and clover/grass ley, 1st year: Manures: (0:18:36) at 410 kg. N at 50 kg as 'Nitro-Chalk' (27.5% N) to grass ley only.

Grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 7.5 t to 5th year only. (0:18:36) at 410 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 7.5 t to 5th year only. (0:18:36) at 410 kg. K20 at 48 kg as muriate of potash in spring and after the first cut.

S. barley, 1st and 2nd treatment crops: Manures: (20:10:10) at 400 kg. Weedkillers: Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l.

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Standard applications:

S. beans: 3rd treatment crop: Manures: (0:24:24) at 170 kg.
W. wheat: 1st test crop: Manures: (0:20:20) at 310 kg. Weedkillers: Glyphosate at 1.5 kg in 280 l. Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l. Nematicide: Aldicarb at 10 kg. Fungicides: Propiconazole on two occasions, at 0.25 kg in 250 l on the first occasion, at 0.12 kg on the second with 'Septal'. Carbendazim with maneb (as 'Septal' at 2.5 kg) in 250 l with propiconazole.
S. barley, 2nd test crop: Manures: Magnesian limestone at 7.5 t. (0:24:24) at 260 kg. Weedkillers: Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l. Nematicide: Aldicarb at 10 kg.

Seed: 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 17 kg, Huia white clover at 4 kg, mixture sown at 39 kg.
S. barley: Triumph, dressed with triadimenol and fuberidazole, sown at 160 kg.
S. beans: Minden, sown at 270 kg.
W. wheat: Avalon, sown at 190 kg.

NOTE: S. beans failed and were resown at the same rate but again failed because of bird damage.

Cultivations, etc.:- Treatment crops:
Grass ley and clover/grass ley, 1st year: Ploughed: 13 Dec, 1984. Spring-tine cultivated with crumbler attached: 18 Mar, 1985. PK applied, N applied to grass ley only: 24 Apr. Spring-tine cultivated, seeds sown: 1 May. Hand hoed: 17 June. Cut: 12 Nov.
Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Corrective K applied to 4th year only: 19 Oct, 1984. Magnesian limestone applied to 5th year only: 23 Oct. PK applied: 6 Feb, 1985. NK applied to grass ley: 12 Mar, 22 July. K applied to clover/grass ley: 12 Mar, 24 July. Chain harrowed: 12 Apr. 1st cut, all plots: 8 July. 2nd cut (3rd and 8th years): 26 Sept. 2nd cut (2nd, 4th, 5th, 6th and 7th years): 11 Nov.
S. barley, 1st and 2nd treatment crops: Ploughed: 13 Dec, 1984. Spring-tine cultivated with crumbler attached, NPK applied, rotary harrowed, seed sown: 18 Mar, 1985. Mecoprop with bromoxynil and ioxynil applied: 16 May. Combine harvested: 27 Aug.
Fallow, 1st and 2nd treatment years: Ploughed: 13 Dec, 1984. Spring-tine cultivated with crumbler attached: 18 Mar, 1985. Spring-tine cultivated: 1 May. Cultivated with thistlebar: 1 May, 26 July. Deep-tine cultivated: 17 June. Rotary cultivated: 30 Sept.
S. beans, 3rd treatment crop: Ploughed: 13 Dec, 1984. PK applied: 12 Mar, 1985. Spring-tine cultivated with crumbler attached: 18 Mar. Seed sown with rotary cultivator and drill combination: 3 Apr. Seed resown with rotary cultivator and drill combination: 29 Apr. Rotary cultivated: 17 June.

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85/W/RN/3

Test crops:

W. wheat, 1st test crop: Glyphosate applied to leys: 1 Oct, 1984. Ploughed: 18 Oct. Corrective K applied: 19 Oct. PK applied: 22 Oct. Power harrowed: 24 Oct. Aldicarb applied, power harrowed, seed sown: 30 Oct. N applied: 19 Apr, 1985. Mecoprop with bromoxynil and ioxynil applied: 16 May. Propiconazole applied: 17 June. Propiconazole with 'Septal' applied: 2 July. Combine harvested: 2 Sept.

S. barley, 2nd test crop: Magnesian limestone applied: 23 Oct, 1984. Ploughed: 13 Dec. PK applied: 12 Mar, 1985. Spring-tine cultivated with crumbler attached, aldicarb applied, rotary harrowed, seed sown: 18 Mar. N applied: 28 Mar. Mecoprop with bromoxynil and ioxynil applied: 16 May. Combine harvested: 27 Aug.

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85/W/RN/3

LEYS

1ST CUTTING OCCASION DRY MATTER TONNES/HECTARE

FYM RES / LEY	NONE	FYM	MEAN
LC1	0.00	0.00	0.00
LC2	6.20	5.94	6.07
LC3	6.60	6.43	6.52
LN1	0.00	0.00	0.00
LN2	7.92	6.81	7.36
LN3	7.61	7.09	7.35
LLC1	0.00	0.00	0.00
LLC2	6.55	5.82	6.19
LLC3	5.55	5.46	5.50
LLC4	5.78	6.14	5.96
LLC5	7.21	6.79	7.00
LLC6	6.76	8.37	7.57
LLC7	6.74	7.47	7.11
LLC8	6.40	7.30	6.85
LLN1	0.00	0.00	0.00
LLN2	7.17	7.84	7.51
LLN3	6.64	7.74	7.19
LLN4	6.05	6.57	6.31
LLN5	7.43	7.62	7.53
LLN6	7.72	8.16	7.94
LLN7	7.53	8.82	8.17
LLN8	6.73	6.61	6.67
MEAN	6.81	7.06	6.93

1ST CUT MEAN DM% 30.6

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85/W/RN/3

2ND CUTTING OCCASION DRY MATTER TONNES/HECTARE

FYM RES LEY	NONE	FYM	MEAN
LC1	4.63	4.08	4.36
LC2	3.16	2.91	3.04
LC3	2.82	3.02	2.92
LN1	4.05	3.43	3.74
LN2	3.80	5.01	4.40
LN3	2.69	3.35	3.02
LLC1	4.00	5.13	4.56
LLC2	3.83	3.77	3.80
LLC3	2.70	3.40	3.05
LLC4	5.53	4.28	4.91
LLC5	4.74	3.13	3.93
LLC6	4.32	3.24	3.78
LLC7	2.81	2.34	2.57
LLC8	2.79	3.27	3.03
LLN1	3.90	4.09	3.99
LLN2	4.83	5.18	5.00
LLN3	2.81	3.16	2.98
LLN4	3.12	3.95	3.53
LLN5	5.30	4.72	5.01
LLN6	4.70	4.72	4.71
LLN7	3.02	3.32	3.17
LLN8	2.48	2.71	2.60
MEAN	3.73	3.74	3.73

2ND CUT MEAN DM% 30.1

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TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

FYM RES LEY	NONE	FYM	MEAN
LC1	4.63	4.08	4.36
LC2	9.36	8.85	9.11
LC3	9.42	9.45	9.44
LN1	4.05	3.43	3.74
LN2	11.72	11.82	11.77
LN3	10.30	10.45	10.38
LLC1	4.00	5.13	4.56
LLC2	10.38	9.59	9.98
LLC3	8.25	8.86	8.56
LLC4	11.31	10.42	10.87
LLC5	11.95	9.91	10.93
LLC6	11.08	11.61	11.35
LLC7	9.55	9.81	9.68
LLC8	9.19	10.57	9.88
LLN1	3.90	4.09	3.99
LLN2	12.01	13.02	12.51
LLN3	9.45	10.90	10.18
LLN4	9.17	10.52	9.84
LLN5	12.74	12.33	12.53
LLN6	12.42	12.89	12.65
LLN7	10.55	12.14	11.34
LLN8	9.21	9.32	9.27
MEAN	9.30	9.51	9.41

TOTAL OF 2 CUTS MEAN DM% 30.4

PLOT AREA HARVESTED 0.00204

https://doi.org/10.23637/ERADOC-1-19

85/W/RN/3

S.BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES63	NONE	FYM	MEAN
ROTATION			
LN 8	5.73	5.56	5.64
LN 3	4.82	5.60	5.21
LC 8	5.54	5.60	5.57
LC 3	5.08	5.07	5.07
AF	4.81	4.91	4.86
AB	4.00	3.83	3.91
MEAN	4.99	5.10	5.04

N	0	60	120	180	MEAN
ROTATION					
LN 8	5.26	6.47	5.79	5.07	5.64
LN 3	4.88	5.60	6.22	4.15	5.21
LC 8	4.78	6.26	5.84	5.40	5.57
LC 3	4.56	5.75	4.96	5.02	5.07
AF	2.11	5.53	6.25	5.55	4.86
AB	1.21	4.23	4.94	5.27	3.91
MEAN	3.80	5.64	5.67	5.08	5.04

N	0	60	120	180	MEAN
FYMRES63					
NONE	3.68	5.79	5.53	4.98	4.99
FYM	3.91	5.49	5.80	5.18	5.10
MEAN	3.80	5.64	5.67	5.08	5.04

N		0	60	120	180
ROTATION	FYMRES63				
LN 8	NONE	5.65	6.38	5.98	4.90
	FYM	4.86	6.55	5.59	5.24
LN 3	NONE	4.52	5.82	4.92	4.00
	FYM	5.23	5.37	7.52	4.29
LC 8	NONE	4.62	6.26	6.02	5.27
	FYM	4.93	6.26	5.66	5.53
LC 3	NONE	4.35	6.03	5.16	4.76
	FYM	4.77	5.48	4.76	5.28
AF	NONE	2.01	5.71	6.16	5.36
	FYM	2.21	5.34	6.33	5.75
AB	NONE	0.93	4.53	4.95	5.58
	FYM	1.49	3.93	4.94	4.96

GRAIN MEAN DM% 83.4

PLOT AREA HARVESTED 0.00251

https://doi.org/10.23637/ERADOC-1-19

85/W/RN/3

WINTER WHEAT

GRAIN TONNES/HECTARE

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

FYMRES64	NONE	FYM	MEAN
ROTATION			
LN 8	7.14	6.85	7.00
LN 3	7.67	7.06	7.36
LC 8	8.11	7.63	7.87
LC 3	7.65	7.86	7.75
AF	6.17	6.03	6.10
AB	6.39	5.94	6.17
MEAN	7.19	6.89	7.04

N	0	70	140	210	MEAN
ROTATION					
LN 8	4.07	6.98	8.39	8.55	7.00
LN 3	4.24	7.26	8.26	9.69	7.36
LC 8	4.44	8.08	8.76	10.19	7.87
LC 3	4.97	7.64	9.57	8.84	7.75
AF	2.03	5.46	7.72	9.20	6.10
AB	2.39	5.90	7.76	8.62	6.17
MEAN	3.69	6.89	8.41	9.18	7.04

N	0	70	140	210	MEAN
FYMRES64					
NONE	3.78	7.03	8.52	9.43	7.19
FYM	3.60	6.75	8.30	8.93	6.89
MEAN	3.69	6.89	8.41	9.18	7.04

N	FYMRES64	0	70	140	210
ROTATION					
LN 8	NONE	4.10	7.14	8.56	8.76
	FYM	4.05	6.81	8.21	8.33
LN 3	NONE	4.33	7.02	8.33	10.99
	FYM	4.15	7.50	8.19	8.38
LC 8	NONE	4.48	8.56	8.68	10.70
	FYM	4.39	7.61	8.83	9.67
LC 3	NONE	5.25	7.37	9.39	8.58
	FYM	4.68	7.92	9.74	9.09
AF	NONE	1.89	5.68	7.80	9.30
	FYM	2.16	5.24	7.63	9.09
AB	NONE	2.60	6.39	8.35	8.23
	FYM	2.17	5.41	7.17	9.00

GRAIN MEAN DM% 83.2

PLOT AREA HARVESTED 0.00251

https://doi.org/10.23637/ERADOC-1-19

85/W/RN/4

MARKET GARDEN

Object: The experiment compared the effects of fertilizers and organic manures applied annually in the period 1942 to 1967. 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 arable 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 44th year, red beet, carrots, clover.

For previous years see 'Details' 1967 & 1973, 74-80/W/RN/4 and 83-84/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, red beet and carrots on sub plots, all combinations of:-

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

To Series B, 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

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85/W/RN/4

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. NPERCUT — Nitrogen (kg N) per cut, as 'Nitro-Chalk' (27.5% N):

0
100

NOTE: On series A red beet in 1985 followed carrots in 1984 and vice versa.

Basal applications:
Series A:
Red Beet: Manures: (0:24:24) at 620 kg. N at 210 kg as 'Nitro-Chalk' (27.5% N). Weedkiller: Phenmedipham (as 'Betanal E' at 8.4 l) in 220 l.
Carrots: Manures: (0:24:24) at 620 kg. N at 70 kg as 'Nitro-Chalk' (27.5% N). Insecticide: Carbofuran (as 'Yaltox' granules at 94 kg). Weedkiller: Linuron at 0.52 kg in 280 l.
Series B:
Clover: Manures: (0:18:36) at 380 kg.

Seed: Red beet: Asmer Detroit, sown by precision drill.
Carrots: Chantenay Red-cored Supreme, sown by precision drill.

Cultivations, etc.:-
Series A:
Red beet: Ploughed: 4 Feb, 1985. PK and N applied, power harrowed: 19 Apr. Spike rotary cultivated with crumbler attached, seed sown: 22 Apr. Weedkiller applied: 14 June. Singled, hand hoed: 24-28 June. Hand harvested: 12 Aug.
Carrots: Ploughed: 4 Feb, 1985. PK and N applied, power harrowed: 19 Apr. Insecticide applied, spike rotary cultivated, seed sown: 22 Apr. Weedkiller applied: 5 June. Hand harvested: 14 Aug.
Series B:
Clover: PK applied: 13 Mar, 1985. N applied: 13 Mar, 22 July. Cut: 3 July, 13 Nov.

NOTE: Crop samples were taken at maturity and soil samples after harvest for chemical analyses.

https://doi.org/10.23637/ERADOC-1-19

85/W/RN/4 RED BEET

ROOTS FRESH WEIGHT TONNES/HECTARE

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

OM RESID OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	21.0	24.8	23.2	22.6	22.9
50	24.6	24.1	22.3	24.8	23.9
MEAN	22.8	24.5	22.7	23.7	23.4

NONE 20.7

GRAND MEAN 22.9

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	OM RESID	OM RATE	OM RESID OM RATE
SED	1.85	1.31	2.62

SED FOR COMPARING EXTRA NONE WITH ANY ITEM IN OM RESID.OM RATE TABLE IS 2.27

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	28	3.70	16.2

TOPS FRESH WEIGHT TONNES/HECTARE

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

OM RESID OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	15.8	19.1	16.9	15.6	16.9
50	18.3	18.5	18.7	18.7	18.6
MEAN	17.1	18.8	17.8	17.2	17.7

NONE 14.4

GRAND MEAN 17.0

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	OM RESID	OM RATE	OM RESID OM RATE
SED	1.59	1.12	2.24

SED FOR COMPARING EXTRA NONE WITH ANY ITEM IN OM RESID.OM RATE TABLE IS 1.94

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	28	3.17	18.6

PLOT AREA HARVESTED 0.00022

https://doi.org/10.23637/ERADOC-1-19

85/W/RN/4 CARROTS

ROOTS FRESH WEIGHT TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	9.3	8.0	6.2	9.7	8.3
50	7.7	8.7	7.9	7.3	7.9
MEAN	8.5	8.3	7.1	8.5	8.1

NONE 8.0

GRAND MEAN 8.1

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	OM RESID	OM RATE	OM RESID OM RATE
SED	1.09	0.77	1.54

SED FOR COMPARING EXTRA NONE WITH ANY ITEM IN OM RESID.OM RATE TABLE IS 1.34

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	28	2.18	27.0

TOPS FRESH WEIGHT TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	4.7	4.1	3.0	4.8	4.2
50	3.8	4.7	3.8	3.7	4.0
MEAN	4.3	4.4	3.4	4.2	4.1

NONE 3.9

GRAND MEAN 4.0

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	OM RESID	OM RATE	OM RESID OM RATE
SED	0.54	0.38	0.76

SED FOR COMPARING EXTRA NONE WITH ANY ITEM IN OM RESID.OM RATE TABLE IS 0.66

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	28	1.08	26.7

PLOT AREA HARVESTED 0.00022

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85/W/RN/4 WHITE CLOVER

1ST CUT (3/7/85) DRY MATTER TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	4.94	4.89	4.76	5.34	4.98
50	4.76	4.78	4.98	5.24	4.94
MEAN	4.85	4.83	4.87	5.29	4.96

NPERCUT / OM RATE	0	100	MEAN
25	4.79	5.18	4.98
50	4.78	5.09	4.94
MEAN	4.79	5.13	4.96

NPERCUT / OM RESID	0	100	MEAN
FYM	4.57	5.13	4.85
SEWAGE	4.78	4.88	4.83
SEW COM	4.71	5.03	4.87
VEG COM	5.08	5.50	5.29
MEAN	4.79	5.13	4.96

NPERCUT		0	100
OM RATE	OM RESID		
25	FYM	4.60	5.29
	SEWAGE	4.96	4.82
	SEW COM	4.53	4.99
	VEG COM	5.07	5.62
50	FYM	4.54	4.97
	SEWAGE	4.61	4.95
	SEW COM	4.88	5.07
	VEG COM	5.10	5.37

PEAT	NPERCUT	0	100	MEAN
		4.87	5.03	4.95

GRAND MEAN 4.96

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	OM RESID	OM RATE	NPERCUT	OM RESID OM RATE
SED	0.180	0.127	0.147	0.255

TABLE	OM RESID NPERCUT	OM RATE NPERCUT	OM RESID OM RATE NPERCUT	PEATNPER
SED	0.276	0.195	0.390	0.295

EXCEPT WHEN COMPARING MEANS WITH THE SAME LEVEL(S) OF:

OM RESID	0.295		
OM RATE		0.209	
OM RESID.OM RATE			0.417

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85/W/RN/4 WHITE CLOVER

1ST CUT (3/7/85) DRY MATTER TONNES/HECTARE

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	28	0.360	7.3
BLOCK.WP.SP	31	0.590	11.9

1ST CUT MEAN DM% 14.3

1ST CUT PLOT AREA HARVESTED 0.00047

2ND CUT (13/11/85) DRY MATTER TONNES/HECTARE

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

OM RESID	FYM	SEWAGE	SEW COM	VEG COM	MEAN
OM RATE					
25	2.97	3.07	3.24	3.36	3.16
50	3.31	3.07	2.96	3.05	3.10
MEAN	3.14	3.07	3.10	3.20	3.13

NPERCUT	0	100	MEAN
OM RATE			
25	3.07	3.25	3.16
50	3.07	3.13	3.10
MEAN	3.07	3.19	3.13

NPERCUT	0	100	MEAN
OM RESID			
FYM	3.06	3.22	3.14
SEWAGE	3.00	3.14	3.07
SEW COM	2.96	3.24	3.10
VEG COM	3.26	3.15	3.20
MEAN	3.07	3.19	3.13

NPERCUT		0	100
OM RATE	OM RESID		
25	FYM	3.13	2.82
	SEWAGE	2.85	3.29
	SEW COM	2.94	3.54
	VEG COM	3.36	3.35
50	FYM	3.00	3.63
	SEWAGE	3.14	3.00
	SEW COM	2.98	2.94
	VEG COM	3.15	2.95

PEAT	NPERCUT	0	100	MEAN
		2.90	3.36	3.13

GRAND MEAN 3.13

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85/W/RN/4 WHITE CLOVER

2ND CUT (13/11/85) DRY MATTER TONNES/HECTARE

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	OM RESID	OM RATE	NPERCUT	OM RESID OM RATE
SED	0.139	0.098	0.105	0.197

TABLE	OM RESID NPERCUT	OM RATE NPERCUT	OM RESID OM RATE NPERCUT	PEATNPER
SED	0.204	0.144	0.288	0.211

EXCEPT WHEN COMPARING MEANS WITH THE SAME LEVEL(S) OF:

OM RESID	0.211		
OM RATE		0.149	
OM RESID.OM RATE			0.298

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	28	0.278	8.9
BLOCK.WP.SP	31	0.422	13.5

2ND CUT MEAN DM% 14.3

2ND CUT PLOT AREA HARVESTED 0.00053

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	7.91	7.95	8.00	8.70	8.14
50	8.07	7.85	7.94	8.28	8.04
MEAN	7.99	7.90	7.97	8.49	8.09

NPERCUT / OM RATE	0	100	MEAN
25	7.86	8.43	8.14
50	7.85	8.22	8.04
MEAN	7.86	8.32	8.09

NPERCUT / OM RESID	0	100	MEAN
FYM	7.63	8.35	7.99
SEWAGE	7.78	8.03	7.90
SEW COM	7.67	8.27	7.97
VEG COM	8.34	8.64	8.49
MEAN	7.86	8.32	8.09

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85/W/RN/4 WHITE CLOVER

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

NPERCUT		0	100
OM RATE	OM RESID		
25	FYM	7.73	8.10
	SEWAGE	7.81	8.10
	SEW COM	7.47	8.54
	VEG COM	8.43	8.97
50	FYM	7.54	8.59
	SEWAGE	7.75	7.95
	SEW COM	7.86	8.01
	VEG COM	8.25	8.32

PEAT	NPERCUT	0	100	MEAN
		7.78	8.40	8.09

GRAND MEAN 8.09

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	OM RESID	OM RATE	NPERCUT	OM RESID OM RATE
SED	0.250	0.177	0.214	0.354

TABLE	OM RESID NPERCUT	OM RATE NPERCUT	OM RESID OM RATE NPERCUT	PEATNPER
SED	0.393	0.278	0.556	0.428
EXCEPT WHEN COMPARING MEANS WITH THE SAME LEVEL(S) OF:				
OM RESID	0.428			
OM RATE		0.303		
OM RESID.OM RATE			0.605	

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	28	0.501	6.2
BLOCK.WP.SP	31	0.856	10.6

TOTAL OF 2 CUTS MEAN DM% 14.3

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85/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.

Sponsor: F.V. Widdowson.

The 30th year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980, w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 25th 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 29th 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 69-84/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

0
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' (26% N)
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 February or March, remainder in April.

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85/R/RN/5

Additional plots

MANURE	Fertilizers from 1980 to 1985 and in previous years:
1980-85	Until 1979
0	0
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 1985: 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 P205 as potassium dihydrogen phosphate.
K: 251 kg K20 total. As potassium dihydrogen phosphate (83 kg K20) on all PK plots. In addition plots without S receive 168 kg K20 as potassium chloride, plots with S receive 92 kg K20 as potassium sulphate plus 76 kg K20 as potassium chloride. Since 1978 all PK plots receive, in addition to the standard total, 126 kg K20 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 0 which was given 5 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: Mecoprop, bromoxynil and ioxynil (as 'Brittox' at 2.8 l) with (except for oats) chlortoluron at 3.5 kg in 220 l. Fungicides: Tridemorph at 0.52 kg in 220 l applied with the dimethoate. Prochloraz at 0.42 kg with benomyl at 0.28 kg in 220 l. Captafol at 1.0 kg with propiconazole at 0.13 kg in 220 l. Insecticide: Dimethoate at 0.67 kg.
W. wheat: Fungicides: Maneb at 1.6 kg, carbendazim at 0.15 kg and tridemorph at 0.37 kg with captafol at 1.0 kg in 220 l applied with the pirimicarb. Insecticide: Pirimicarb at 0.14 kg. Growth regulator: Chlormequat at 1.9 kg in 220 l.
W. barley: Growth regulator: Mepiquat chloride and ethephon (as 'Terpal' at 2.8 l) in 220 l.
W. oats: Growth regulator: Chlormequat at 1.9 kg in 220 l.
Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 220 l. Fungicides: Captafol at 1.0 kg in 220 l applied with the insecticide. Mancozeb at 1.3 kg in 220 l applied with the insecticide (except for plots given neither FYM nor K on the original plots, and the plot given no fertilizers on the additional plots). Insecticide: Pirimicarb at 0.14 kg.

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Seed: W. wheat: Norman, sown at 210 kg.
W. barley: Panda, sown at 200 kg.
W. oats: Peniarth, sown at 210 kg.
Potatoes: Desiree.
Grass-clover ley: RVP Italian ryegrass and Hungaropoly red clover.

Cultivations, etc.:-
W. wheat: Dug by hand: 12 Sept, 1984 (additional plots), 13 Sept (original plots). P, K, Mg and S applied (S to additional plots only): 13 Sept. Raked level, seed sown and raked in: 26 Sept. 'Brittox' and chlortoluron applied: 23 Oct. Tridemorph and dimethoate applied: 16 Nov. First N treatments applied: 26 Feb, 1985. Second N treatments applied: 15 Apr. Prochloraz and benomyl applied: 24 Apr. Growth regulator applied: 2 May. Captafol and propiconazole applied: 22 May. Maneb, carbendazim, tridemorph, captafol and pirimicarb applied: 27 June. Harvested by hand: 16 Aug.
W. barley: Rotary cultivated, P and K applied to original plots: 10 Sept, 1984. P, K, Mg and S applied to additional plots: 11 Sept. Raked level, seed sown and raked in: 18 Sept. 'Brittox' and chlortoluron applied: 23 Oct. Tridemorph and dimethoate applied: 16 Nov. First N treatments applied: 26 Feb, 1985. Second N treatments applied: 15 Apr. Prochloraz and benomyl applied: 24 Apr. Growth regulator applied: 2 May. Captafol and propiconazole applied: 22 May. Harvested by hand: 1 Aug.
W. oats: Rotary cultivated, P and K applied to original plots: 10 Sept, 1984. P, K, Mg and S applied to additional plots: 11 Sept. Raked level, seed sown, raked in: 26 Sept. 'Brittox' applied: 23 Oct. Tridemorph and dimethoate applied: 16 Nov. First N treatments applied: 26 Feb, 1985. Second N treatments applied: 15 Apr. Prochloraz and benomyl applied: 24 Apr. Growth regulator applied: 2 May. Captafol and propiconazole applied: 22 May. Harvested by hand: 8 Aug.
Potatoes: FYM applied, dug by hand (original plots): 10 Dec, 1984. Dug by hand, P, K, Mg and S applied (additional plots), P and K applied (original plots): 11 Dec. N applied, deep rotary cultivated twice: 18 Apr, 1985. Raked level, potatoes planted and ridged by hand: 18 Apr (original plots), 19 Apr (additional plots). Weedkillers applied: 20 May. Captafol with pirimicarb applied: 27 June. Plots given neither FYM nor K on original plots, and plots given no fertilizer on additional plots harvested by hand, remaining plots mancozeb and pirimicarb applied: 24 July. These remaining plots harvested by hand: 11 Sept.
Grass-clover ley: Lightly rotary cultivated, raked level, seed sown and raked in: 6 Aug, 1984. P and K applied (original plots): 6 Dec. P, K, Mg and S applied (additional plots): 7 Dec. N applied: 4 Mar, 1985. Cut: 21 May, 18 July, 24 Sept.
Permanent grass: P and K applied: 6 Dec, 1984. First N applied: 4 Mar, 1985. FYM applied: 11 Mar. Second N applied: 21 May. Final N applied: 18 July. Cut: 20 May, 18 July, 24 Sept.

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ORIGINAL PLOTS

TONNES/HECTARE

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

	W. WHEAT:		W. BARLEY:		LEY : DRY MATTER			
	GRAIN	STRAW	GRAIN	STRAW	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE								
0	4.49	4.35	3.09	2.22	1.34	1.44	0.95	3.73
N1	6.42	5.91	5.39	4.37	2.26	1.55	0.72	4.53
P	5.95	5.51	1.59	1.85	1.55	2.53	2.48	6.57
N1P	3.17	4.56	2.84	4.79	2.86	1.60	0.44	4.90
K	4.75	4.35	2.41	2.41	1.92	2.07	1.79	5.78
N1K	7.70	6.79	6.37	5.16	2.79	2.08	1.36	6.24
PK	5.65	5.39	3.48	2.41	2.41	4.81	4.14	11.36
N1PK	9.46	8.89	8.26	6.64	2.95	4.40	3.95	11.30
N2PK	10.82	10.85	10.06	9.04	4.24	2.94	3.45	10.63
D	7.63	7.34	5.34	3.92	2.50	3.22	3.30	9.02
N1PKD	11.12	12.34	8.97	7.22	3.94	4.12	4.80	12.85
N2PKD	11.93	12.92	10.01	9.24	4.91	3.44	3.65	12.00
MEAN DM%	77.1	54.4	80.0	56.6	22.4	24.8	22.1	23.1

	W. OATS:		POTATOES:	PERMANENT GRASS : DRY MATTER			
	GRAIN	STRAW	TOTAL TUBERS	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE							
0	3.35	4.33	9.6	0.60	1.34	0.66	2.59
N1	5.92	8.92	9.6	0.83	2.35	1.62	4.80
P	3.59	4.39	11.1	0.47	1.69	0.70	2.85
N1P	5.92	7.17	9.6	1.53	2.59	2.01	6.13
K	2.88	5.15	17.3	0.66	1.76	0.78	3.20
N1K	5.54	8.85	31.1	1.72	3.14	1.67	6.53
PK	3.27	5.58	38.8	0.67	1.59	0.93	3.19
N1PK	7.27	12.00	56.9	3.09	3.16	2.17	8.42
N2PK	8.48	14.62	58.8	4.00	3.87	2.93	10.79
D	4.13	7.61	62.3	4.24	2.60	1.83	8.66
N1PKD	7.95	12.04	82.8	5.59	3.87	2.77	12.23
N2PKD	7.79	17.27	87.3	6.10	4.91	3.59	14.60
MEAN DM%	75.9	41.3	22.1	25.9	20.3	23.6	23.3

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ADDITIONAL PLOTS

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

	W. WHEAT: GRAIN	W. WHEAT: STRAW	W. BARLEY: GRAIN	W. BARLEY: STRAW	W. OATS: GRAIN	W. OATS: STRAW	POTATOES: TOTAL TUBERS
MANURES							
0	5.06	4.53	3.05	2.61	3.68	5.08	8.6
N2PK	10.67	11.10	10.04	8.19	7.17	12.93	61.3
N2PKMG	9.87	9.47	9.17	8.12	7.48	13.03	68.0
N2PKS	10.38	10.05	9.36	8.27	7.02	11.09	63.0
N2PKMGS	10.59	11.32	9.61	7.91	6.78	11.43	59.8
N1PKMGS	9.53	9.12	9.01	8.29	7.23	12.47	60.5
N3PKMGS	10.29	10.84	10.05	7.56	7.16	7.68	61.9
MEAN DM%	77.9	55.1	80.5	62.4	75.4	44.0	23.9

	LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURES				
0	1.92	1.55	0.94	4.41
N2PK	4.00	3.10	3.63	10.72
N2PKMG	3.75	3.63	3.72	11.10
N2PKS	3.00	3.37	3.72	10.10
N2PKMGS	3.72	3.48	3.70	10.90
N1PKMGS	2.81	4.07	3.65	10.54
N3PKMGS	4.07	3.36	3.57	10.99
MEAN DM%	22.2	22.6	23.0	22.6

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85/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 25th year, w. barley.

For previous years see 'Details' 1967 and 1973 and 74-84/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 Sept, 1984
ROTA DIG	Cultivated by rotary digger: 19 Sept
DEEPTINE	Deep-tine cultivated: 17 Sept

2. SUBSOIL(82) — Subsoiling in September 1982:

NONE	None
CNVNTIAL	Conventional vertical tine
PARAPLOW	'Paraplow'

XTR BURN — plus three extra plots with straw burnt since 1985 direct drilled until 1984, spring-tine cultivated twice, on 19 September, 1984, 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 27 July, 1984 and was burnt on XTR BURN on 14 August. All plots were disc cultivated on 15 August, sprayed paraquat at 0.60 kg ion in 250 l on 8 September, rotary harrowed and drilled on 28 September.

(2) The conventional vertical tine sub soiler 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.

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Basal applications: Manures: (5:14:30) at 340 kg, combine drilled. 'Nitro-Chalk' (26% N) at 620 kg. Weedkillers: Isoproturon at 2.4 kg with mecoprop (as 'CMPP' at 4.2 l) and the insecticide in 250 l. Cyanazine at 0.30 kg with mecoprop at 2.0 kg and the fungicides in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Insecticide: Cypermethrin at 0.025 kg.

Seed: Panda, dressed triadimenol and fuberidazole sown at 140 kg.

Cultivations, etc.:- Isoproturon, mecoprop and the insecticide applied: 31 Oct, 1984. N applied: 9 Apr, 1985. Cyanazine, mecoprop and the fungicides applied: 10 Apr. Combine harvested: 8 Aug.

GRAIN TONNES/HECTARE

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

SUBSOIL(82) CLT CHOP	NONE	CNVNTIAL	PARAPLOW	MEAN
PLOUGH	8.13	7.67	7.97	7.92
ROTA DIG	7.88	7.63	7.97	7.83
DEEPTINE	7.79	7.72	8.00	7.83
MEAN	7.93	7.67	7.98	7.86

XTR BURN	NONE	CNVNTIAL	PARAPLOW	MEAN
	8.24	8.37	8.17	8.26

GRAND MEAN 7.96

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	CLT CHOP	SUBSOIL(82)	XTRA BURN	CLT CHOP SUBSOIL(82)
SED	0.157	0.157	0.273	0.273

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	11	0.273	3.4

GRAIN MEAN DM% 76.0

PLOT AREA HARVESTED 0.00285

https://doi.org/10.23637/ERADOC-1-19

85/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: A.E. Johnston.

The 21st year, s. oats, w. rye, ley.

For previous years see 'Details' 1973 and 74-84/W/RN/12.

Design for s. oats and w. rye: 2 blocks of 4 plots
4th, 5th, 6th and 7th year leys: 2 blocks of 2 plots.

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. In addition to leys the first pair included w. rye in 1985 and the second pair s. oats.

S. oats and w. rye tested:

MANURE	Organic manures and fertilizers in 1985, cumulative to 1984, 1983 and 1982 (both crops) and to 1981 (w. rye only) and to those applied in the preliminary period:
FYM	Farmyard manure at 50 tonnes
STRAW	Straw at 7.5 tonnes plus P205 at 140 kg, K20 at 140 kg, MgO at 50 kg
FERT-FYM	P205 at 280 kg, K20 at 560 kg, MgO at 100 kg
FERT-STR	P205 at 140 kg, K20 at 280 kg, MgO at 50 kg

All leys are clover/grass (LC) without N. 4th and 5th year leys tested:

PREV LEY	Previous ley:
LC(LC)	Clover/grass ley in preliminary period
LC(LN)	Grass ley with N in preliminary period

6th and 7th year leys tested:

PREV MAN	Previous manure:
LC(GM)	Green manures in preliminary period
LC(PT)	Peat in preliminary period

https://doi.org/10.23637/ERADOC-1-19

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Standard applications:
W. oats/s. oats: Manures: N at 50 kg as 'Nitro-Chalk' (27.5% N). Weedkillers: Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l.
W. rye: Manures: N at 30 kg as 'Nitro-Chalk' (27.5% N). Weedkillers: Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l.
Leys, 4th, 5th, 6th and 7th years: Manures: P2O5 at 140 kg, K2O at 280 kg as (0:18:36). MgO at 50 kg as kieserite.

Seed: W. oats: Panema, sown at 180 kg.
S. oats: Trafalgar, sown at 200 kg.
W. rye: Animo, sown at 220 kg.

NOTE: S. oats were sown in place of the w. oats that failed because of bird damage.

Cultivations, etc.:-
W. oats/s. oats: Sugar beet tops spread over arable plots, PK and Mg applied to FERT-FYM, treatment FYM and STRAW applied, ploughed, PK and Mg applied to STRAW, Mg applied to FERT-FYM and FERT-STR: 5 Nov, 1984. Rotary harrowed, w. oats sown: 12 Nov. Spring-tine cultivated: 18 Mar, 1985. Power harrowed, s. oats sown: 20 Mar. N applied: 24 Apr. Weedkillers applied: 16 May. Combine harvested: 27 Aug.
W. rye: Half PK and Mg applied to FERT-FYM plots, treatment FYM applied: 20 Sept, 1984. Ploughed FYM plots only: 21 Sept. Treatment STRAW applied, FERT-FYM, FERT-STR and STRAW ploughed: 3 Oct. PK applied to STRAW plots: 15 Oct. PK and Mg applied. FERT-STR and half PK and Mg applied to FERT-FYM, Mg applied to STRAW: 16 Oct. Rotary harrowed, seed sown: 24 Oct. N applied: 24 Apr, 1985. Weedkillers applied: 16 May. Combine harvested: 2 Sept.
4th, 5th, 6th and 7th year leys: PK and Mg applied to 4th and 6th years: 5 Nov, 1984, 5th and 7th years: 9 Nov. Chain harrowed: 12 Apr, 1985. Cut: 2 July, 11 Nov.

SPRING OATS

GRAIN TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT-FYM	FERT-STR	MEAN
	4.96	4.74	4.15	4.65	4.62

GRAIN MEAN DM% 81.7

STRAW TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT-FYM	FERT-STR	MEAN
	4.05	3.80	3.55	3.89	3.82

STRAW MEAN DM% 86.3 PLOT AREA HARVESTED 0.00796

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85/W/RN/12

RYE

GRAIN TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT-FYM	FERT-STR	MEAN
	5.80	4.70	4.64	4.25	4.85

GRAIN MEAN DM% 82.7

STRAW TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT-FYM	FERT-STR	MEAN
	6.13	4.37	4.21	3.97	4.67

STRAW MEAN DM% 89.3

PLOT AREA HARVESTED 0.00796

4TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT (2/7/85)	2ND CUT (11/11/85)	TOTAL OF 2 CUTS
PREV LEY			
LC(LC)	5.44	2.00	7.44
LC(LN)	6.06	2.00	8.06
MEAN	5.75	2.00	7.75
MEAN DM%	27.6	19.9	23.7

5TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT (2/7/85)	2ND CUT (11/11/85)	TOTAL OF 2 CUTS
PREV LEY			
LC(LC)	6.33	3.08	9.41
LC(LN)	5.96	3.07	9.03
MEAN	6.14	3.08	9.22
MEAN DM%	24.1	22.6	23.4

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6TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT (2/7/85)	2ND CUT (11/11/85)	TOTAL OF 2 CUTS
PREV MAN			
LC(GM)	4.30	2.10	6.40
LC(PT)	4.77	2.03	6.80
MEAN	4.54	2.06	6.60
MEAN DM%	26.8	20.7	23.7

7TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT (2/7/85)	2ND CUT (11/11/85)	TOTAL OF 2 CUTS
PREV MAN			
LC(GM)	6.91	2.34	9.25
LC(PT)	5.39	1.79	7.18
MEAN	6.15	2.07	8.21
MEAN DM%	29.5	25.6	27.6

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85/W/RN/13

INTENSIVE CEREALS

Object: To study the effects of intensive cereal cropping on yield, incidence of soil-borne pathogens and organic matter in the soil - Woburn Stackyard I.

Sponsors: A.E. Johnston, J. McEwen.

The 20th year, w. wheat, ley.

For previous years see 'Details' 1973 and 74-84/W/RN/13.

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 wheat experiment 1877-1954 and one in which the cereal was s. barley, sown on part of the site of the classical barley experiment 1877-1954. From 1981 the experiment is being used to establish leys of different durations for tests on w. wheat in 1987. Plots not in ley are sown to w. wheat on both halves of the experiment.

The following crop sequences are being followed:

1981	82	83	84	85	86	87
W(5)	W	W	W	W	L	W
W(5)	W	W	W	L	L	W
W(6)	W	W	L	L	L	W
W(7)	W	L	L	L	L	W
W(8)	L	L	L	L	L	W
L	L	L	L	L	L	W

L = clover/grass ley W = w. wheat (5)etc = number of years continous cereal

NOTE: Yields are not taken in the period 1981-86.

Standard applications:

W. wheat: Manures: (5:14:30) at 340 kg. N at 80 kg followed by N at 70 kg, as 'Nitro-Chalk' (27.5% N). Weedkillers: Mecoprop at 1.2 kg with bromoxynil at 0.3 kg and ioxynil at 0.3 kg in 250 l. Fungicides: Propiconazole on two occasions at 0.25 kg in 250 l on the first occasion and at 0.12 kg in 250 l on the second occasion with carbendazim and maneb (as 'Septal' at 2.5 kg).

Ley, 1st year: Manures: (5:14:30) at 340 kg. N at 50 kg as 'Nitro-Chalk' (27.5% N).

Ley, 2nd, 3rd, 4th and 5th years: Manures: (0:18:36) at 380 kg.

Seed: W. wheat: Avalon, sown at 160 kg.
Ley: S23 perennial ryegrass at 27 kg, Blanca white clover at 7 kg, mixture sown at 34 kg.

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Cultivations, etc.:-

W. wheat: Ploughed: 3 Oct, 1984. NPK applied, spring-tine cultivated, seed sown: 9 Oct. N applied: 15 Apr, 1985, 24 Apr. Weedkillers applied: 16 May. Propiconazole applied: 17 June, 2 July. 'Septal' applied: 2 July. Combine harvested: 2 Sept.

Ley, 1st year: Ploughed: 3 Oct, 1984. Spring-tine cultivated: 22 Apr, 1985. N applied: 24 Apr. NPK applied: 25 Apr. Spring-tine cultivated with crumbler attached, seeds sown: 1 May. Cut: 20 Nov.

Ley, 2nd, 3rd, 4th and 5th years: PK applied: 25 Jan, 1985. Chain harrowed: 12 Apr. Cut: 1 July, 20 Nov.

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85/W/RN/16

EFFECTS OF DEEP PK

Object: To study the residual effects of subsoiling and of incorporating a large dressing of PK in either the subsoil or topsoil, on yields and nutrient uptakes of s. barley - Woburn Butt Furlong.

Sponsors: J. McEwen, A.E. Johnston.

The 11th year, s. barley.

For previous years see 74-84/W/RN/16.

Design: 4 series (for crops) each of 3 randomised blocks of 4 plots.

Whole plot dimensions: 4.27 x 2.59.

Treatments: All combinations of:-

Series

1. PREVCROP — Previous crop in 1984, all s. barley in 1985:

   FALLOW
   OATS
   BARLEY

Plots

2. PK SUB — Extra PK and subsoil treatment (applied autumn 1973):

	Extra PK	Subsoil (25-50 cm) treatment
- - -	None	None
- - S	None	Subsoiled
P K T	To topsoil (0-25 cm)	None
P K S	To subsoil	Subsoiled

NOTES: (1) The rates of P and K were 1930 kg P2O5, as superphosphate and 460 kg K2O as muriate of potash. These quantities, applied to subsoil, were chosen to equalize available P and K in top and subsoil.
(2) Subsoiling was done by spade, after removing the topsoil which was then replaced. PK to subsoil was worked in by forking.
(3) PK to topsoil was applied half before ploughing in autumn half soon after on the plough furrow.
(4) One series was fallow in 1985.

Basal applications:
Series I, III and IV: S. barley: Manures: (20:10:10) at 750 kg. Weedkillers: Dicamba with mecoprop and MCPA (as 'Herrisol' at 5.0 l) in 250 l with fungicide: Fungicide: Tridemorph at 0.52 kg.

Seed: Triumph, dressed with triadimenol and fuberidazole, sown at 160 kg.

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85/W/RN/16

Cultivations, etc.:-
Series I, III and IV: S. barley: Ploughed: 10 Dec, 1984. Spring-tine cultivated with crumbler attached, NPK applied, seed sown: 14 Mar, 1985. Weedkillers with fungicide applied: 17 May. Combine harvested: 21 Aug.
Series II: Fallow: Ploughed: 10 Dec, 1984. Spring-tine cultivated with crumbler attached: 14 Mar, 1985. Rotary cultivated: 30 May, 26 July.

S.BARLEY

GRAIN TONNES/HECTARE

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

PK SUB / PREVCROP	- - -	- - S	P K T	P K S	MEAN
FALLOW	7.87	7.67	7.78	7.72	7.76
OATS	7.68	7.90	7.65	8.01	7.81
BARLEY	7.02	7.28	7.34	6.78	7.10
MEAN	7.52	7.62	7.59	7.50	7.56

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	PK SUB	PREVCROP* PK SUB
SED	0.113	0.196

* WITHIN THE SAME LEVEL OF PREVCROP ONLY

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
SERIES.BLOCK	6	0.166	2.2
SERIES.BLOCK.WP	18	0.240	3.2

GRAIN MEAN DM% 75.0

SUB PLOT AREA HARVESTED 0.00057

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RATES OF P AND K TO THE SUBSOIL

Object: To study the effects of a range of rates and frequencies of application of P and K to the subsoil, singly and together, on the yields and nutrient uptakes of a rotation of crops - Meadow.

Sponsors: J. McEwen, A.E. Johnston.

The fifth year, potatoes, s. barley, s. beans, w. wheat.

For previous years see 81-84/R/RN/17.

Design: 4 series (for crops) each of 40 plots.

Whole plot dimensions: 3.0 x 14.0.

Treatments to each series:

TREATMENT Extra P and K and primary cultivation tool in autumn 1980 only, except on A plots, treatments repeated annually, and F plots treatments repeated four yearly:

	P205(kg)	K20(kg)	Tool	
- - -	0	0	Plough	(duplicated)
P6 K6 T	1000	500 to topsoil	"	(")
- - S	0	0	Wye double-digger	(triplicated)
- - SA	0	0	" " "	(duplicated)
- - SF	0	0	" " "	
P2 - SA	63	0 to subsoil	" " "	
P3 - SF	125	0 " "	" " "	
P4 - S	250	0 " "	" " "	
P5 - S	500	0 " "	" " "	
P5 - SF	500	0 " "	" " "	
P6 - S	1000	0 " "	" " "	
- K2 SA	0	31 " "	" " "	
- K3 SF	0	63 " "	" " "	
- K4 S	0	125 " "	" " "	
- K5 S	0	250 " "	" " "	
- K5 SF	0	250 " "	" " "	
- K6 S	0	350 " "	" " "	
P1 K1 SA	31	16 " "	" " "	
P1 K3 SA	31	63 " "	" " "	
P2 K2 SA	63	31 " "	" " "	
P3 K1 SA	125	16 " "	" " "	
P3 K3 SA	125	63 " "	" " "	
P3 K4 SF	125	125 " "	" " "	
P4 K3 SF	250	63 " "	" " "	
P4 K4 S	250	125 " "	" " "	
P4 K5 S	250	250 " "	" " "	
P4 K5 SF	250	250 " "	" " "	
P4 K6 S	250	350 " "	" " "	
P5 K4 S	500	125 " "	" " "	
P5 K4 SF	500	125 " "	" " "	
P5 K5 S	500	250 " "	" " "	
P5 K6 S	500	350 " "	" " "	
P6 K4 S	1000	125 " "	" " "	
P6 K5 S	1000	250 " "	" " "	
P6 K6 S	1000	350 " "	" " "	

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NOTES: (1) Subsoiling was done with the Wye double-digger which turns a furrow with a conventional plough share, to a depth of 23 cm, and at the same time rotary cultivates the bottom of the adjacent furrow to a further depth of 15 cm. When applying P and K this was distributed ahead of the rotary cultivator.
(2) The topsoil PK dressing was equally divided before and after ploughing.
(3) All plots were conventionally ploughed each autumn unless the Wye double-digging treatment was due.
(4) The rate of 350 kg K20 applied was in error for 500 kg K20.

Standard applications:
Potatoes: Manures: Chalk at 5.0 t. (10:10:15+4.5 Mg) at 1960 kg. Weedkillers: Linuron at 1.3 kg with paraquat at 0.50 kg ion in 500 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions, with the insecticide on the second and third. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg on two occasions.
S. barley: Manures: Chalk at 5.0 t. (20:10:10) at 630 kg. Weedkillers: Clopyralid at 0.05 kg with bromoxynil octanoate at 0.24 kg, mecoprop (as 'CMPP' at 3.0 l) applied with the fungicide in 200 l. Fungicide: Tridemorph at 0.52 kg.
S. beans: Manures: Chalk at 5.0 t. Weedkiller: Simazine at 1.2 kg in 200 l. Fungicide: Benomyl at 0.50 kg, applied with the pirimicarb and a wetting agent ('Agral' at 0.075 l) in 500 l. Insecticides: Phorate at 5.6 kg. Pirimicarb at 0.14 kg.
W. wheat. Manures: Chalk at 5.0 t. (0:18:36) at 350 kg. 'Nitro-Chalk' (27.5% N) at 540 kg. Weedkillers: Clopyralid at 0.05 kg with bromoxynil octanoate at 0.24 kg and mecoprop (as 'CMPP' at 3.0 l), applied with the tridemorph in 200 l. Fungicides: Tridemorph at 0.52 kg. Propiconazole at 0.25 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 200 l. Insecticide: Pirimicarb at 0.14 kg in 200 l.

Seed: Potatoes: Pentland Crown.
S. barley: Klaxon, sown at 160 kg.
S. beans: Minden, sown at 240 kg.
W. wheat: Avalon, sown at 200 kg.

Cultivations, etc.:-
All crops: Chalk applied: 2 Oct, 1984. Treatments applied by double-digger: 14-19 Nov. Ploughed: 26 Nov. Spring-tine cultivated (twice for w. wheat): 11 Dec.
Potatoes: Spring-tine cultivated: 12 Mar, 1985. NPK Mg applied: 3 Apr. Rotary harrowed, potatoes planted: 9 Apr. Rotary ridged: 30 Apr. Weedkillers applied: 16 May. Mancozeb applied: 20 June, 3 July, 23 July, 6 Aug with pirimicarb on the second and third occasion. Fentin hydroxide applied: 21 Aug, 11 Sept. Haulm mechanically destroyed: 17 Sept. Lifted: 16 Oct.
S. barley: NPK applied: 11 Mar, 1985. Spring-tine cultivated, rotary harrowed, seed sown: 12 Mar. Weedkillers and fungicide applied: 16 May. Combine harvested: 21 Aug.
S. beans: Phorate applied: 11 Mar, 1985. Spring-tine cultivated, rotary harrowed, seed sown: 12 Mar. Weedkiller applied: 13 Mar. Benomyl and pirimicarb applied: 8 July. Combine harvested: 25 Sept.

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Cultivations, etc.:- (continued)
W.wheat: PK applied: 11 Dec, 1984. Seed sown, spring-tine cultivated: 13 Dec. N applied: 16 Apr, 1985. Weedkillers and tridemorph applied: 16 May. Propiconazole, carbendazim and maneb applied: 3 July. Insecticide applied: 10 July. Combine harvested: 6 Sept.

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SERIES I POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	57.6
P6 K6 T	61.8
- - S	56.8
- - SA	63.0
- - SF	58.5
P2 - SA	60.0
P3 - SF	76.3
P4 - S	60.5
P5 - S	62.2
P5 - SF	60.2
P6 - S	65.1
- K2 SA	74.1
- K3 SF	66.5
- K4 S	57.1
- K5 S	60.2
- K5 SF	66.5
- K6 S	63.8
P1 K1 SA	63.0
P1 K3 SA	62.1
P2 K2 SA	62.8
P3 K1 SA	55.9
P3 K3 SA	68.2
P3 K4 SF	61.3
P4 K3 SF	66.4
P4 K4 S	63.0
P4 K5 S	61.3
P4 K5 SF	66.1
P4 K6 S	64.2
P5 K4 S	67.0
P5 K4 SF	66.0
P5 K5 S	64.3
P5 K6 S	58.5
P6 K4 S	61.7
P6 K5 S	61.2
P6 K6 S	64.0
MEAN	63.1

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	TREATMNT*	
SED	3.07	MIN REP
	2.51	MAX-MIN

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP	5	2.17	3.5

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SERIES I POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	96.2
P6 K6 T	95.8
- - S	96.6
- - SA	97.7
- - SF	95.4
P2 - SA	97.9
P3 - SF	96.8
P4 - S	97.1
P5 - S	96.3
P5 - SF	94.6
P6 - S	97.3
- K2 SA	97.4
- K3 SF	96.4
- K4 S	96.9
- K5 S	97.3
- K5 SF	94.9
- K6 S	97.3
P1 K1 SA	97.7
P1 K3 SA	96.5
P2 K2 SA	96.2
P3 K1 SA	96.4
P3 K3 SA	96.9
P3 K4 SF	95.5
P4 K3 SF	97.2
P4 K4 S	94.9
P4 K5 S	95.1
P4 K5 SF	96.8
P4 K6 S	97.8
P5 K4 S	96.6
P5 K4 SF	97.3
P5 K5 S	97.0
P5 K6 S	96.9
P6 K4 S	96.3
P6 K5 S	97.5
P6 K6 S	97.0
MEAN	96.6

PLOT AREA HARVESTED 0.00210

* SEDs APPLIES ONLY TO - - -, P6 K6 T, - - S, - - SR, P5 - S, - K5 S, P4 K5 S AND P5 K4 S

	TREATMENT
MAX-MIN	- - S V ANY OF REMAINDER
MIN REP	ANY OF REMAINDER

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SERIES II SPRING BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	5.65
P6 K6 T	5.17
- - S	5.62
- - SA	5.43
- - SF	5.26
P2 - SA	5.57
P3 - SF	5.61
P4 - S	5.48
P5 - S	5.47
P5 - SF	4.82
P6 - S	5.55
- K2 SA	5.62
- K3 SF	5.40
- K4 S	5.58
- K5 S	5.70
- K5 SF	5.18
- K6 S	5.82
P1 K1 SA	5.45
P1 K3 SA	5.52
P2 K2 SA	5.34
P3 K1 SA	5.50
P3 K3 SA	5.33
P3 K4 SF	5.13
P4 K3 SF	5.03
P4 K4 S	5.31
P4 K5 S	5.35
P4 K5 SF	5.00
P4 K6 S	5.22
P5 K4 S	5.15
P5 K4 SF	5.10
P5 K5 S	5.09
P5 K6 S	5.51
P6 K4 S	4.92
P6 K5 S	5.82
P6 K6 S	4.98
MEAN	5.38

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	TREATMNT*	
SED	0.277	MIN REP
	0.226	MAX-MIN

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP	5	0.196	3.6

GRAIN MEAN DM% 80.2 PLOT AREA HARVESTED 0.00420

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SERIES III SPRING BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	4.86
P6 K6 T	5.57
- - S	6.05
- - SA	6.20
- - SF	5.84
P2 - SA	6.37
P3 - SF	6.31
P4 - S	5.96
P5 - S	6.07
P5 - SF	5.69
P6 - S	5.64
- K2 SA	5.64
- K3 SF	5.32
- K4 S	4.44
- K5 S	5.78
- K5 SF	5.81
- K6 S	5.86
P1 K1 SA	6.40
P1 K3 SA	6.23
P2 K2 SA	6.08
P3 K1 SA	6.17
P3 K3 SA	5.56
P3 K4 SF	5.85
P4 K3 SF	6.08
P4 K4 S	5.65
P4 K5 S	5.58
P4 K5 SF	5.36
P4 K6 S	6.18
P5 K4 S	6.58
P5 K4 SF	5.58
P5 K5 S	5.71
P5 K6 S	5.62
P6 K4 S	4.87
P6 K5 S	5.64
P6 K6 S	5.60
MEAN	5.77

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	TREATMNT*	
SED	0.570	MIN REP
	0.465	MAX-MIN

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP	5	0.403	7.0

GRAIN MEAN DM% 83.5 PLOT AREA HARVESTED 0.00386

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SERIES IV WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	5.91
P6 K6 T	6.10
- - S	5.61
- - SA	5.44
- - SF	6.13
P2 - SA	5.15
P3 - SF	5.51
P4 - S	5.65
P5 - S	6.07
P5 - SF	4.89
P6 - S	5.45
- K2 SA	5.33
- K3 SF	6.04
- K4 S	5.80
- K5 S	5.94
- K5 SF	5.88
- K6 S	5.82
P1 K1 SA	5.67
P1 K3 SA	6.05
P2 K2 SA	5.25
P3 K1 SA	4.99
P3 K3 SA	6.46
P3 K4 SF	5.12
P4 K3 SF	6.21
P4 K4 S	5.87
P4 K5 S	5.79
P4 K5 SF	5.32
P4 K6 S	6.46
P5 K4 S	6.09
P5 K4 SF	5.82
P5 K5 S	6.04
P5 K6 S	5.78
P6 K4 S	4.92
P6 K5 S	6.12
P6 K6 S	5.80
MEAN	5.73

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	TREATMNT*	
SED	0.397	MIN REP
	0.324	MAX-MIN

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP	5	0.281	4.9

GRAIN MEAN DM% 77.2 PLOT AREA HARVESTED 0.00420

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85/R/RN/19

WORM-WORKED WASTES

Object: To study the effects of the residues of pig manure, after it has been worked by earthworms, on the growth and yield of arable crops - Ninnings.

Sponsor: K.E. Fletcher.

The first year, potatoes, maize, kale.

Design: 3 series (for crops) each of 3 blocks of 3 plots.

Whole plot dimensions: 3.05 x 2.8.

Treatments to each series:

MANURE	Fertilizers and organic manures:
FERTLZER	Inorganic fertilizers
WW FYM	Worm-worked pig farmyard manure
WW SS	Worm-worked pig separated solids

NOTES: (1) Fertilizers to potatoes: (10:10:15+4.5 Mg) at 870 kg followed by 1330 kg to seedbed, 'Nitro-Chalk' (27.5% N) at 180 kg in summer.
(2) Fertilizers to maize: (20:10:10) at 750 kg to seedbed.
(3) Fertilizers to kale: 'Nitro-Chalk' (27.5% N) at 450 kg (0:20:20) at 500 kg to seedbed, 'Nitro-Chalk' (27.5% N) at 180 kg in summer.
(4) WW FYM and WW SS were each applied to potatoes at 44.7 t to maize at 24.7 t and to kale at 28.2 t.

Standard applications:
Potatoes: Weedkillers: Linuron at 1.3 kg with paraquat at 0.28 kg ion in 220 l. Fungicide: Mancozeb at 1.3 kg in 220 l on eight occasions, with the insecticide on the third, fourth and fifth occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.60 kg ion in 220 l.
Maize: Weedkillers: Glyphosate at 1.0 kg in 220 l. Atrazine at 2.8 kg in 220 l.
Kale: Weedkillers: Glyphosate at 1.0 kg in 220 l. Trifluralin at 0.55 kg in 220 l. Desmetryne (as 'Semeron 25 WP' at 1.7 kg) in 220 l, on two occasions.

Seed: Maize: Leader, sown at 50 kg.
Potatoes: Maris Piper.
Kale: Merlin, sown at 3.6 kg.

Cultivations, etc.:-
Potatoes: Ploughed: 5 Feb, 1985. Spring-tine cultivated, organic manures applied, power harrowed, planted by hand: 29 Apr. First NPK Mg applied: 9 May. Weedkillers applied: 16 May. Second NPK Mg applied: 23 May (omitted in error on 9 May). Fungicide alone applied: 13 June, 28 June, 20 Aug, 30 Aug, 5 Sept. N applied: 26 July. Fungicide with insecticide applied: 10 July, 23 July, 6 Aug. Desiccant applied: 17 Sept. Lifted by hand: 27 Sept.

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Maize: Ploughed: 5 Feb, 1985. Glyphosate applied: 16 May. Spring-tine cultivated, treatments applied, power harrowed, seed sown: 20 May. Atrazine applied: 30 May. Harvested by hand: 6 Nov.
Kale: Ploughed: 5 Feb, 1985. Glyphosate applied: 16 May. Spring-tine cultivated, treatments applied, power harrowed, trifluralin applied, power harrowed, seed sown: 20 May. Desmetryne applied: 10 July, 23 July. N applied: 26 July. Harvested by hand: 6 Nov. Previous crops: Grass 1983, w. wheat 1984.

NOTES: (1) Because of an error dry matter percentages were not measured on one block of kale. Yields presented are based on only two blocks and consequently standard errors have been omitted.
(2) Emergence counts were made on potatoes at the end of May, and stem counts made just before harvest. Number of maize plants, cobs, and size of cobs were noted at the end of September.

POTATOES

TOTAL TUBERS TONNES/HECTARE

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

MANURE	FERTLZER	WW FYM	WW SS	MEAN
	88.4	72.5	85.5	82.1

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	MANURE
SED	6.300

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	4	7.716	9.4

PLOT AREA HARVESTED 0.00042

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MAIZE

FORAGE DRY MATTER TONNES/HECTARE

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

MANURE	FERTLZER	WW FYM	WW SS	MEAN
	11.80	11.24	11.70	11.58

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	MANURE
SED	1.307

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	4	1.601	13.8

FORAGE MEAN DM% 34.7

PLOT AREA HARVESTED 0.00030

KALE

FORAGE DRY MATTER TONNES/HECTARE

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

MANURE	FERTLZER	WW FYM	WW SS	MEAN
	6.48	8.08	7.11	7.22

FORAGE MEAN DM% 13.8

PLOT AREA HARVESTED 0.00028

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