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Yields of the Field Experiments 1983

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Rotations

Rothamsted Research

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83/R/RN/1 and 83/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, D.B. Slope.

The 35th year, old grass, leys, sugar beet, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-82/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD A site with much organic matter initially (ploughed out from permanent grass) (83/R/RN/1)

FOSTERS A site with little organic matter initially (83/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.

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 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.

83/R/RN/1 and 83/R/RN/2

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 RESEDED)	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.

Additional treatments to 2nd test crop w. wheat in the museum blocks:-

Sub plots

FYMRES70 Farmyard manure residues, last applied 1970:

NONE None

FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertilizer in 1983 (kg N) as 'Nitro-Chalk':

0
50
100
150

Additional treatments to 1st, 2nd, 3rd and 4th test crops w. wheat in the new sequence blocks:

Sub plots

N Nitrogen fertilizer in 1983 (kg N) as 'Nitro-Chalk':

0
50
100
150

83/R/RN/1 and 83/R/RN/2

Standard applications:

Museum blocks:

2nd Treatment crops:

Lucerne: Manures: (0:18:36) at 620 kg.

All-grass ley: Manures: (0:18:36) at 420 kg. (25:0:16) at 300 kg in spring and after each cut except the last.

Clover-grass ley: Manures: (0:18:36) at 420 kg. (25:0:16) at 300 kg in spring (in error).

Sugar beet: Manures: (10:10:15+Mg) at 1640 kg. Weedkillers: Glyphosate at 1.4 kg in 500 l. Chloridazon at 2.6 kg in 250 l. Insecticide: Demeton-S-Methyl at 0.24 kg in 250 l.

2nd Test crop:

W. wheat: Manures: (0:20:20) at 250 kg. Weedkillers: Mecoprop, bromoxynil and ioxynil (as 'Brittox' at 3.5 l) with isoproturon at 2.0 kg in 250 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.

New sequence blocks:

1st, 2nd, 3rd and 4th Test crops:

W. Wheat: Manures: (0:20:20) at 250 kg, combine drilled. Weedkillers: Glyphosate at 1.4 kg in 250 l, to all except 1st test after LUCERNE, CLOGRA and GRASS/G. Mecoprop, bromoxynil and ioxynil (as 'Brittox' at 3.5 l) with isoproturon at 2.0 kg in 250 l.

Seed:

Museum blocks:

Sugar beet: Monoire, sown at 490,000 seeds per ha.

W. wheat: Flanders, sown at 200 kg.

New sequence blocks:

W. wheat: Flanders, sown at 200 kg.

Cultivations, etc.:-

Museum blocks:

2nd Treatment crops:

Lucerne: PK applied: 11 Jan, 1983. Cut: 10 June, 1 Aug, 31 Oct.

All-grass ley and clover-grass ley: PK applied: 11 Jan, 1983.

NK applied: 25 Mar to both leys and on 17 June, 3 Aug to all-grass ley only. Cut: 6 June, 1 Aug, 31 Oct (Highfield), 1 Nov (Fosters).

Sugar beet: Glyphosate applied: 20 Nov, 1982. Ploughed: 11 Jan, 1983. NPK Mg applied: 14 Apr. Rotary harrowed, chloridazon applied, seed sown: 29 Apr. Singled: 14 June. Insecticide applied: 17 June. Lifted: 3 Nov.

2nd Test crop:

W. wheat: Spring-tine cultivated: 31 Oct, 1982. PK applied: 11 Nov. Rotary harrowed, seed sown, spring-tine cultivated: 18 Nov. N treatments applied: 14 Apr, 1983 (Fosters), 15 Apr (Highfield). Weedkillers applied: 28 Apr. Combine harvested: 11 Aug (Fosters), 13 Aug (Highfield).

Re-seeded grass and old grass: PK applied: 11 Jan, 1983. NK applied to all-grass half-plots: 25 Mar, 17 June, 3 Aug. Cut: 6 June, 1 Aug, 31 Oct (Highfield), 1 Nov (Fosters).

83/R/RN/1 and 83/R/RN/2

New sequence blocks:

1st Test crop:

W. wheat: After lucerne, clover-grass, and ryegrass (except GRASS/OG): Ploughed: 2 Aug, 1982. Glyphosate applied to GRASS/OG: 3 Aug. Spring-tine cultivated after lucerne, clover-grass and ryegrass (except GRASS/OG): 27 Aug. Glyphosate applied after wheat: 8 Sept. Glyphosate applied after beans: 10 Sept. Ploughed after beans and wheat: 27 Sept (Fosters), 28 Sept (Highfield). Spring-tine cultivated: 31 Oct (Fosters), 1 Nov (Highfield, except GRASS/OG). PK applied, rotary harrowed, seed sown: 11 Nov. GRASS/OG direct drilled: 17 Nov. N treatments applied: 14 Apr, 1983 (Fosters), 15 Apr (Highfield). 'Brittox' and isoproturon applied: 28 Apr. Combine harvested: 11 Aug (Fosters), 13 Aug (Highfield).

2nd, 3rd and 4th Test crops:

W. wheat: Glyphosate applied: 8 Sept, 1982. Ploughed: 27 Sept (Fosters), 28 Sept (Highfield, except 2nd test GRASS/OG). Spring-tine cultivated: 31 Oct (Fosters), 1 Nov (Highfield, except 2nd test GRASS/OG). PK applied, rotary harrowed, seed sown: 11 Nov. 2nd test GRASS/OG direct drilled, spring-tine cultivated: 17 Nov. N treatments applied: 14 Apr, 1983 (Fosters), 15 Apr (Highfield). 'Brittox' and isoproturon applied: 28 Apr. Combine harvested: 11 Aug (Fosters), 13 Aug (Highfield).

NOTE: Due to waterlogging two plots were lost on Highfield 2nd test crop, new sequence blocks wheat, those with treatment combinations:-

SEQUENCE	GRASS/OG	GRASS/OG
N	0	150

Also on 4th test crop one plot was lost with treatment combinations:-

SEQUENCE	CLOGRA
N	0

83/R/RN/1 AND 83/R/RN/2

MUSEUM BLOCKS

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD		FOSTERS			
CLOVER-GRASS LEY						
TOTAL OF 3 CUTS	9.96		9.55			
MEAN DM%	26.1		26.1			
ALL GRASS LEY						
TOTAL OF 3 CUTS	13.64		11.98			
MEAN DM%	24.6		24.1			
LUCERNE						
TOTAL OF 3 CUTS	5.48		10.24			
MEAN DM%	26.2		26.0			
OLD GRASS						
TOTAL OF 3 CUTS						
		HIGHFIELD				
35TH EXPTL YEAR	C		N			
BLOCKS 1 & 4	6.12		11.54			
BLOCK 2	6.11		11.24			
MEAN DM%	23.6		19.8			
RESEDED GRASS						
TOTAL OF 3 CUTS						
		HIGHFIELD		FOSTERS		
	BLOCKS	C	N	BLOCKS	C	N
35TH EXPTL YEAR	1 & 4	6.09	11.49	1 & 3	8.02	11.25
35TH EXPTL YEAR	2 & 3	6.70	12.52	2 & 4	7.71	9.54
(SEDED 1949 RESEDED 1973)						
MEAN DM%		24.7	22.4		21.9	22.3
SUGAR BEET		HIGHFIELD		FOSTERS		
ROOTS (WASHED)		45.5		39.4		
SUGAR PERCENTAGE		17.5		16.7		
TOTAL SUGAR		7.97		6.61		
TOPS		23.6		26.7		

83/R/RN/1 HIGHFIELD

W.WHEAT 2ND TEST CROP - MUSEUM BLOCKS

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	MEAN		
SEQUENCE					
LUCERNE	5.31	5.22	5.27		
CLOGRA	4.53	4.93	4.73		
GRASS	4.72	4.59	4.66		
ARABLE	4.38	3.99	4.19		
MEAN	4.73	4.69	4.71		
N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	3.84	5.08	6.23	5.90	5.27
CLOGRA	3.53	5.08	5.26	5.06	4.73
GRASS	3.69	4.55	5.16	5.24	4.66
ARABLE	2.52	4.19	4.95	5.09	4.19
MEAN	3.40	4.73	5.40	5.32	4.71
N	0	50	100	150	MEAN
FYMRES70					
NONE	3.46	5.00	5.14	5.34	4.73
FYM	3.33	4.46	5.66	5.31	4.69
MEAN	3.40	4.73	5.40	5.32	4.71
N	0	50	100	150	
FYMRES70 SEQUENCE					
NONE LUCERNE	3.93	5.53	6.06	5.70	
CLOGRA	3.45	5.10	4.49	5.09	
GRASS	3.82	4.84	5.05	5.17	
ARABLE	2.65	4.52	4.96	5.39	
FYM LUCERNE	3.75	4.64	6.40	6.11	
CLOGRA	3.61	5.07	6.03	5.03	
GRASS	3.56	4.27	5.26	5.30	
ARABLE	2.40	3.85	4.94	4.78	

GRAIN MEAN DM% 85.8

PLOT AREA HARVESTED 0.00663

83/R/RN/2 FOSTERS

W.WHEAT 2ND TEST CROP - MUSEUM BLOCKS

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	MEAN		
SEQUENCE					
LUCERNE	5.68	6.06	5.87		
CLOGRA	5.42	5.30	5.36		
GRASS	4.48	4.87	4.67		
ARABLE	4.51	4.46	4.48		
MEAN	5.02	5.17	5.10		
N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	5.03	6.40	6.15	5.90	5.87
CLOGRA	4.51	5.69	5.62	5.64	5.36
GRASS	3.51	4.58	5.29	5.31	4.67
ARABLE	2.64	4.23	5.77	5.30	4.48
MEAN	3.92	5.22	5.71	5.54	5.10
N	0	50	100	150	MEAN
FYMRES70					
NONE	3.78	5.20	5.50	5.61	5.02
FYM	4.06	5.24	5.92	5.46	5.17
MEAN	3.92	5.22	5.71	5.54	5.10
N	0	50	100	150	
FYMRES70 SEQUENCE					
NONE LUCERNE	4.72	6.19	5.30	6.51	
CLOGRA	4.18	6.48	5.24	5.80	
GRASS	3.42	4.36	5.00	5.14	
ARABLE	2.82	3.79	6.45	5.00	
FYM LUCERNE	5.34	6.61	7.00	5.29	
CLOGRA	4.83	4.90	6.00	5.47	
GRASS	3.60	4.80	5.58	5.48	
ARABLE	2.46	4.67	5.09	5.61	

GRAIN MEAN DM% 85.6

PLOT AREA HARVESTED 0.00663

83/R/RN/1 HIGHFIELD

W.WHEAT 1ST TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	5.93	6.44	5.89	6.22	6.12
CLOGRA	5.47	6.23	5.90	4.86	5.62
GRASS/G	3.96	5.44	5.70	5.46	5.14
ARABLE/A	4.59	5.46	6.52	6.20	5.69
ARABLE/R	3.87	4.19	5.60	5.41	4.77
GRASS/OG	2.96	3.68	3.53	5.19	3.84
MEAN	4.46	5.24	5.52	5.56	5.20

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

TABLE	SEQUENCE	N	SEQUENCE N

SED	0.327	0.186	0.512
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.455

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.327	6.3
BLOCK.WP.SP	18	0.455	8.8

GRAIN MEAN DM% 87.0

SUB PLOT AREA HARVESTED 0.00325

83/R/RN/1 HIGHFIELD

W.WHEAT 2ND TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

	N	0	50	100	150	MEAN
SEQUENCE						
LUCERNE		3.56	5.65	5.94	5.98	5.28
CLOGRA		3.23	5.31	6.17	5.89	5.15
GRASS/G		4.38	5.91	6.55	6.40	5.81
ARABLE/A		3.21	4.52	5.69	6.19	4.90
ARABLE/R		3.89	5.50	6.25	6.03	5.42
GRASS/OG		3.47	4.19	4.58	5.29	4.39
MEAN		3.62	5.18	5.86	5.97	5.16

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

TABLE	SEQUENCE	N	SEQUENCE
			N
SED	0.194	0.222	0.509
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.544

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.194	3.8
BLOCK.WP.SP	16	0.544	10.5

GRAIN MEAN DM% 86.6

SUB PLOT AREA HARVESTED 0.00322

83/R/RN/1 HIGHFIELD

W.WHEAT 3RD TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

SEQUENCE	N	0	50	100	150	MEAN
LUCERNE		2.90	4.43	5.72	5.03	4.52
CLOGRA		2.23	4.33	5.28	6.04	4.47
GRASS/G		2.78	4.30	5.08	5.22	4.34
ARABLE/A		2.58	3.84	5.16	5.51	4.27
ARABLE/R		3.64	4.57	6.12	5.85	5.04
GRASS/OG		4.24	5.89	5.81	5.78	5.43
MEAN		3.06	4.56	5.53	5.57	4.68

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

TABLE	SEQUENCE	N	SEQUENCE
			N
SED	0.377	0.154	0.499
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.378

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.377	8.0
BLOCK.WP.SP	18	0.378	8.1

GRAIN MEAN DM% 86.6

SUB PLOT AREA HARVESTED 0.00322

83/R/RN/1 HIGHFIELD

W.WHEAT 4TH TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

	N	0	50	100	150	MEAN
SEQUENCE						
LUCERNE		2.86	3.37	4.82	4.69	3.93
CLOGRA		2.50	3.71	4.03	5.35	3.90
GRASS/G		2.39	4.26	4.79	5.15	4.15
ARABLE/A		2.50	4.33	5.43	5.82	4.52
ARABLE/R		3.19	4.76	6.08	5.78	4.95
GRASS/OG		3.75	4.63	5.88	6.15	5.10
MEAN		2.87	4.18	5.17	5.49	4.43

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.354	0.184	0.527
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.451

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

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.354	8.0
BLOCK.WP.SP	17	0.451	10.2

GRAIN MEAN DM% 86.4

SUB PLOT AREA HARVESTED 0.00322

83/R/RN/2 FOSTERS

W.WHEAT 1ST TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

	N	0	50	100	150	MEAN
SEQUENCE						
LUCERNE		6.23	7.25	7.17	6.64	6.82
CLOGRA		5.69	6.60	6.60	6.26	6.29
GRASS/G		5.35	5.79	6.27	6.10	5.88
ARABLE/A		4.53	6.96	6.57	7.20	6.31
ARABLE/R		4.21	5.62	6.16	6.49	5.62
MEAN		5.20	6.45	6.55	6.54	6.19

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

TABLE	SEQUENCE	N	SEQUENCE N

SED	0.283	0.108	0.352
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.240

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.283	4.6
BLOCK.WP.SP	15	0.240	3.9

GRAIN MEAN DM% 85.5

SUB PLOT AREA HARVESTED 0.00325

83/R/RN/2 FOSTERS

W.WHEAT 2ND TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

SEQUENCE	N	0	50	100	150	MEAN
LUCERNE		4.75	6.26	7.29	7.24	6.38
CLOGRA		4.31	6.13	6.20	7.25	5.97
GRASS/G		4.28	6.06	6.70	6.70	5.94
ARABLE/A		3.18	5.17	5.66	6.28	5.07
ARABLE/R		3.83	5.75	6.51	6.18	5.57
MEAN		4.07	5.87	6.47	6.73	5.79

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.160	0.186	0.394
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: SEQUENCE			0.416

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.160	2.8
BLOCK.WP.SP	15	0.416	7.2

GRAIN MEAN DM% 85.7

SUB PLOT AREA HARVESTED 0.00322

83/R/RN/2 FOSTERS

WHEAT 3RD TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

	N	0	50	100	150	MEAN
SEQUENCE						
LUCERNE		3.35	4.74	6.19	6.20	5.12
CLOGRA		4.12	5.83	6.36	6.87	5.80
GRASS/G		3.71	5.20	6.90	6.69	5.62
ARABLE/A		3.12	4.40	6.48	6.14	5.03
ARABLE/R		3.97	4.77	6.22	6.17	5.28
MEAN		3.65	4.99	6.43	6.41	5.37

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

TABLE	SEQUENCE	N	SEQUENCE N

SED	0.151	0.228	0.467
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: SEQUENCE			0.510

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.151	2.8
BLOCK.WP.SP	15	0.510	9.5

GRAIN MEAN DM% 85.8

SUB PLOT AREA HARVESTED 0.00322

83/R/RN/2 FOSTERS

WHEAT 4TH TEST CROP - NEW SEQUENCE BLOCKS

GRAIN TONNES/HECTARE

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

N	0	50	100	150	MEAN
SEQUENCE					
LUCERNE	3.28	5.38	6.59	6.74	5.50
CLOGRA	4.18	5.77	6.10	6.55	5.65
GRASS/G	4.01	5.29	6.69	6.51	5.63
ARABLE/A	3.69	4.89	6.38	6.96	5.48
ARABLE/R	3.68	4.75	6.50	6.62	5.39
MEAN	3.77	5.22	6.45	6.68	5.53

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

TABLE	SEQUENCE	N	SEQUENCE N
SED	0.155	0.159	0.344
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
SEQUENCE			0.355

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

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.155	2.8
BLOCK.WP.SP	15	0.355	6.4

GRAIN MEAN DM% 86.3

SUB PLOT AREA HARVESTED 0.00322

83/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 46th year, leys, s. barley, s. beans, w. wheat.

For previous years see 'Details' 1967 & 1973 and 74-82/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, failed in 1983 and replaced by potatoes), F = fallow

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

83/W/RN/3

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 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. FYMRES62 Farmyard manure residues, last applied 1962:

NONE None
FYM 38 tonnes on each occasion

1/8 plots

3. N Nitrogen fertilizer (kg 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

1/2 plots

2. FYMRES66 Farmyard manure residues, last applied 1966:

NONE None
FYM 38 tonnes on each occasion

83/W/RN/3

1/8 plots

3. N	Nitrogen fertilizer (kg N):
0	None
60+60	60 kg to seedbed + 60 kg in June
120+60	120 kg to seedbed + 60 kg in June
180+60	180 kg to seedbed + 60 kg in June

NOTE: June nitrogen fertilizer was applied because of much leaching in the wet spring and consequent poor crop growth.

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	276	276
LC	188	163
AF	289	251
AB	264	264

Ex-alternating rotations

LN 8 ploughed for w. wheat	226	251
LN 8 not ploughed	301	163
LC 8 ploughed for w. wheat	0	0
LC 8 not ploughed	251	0

Standard applications:-

Grass ley and clover/grass, 1st year: Manures: (0:18:36) at 420 kg. N at 75 kg as 'Nitro-Chalk' to grass ley only. Weedkiller: Glyphosate at 1.5 kg in 280 l.

Grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 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 5.0 t to 5th year only. (0:18:36) at 410 kg. K₂O 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, N at 60 kg as 'Nitro-Chalk'. Weedkillers: Dicamba with mecoprop and MCPA (as 'Herrisol' at 5.0 l) in 250 l.

Fallow, 1st treatment crop: Weedkiller: Paraquat 0.84 kg ion in 280 l.

S. beans: 3rd treatment crop: Manures: (0:20:20) at 200 kg. Weedkiller: Trietazine at 0.76 kg with simazine at 0.11 kg in 280 l.

Potatoes, 3rd treatment crop: Manures: (10:10:15+4.5 Mg) at 1990 kg. Weedkillers: Linuron at 1.0 kg with paraquat at 0.40 kg ion in 250 l. Fungicides: Mancozeb at 1.4 kg in 250 l applied three times, with insecticide on the first and third occasions. Fentin hydroxide at 0.28 kg in 250 l applied five times, with insecticide on the first four occasions. Insecticide: Pirimicarb at 0.14 kg on six occasions.

W. wheat, 1st test crop: Manures: (0:20:20) at 310 kg. Weedkillers: Glyphosate at 1.5 kg in 280 l, mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.5 l) with fungicide in 250 l. Fungicide: Prochloraz at 0.40 l. Nematicide: Aldicarb at 10 kg.

83/W/RN/3

- S. barley, 2nd test crop: Manures: Magnesian limestone at 5.0 t. (0:20:20) at 300 kg. Weedkillers: Dicamba with mecoprop and MCPA (as 'Herrisol' at 5.0 l) in 250 l. Nematicide: Aldicarb at 10 kg.
- Varieties: Grass ley: Climax timothy at 17 kg, meadow fescue at 17 kg, mixture sown at 34 kg.
- Clover/grass ley: Climax timothy at 18 kg, meadow fescue at 15 kg, Huia white clover at 4 kg, mixture sown at 37 kg.
- S. barley: Triumph, dressed with triadimenol and fuberidazole, sown at 160 kg.
- S. beans: Minden, sown at 270 kg.
- W. wheat: Avalon, sown at 190 kg.
- Potatoes: Cara

NOTE: 3rd treatment crop of spring beans failed and was replaced by potatoes.

Cultivations, etc.: - Treatment crops:

- Grass ley and clover/grass ley, 1st year: Ploughed: 8 Oct, 1982. Spring-tine cultivated: 8 Mar, 1983. PK applied, N applied to grass ley only: 13 Apr. Weedkiller applied: 16 May. Rotary cultivated: 7 June. Seeds sown: 9 June. Topped: 2 Aug, 15 Aug.
- Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Corrective K applied to 4th year only: 1 Oct, 1982. Magnesian limestone applied to 5th year only: 5 Oct. PK applied: 12 Jan, 1983. NK applied to grass ley, K applied to clover/grass ley: 17 Mar, 7 July. Cut: 17 June, 23 Aug.
- S. barley, 1st and 2nd treatment crops: Ploughed, 2nd treatment crop: 21 Sept, 1982, 1st treatment crop: 8 Oct. Heavy spring-tine cultivated 2nd treatment crop, spring-tine cultivated 1st treatment crop: 8 Mar, 1983. NPK applied: 9 Mar. Spring-tine cultivated with crumbler attached, seed sown: 10 Mar. Weedkillers applied: 26 May. N applied: 6 June. Combine harvested: 10 Aug.
- S. beans/Potatoes, 3rd treatment crop: Ploughed: 21 Sept, 1982. Heavy spring-tine cultivated: 8 Mar, 1983. PK applied: 9 Mar. Rotary cultivated, seed sown: 17 Mar. Trietazine with simazine applied: 29 Mar. NPK with Mg applied, rotary cultivated, potatoes planted: 27 May. Rotary ridged, linuron with paraquat applied: 7 June. Mancozeb applied: 22 June, 1 July, 8 July. Fentin hydroxide applied: 18 July, 29 July, 11 Aug, 26 Aug, 9 Sept. Insecticide applied: 22 June, 8 July, 18 July, 29 July, 11 Aug, 26 Aug. Haulm mechanically destroyed: 15 Sept. Lifted: 16 Sept.

Test crops:

- W. wheat, 1st test crop: Glyphosate applied: 10 Sept, 1982. Ploughed: 24 Sept. PK applied: 30 Sept. Corrective K and aldicarb applied, rotary cultivated, seed sown: 1 Oct. N applied: 6 Apr, 1983. 'Brittox' with prochloraz applied: 15 Apr. Combine harvested: 12 Aug.
- S. barley, 2nd test crop: Magnesian limestone applied: 5 Oct, 1982. Ploughed: 8 Oct. Spring-tine cultivated: 8 Mar, 1983. PK applied: 9 Mar. Aldicarb applied, rotary cultivated, seed sown: 10 Mar. N applied: 14 Mar. 'Herrisol' applied: 26 May. Extra N applied: 6 June. Combine harvested: 6 Aug.

83/W/RN/3

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES62	NONE	FYM	MEAN			
ROTATION						
LN 8	6.75	6.29	6.52			
LN 3	6.46	7.17	6.81			
LC 8	8.22	9.02	8.62			
LC 3	8.14	8.74	8.44			
AF	7.26	6.98	7.12			
AB	6.65	6.98	6.81			
MEAN	7.25	7.53	7.39			
	N	0	70	140	210	
ROTATION					MEAN	
LN 8	4.45	7.23	7.48	6.93	6.52	
LN 3	3.86	7.05	8.06	8.28	6.81	
LC 8	7.39	9.64	8.80	8.66	8.62	
LC 3	6.36	9.67	9.34	8.40	8.44	
AF	3.76	6.79	8.50	9.43	7.12	
AB	4.11	6.28	8.70	8.17	6.81	
MEAN	4.99	7.78	8.48	8.31	7.39	
	N	0	70	140	210	
FYMRES62					MEAN	
NONE	4.94	7.48	8.30	8.26	7.25	
FYM	5.03	8.07	8.66	8.36	7.53	
MEAN	4.99	7.78	8.48	8.31	7.39	
		N	0	70	140	210
ROTATION	FYMRES62					
LN 8	NONE	4.99	7.23	7.31	7.48	
	FYM	3.91	7.23	7.65	6.38	
LN 3	NONE	3.61	6.74	7.40	8.07	
	FYM	4.10	7.36	8.71	8.49	
LC 8	NONE	7.21	8.79	8.95	7.95	
	FYM	7.56	10.49	8.65	9.37	
LC 3	NONE	5.85	9.15	9.32	8.25	
	FYM	6.86	10.19	9.36	8.55	
AF	NONE	4.01	7.16	8.29	9.58	
	FYM	3.51	6.42	8.71	9.28	
AB	NONE	3.98	5.82	8.53	8.25	
	FYM	4.24	6.74	8.87	8.09	

GRAIN MEAN DM% 85.9

PLOT AREA HARVESTED 0.00251

83/W/RN/3

BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES66	NONE	FYM	MEAN		
ROTATION					
LN 8	6.19	5.89	6.04		
LN 3	5.70	5.63	5.66		
LC 8	5.95	5.66	5.80		
LC 3	5.66	5.59	5.62		
AF	3.82	3.72	3.77		
AB	4.73	6.04	5.39		
MEAN	5.34	5.42	5.38		
N	0	60+60	120+60	180+60	MEAN
ROTATION					
LN 8	5.20	6.91	5.95	6.09	6.04
LN 3	4.82	6.47	6.02	5.32	5.66
LC 8	5.30	6.42	5.72	5.78	5.80
LC 3	4.22	6.29	6.11	5.87	5.62
AF	1.32	3.99	5.20	4.58	3.77
AB	3.79	6.07	6.53	5.16	5.39
MEAN	4.11	6.02	5.92	5.47	5.38
N	0	60+60	120+60	180+60	MEAN
FYMRES66					
NONE	3.87	6.04	5.99	5.46	5.34
FYM	4.34	6.01	5.85	5.48	5.42
MEAN	4.11	6.02	5.92	5.47	5.38
N	0	60+60	120+60	180+60	
ROTATION FYMRES66					
LN 8 NONE	4.70	7.11	6.49	6.44	
LN 8 FYM	5.69	6.70	5.41	5.74	
LN 3 NONE	4.54	6.55	6.12	5.57	
LN 3 FYM	5.11	6.39	5.93	5.08	
LC 8 NONE	5.01	6.55	5.39	6.83	
LC 8 FYM	5.58	6.30	6.04	4.73	
LC 3 NONE	4.92	6.02	6.46	5.23	
LC 3 FYM	3.53	6.57	5.75	6.52	
AF NONE	1.00	4.50	5.71	4.08	
AF FYM	1.65	3.48	4.69	5.07	
AB NONE	3.06	5.53	5.75	4.59	
AB FYM	4.51	6.61	7.31	5.73	

GRAIN MEAN DM% 85.0

PLOT AREA HARVESTED 0.00251

83/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 42nd year, red beet, carrots, s. barley.

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

Design: 2 series each of 4 blocks of 10 plots. On one series the plots are split, systematically, for red beet and carrots.

Whole plot dimensions: 8.15 x 5.18.

Treatments:

To Series A, red beet and carrots, all combinations of:-

1. OM RESID Residues of organic manures:

FYM Farmyard manure until 1967
SEWAGE Sewage sludge until 1962
SEW COM Sewage sludge, composted with straw, until 1962
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, s. barley, all combinations of:-

1. OM RESID Residues of organic manures:

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

83/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.

NOTE: In 1981 and 1982 (25:0:16) was applied to the grass in spring and after each cut except the last. Two cuts were made in each year. Weedkillers: Mecoprop (as 'Herrifex' at 3.5 l) with MCPA (as 'Agroxone' at 1.4 l) in 250 l was applied in 1982 only.

Basal applications:

- To both series: Weedkiller: Glyphosate at 2.0 kg in 250 l.
- Series A: Red beet: Manures: (0:20:20) at 750 kg, N at 170 kg as 'Nitro-Chalk'. Weedkillers: Paraquat at 0.84 kg ion in 280 l, phenmedipham at 1.3 kg in 280 l. Insecticide: Demeton-s-methyl at 0.24 kg in 280 l.
- Carrots: Manures: (0:20:20) at 750 kg, N at 60 kg as 'Nitro-Chalk'. Weedkiller: Linuron at 0.47 kg in 280 l. Insecticide: Carbofuran (as 'Yaltox' granules at 34 kg).
- Series B: S. barley: Manures: (0:20:20) at 380 kg, N at 120 kg as 'Nitro-Chalk'. Weedkillers: Dicamba with mecoprop and MCPA (as 'Herrisol' at 5 l) in 250 l. Fungicide: Tridemorph at 0.52 kg in 250 l.

Seed: Red beet: Detroit Crimson Globe, sown by precision drill.
Carrots: Chantenay Red-cored Supreme, sown by precision drill.
S. barley: Triumph, dressed with triadimenol and fuberidazole, sown at 160 kg.

Cultivations, etc.:-

- Series A: Red beet: Glyphosate applied: 10 Aug, 1982. Ploughed: 13 Sept. Spring-tine cultivated: 11 Mar, 1983. Paraquat applied: 16 Apr. PK and N applied, spring-tine cultivated: 26 Apr. Rotary cultivated, seed sown: 30 Apr. Phenmedipham applied: 7 June. Insecticide applied: 29 June. Singled: 30 June, 1 July. Hand harvested: 9 Aug.
- Carrots: Glyphosate applied: 10 Aug, 1982. Ploughed: 13 Sept. Spring-tine cultivated: 11 Mar, 1983. PK and N applied, spring-tine cultivated: 26 Apr. Rotary cultivated, seed sown: 30 Apr. Insecticide applied: 8 June. Rotary cultivated because of crop failure, seed resown: 8 June. Weedkiller applied: 16 June.
- Series B: S. barley: Glyphosate applied: 10 Aug, 1982. Ploughed: 13 Sept. Spring-tine cultivated: 11 Mar, 1983. PK and N applied, spring-tine cultivated with crumbler attached, seed sown: 15 Mar. Weedkillers applied: 27 May. Fungicide applied: 16 June. Combine harvested: 9 Aug.

NOTES: (1) Despite resowing, the carrot crop failed to establish.
(2) Crop samples were taken at maturity and soil samples after harvest for chemical analyses.

83/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	21.7	15.9	16.6	20.4	18.6
50	22.1	14.7	18.1	23.8	19.6
MEAN	21.9	15.3	17.4	22.1	19.1

NONE 16.7 GRAND MEAN 18.7

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

TABLE	OM RESID	OM RATE	OM RESID OM RATE
SED	1.66	1.17	2.34

SED FOR COMPARING EXTRA NONE WITH ANY ITEM IN OM RESID.OM RATE TABLE IS 2.03

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

STRATUM	DF	SE	CV%
BLOCK.WP	28	3.31	17.8

TOPS FRESH WEIGHT TONNES/HECTARE

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

OM RESID OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	10.6	9.4	8.8	10.2	9.7
50	11.5	7.5	9.9	11.8	10.2
MEAN	11.1	8.4	9.3	11.0	10.0

NONE 9.7 GRAND MEAN 9.9

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

TABLE	OM RESID	OM RATE	OM RESID OM RATE
SED	0.65	0.46	0.92

SED FOR COMPARING EXTRA NONE WITH ANY ITEM IN OM RESID.OM RATE TABLE IS 0.79

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

STRATUM	DF	SE	CV%
BLOCK.WP	28	1.30	13.1

PLOT AREA HARVESTED 0.00045

83/W/RN/4

SPRING BARLEY

GRAIN TONNES/HECTARE

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

OM RESID OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	6.00	5.88	6.02	6.70	6.15
50	6.27	5.51	5.82	5.80	5.85
MEAN	6.14	5.70	5.92	6.25	6.00

NONE 6.54

GRAND MEAN 6.11

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

TABLE	OM RESID	OM RATE	OM RESID OM RATE
SED	0.256	0.181	0.362

SED FOR COMPARING EXTRA NONE WITH ANY ITEM IN OM RESID.OM RATE TABLE IS 0.313

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

STRATUM	DF	SE	CV%
BLOCK.WP	28	0.511	8.4

GRAIN MEAN DM% 86.5

STRAW TONNES/HECTARE

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

OM RESID OM RATE	FYM	SEWAGE	SEW COM	VEG COM	MEAN
25	4.34	4.01	4.02	4.80	4.29
50	4.54	3.90	4.13	3.88	4.11
MEAN	4.44	3.95	4.07	4.34	4.20

NONE 3.92

GRAND MEAN 4.15

STRAW MEAN DM% 88.4

PLOT AREA HARVESTED 0.00249

83/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 28th year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980, w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 23rd 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 27th 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 69-82/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

N_{1,2} (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 P₂O₅ as superphosphate

K: 250 kg K₂O 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 40 kg N in March, remainder in April

83/R/RN/5

Additional plots

MANURE Fertilizers from 1980 to 1983 and in previous years:

1980-83	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 1983: 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: Ioxynil at 0.32 kg with mecoprop at 0.95 kg in 220 l. Mecoprop, bromoxynil and ioxynil (as 'Brittox' at 2.1 l) in 220 l with the tridemorph. Fungicides: Tridemorph at 0.52 kg. Benomyl at 0.28 kg in 220 l. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.37 kg in 220 l, applied on three occasions, with the growth regulator on the first, and with the pirimicarb and captafol on the third. Captafol at 1.1 kg. Insecticides: Pirimicarb at 0.14 kg. Permethrin at 0.05 kg in 220 l.
- W. wheat: Growth regulator: Chlormequat at 1.9 kg in 220 l.
- W. barley: Additional insecticide: Omethoate at 0.64 l in 220 l. 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 in 220 l. Fungicide: Mancozeb at 1.3 kg in 220 l with the insecticide. Insecticide: Pirimicarb at 0.14 kg.
- Seed: W. wheat: Norman, sown at 210 kg
W. barley: Igrí, sown at 200 kg
W. oats: Peniarth, sown at 210 kg
Potatoes: Desiree
Grass-clover ley: RVP Italian ryegrass and Hungaropoly red clover.

83/R/RN/5

Cultivations, etc.:-

- W. wheat: Dug by hand: 10 Sept, 1982. P, K and Mg applied to original plots; P, K, Mg and S applied to additional plots: 14 Sept. All plots raked level, seed sown and raked in: 15 Sept. Ioxynil and mecoprop applied: 18 Oct. Permethrin applied: 25 Oct. First N applied: 14 Mar, 1983. 'Brittox' with tridemorph applied: 30 Mar. Benomyl applied: 7 Apr. Second N applied: 22 Apr. Growth regulator, carbendazim with maneb and tridemorph applied: 27 Apr. Carbendazim with maneb and tridemorph applied: 20 May. Pirimicarb, captafol, carbendazim with maneb and tridemorph applied: 16 June. Harvested by hand: 1 Aug.
- W. barley: Rotary cultivated: 13 Sept, 1982. P and K applied to original plots; P, K, Mg and S to additional plots, raked level, seed sown, raked in: 15 Sept. Ioxynil and mecoprop applied: 18 Oct. Omethoate, permethrin applied: 25 Oct. First N applied: 14 Mar, 1983. 'Brittox' with tridemorph applied: 30 Mar. Benomyl applied: 7 Apr. Second N applied: 8 Apr. Growth regulator, carbendazim, maneb and tridemorph applied: 27 Apr. Carbendazim, maneb and tridemorph applied: 20 May. Pirimicarb, carbendazim, maneb, tridemorph and captafol applied: 16 June. Harvested by hand: 18 July.
- W. oats: Rotary cultivated: 14 Sept, 1982. P and K applied to original plots; P, K, Mg and S applied to additional plots, raked level, seed sown, raked in: 22 Sept. Ioxynil and mecoprop applied: 18 Oct. Permethrin applied: 25 Oct. First N applied: 14 Mar, 1983. 'Brittox' with tridemorph applied: 30 Mar. Benomyl applied: 7 Apr. Second N applied: 8 Apr. Growth regulator, carbendazim, maneb and tridemorph applied: 27 Apr. Carbendazim, maneb and tridemorph applied: 20 May. Pirimicarb, carbendazim, maneb, tridemorph and captafol applied: 16 June. Harvested by hand: 26 July.
- Potatoes: FYM applied to original plots, dug by hand; extra K applied to additional plots, dug by hand: 19 Oct, 1982. P and K applied to original plots; P, K, Mg and S applied to additional plots: 1 Nov. Total N applied, rotary cultivated, potatoes planted and ridged by hand: 23 May, 1983. Linuron and paraquat applied: 7 June. Mancozeb and pirimicarb applied: 6 July. Plots given neither FYM nor K harvested by hand: 26 Aug. Remaining plots harvested by hand: 19 Sept.
- Grass-clover ley: Rotary cultivated, raked level, seed sown and raked in: 26 July, 1982. P and K applied to original plots; P, K, Mg and S applied to additional plots: 1 Nov. N applied: 14 Mar, 1983. Cut: 25 May, 20 July, 11 Oct.
- Permanent grass: P and K applied: 1 Nov, 1982. FYM and first N applied: 14 Mar, 1983. Second N applied: 24 May. Final N applied: 20 July. Cut: 24 May, 20 July, 11 Oct.

83/R/RN/5

GREAT FIELD IV (R):ORIGINAL PLOTS

TONNES/HECTARE

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

	WINTER WHEAT:				BARLEY:		LEY : DRY MATTER			
	GRAIN		STRAW		GRAIN	STRAW	1ST	2ND	3RD	TOTAL OF
							CUT	CUT	CUT	3 CUTS
MANURE										
O	5.00	5.25	3.02	2.19			1.85	1.84	0.90	4.60
N1	7.91	8.33	1.80	2.82			4.36	1.81	0.65	6.83
P	2.90	3.14	2.81	2.32			2.83	3.14	1.59	7.55
N1P	2.29	3.86	1.30	2.76			4.86	1.87	0.62	7.35
K	5.24	5.97	3.13	3.73			2.32	3.20	1.45	6.96
N1K	9.39	10.21	5.91	5.34			4.20	2.54	1.09	7.82
PK	5.89	6.75	4.87	3.62			4.09	5.09	1.68	10.86
N1PK	9.73	10.67	8.31	7.02			5.11	4.61	2.43	12.15
N2PK	10.92	12.59	10.04	9.96			6.17	4.19	2.35	12.72
D	9.26	10.98	4.55	3.64			3.91	4.47	2.18	10.55
N1PKD	11.27	13.74	8.98	8.68			5.84	5.36	2.66	13.86
N2PKD	10.92	14.42	9.93	11.70			7.33	4.00	2.10	13.43
MEAN DM%	80.1	67.6	86.9	63.8			23.4	28.4	23.1	25.0
	OATS:		POTATOES:		PERMANENT GRASS : DRY MATTER					
	GRAIN	STRAW	TOTAL	TUBERS	1ST	2ND	3RD	TOTAL OF		
					CUT	CUT	CUT	3 CUTS		
MANURE										
O	4.39	6.28	9.6		0.64	0.82	0.29	1.75		
N1	7.03	10.40	9.4		1.59	1.29	0.80	3.68		
P	4.80	6.56	7.6		0.64	1.03	0.24	1.90		
N1P	6.33	10.72	8.8		2.24	1.55	1.04	4.83		
K	4.46	6.76	25.0		0.78	1.04	0.39	2.22		
N1K	7.06	11.99	26.3		2.02	2.26	0.88	5.17		
PK	4.69	7.67	27.5		0.72	1.06	0.38	2.17		
N1PK	8.60	13.59	36.5		3.42	2.31	0.78	6.52		
N2PK	6.94	15.50	33.8		4.94	2.84	1.56	9.34		
D	6.06	9.20	36.5		5.15	2.04	0.65	7.84		
N1PKD	8.42	14.66	47.7		5.68	2.97	1.37	10.02		
N2PKD	8.36	20.50	43.8		5.81	4.10	1.68	11.58		
MEAN DM%	82.6	46.1	23.2		25.6	35.3	23.6	28.2		

83/R/RN/5

GREAT FIELD IV (R): ADDITIONAL PLOTS

TONNES/HECTARE

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

	WINTER WHEAT:		BARLEY:		OATS:		POTATOES:
	GRAIN	STRAW	GRAIN	STRAW	GRAIN	STRAW	TOTAL
							TUBERS
MANURES							
0	5.15	5.81	3.27	2.13	3.01	3.82	9.1
N2PK	10.28	11.95	8.32	8.29	8.50	17.71	40.9
N2PKMG	10.68	11.73	10.49	8.69	7.45	13.97	45.6
N2PKS	10.97	12.00	9.77	8.04	8.19	11.42	40.8
N2PKMGS	10.83	12.84	9.76	8.66	7.71	17.16	32.3
N1PKMGS	9.22	10.66	9.50	8.81	8.06	13.01	43.6
N3PKMGS	10.49	12.40	9.96	8.99	7.07	16.23	42.7
MEAN DM%	80.8	73.0	87.7	67.1	85.2	58.0	23.8

	LEY : DRY MATTER			
	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURES				
0	2.87	2.06	0.66	5.59
N2PK	6.60	4.46	1.95	13.01
N2PKMG	5.21	4.00	1.80	11.01
N2PKS	5.56	4.61	2.03	12.20
N2PKMGS	6.17	4.41	2.00	12.58
N1PKMGS	5.25	4.74	2.04	12.03
N3PKMGS	5.85	4.86	1.91	12.63
MEAN DM%	22.9	28.4	21.7	24.3

83/R/RN/8

CULTIVATION/WEEDKILLER

Object: To study the long-term effects of weedkillers and different methods of primary cultivation on a sequence of crops - Great Harpenden I.

Sponsors: R. Moffitt, J.A. Currie.

The 23rd year, w. barley.

For previous years see 'Details' 1967 and 1973 and 74-82/R/RN/8.

Design: 2 randomised blocks of 12 plots split into 2.

Whole plot dimensions: 12.8 x 12.2.

Treatments: All combinations of:-

Whole plots

1. CULTIVTN Primary cultivations annually:
 PLOUGH Ploughed: 24 Sept, 1982
 ROTA DIG Cultivated by rotary digger: 9 Sept
 DEEPTINE Deep-tine cultivated: 8 Sept

2. SUBSOIL Subsoiling in autumn 1982:
 NONE None
 CNVTIAL Conventional vertical tine on 6 Sept
 PARAPLOW 'Paraplowed' on 6 Sept

Sub plots

3. WEEDKLLR(75) Hormone weedkiller to cereals in the previous rotation, last applied to barley 1975 (basal hormone weedkiller to s. wheat 1977, s. barley 1978 to 1980 and w. barley 1981 to 1983):

 NONE
 HORMONE

4. WEEDKLLR(81) Paraquat weedkiller to preceding cereal stubbles last applied for w. barley 1981:

 NONE
 PARAQUAT

NOTE: The combinations of 3 and 4 are tested on half plots: WEEDKLLR(75) NONE, WEEDKLLR(81) NONE and WEEDKLLR(75) HORMONE, WEEDKLLR(81) PARAQUAT on one block, remaining combinations on the other.

83/R/RN/8

EXTRA (DD) plus three extra whole plot treatments all with sub plot test 3 above; all given paraquat to preceding cereal stubble, direct drilled 1981, 1982 and 1983 but differing in subsoiling in autumn 1982:

NONE None
 CNVTIAL Conventional vertical tine on 6 Sept, 1982
 PARAPLOW 'Paraplowed' on 6 Sept

NOTES: (1) The conventional vertical tine sub-soiler had tines 76 cm apart and worked at a depth of about 50 cm.
 (2) The 'Paraplow' had rigid tines set at a 45° 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: (5:14:30) at 340 kg, combine drilled. 'Nitro-Chalk' at 250 kg followed by 500 kg. Weedkillers: Paraquat at 0.70 kg ion in 250 l followed by 0.84 kg ion in 500 l. Isoproturon at 2.1 kg with dicamba, mecoprop and MCPA (as 'Poly-Farmon CMPP' at 4.2 l) in 250 l applied with the prochloraz. Fungicides: Prochloraz at 0.40 kg. Carbendazim at 0.15 kg with maneb at 1.6 kg and tridemorph at 0.38 kg in 250 l.

Seed: Igri, dressed ethirimol, sown at 160 kg.

Cultivations, etc.:- Paraquat applied: 23 Aug, 1982. Disced: 1 Sept. Paraquat applied: 15 Oct. Spring-tine cultivated: 29 Oct. Seed sown: 30 Oct. Isoproturon, 'Poly-Farmon CMPP' and prochloraz applied: 4 Feb, 1983. First N applied: 14 Mar. Second N applied: 14 Apr. Carbendazim with maneb and tridemorph applied: 8 June. Combine harvested: 26 July.

EXTRA PLOTS

GRAIN TONNES/HECTARE

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

WEEDKLLR(75)	NONE	HORMONE	MEAN
EXTRA DD			
NONE	7.22	7.26	7.24
CNVNTIAL	7.72	7.69	7.71
PARAPLOW	7.35	7.70	7.52
MEAN	7.43	7.55	7.49

GRAIN MEAN DM% 86.5

SUB PLOT AREA HARVESTED 0.00347

83/R/RN/8

OMITTING EXTRA PLOTS

GRAIN TONNES/HECTARE

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

SUBSOIL	NONE	CNVNTIAL	PARAPLOW	MEAN
CULTIVTN				
PLOUGH	7.26	7.25	7.37	7.29
ROTA DIG	7.44	7.43	7.38	7.42
DEEPTINE	7.65	7.61	7.75	7.67
MEAN	7.45	7.43	7.50	7.46
WEEDKLLR(75)	NONE	HORMONE	MEAN	
CULTIVTN				
PLOUGH	7.47	7.12	7.29	
ROTA DIG	7.42	7.42	7.42	
DEEPTINE	7.62	7.71	7.67	
MEAN	7.50	7.42	7.46	
WEEDKLLR(75)	NONE	HORMONE	MEAN	
SUBSOIL				
NONE	7.55	7.35	7.45	
CNVNTIAL	7.47	7.38	7.43	
PARAPLOW	7.49	7.51	7.50	
MEAN	7.50	7.42	7.46	
WEEDKLLR(81)	NONE	PARAQUAT	MEAN	
CULTIVTN				
PLOUGH	7.26	7.33	7.29	
ROTA DIG	7.34	7.49	7.42	
DEEPTINE	7.72	7.62	7.67	
MEAN	7.44	7.48	7.46	
WEEDKLLR(81)	NONE	PARAQUAT	MEAN	
SUBSOIL				
NONE	7.39	7.51	7.45	
CNVNTIAL	7.47	7.39	7.43	
PARAPLOW	7.46	7.54	7.50	
MEAN	7.44	7.48	7.46	
WEEDKLLR(81)	NONE	PARAQUAT	MEAN	
WEEDKLLR(75)				
NONE	7.59	7.42	7.50	
HORMONE	7.30	7.54	7.42	
MEAN	7.44	7.48	7.46	

83/R/RN/8

OMITTING EXTRA PLOTS

GRAIN TONNES/HECTARE

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

TABLE	CULTIVTN	SUBSOIL	WEEDKLLR(75)	WEEDKLLR(81)
SED	0.147	0.147	0.040	0.040

TABLE	CULTIVTN SUBSOIL	CULTIVTN WEEDKLLR(75)	SUBSOIL WEEDKLLR(75)	CULTIVTN WEEDKLLR(81)
SED	0.254	0.155	0.155	0.155
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
	CULTIVTN	0.070		0.070
	SUBSOIL		0.070	

TABLE	SUBSOIL WEEDKLLR(81)
SED	0.155
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:	
	SUBSOIL 0.070

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

STRATUM	DF	SE	CV%
BLOCK.WP	8	0.254	3.4
BLOCK.WP.SP	8	0.121	1.6

GRAIN MEAN DM% 87.1

SUB PLOT AREA HARVESTED 0.00347

83/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 19th year, sugar beet, w. wheat, ley.

For previous years see 'Details' 1973 and 74-82/W/RN/12.

Design for sugar beet and w. wheat: 2 blocks of 4 plots
2nd, 3rd, 4th and 5th 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 sugar beet in 1983 and the second pair w. wheat.

Sugar beet and w. wheat tested:

MANURE	Organic manures and fertilizers in 1983, cumulative to 1982 (both crops) and 1981 (sugar beet only) and to those applied in the preliminary period:
FYM	Farmyard manure at 50 tonnes
STRAW	Straw at 7.5 tonnes plus P ₂ O ₅ at 140 kg, K ₂ O at 140 kg, MgO at 50 kg
FERT-FYM	P ₂ O ₅ at 280 kg, K ₂ O at 560 kg, MgO at 100 kg
FERT-STR	P ₂ O ₅ at 140 kg, K ₂ O at 280 kg, MgO at 50 kg

All leys are clover/grass (LC) without N except to seedbed in first year. 2nd and 3rd year leys tested:

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

4th and 5th year leys tested:

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

83/W/RN/12

Standard applications:

- W. wheat: Manures: N at 150 kg as 'Nitro-Chalk'. Weedkillers: Glyphosate at 1.5 kg in 280 l. Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 4.2 l) in 280 l.
- Sugar beet: Manures: Ground chalk at 5.0 t, N at 150 kg as 'Nitro-Chalk'. Weedkillers: Glyphosate at 1.5 kg in 280 l. Phenmedipham at 1.3 kg in 280 l. Insecticide: Demeton-s-methyl at 0.24 kg in 280 l.
- Leys, 2nd, 3rd, 4th and 5th years: Manures: Ground chalk at 5.0 t to 3rd and 5th years only. P₂O₅ at 140 kg, K₂O at 280 kg as (0:18:36), MgO at 50 kg as kieserite.

- Seed: W. wheat: Avalon, sown at 190 kg.
Sugar beet: Monoire, sown by precision drill.

Cultivations, etc.:-

- W. wheat: Glyphosate applied: 10 Sept, 1982. Half PK and Mg applied to FERT-FYM plots: 5 Oct. Treatment FYM and straw applied, ploughed: 5 Nov. Half PK and Mg applied to FERT-FYM, all PK and Mg applied to FERT-STR and STRAW plots only: 8 Nov. Spring-tine cultivated with crumbler attached, seed sown, spring-tine cultivated: 11 Nov. N applied: 28 Apr, 1983. 'Brittox' applied: 29 Apr. Combine harvested: 12 Aug.
- Sugar beet: Glyphosate applied: 10 Sept, 1982. Half PK and Mg applied to FERT-FYM plots: 5 Oct. Ground chalk applied: 3 Nov. Treatment FYM applied and these plots ploughed: 5 Nov. Treatment straw applied, remaining plots ploughed, PK applied to STRAW plots: 8 Nov. Half PK and Mg applied to FERT-FYM, all PK and Mg applied to FERT-STR plots, all Mg applied to STRAW plots: 9 Nov. Deep-tine cultivated: 12 Jan, 1983. Heavy spring-tine cultivated, spring-tine cultivated, N applied: 22 Mar. Spring-tine cultivated with crumbler attached: 14 Apr. Rotary cultivated, seed sown: 30 Apr. Phenmedipham applied: 7 June. Singled: 9-14 June. Tractor hoed: 20 June, 1 July. Insecticide applied: 29 June. Hand hoed: 4-11 July. Lifted: 10 Oct.
- 2nd, 3rd, 4th and 5th year leys: Ground chalk applied to 3rd and 5th years only: 3 Nov, 1982. PK and Mg applied: 9 Nov. Cut: 16 June, 1983, 24 Aug.

83/W/RN/12

SUGAR BEET

ROOTS WASHED TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT FYM	FERT STR	MEAN
	38.0	36.7	32.7	32.6	35.0

SUGAR PERCENTAGE

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

MANURE	FYM	STRAW	FERT FYM	FERT STR	MEAN
	16.7	16.9	17.0	16.2	16.7

TOTAL SUGAR TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT FYM	FERT STR	MEAN
	6.32	6.20	5.56	5.34	5.85

TOPS TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT FYM	FERT STR	MEAN
	30.4	27.1	25.9	24.8	27.1

PLOT AREA HARVESTED 0.00130

83/W/RN/12

W.WHEAT

GRAIN TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT FYM	FERT STR	MEAN
	6.91	6.16	5.55	6.69	6.32

GRAIN MEAN DM% 86.3

STRAW TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT FYM	FERT STR	MEAN
	4.69	3.73	3.19	3.70	3.83

STRAW MEAN DM% 91.5

PLOT AREA HARVESTED 0.00796

2ND YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT(16/6/83)	2ND CUT(23/8/83)	TOTAL OF 2 CUTS
PREV LEY			
LC(LC)	6.31	0.73	7.03
LC(LN)	6.95	1.05	8.00
MEAN	6.63	0.89	7.52
MEAN DM%	26.1	25.6	25.9

3RD YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT(16/6/83)	2ND CUT(23/8/83)	TOTAL OF 2 CUTS
PREV LEY			
LC(LC)	6.19	1.17	7.36
LC(LN)	5.49	1.42	6.91
MEAN	5.84	1.29	7.13
MEAN DM%	19.0	27.1	23.1

83/W/RN/12

4TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT(16/6/83)	2ND CUT(23/8/83)	TOTAL OF 2 CUTS
PREV MAN			
LC(GM)	5.08	1.04	6.12
LC(PT)	5.59	0.90	6.49
MEAN	5.33	0.97	6.30
MEAN DM%	24.0	30.2	27.1

5TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT(16/6/83)	2ND CUT(23/8/83)	TOTAL OF 2 CUTS
PREV MAN			
LC(GM)	5.84	1.32	7.16
LC(PT)	4.56	0.94	5.50
MEAN	5.20	1.13	6.33
MEAN DM%	18.4	27.5	23.0

PLOT AREA HARVESTED 0.00265

83/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 18th year, w. wheat, ley.

For previous years see 'Details' 1973 and 74-82/W/RN/13.

Treatments:-

Until 1977 the experiment tested all phases of the five-course rotation ley, potatoes, cereal, cereal, cereal and continuous 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 test 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 continuous cereal

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

Standard applications:

W. wheat: Manures: (5:14:30) at 340 kg, N at 150 kg as 'Nitro-Chalk'.
Weedkillers: Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.5 l) with the fungicide in 280 l. Fungicide: Prochloraz at 0.4 kg.
Ley, 1st year: Manures: (5:14:30) at 340 kg, N at 50 kg as 'Nitro-Chalk'. Weedkiller: Paraquat at 0.84 kg ion in 280 l.
Ley, 2nd and 3rd years: Manures: (0:18:36) at 380 kg.

Seed: W. wheat: Avalon, sown at 190 kg.

Ley: S 23 perennial ryegrass at 27 kg, Blanca white clover at 7 kg, mixture sown at 34 kg.

83/W/RN/13

Cultivations, etc.:-

W. wheat: Ploughed: 20 Sept, 1982. Spring-tine cultivated: 28 Sept.
NPK applied: 30 Sept. Rotary cultivated, seed sown: 1 Oct.
Weedkillers and fungicide applied: 15 Apr, 1983. N applied: 28 Apr.
Combine harvested: 5 Aug.

Ley, 1st year: Ploughed: 20 Sept, 1982. Spring-tine cultivated:
28 Sept. NPK applied: 30 Sept. Spring-tine cultivated: 8 Mar, 1983.
N applied, rotary cultivated: 17 Mar. Weedkiller applied: 16 May.
Rotary cultivated: 7 June. Seed sown: 9 June. Cut: 15 Aug.

Ley, 2nd and 3rd years: PK applied: 11 Jan, 1983. Cut: 21 June, 15 Aug.

83/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 tenth year, s. barley.

For previous years see 74-82/W/RN/16.

Design: 4 series of 3 randomised blocks of 4 plots with PREVCROP on series.

Whole plot dimensions: 4.27 x 2.59.

Treatments: All combinations of:-

Series

1. PREVCROP Previous crop in 1982, all s. barley 1978 to 1981:

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) Each series followed the rotation w. wheat, sugar beet, s. barley, potatoes until 1977. Cropping since 1978 was as above, one series in s. barley 1982 was fallow in 1983.

Basal applications:

S. barley: Manures: (20:10:10) at 590 kg. N at 80 kg as 'Nitro-Chalk'.
Weedkillers: Dicamba with mecoprop and MCPA (as 'Herrisol' at 4.9 l) in 280 l. Fungicide: Tridemorph at 0.53 kg in 280 l.

83/W/RN/16

Seed: S. barley: Triumph, dressed with ethirimol, sown at 160 kg.

Cultivations, etc.:-

S. barley: Ploughed: 5 Oct, 1982. NPK applied: 8 Mar, 1983. Spring-tine cultivated with crumbler attached, seed sown: 9 Mar. Weedkillers applied: 23 May. N applied: 1 June. Fungicide applied: 17 June. Harvested by hand: 12 Aug.
Fallow: Ploughed: 5 Oct, 1982. Spring-tine cultivated with crumbler attached: 9 Mar, 1983. Rotary cultivated: 22 June, 3 Aug.

GRAIN TONNES/HECTARE

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

PK SUB PREVCROP	- - -	- - S	P K T	P K S	MEAN
FALLOW	5.78	5.50	6.09	6.10	5.87
OATS	4.92	4.05	4.26	4.88	4.53
BARLEY	4.09	4.23	4.73	4.22	4.32
MEAN	4.93	4.60	5.03	5.06	4.90

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

TABLE	PK SUB	PREVCROP* PK SUB
SED	0.279	0.482

*WITHIN THE SAME LEVEL OF PREVCROP ONLY

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

STRATUM	DF	SE	CV%
SERIES.BLOCK	6	0.415	8.5
SERIES.BLOCK.WP	18	0.591	12.0

GRAIN MEAN DM% 87.4

STRAW TONNES/HECTARE

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

PK SUB PREVCROP	- - -	- - S	P K T	P K S	MEAN
FALLOW	4.49	4.06	4.50	4.40	4.37
OATS	3.41	2.79	3.31	3.45	3.24
BARLEY	2.82	3.11	3.41	3.16	3.12
MEAN	3.57	3.32	3.74	3.67	3.58

STRAW MEAN DM% 86.6

PLOT AREA HARVESTED 0.00063

83/R/RN/17

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 third year, potatoes, s. barley, s. beans, w. wheat.

For previous years see 81-82/R/RN/17.

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

Whole plot dimensions: 3.0 x 14.0.

Treatments to each series:

TREATMNT Extra P and K and primary cultivation tool in autumn 1980 only except on R plots, treatments repeated each autumn:

	P ₂ O ₅ (kg)	K ₂ O(kg)	Tool	
- - -	0	0	Plough	(duplicated)
P6 K6 T	1000	500 to topsoil	"	(")
- - S	0	0 " "	Wye double-digger	(four plots)
- - SR	0	0 " "	" " "	(duplicated)
P2 - SR	63	0 to subsoil	" " "	
P3 - S	125	0 " "	" " "	
P4 - S	250	0 " "	" " "	
P5 - S	500	0 " "	" " "	(duplicated)
P6 - S	1000	0 " "	" " "	
- K2 SR	0	31 " "	" " "	
- K3 S	0	63 " "	" " "	
- K4 S	0	125 " "	" " "	
- K5 S	0	250 " "	" " "	(duplicated)
- K6 S	0	350 " "	" " "	
P1 K1 SR	31	16 " "	" " "	
P1 K3 SR	31	63 " "	" " "	
P2 K2 SR	63	31 " "	" " "	
P3 K1 SR	125	16 " "	" " "	
P3 K3 SR	125	63 " "	" " "	
P3 K4 S	125	125 " "	" " "	
P4 K3 S	250	63 " "	" " "	
P4 K4 S	250	125 " "	" " "	
P4 K5 S	250	250 " "	" " "	(duplicated)
P4 K6 S	250	350 " "	" " "	
P5 K4 S	500	125 " "	" " "	(duplicated)
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 " "	" " "	

83/R/RN/17

- 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 other than R were conventionally ploughed in autumn 1981 and 1982.
- (4) The rate of 350 kg K₂O applied was in error for 500 kg K₂O.

Standard applications:

- Potatoes: Manures: (10:10:15 + 4.5 Mg) at 1960 kg. Weedkillers: Paraquat at 0.56 kg ion with linuron at 1.0 l in 500 l. Fungicides: Mancozeb at 1.4 kg in 250 l on three occasions. Fentin hydroxide at 0.28 kg in 250 l on five occasions, with the insecticide on the first four. Insecticide: Pirimicarb at 0.14 kg. Haulm desiccant: BOV at 170 l.
- S. barley: Manures: (20:10:10) at 450 kg. 'Nitro-Chalk' at 250 kg. Weedkillers: Dicamba, mecoprop and MCPA (as 'Herrisol' at 5.0 l) in 250 l. Fungicide: Prochloraz at 0.40 kg in 250 l.
- S. beans: Weedkillers: Trietazine and simazine (as 'Aventox' at 2.4 l) in 250 l. Insecticides: Pirimicarb at 0.14 kg in 250 l. Phorate at 5.6 kg.
- W. wheat: Manures: (0:18:36) at 350 kg combine drilled. 'Nitro-Chalk' at 750 kg. Weedkillers: Dicamba, mecoprop and MCPA (as 'Herrisol' at 5.0 l) in 250 l. Fungicide: Propiconazole at 0.12 kg in 250 l.

Seed: Potatoes: Pentland Crown.

- S. barley: Triumph, seed dressed with ethirimol, sown at 160 kg.
- S. beans: Minden, sown at 280 kg.
- W. wheat: Avalon, sown at 210 kg.

Cultivations, etc.:-

All crops: Treatments applied by double digger: 15-17 Nov, 1982.
Ploughed: 18 Nov.

- Potatoes: Spring-tine cultivated twice: 7 Mar, 1983. NPK Mg applied: 28 Apr. Spiked rotary cultivated, potatoes planted: 29 Apr. Rotary ridged: 6 May. Weedkillers applied: 24 May. Mancozeb applied: 22 June. Fentin hydroxide with insecticide applied: 1 July, 8 July, 18 July and 28 July. Fentin hydroxide applied: 11 Aug. Mancozeb applied: 25 Aug, 9 Sept. Haulm mechanically destroyed: 11 Oct. BOV applied: 19 Oct. Lifted: 27 Oct.
- S. barley: Spring-tine cultivated, NPK applied, spring-tine cultivated a second time: 7 Mar, 1983. Rotary harrowed, seed sown: 8 Mar. 'Herrisol' applied: 23 May. N applied: 26 May. Fungicide applied: 23 June. Combine harvested: 3 Aug.
- S. beans: Spring-tine cultivated, phorate applied, spring-tine cultivated a second time, rotary harrowed, seed sown: 7 Mar, 1983. Weedkillers applied: 12 Mar. Pirimicarb applied: 16 June. Combine harvested: 12 Aug.
- W. wheat: Heavy spring-tine cultivated twice, spring-tine cultivated twice, seed sown: 18 Jan, 1983. N applied: 16 Apr. Weedkillers applied: 28 Apr. Fungicide applied: 17 June. Combine harvested: 12 Aug.

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SERIES III POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	43.6
P6 K6 T	45.4
- - S	41.5
- - SR	38.8
P2 - SR	36.1
P3 - S	45.8
P4 - S	45.3
P5 - S	42.1
P6 - S	46.4
- K2 SR	39.8
- K3 S	44.6
- K4 S	45.2
- K5 S	41.8
- K6 S	46.5
P1 K1 SR	39.2
P1 K3 SR	45.2
P2 K2 SR	36.4
P3 K1 SR	43.1
P3 K3 SR	39.3
P3 K4 S	41.0
P4 K3 S	42.4
P4 K4 S	39.7
P4 K5 S	44.2
P4 K6 S	46.9
P5 K4 S	43.1
P5 K5 S	43.9
P5 K6 S	47.6
P6 K4 S	47.5
P6 K5 S	45.3
P6 K6 S	43.5
MEAN	42.9

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

TABLE	TREATMNT*
-----	-----
SED	4.73 MIN REP
	3.74 MAX-MIN

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

TREATMNT
 MAX-MIN - - S V ANY OF REMAINDER
 MIN REP ANY OF THE REMAINDER

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

STRATUM	DF	SE	CV%
WP	10	3.34	7.8

83/R/RN/17

SERIES III POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	93.8
P6 K6 T	94.7
- - S	93.5
- - SR	95.2
P2 - SR	93.9
P3 - S	93.5
P4 - S	93.4
P5 - S	94.1
P6 - S	96.2
- K2 SR	92.6
- K3 S	94.6
- K4 S	93.9
- K5 S	95.1
- K6 S	95.5
P1 K1 SR	93.5
P1 K3 SR	95.9
P2 K2 SR	93.7
P3 K1 SR	95.2
P3 K3 SR	93.3
P3 K4 S	95.5
P4 K3 S	94.8
P4 K4 S	93.7
P4 K5 S	95.3
P4 K6 S	96.9
P5 K4 S	94.1
P5 K5 S	94.7
P5 K6 S	95.0
P6 K4 S	94.5
P6 K5 S	94.4
P6 K6 S	93.6
MEAN	94.4

PLOT AREA HARVESTED 0.00210

83/R/RN/17

SERIES IV SPRING BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.30
P6 K6 T	7.43
- - S	6.82
- - SR	6.42
P2 - SR	6.35
P3 - S	6.66
P4 - S	6.98
P5 - S	7.09
P6 - S	7.05
- K2 SR	6.87
- K3 S	7.24
- K4 S	7.37
- K5 S	6.94
- K6 S	7.56
P1 K1 SR	6.81
P1 K3 SR	7.33
P2 K2 SR	5.68
P3 K1 SR	7.13
P3 K3 SR	6.77
P3 K4 S	7.51
P4 K3 S	7.42
P4 K4 S	7.37
P4 K5 S	6.93
P4 K6 S	7.39
P5 K4 S	6.98
P5 K5 S	7.24
P5 K6 S	7.10
P6 K4 S	7.51
P6 K5 S	7.40
P6 K6 S	6.34
MEAN	7.01

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

TABLE	TREATMNT*
-----	-----
SED	0.336 MIN REP
	0.266 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.238	3.4
GRAIN MEAN DM%	85.7		
PLOT AREA HARVESTED	0.00286		

83/R/RN/17

SERIES I SPRING BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	4.17
P6 K6 T	4.49
- - S	4.32
- - SR	4.61
P2 - SR	4.72
P3 - S	4.82
P4 - S	4.48
P5 - S	4.44
P6 - S	4.46
- K2 SR	4.34
- K3 S	4.28
- K4 S	4.01
- K5 S	4.28
- K6 S	4.41
P1 K1 SR	4.53
P1 K3 SR	4.24
P2 K2 SR	4.13
P3 K1 SR	4.34
P3 K3 SR	4.69
P3 K4 S	4.16
P4 K3 S	4.39
P4 K4 S	4.73
P4 K5 S	4.37
P4 K6 S	4.08
P5 K4 S	4.66
P5 K5 S	4.44
P5 K6 S	4.82
P6 K4 S	4.39
P6 K5 S	4.58
P6 K6 S	4.57
MEAN	4.42

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

TABLE	TREATMNT*
-----	-----
SED	0.324 MIN REP
	0.257 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.229	5.2

GRAIN MEAN DM% 85.5

PLOT AREA HARVESTED 0.00386

83/R/RN/17

SERIES II WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	6.52
P6 K6 T	7.40
- - S	6.81
- - SR	6.06
P2 - SR	6.45
P3 - S	6.72
P4 - S	6.98
P5 - S	7.06
P6 - S	6.70
- K2 SR	5.65
- K3 S	7.04
- K4 S	6.78
- K5 S	6.44
- K6 S	5.42
P1 K1 SR	5.62
P1 K3 SR	6.14
P2 K2 SR	6.04
P3 K1 SR	6.54
P3 K3 SR	6.51
P3 K4 S	6.61
P4 K3 S	7.23
P4 K4 S	7.33
P4 K5 S	6.66
P4 K6 S	6.69
P5 K4 S	6.76
P5 K5 S	7.16
P5 K6 S	6.44
P6 K4 S	7.51
P6 K5 S	5.57
P6 K6 S	7.41
MEAN	6.64

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

TABLE	TREATMNT*
-----	-----
SED	0.362 MIN REP
	0.286 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.256	3.9

GRAIN MEAN DM% 85.7

PLOT AREA HARVESTED 0.00286