ROTHAMSTED RESEARCH

Yields of the Field Experiments 1978

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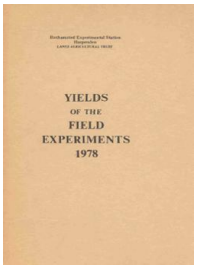

Rotations

Rothamsted Research

Rothamsted Research (1979) *Rotations ;* Yields Of The Field Experiments 1978, pp 64 - 112 **- DOI: https://doi.org/10.23637/ERADOC-1-30**

78/R/RN/1 and 78/R/RN/2

LEY/ARABLE

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

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

The 30th year, old grass, leys, potatoes, wheat, oats, barley.

For previous years see 'Details' 1967 & 1973 and 74-77/R/RN/1&2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (78/R/RN/1)

FOSTERS — A site with little organic matter initially (78/R/RN/2)

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

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

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

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

From 1975 the barley test crop was changed to wheat.

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

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

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

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

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78/R/RN/1 and 78/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 wheat every year at the end of the test-crop cycle. In both 1977 and 1978 one phase, fallowed in the previous year started a new sequence of treatment cropping. In 1978 one of the remaining phases was fallowed and the other remained in wheat (no yields). The new sequences will be introduced progressively on these remaining phases. The new sequences are:

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

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

Additional treatments to 3rd test crop wheat in the original rotation:-

Sub plots

FYMRES70 Farmyard manure residues, last applied 1970:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N 78 Nitrogen fertiliser (kg N as 'Nitro-Chalk 26'):

0
50
100
150

Standard applications:
Museum blocks:
3rd Treatment Crops:
All-grass ley: Manures: (0:14:28) at 540 kg. (25:0:16) at 300 kg in spring, and after each cut except the last.
Clover-grass ley: Manures: (0:14:28) at 540 kg.
Lucerne: Manures: (0:14:28) at 810 kg.
Oats: Manures: (20:14:14) at 350 kg, combine drilled. Weedkillers: Dicamba with mecoprop and MCPA (as 'Banlene Plus' at 4.9 l in 220 l).

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3rd Test Crop: Wheat: Manures: (0:20:20) at 380 kg, combine drilled. Weedkillers: Methabenzthiazuron at 3.1 kg in 220 l. Dicamba with mecoprop and MCPA (as 'Banlene Plus' at 4.9 l in 220 l).
Reseeded Grass and Old grass: (0:14:28) at 540 kg.
All-grass half plots: (25:0:16) at 300 kg in spring, and after each cut except the last.

New sequence blocks:

1st Treatment Crops:

All crops: Manures: Chalk at 8.7 t, Highfield only.
Lucerne: Manures: (0:14:28) at 720 kg in seedbed.
Clover-grass ley: Manures: (0:14:28) at 720 kg in seedbed. (25:0:16) at 300 kg after clover established.
Ryegrass: (0:14:28) at 720 kg to seedbed. (25:0:16) at 300 kg to seedbed and after each cut except the last. On Highfield both ryegrass plots in one block received (13:13:20) at 1500 kg in error before the planned seedbed application of (0:14:28) and (25:0:16). Accordingly on these plots only the planned seedbed dressings were omitted.
Oats and Barley: Manures: (20:14:14) at 350 kg, combine drilled. Weedkillers: Dicamba with mecoprop and MCPA (as 'Banlene Plus' at 4.9 l in 220 l) except Barley on Fosters which received ioxynil at 0.53 l and mecoprop at 1.6 l in 220 l. Fungicide (to Barley only): Tridemorph at 0.53 kg in 220 l.

2nd Treatment Crops:

Lucerne: Manures: (0:14:28) at 720 kg.
Clover-grass leys and Ryegrass: Manures: (0:14:28) at 720 kg. (25:0:16) at 300 kg in spring, repeated (Ryegrass only) after each cut except the last.
Potatoes: Manures: (13:13:20) at 1500 kg. Weedkillers: Linuron at 1.1 kg in 220 l. Paraquat at 0.42 kg ion in 220 l. Fungicides: Mancozeb at 1.3 kg in 220 l. Fentin acetate and maneb (as 'Fentin A' at 1.7 kg in 220 l). Insecticide: Pirimicarb at 0.14 kg in 220 l.
Barley: Manures: (20:14:14) at 350 kg. Weedkillers: Dicamba with mecoprop and MCPA (as 'Banlene Plus' at 4.9 l in 220 l). Fungicide: Tridemorph at 0.53 kg in 220 l.

Preparatory Crop:

Wheat: Manures: (0:20:20) at 380 kg. 'Nitra-Shell 34' at 360 kg. Weedkillers: Methabenzthiazuron at 3.1 kg in 220 l. Dicamba with mecoprop and MCPA (as 'Banlene Plus' at 4.9 l in 220 l).

Seed:

Museum blocks:

All-grass ley: Pecora Timothy at 15 kg, Meadow Fescue S.215 at 19 kg. Mixture sown at 34 kg.
Clover-grass ley: Pecora Timothy at 15 kg, Meadow Fescue S.215 at 19 kg, White Clover S.100 at 3 kg. Mixture sown at 37 kg.
Oats: Manod, sown at 130 kg.
Wheat: Cappelle, sown at 200 kg.

New Sequence blocks:

Lucerne: Vertus, sown at 28 kg.
Clover-grass leys: Timothy RvP Erecta (Pecora on 2nd treatment crops) at 15 kg, Meadow Fescue S.215 at 19 kg, Clover New Zealand Huia at 3 kg. Mixture sown at 37 kg.
Ryegrass: S.24 sown at 22 kg.
Oats: Manod, sown at 130 kg.
Barley: Porthos, sown at 160 kg.
Potatoes: Pentland Crown.
Wheat: Cappelle, sown at 200 kg.

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78/R/RN/1 and 78/R/RN/2

Cultivations, etc.:-

Museum blocks:

All-grass ley and clover-grass ley: PK applied: 9 Dec, 1977 (Highfield), 12 Dec, 1977 (Fosters). NK applied three times (all-grass ley only): 17 Mar, 1978, 8 June, 28 July. Cut three times: 2 June, 25 July, 31 Oct.

Lucerne: PK applied: 9 Dec, 1977 (Highfield), 12 Dec (Fosters). Cut three times: 27 June, 1978, 17 Aug and 7 Nov.

Oats: Ploughed: 2 Dec, 1977 (Fosters), 5 Dec (Highfield). Rotary harrowed, seed sown: 8 Apr. Weedkiller applied: 26 May. Combine harvested: 18 Sept.

Wheat: Ploughed: 11 Oct, 1977. Power harrowed: 18 Oct. Seed sown: 20 Oct. Methabenzthiazuron applied: 25 Oct. N applied: 8 May, 1978. 'Banlene Plus' applied: 10 May. Combine harvested: 4 Sept.

Reseeded Grass and Old Grass: PK applied: 12 Dec, 1977. NK applied (to N sub plots only): 17 Mar, 1978, 8 June and 28 July. Cut three times: 1 June, 25 July, 31 Oct.

New sequence blocks:

1st Treatment Crops:

All crops: Ploughed: 11 Oct, 1977. Chalk applied (Highfield only): 30 Nov. Chisel ploughed (Highfield only): 2 Dec.

Lucerne: Heavy spring-tine cultivated, PK applied, rotary harrowed: 18 May, 1978. Seed sown: 23 May. Topped: 27 July. Cut: 1 Nov.

Clover-grass ley: Heavy spring-tine cultivated, PK applied and rotary harrowed: 18 May, 1978. Seed sown: 22 May. Topped: 27 July. NK applied: 28 July. Cut: 1 Nov.

Ryegrass: Heavy spring-tine cultivated, PK and NK applied, rotary harrowed: 18 May, 1978. Seed sown: 22 May. Topped: 1 Aug. Cut: 1 Nov.

Oats and Barley: Rotary harrowed, seed sown: 8 Apr, 1978. Weedkillers and fungicide applied: 26 May. Combine harvested: 18 Sept.

2nd Treatment Crops:

Lucerne: PK applied: 9 Dec, 1977. Cut three times: 27 June, 1978, 17 Aug, 1 Nov.

Clover-grass leys: PK applied: 9 Dec, 1977. NK applied: 17 Mar, 1978. Cut three times: 1 June, 26 July, 1 Nov.

Ryegrass: PK applied: 12 Dec, 1977. NK applied three times: 17 Mar, 1978, 8 June, 28 July. Cut three times: 1 June, 26 July, 1 Nov.

Potatoes: Ploughed: 2 Dec, 1977. NPK applied: 25 Apr, 1978. Spike rotary cultivated, seed sown: 9 May. Weedkillers applied: 15 May. Grubbed and rotary ridged: 19 June. Mancozeb applied: 5 July. Mancozeb and pirimicarb applied twice: 17 July, 4 Aug. 'Fennite A' applied twice: 17 Aug, 8 Sept. Haulm pulverized: 22 Sept. Lifted: 18 Oct.

Barley: Rotary harrowed, seed sown: 2 Apr, 1978. Weedkillers and fungicide applied: 26 May. Combine harvested: 10 Sept.

Preparatory Crop:

Wheat: Ploughed: 11 Oct, 1977. Power harrowed: 18 Oct. Seed sown: 20 Oct. Methabenzthiazuron applied: 25 Oct. N applied: 5 May, 1978. 'Banlene Plus' applied: 10 May. Combine harvested: 5 Sept.

Fallow: Ploughed: 1 Dec, 1977. Rotary cultivated three times: 17 May, 1978, 13 June, 7 Aug. Spring-tine cultivated: 26 June. Chisel ploughed: 16 Aug. Disced: 1 Nov.

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78/R/RN/1 and 78/R/RN/2

NOTES: (1) In July 1978 all spring barley on the New Sequence plots was sampled for take-all (Gaeumannomyces graminis) and Phialophora.
(2) In April and July all wheat plots on the museum blocks were sampled for take-all, Phialophora and eyespot (Pseudocercosporella herpotrichoides).
(3) In September 1978 soil samples were taken from Wheat after LUCERNE, CLOGRA and ARABLE A rotations for assays of take-all and Phialophora.

MUSEUM BLOCKS

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 3 CUTS	8.02	8.43
MEAN DM%	21.8	21.3
ALL GRASS LEY		
TOTAL OF 3 CUTS	12.99	11.82
MEAN DM%	26.4	26.6
LUCERNE		
TOTAL OF 3 CUTS	12.05	13.68
MEAN DM%	21.2	20.2

OLD GRASS

TOTAL OF 3 CUTS

	HIGHFIELD	
	C	N
30TH EXPTL YEAR		
BLOCKS 1 & 4	6.16	10.60
BLOCK 2	6.48	11.09
MEAN DM%	23.6	22.7

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RESEEDED GRASS

TOTAL OF 3 CUTS

		HIGHFIELD			FOSTERS	
	BLOCKS	C	N	BLOCKS	C	N
30TH EXPTL YEAR	1 & 4	6.12	10.97	1 & 3	5.98	10.62
30TH EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	8.09	11.73	2 & 4	8.03	10.91
MEAN DM%		23.1	25.1		22.7	24.8

NEW SEQUENCE BLOCKS

DRY MATTER: TONNES/HECTARE

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

BARLEY

	HIGHFIELD	FOSTERS
	5.04	5.80
MEAN DM%	77.6	81.0

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MUSEUM BLOCKS

78/R/RN/1 HIGHFIELD

WHEAT

GRAIN TONNES/HECTARE

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

ROTATION	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
FYMRES70					
NONE	4.80	6.30	6.09	5.51	5.68
FYM	5.38	6.43	6.23	5.44	5.87
MEAN	5.09	6.37	6.16	5.48	5.77

N 78	0	50	100	150	MEAN
FYMRES70					
NONE	4.29	5.84	6.22	6.35	5.68
FYM	4.24	6.13	6.35	6.76	5.87
MEAN	4.27	5.99	6.29	6.56	5.77

N 78	0	50	100	150	MEAN
ROTATION					
LUCERNE	3.37	5.59	5.30	6.09	5.09
CLOGRA	5.03	6.72	6.75	6.97	6.37
GRASS	5.06	6.12	6.71	6.76	6.16
ARABLE	3.60	5.51	6.39	6.41	5.48
MEAN	4.27	5.99	6.29	6.56	5.77

N 78		0	50	100	150
FYMRES70	ROTATION				
NONE	LUCERNE	3.65	5.09	5.37	5.07
	CLOGRA	5.06	6.79	6.59	6.76
	GRASS	5.01	6.31	6.36	6.69
	ARABLE	3.45	5.16	6.57	6.87
FYM	LUCERNE	3.09	6.09	5.23	7.10
	CLOGRA	5.00	6.65	6.91	7.17
	GRASS	5.10	5.93	7.06	6.84
	ARABLE	3.75	5.86	6.21	5.95

GRAIN MEAN DM% 82.3

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78/R/RN/1 HIGHFIELD

WHEAT

STRAW TONNES/HECTARE

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

ROTATION	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
FYMRES70					
NONE	4.51	5.18	4.81	4.45	4.74
FYM	4.79	4.95	4.89	4.42	4.76
MEAN	4.65	5.07	4.85	4.43	4.75

N 78	0	50	100	150	MEAN
FYMRES70					
NONE	3.55	4.94	5.37	5.08	4.74
FYM	3.25	4.79	5.36	5.65	4.76
MEAN	3.40	4.87	5.36	5.37	4.75

N 78	0	50	100	150	MEAN
ROTATION					
LUCERNE	3.12	4.92	5.49	5.07	4.65
CLOGRA	3.94	5.33	5.64	5.36	5.07
GRASS	3.83	4.61	5.26	5.70	4.85
ARABLE	2.71	4.61	5.06	5.34	4.43
MEAN	3.40	4.87	5.36	5.37	4.75

N 78		0	50	100	150
FYMRES70	ROTATION				
NONE	LUCERNE	3.82	4.78	5.30	4.14
	CLOGRA	4.01	5.56	6.09	5.06
	GRASS	3.76	5.00	4.98	5.51
	ARABLE	2.63	4.43	5.09	5.63
FYM	LUCERNE	2.41	5.06	5.67	6.00
	CLOGRA	3.88	5.09	5.19	5.66
	GRASS	3.91	4.23	5.54	5.89
	ARABLE	2.80	4.79	5.03	5.06

STRAW MEAN DM% 83.8

SUB PLOT AREA HARVESTED 0.00655

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78/R/RN/2 FOSTERS

WHEAT

GRAIN TONNES/HECTARE

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

ROTATION FYMRES70	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
NONE	5.85	6.21	5.48	5.64	5.79
FYM	6.33	6.42	5.33	5.51	5.89
MEAN	6.09	6.31	5.40	5.57	5.84

N 78 FYMRES70	0	50	100	150	MEAN
NONE	4.16	5.68	6.73	6.60	5.79
FYM	4.62	5.54	6.67	6.75	5.89
MEAN	4.39	5.61	6.70	6.67	5.84

N 78 ROTATION	0	50	100	150	MEAN
LUCERNE	4.91	6.03	6.82	6.59	6.09
CLOGRA	4.95	6.11	7.19	7.01	6.31
GRASS	3.85	5.09	6.21	6.46	5.40
ARABLE	3.85	5.23	6.56	6.63	5.57
MEAN	4.39	5.61	6.70	6.67	5.84

N 78 FYMRES70	ROTATION	0	50	100	150
NONE	LUCERNE	4.68	5.71	6.56	6.44
	CLOGRA	4.29	6.50	7.18	6.87
	GRASS	3.71	5.42	6.19	6.59
	ARABLE	3.96	5.10	6.98	6.50
FYM	LUCERNE	5.15	6.34	7.08	6.74
	CLOGRA	5.61	5.71	7.19	7.15
	GRASS	3.99	4.75	6.24	6.33
	ARABLE	3.75	5.36	6.15	6.77

GRAIN MEAN DM% 80.9

https://doi.org/10.23637/ERADOC-1-30

78/R/RN/2 FOSTERS

WHEAT

STRAW TONNES/HECTARE

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

ROTATION	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
FYMRES70					
NONE	4.69	4.13	4.27	3.89	4.24
FYM	4.84	4.57	4.04	4.00	4.36
MEAN	4.76	4.35	4.15	3.95	4.30

N 78	0	50	100	150	MEAN
FYMRES70					
NONE	2.70	3.88	4.91	5.49	4.24
FYM	3.13	3.91	4.97	5.44	4.36
MEAN	2.92	3.89	4.94	5.47	4.30

N 78	0	50	100	150	MEAN
ROTATION					
LUCERNE	3.60	4.32	5.34	5.80	4.76
CLOGRA	3.00	4.28	4.89	5.23	4.35
GRASS	2.85	3.46	4.78	5.53	4.15
ARABLE	2.22	3.52	4.74	5.31	3.95
MEAN	2.92	3.89	4.94	5.47	4.30

	N 78	0	50	100	150
FYMRES70	ROTATION				
NONE	LUCERNE	3.58	4.11	4.95	6.12
	CLOGRA	2.25	4.75	4.32	5.21
	GRASS	2.70	3.61	5.14	5.62
	ARABLE	2.26	3.07	5.22	5.01
FYM	LUCERNE	3.62	4.53	5.73	5.47
	CLOGRA	3.74	3.81	5.46	5.25
	GRASS	3.00	3.31	4.43	5.44
	ARABLE	2.18	3.97	4.26	5.60

STRAW MEAN DM% 86.7

SUB PLOT AREA HARVESTED 0.00655

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78/W/RN/3

LEY/ARABLE

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

Sponsors: A.E. Johnston, F.G.W. Jones, G.A. Salt.

The 41st year, leys, barley, oats, wheat.

For previous years see 'Details' 1967 & 1973 and 74-77/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 = rye, C = carrots, W = wheat, B = 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 (PER)
On four plots in each block arable rotations alternated each five years with ley rotations (ALT)

From 1976 all the rotations were changed on all phases except for the first and second test crops in 1976:

LN	(Previous LEY) LN, LN, LN, W, B
LC	(Previous CLO) LC, LC, LC, W, B
AF	(Previous A) F, F, O, W, B
AB	(Previous A H) B, B, O, W, B

LN = grass ley with N, LC = clover/grass ley no N, O = oats, F = fallow

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

ALT LN	LN, LN, LN, LN, LN, LN, LN, LN, W, B
ALT LC	LC, LC, LC, LC, LC, LC, LC, LC, W, B

The new scheme started by sowing these new leys in spring 1976 on four phases and in spring 1977 on the fifth phase (2nd test crop in 1976). Initially some of the long term leys are ploughed up in less than eight years, depending on the starting point in relation to the test crop, to ensure that ultimately eight-year leys will be available for each test crop period.

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78/W/RN/3

Treatments to first test crop wheat and second test crop barley (yields are taken only from the test crops):

ROT CYCL — Combinations of rotations and cycles defined above

LN
LC
AF
AB
ALT LN
ALT LC

Additional treatments to first test crop, wheat:-

1/2 plots

1. FYMRES65 — Farmyard manure residues, last applied 1965:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

2. N — Nitrogen fertiliser (kg N):

0
63
126
189

Additional treatments to second test crop, barley:-

1/2 plots

1. FYMRES67 — Farmyard manure residues, last applied 1967:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

2. N — Nitrogen fertiliser (kg N):

0
50
100
150

NOTE: The first and second treatment crop barley was resown because of bird damage to the first sowing.

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78/W/RN/3

Corrective K dressings (kg K_2O) as muriate of potash, applied to first test crop wheat and long-term leys in the wheat block:

Continuous rotations	No FYM half plots	FYM half plots
Ley	326	176
Clover	63	126
Arable with hay	126	138
Arable	126	163
Alternating rotations (last two rotations in order)		
Ley/Arable with hay	151	213
Sainfoin/Arable	75	0
Arable with hay/Ley	264	264
Arable/Clover	100	38

Standard applications:-

Grass ley and Clover/grass ley, 1st year: Manures: (0:14:28) at 540 kg. N at 75 kg as 'Nitro-Chalk 25' to grass ley only. Weedkillers: Paraquat at 0.84 kg ion in 280 l. Dinoseb amine at 2.0 kg in 450 l.

Grass ley, 2nd, 3rd, 4th, 5th and 6th years: Manures: Magnesian limestone at 5 t to 5th year only. (0:14:28) at 540 kg. (25:0:16) at 300 kg in spring and after the first cut.

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

Barley: Manures: 1st and 2nd treatment crops: (20:14:14) at 400 kg combine drilled. 2nd test crop: Magnesian limestone at 5 t. (0:20:20) at 300 kg combine drilled. Weedkillers: Mecoprop, bromoxynil and ioxynil ('Brittox' at 2.5 kg in 280 l). Fungicide: Tridemorph at 0.53 kg in 280 l, with weedkillers. 2nd test crop only: Nematicide: Aldicarb at 10 kg.

Oats: Manures: (20:14:14) at 400 kg combine drilled. Weedkillers: Mecoprop, bromoxynil and ioxynil ('Brittox' at 2.5 kg in 280 l).

Winter wheat: Manures: (0:20:20) at 310 kg combine drilled. Weedkillers: Paraquat at 0.84 kg ion in 220 l. Mecoprop, bromoxynil and ioxynil ('Brittox' at 3.5 kg in 280 l). Nematicide: Aldicarb at 10 kg.

Fallow, 1st year: Paraquat at 0.84 kg ion in 280 l.

Varieties: Grass ley: Erecta timothy 17 kg, Meadow fescue S.215 17 kg, sown at 34 kg.
Clover/grass ley: Erecta timothy 20 kg, Meadow fescue S.215 16 kg, Huia white clover 4 kg, sown at 40 kg.
Barley: Porthos, dressed with ethirimol, sown at 160 kg.
Oats: Manod, sown at 200 kg.

Cultivations, etc.:- Treatment crops.

Grass ley and Clover/grass ley, 1st year: Ploughed: 27 Sept, 1977. Spring-tine cultivated with crumbler attached: 13 Mar, 1978. PK applied, N applied to grass ley only: 17 Apr. Paraquat applied: 8 May. Spring-tine cultivated, seeds sown: 10 May. Dinoseb amine applied: 9 June. Cut once: 13 Sept.

Grass ley and Clover/grass ley, 2nd, 3rd, 4th, 5th and 6th years: Magnesian limestone applied to 5th year only: 21 Oct, 1977. PK applied: 6 Jan, 1978. NK applied to grass ley, K applied to Clover/grass ley: 8 Mar, 20 June. Cut twice: 12 June, 13 Sept.

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Barley: 1st and 2nd treatment crops: Ploughed: 27 Sept, 1977. Spring-tine cultivated with crumbler attached, seed sown: 15 Mar, 1978. Spring-tine cultivated, seed resown: 7 Apr. Weedkiller applied: 15 May. Combine harvested: 4 Sept.

Oats: 3rd treatment crop: Ploughed: 27 Sept, 1977. Spring-tine cultivated with crumbler attached, seed sown: 13 Mar, 1978. Weedkiller applied: 15 May. Combine harvested: 4 Sept.

Fallow: 1st treatment year: Ploughed: 27 Sept, 1977. Spring-tine cultivated with crumbler attached: 13 Mar, 1978. Weedkiller applied: 8 May. Spring-tine cultivated twice: 10 May, 24 July. Rotary cultivated twice: 16 June, 8 Sept.

Fallow: 2nd treatment year: Ploughed: 27 Sept, 1977. Spring-tine cultivated with crumbler attached: 13 Mar. Spring-tine cultivated: 24 July. Rotary cultivated: 8 Sept.

Test Crops:

Winter wheat, 1st test crop: Paraquat applied: 26 Sept, 1977. Ploughed: 7 Oct. Corrective K applied: 10 Oct. Aldicarb applied, rotary cultivated: 24 Oct. Spring-tine cultivated, seed sown: 25 Oct. N applied: 7 Apr, 1978. Mecoprop, bromoxynil and ioxynil applied: 10 May. Combine harvested: 25 Aug.

Barley, 2nd test crop: Magnesian limestone applied: 21 Oct, 1977. Ploughed: 8 Nov. Spring-tine cultivated with crumbler attached: 13 Mar, 1978. Aldicarb applied, rotary cultivated, spring-tine cultivated with crumbler attached, seed sown: 3 Apr. N applied: 7 Apr. Weedkiller applied: 15 May. Combine harvested: 23 Aug.

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WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

ROT CYCL FYMRES65	LN	LC	AF	AB	ALT LN	ALT LC	MEAN
NONE	5.08	4.76	4.50	4.62	4.99	4.63	4.76
FYM	4.74	5.08	4.58	4.78	4.49	4.73	4.73
N							
0	3.58	3.45	2.14	2.80	3.61	2.95	3.09
63	5.52	5.37	4.59	5.00	5.31	4.82	5.10
126	5.33	5.42	5.77	5.62	5.01	5.70	5.47
189	5.22	5.44	5.66	5.39	5.02	5.26	5.33
MEAN	4.91	4.92	4.54	4.70	4.74	4.68	4.75

	ROT CYCL N	LN	LC	AF	AB	ALT LN	ALT LC
FYMRES65							
NONE	0	3.69	3.39	2.26	2.95	3.74	2.80
	63	5.51	5.15	4.57	4.73	5.39	4.74
	126	5.47	5.35	5.81	5.22	5.46	5.48
	189	5.66	5.17	5.33	5.56	5.36	5.50
FYM	0	3.47	3.51	2.02	2.64	3.48	3.09
	63	5.53	5.60	4.61	5.27	5.23	4.90
	126	5.19	5.48	5.72	6.01	4.56	5.91
	189	4.77	5.72	5.99	5.21	4.69	5.03

GRAIN MEAN DM% 79.8

STRAW TONNES/HECTARE

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

ROT CYCL FYMRES65	LN	LC	AF	AB	ALT LN	ALT LC	MEAN
NONE	5.34	5.28	4.12	4.98	5.33	4.67	4.95
FYM	5.03	5.60	4.53	4.92	5.52	4.60	5.03
N							
0	3.31	2.80	1.48	2.26	3.35	2.68	2.65
63	5.62	5.31	4.88	5.09	6.09	4.99	5.33
126	5.66	6.55	5.81	5.85	5.81	5.29	5.83
189	6.13	7.08	5.12	6.59	6.44	5.57	6.15
MEAN	5.18	5.44	4.32	4.95	5.42	4.63	4.99

	ROT CYCL N	LN	LC	AF	AB	ALT LN	ALT LC
FYMRES65							
NONE	0	3.79	2.69	1.48	2.29	3.30	2.44
	63	5.64	4.17	5.28	5.16	6.09	4.97
	126	6.29	6.11	5.21	5.63	5.97	5.96
	189	5.63	8.13	4.52	6.83	5.94	5.29
FYM	0	2.84	2.91	1.49	2.23	3.39	2.92
	63	5.60	6.45	4.48	5.03	6.09	5.00
	126	5.04	7.00	6.42	6.06	5.65	4.61
	189	6.63	6.03	5.72	6.35	6.93	5.85

STRAW MEAN DM% 80.6 PLOT AREA HARVESTED 0.00260

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BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

ROT CYCL / FYMRES67	LN	LC	AF	AB	ALT LN	ALT LC	MEAN
NONE	4.84	4.84	4.65	5.46	4.78	4.68	4.87
FYM	5.81	4.54	4.02	5.07	5.23	4.59	4.88
N							
0	3.49	2.72	1.88	3.01	2.75	2.51	2.73
50	5.44	4.21	3.52	4.79	4.82	4.65	4.57
100	6.10	6.06	5.63	6.17	6.23	5.62	5.97
200	6.27	5.75	6.29	7.09	6.21	5.77	6.23
MEAN	5.33	4.69	4.33	5.27	5.00	4.64	4.88

FYMRES67	ROT CYCL / N	LN	LC	AF	AB	ALT LN	ALT LC
NONE	0	3.00	2.90	1.91	2.86	2.07	2.58
	50	4.69	4.71	3.84	4.71	5.18	4.52
	100	5.55	6.28	5.76	6.12	5.93	5.46
	200	6.11	5.46	7.07	8.16	5.93	6.17
FYM	0	3.99	2.55	1.85	3.16	3.42	2.44
	50	6.18	3.72	3.21	4.87	4.46	4.78
	100	6.64	5.85	5.50	6.23	6.54	5.78
	200	6.43	6.05	5.51	6.01	6.50	5.36

GRAIN MEAN DM% 79.9

STRAW TONNES/HECTARE

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

ROT CYCL / FYMRES67	LN	LC	AF	AB	ALT LN	ALT LC	MEAN
NONE	3.55	3.58	3.02	3.41	3.01	3.48	3.34
FYM	4.41	3.49	2.27	3.23	3.47	3.39	3.38
N							
0	1.79	1.52	1.07	1.40	1.33	1.35	1.41
50	3.94	2.65	1.84	3.01	2.95	3.09	2.91
100	4.79	4.78	3.34	4.30	4.12	3.84	4.19
200	5.40	5.20	4.33	4.57	4.58	5.46	4.92
MEAN	3.98	3.54	2.65	3.32	3.24	3.44	3.36

FYMRES67	ROT CYCL / N	LN	LC	AF	AB	ALT LN	ALT LC
NONE	0	1.48	1.45	1.12	1.34	1.00	1.53
	50	3.67	3.26	2.03	2.93	3.17	2.96
	100	3.65	4.80	3.31	4.27	3.54	3.78
	200	5.40	4.84	5.62	5.09	4.35	5.66
FYM	0	2.10	1.59	1.02	1.46	1.66	1.17
	50	4.21	2.04	1.66	3.09	2.74	3.23
	100	5.93	4.76	3.37	4.33	4.69	3.91
	200	5.40	5.56	3.04	4.06	4.81	5.26

STRAW MEAN DM% 74.2 PLOT AREA HARVESTED 0.00260

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78/W/RN/4

MARKET GARDEN

Object: To study the residual effects of fertilisers and organic manures applied in the period 1942-67 - Woburn Lansome I.

Sponsor: A.E. Johnston.

The 37th year, ryegrass.

For previous years see 'Details' 1967 & 1973 and 74-77/W/RN/4.

Design: 2 series each of 40 plots divided into 4 blocks of 10 plots. Series B has the plots split into 2.

Whole plot dimensions: 8.53 x 5.18.

NOTE: Yields were not taken and no new treatments were applied.

Basal applications: Manures: 80 kg N, as 'Nitro-Chalk 25' in spring and as 'Nitra-Shell 34' after the first cut.

Seed: RvP Italian ryegrass at 40 kg, sown 16 Sept, 1974.

Cultivations, etc.:- Both series.
N applied: 8 Mar, 1978, 23 June. Cut three times: 6 Jan, 12 June, 17 Aug.

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78/R/RN/5

ARABLE REFERENCE PLOTS

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

Sponsor: F.V. Widdowson.

The 23rd year of the rotation, barley, ley, potatoes, winter wheat, kale.
The 19th year of the same rotation on the additional plots.
The 22nd 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 69-77/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: Fertilisers and farmyard manure:

MANURE

Original plots

0
N1
P
N1P
K
N1K
PK
N1PK
N2PK
D
N1PKD
N2PKD

N1, 2 (kg N): 19, 38 (ley): 56, 112 (barley): 75, 150 (wheat): 125, 250 (potatoes - 75, 150 until 1975): 125, 250 (kale and permanent grass) as 'Nitro-Chalk'

P: 63 kg P205 as superphosphate

K: 250 kg K20 as muriate of potash

D: 38 tonnes FYM (permanent grass): 50 tonnes (kale and potatoes): none to other crops.

NOTE: Since 1977 all wheat on these plots receives a standard dressing of 82 kg MgO as Epsom salts. Before 1976 potatoes tested 0 v 82 kg MgO on sub plots, dressing balanced-up after harvest before wheat.

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Additional plots

MANURE

O	None
F	N PK
FMGCA	N PK Mg Ca
FMGS	N PK Mg S
FCAS	N PK Ca S
FMGCAS	N PK Mg Ca S
FMGCASTE	N PK Mg Ca S TE

F: N PK
N: N applied as urea. N1 to wheat, N2 to other crops. Rates as above.
P: 126 kg P205 as potassium dihydrogen phosphate
K: 251 kg K20 total. As potassium dihydrogen phosphate (83 kg K20) on all NPK 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 F plots received in addition 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
S: 30 kg S supplied by potassium sulphate
TE: Trace element mixture including Mn, Cu, Zn, B, Mo, Ca, Fe. Test varies with crop.

Standard applications:
Barley: Weedkillers: Ioxynil at 0.53 kg and mecoprop at 1.6 kg in 280 l applied with the fungicide. Fungicide: Tridemorph at 0.53 kg in 280 l.
Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 280 l. Fungicide: Mancozeb at 1.3 kg in 280 l on two occasions, the second with insecticide. Insecticide: Pirimicarb at 0.14 kg.
Winter Wheat: Ioxynil at 0.63 kg and mecoprop at 1.9 kg in 280 l. Fungicides: Tridemorph at 0.53 kg in 280 l. Carbendazim at 0.25 kg and maneb at 1.6 kg in 280 l.
Kale: Insecticides: Pirimicarb at 0.14 kg, menazon at 0.28 kg, HCH, derris, and thiram ('Hexil Plus' at 0.28 kg) all in 280 l.

Seed: Barley: Maris Mink, sown at 200 kg.
Grass-clover ley: RvP Italian ryegrass and Hungaropoly red clover.
Potatoes: Pentland Crown.
Winter Wheat: Maris Hobbit, sown at 220 kg.
Kale: Thousand Headed.

Cultivations, etc.:-
Barley: Additional plots dug by hand: 11 July, 1977. Original plots dug by hand: 11 Nov. P, K, Ca, Mg, and S applied: 16 Feb, 1978. N applied, rotary cultivated, seed sown: 13 Mar. Weedkillers applied: 19 May. Trace elements applied: 7 June. Harvested by hand: 22 Aug.
Grass-clover ley: Additional plots rotary cultivated, seed sown: 16 Aug, 1977. Original plots rotary cultivated, seed sown: 23 Aug. P, K, Ca, Mg and S applied: 15 Dec. N applied: 13 Mar, 1978. Trace elements applied to additional plots: 17 May. Cut: 25 May, 27 Aug, and 20 Sept.

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Potatoes: FYM applied to original plots. All plots dug: 25 Oct, 1977. P, K, Ca, Mg, and S applied: 16 Feb, 1978. First half N applied, rotary cultivated twice, potatoes planted: 11 May. Weedkillers applied: 25 May. Second half N applied to additional plots: 13 June. Trace elements applied to additional plots: 20 June. Fungicide applied: 7 July. Insecticide applied with fungicide: 4 Aug. All plots not given K or FYM lifted by hand: 9 Aug. Remaining plots lifted: 21 Sept.

Winter Wheat: Mg applied to original plots, all plots dug by hand: 7 Oct, 1977. P, K, Ca, Mg, and S applied, seed sown: 17 Oct. Weedkiller applied: 30 Mar, 1978. N applied: 14 Apr. Trace elements applied: 17 May. Tridemorph applied: 22 May. Carbendazim and maneb applied: 12 June. Harvested by hand: 21 Aug.

Kale: FYM applied to original plots, all plots dug by hand: 25 Oct, 1977. P, K, Mg, Ca and S applied: 16 Feb, 1978. All N applied to original plots and first half N to additional plots, seed sown: 17 May. Second half N applied to additional plots: 27 June. Trace elements applied to additional plots: 7 July. Pirimicarb applied: 19 Sept. Menazon applied: 26 Sept. 'Hexil Plus' applied: 3 Oct. Harvested by hand: 17 Oct.

Permanent Grass: P and K applied: 15 Dec, 1977. FYM applied: 17 Feb, 1978. N applied three times: 13 Mar, 22 May, 28 July. Cut three times: 22 May, 27 July, 6 Oct.

NOTES: (1) Potato leaves were assessed for K and Mg.
(2) Despite the use of insecticides the kale became severely infested with caterpillars and was harvested early to prevent further loss.

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GREAT FIELD IV (R):ORIGINAL PLOTS

TONNES/HECTARE

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

	WINTER WHEAT:		KALE: FRESH	BARLEY:		LEY : DRY MATTER 1ST	2ND	3RD	TOTAL OF
	GRAIN	STRAW	WEIGHT	GRAIN	STRAW	CUT	CUT	CUT	3 CUTS
MANURE									
0	5.28	4.64	13.1	2.79	2.66	1.75	3.06	1.95	6.76
N1	5.64	5.55	11.3	1.74	2.39	3.53	3.45	2.25	9.23
P	2.60	3.04	18.3	2.03	2.43	2.78	4.93	2.89	10.60
N1P	2.46	3.34	33.1	1.07	1.89	3.47	2.97	1.50	7.93
K	4.44	4.07	13.9	3.88	2.95	2.65	4.75	2.63	10.03
N1K	6.91	6.36	14.8	4.80	3.46	3.11	4.04	2.14	9.29
PK	5.87	4.97	19.2	4.38	3.34	3.60	6.82	3.57	13.99
N1PK	7.66	6.92	40.1	4.78	4.40	3.65	6.08	3.24	12.97
N2PK	8.11	7.92	54.1	5.84	5.16	4.37	5.44	3.31	13.12
D	6.66	6.29	27.0	4.81	3.95	3.94	5.91	3.91	13.77
N1PKD	8.55	8.22	49.7	6.00	5.14	3.60	6.39	3.46	13.45
N2PKD	8.42	8.12	61.9	6.58	6.16	5.66	6.42	4.10	16.19
MEAN DM%	83.6	61.8		70.1	52.4	20.0	24.4	22.0	22.1

	POTATOES: TOTAL TUBERS	PERMANENT GRASS : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE					
0	11.3	0.94	1.36	0.63	2.93
N1	10.2	1.89	1.90	1.72	5.52
P	8.6	1.16	1.14	0.61	2.91
N1P	7.3	2.43	1.99	2.01	6.44
K	30.8	1.24	1.79	0.88	3.91
N1K	38.9	2.96	2.71	1.96	7.63
PK	41.1	1.06	1.56	0.91	3.53
N1PK	60.3	2.92	2.54	1.73	7.19
N2PK	71.3	4.43	3.28	2.80	10.50
D	52.3	4.84	2.28	1.65	8.76
N1PKD	69.5	5.81	3.10	2.60	11.50
N2PKD	73.3	4.80	5.59	3.65	14.04
MEAN DM%		24.4	31.9	28.5	28.3

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GREAT FIELD IV (R): ADDITIONAL PLOTS

TONNES/HECTARE

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

	WINTER WHEAT: GRAIN	WINTER WHEAT: STRAW	KALE: FRESH WEIGHT	BARLEY: GRAIN	BARLEY: STRAW	POTATOES: TOTAL TUBERS
MANURE						
0	4.27	3.64	17.4	1.97	2.24	16.6
F	7.74	7.05	56.7	5.20	4.46	69.6
FMGCA	7.66	6.66	57.5	6.58	5.37	78.5
FMGS	7.04	6.42	55.8	5.82	4.66	67.3
FCAS	7.68	7.14	53.2	6.50	5.49	71.5
FMGCAS	7.48	6.87	61.9	6.41	5.52	68.8
FMGCASTE	7.32	7.32	55.8	6.09	5.05	70.3
MEAN DM%	83.9	59.6		74.8	56.1	

	LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE				
0	1.95	2.95	1.83	6.74
F	5.26	4.76	3.42	13.44
FMGCA	5.32	4.46	3.42	13.20
FMGS	4.74	4.84	3.26	12.84
FCAS	5.18	5.40	3.66	14.23
FMGCAS	5.12	4.87	3.43	13.41
FMGCASTE	5.16	4.97	3.42	13.55
MEAN DM%	21.8	23.4	20.8	22.0

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78/W/RN/6

ARABLE REFERENCE PLOTS

Object: To study the long term effects of FYM and N, P and K fertilisers on the yield and mineral content of crops - Woburn Stackyard C.

Sponsor: F.V. Widdowson.

The 19th year, oats, sugar beet, barley, ley, potatoes, permanent grass.

For previous years see 60/B/3(t), 61-65/B/2, 66/B/2(t), 67/B/2(t), 68/B/3(t), 69/W/RN/6, 70/W/RN/6(t) and 71-77/W/RN/6.

Design: 1 block of 12 plots for each crop.

Whole plot dimensions: 2.74 x 2.13.

Treatments: All combinations of:-

Blocks

1. CROP		Crops:-
		After old grass (1960-73):
	S BEET/G	Sugar beet
		In arable rotation since 1960:
	BARLEY	Barley
	LEY	Ley
	POTATOES	Potatoes
	S BEET/A	Sugar beet
	OATS	Oats
	Also:	
	PERMGRAS	Permanent grass, sown autumn 1973

Plots

2. MANURE — Fertilisers and farmyard manure:-

0
N1
P
N1P
K
NIK
PK
N1PK
N2PK
D
N1PKD
N2PKD

N1,2 (kg N): 31.5, 63 (ley): 63, 126 (barley and oats): 126, 252 (sugar beet and potatoes): 188, 376 (permanent grass) as ammonium nitrate.
P: P205 at 63 kg as triple superphosphate.
K: K20 at 252 kg as potassium bicarbonate.
D: Farmyard manure at 25 tonnes (permanent grass): 50 tonnes (sugar beet and potatoes): none to other crops.

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NOTES: (1) The old grass block was dug in autumn 1973 and follows the arable rotation, the crop in 1978 being sugar beet. A new block was sown to permanent grass in 1974.
(2) Potatoes and sugar beet test on sub plots: - v MG (82 kg MgO as Epsom salts). Yields are recorded from potatoes only. Untreated sub plots receive 82 kg MgO after potato and sugar beet harvest.

Standard applications:
Winter oats: Insecticide: Phorate granules at 2 kg. Weedkillers: Ioxynil at 0.63 kg plus mecoprop at 1.9 kg in 280 l.
Sugar beet: Manures: Boron at 0.92 kg B_2O_3 as borax in 1120 l. Insecticide: Pirimicarb at 0.14 kg in 280 l.
Barley: Weedkillers: Ioxynil at 0.52 kg plus mecoprop at 1.6 kg in 280 l with the fungicide. Fungicide: Tridemorph at 0.53 kg.
Potatoes: Weedkillers: Linuron at 1.0 kg plus paraquat at 0.28 kg ion in in 280 l. Insecticide: Pirimicarb at 0.14 kg in 280 l. Fungicide: Mancozeb at 1.3 kg in 280 l.

Seed: Winter oats: Peniarth, sown at 210 kg.
Sugar beet: Klein E, sown at 5.6 kg.
Barley: Wing, sown at 180 kg.
Potatoes: Pentland Crown.
Grass-clover ley: RvP Italian ryegrass and Hungaropoly red clover.
Permanent Grass: S215 Meadow fescue at 20 kg; S24 perennial ryegrass at 20 kg; crested dogstail at 7 kg; chewings fescue at 7 kg; smooth stalked meadow grass at 7 kg; alsike clover at 4 kg; wild white clover at 2 kg. Mixture sown at 67 kg.

Cultivations, etc.:-
Winter Oats: Balancing Mg applied after potatoes: 3 Oct, 1977. P and K applied, raked, phorate applied, raked, seed sown, raked: 20 Oct. First half N applied: 21 Mar, 1978. Weedkiller applied: 31 Mar. Second half N applied: 12 May. Harvested: 10 Aug.
Sugar beet: FYM applied to block after old arable and plots in this block only dug by hand: 6 Dec, 1977. FYM applied to block after old grass and plots in this block only dug by hand: 9 Dec. P and K applied: 20 Feb, 1978. First N applied, raked, Mg applied to half plots, seed sown, raked in: 21 Mar. Second N applied, boron applied, singled: 14 June. Insecticide applied: 13 July. Lifted: 25 Oct.
Barley: Plots dug by hand: 9 Dec, 1977. P and K applied: 20 Feb, 1978. First N applied, raked, seed sown, raked: 6 Mar. Second N applied: 12 May. Weedkiller and fungicide applied: 19 May. Harvested: 11 Aug.
Potatoes: FYM applied, plots dug by hand: 5 Dec, 1977. P and K applied: 20 Feb, 1978. First N applied, rotary cultivated, Mg applied to half plots, potatoes planted and earthed up: 12 May. Weedkiller applied: 25 May. Second N applied: 14 June. Insecticide and fungicide applied: 13 July. Lifted plots without K: 10 Aug. Remaining plots lifted: 2 Oct.
Grass-clover ley: Barley stubble raked, seeds sown, raked in: 11 Aug, 1977. P and K applied: 12 Dec. N applied: 7 Mar, 1978. Cut three times: 5 June, 1 Aug, 16 Oct.
Permanent Grass: P and K applied: 10 Nov, 1977. FYM applied: 20 Feb, 1978. N applied in three equal amounts: 7 Mar, 5 June, 1 Aug. Cut three times: 5 June, 1 Aug, 16 Oct.

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NOTES: (1) Samples were taken for determination of dry matter for each crop and the percentage N, P and K.
(2) The percentages of Mg in sugar beet tops, potato tubers and leaves were determined.
(3) The percentage of K in potato leaves in July was determined.

TONNES/HECTARE

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

	S BEET/G				BARLEY		OATS	
	ROOTS WASHED	SUGAR %	TOTAL SUGAR	TOPS	GRAIN	STRAW	GRAIN	STRAW
MANURE								
0	17.8	17.4	3.10	10.9	1.71	1.50	1.49	1.62
N1	27.3	17.6	4.82	22.2	3.38	3.03	3.25	3.46
P	20.3	18.2	3.71	11.8	1.68	1.75	1.45	1.53
N1P	13.5	16.9	2.27	16.1	2.50	2.67	2.85	3.14
K	22.9	18.2	4.17	12.1	1.57	1.54	1.48	1.61
N1K	37.6	18.6	6.99	22.7	3.57	3.09	3.47	5.30
PK	19.8	17.5	3.48	9.4	1.58	1.60	2.05	2.72
N1PK	32.8	18.4	6.05	19.5	5.29	4.47	4.26	6.71
N2PK	36.2	18.9	6.86	23.8	5.61	5.17	4.71	6.52
D	38.3	19.4	7.44	21.9	2.84	2.66	2.35	3.07
N1PKD	46.0	19.9	9.13	23.8	5.59	5.48	4.13	6.73
N2PKD	46.1	19.1	8.79	31.3	5.75	6.12	5.46	9.26
MEAN DM%					78.6	74.1	78.8	46.1

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TONNES/HECTARE

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

	LEY : DRY MATTER				POTATOES		
	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS	-	TOTAL TUBERS MG	MEAN
MANURE							
0	2.36	1.05	1.09	4.51	8.9	5.1	7.0
N1	3.62	0.83	0.95	5.40	10.3	10.9	10.6
P	2.89	0.88	1.04	4.81	8.2	7.5	7.9
N1P	3.97	0.74	0.72	5.44	9.9	13.0	11.4
K	3.58	2.42	2.24	8.24	7.2	8.5	7.9
N1K	5.36	2.37	2.21	9.93	5.8	8.2	7.0
PK	4.99	2.67	2.27	9.92	17.4	16.7	17.1
N1PK	6.09	2.55	2.55	11.19	15.7	20.8	18.3
N2PK	5.73	1.84	2.16	9.73	46.1	49.2	47.7
D	4.64	2.55	2.37	9.56	27.0	30.1	28.5
N1PKD	6.50	2.70	2.45	11.65	42.0	47.2	44.6
N2PKD	7.12	2.11	2.11	11.34	50.6	47.2	48.9
MEAN DM%	26.1	24.1	28.3	26.1			

	S BEET/A				PERMGRAS : DRY MATTER			
	ROOTS WASHED	SUGAR %	TOTAL SUGAR	TOPS	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE								
0	14.2	16.9	2.40	6.8	2.48	0.63	0.74	3.85
N1	21.2	17.5	3.71	15.0	3.81	1.24	1.65	6.71
P	12.5	16.8	2.10	6.8	2.18	0.69	0.78	3.65
N1P	16.1	16.8	2.71	14.2	4.55	1.03	1.80	7.38
K	15.5	17.9	2.78	6.8	3.33	1.07	1.01	5.41
N1K	33.5	18.5	6.21	18.6	5.49	1.29	1.90	8.68
PK	11.8	16.8	1.98	6.8	3.48	1.30	1.05	5.83
N1PK	35.9	19.5	6.99	17.9	5.09	1.28	2.10	8.47
N2PK	41.0	17.9	7.33	29.6	6.34	1.55	2.55	10.44
D	30.8	18.1	5.57	21.0	4.66	0.67	0.92	6.24
N1PKD	44.4	18.8	8.34	28.7	5.73	1.16	2.12	9.01
N2PKD	57.1	17.8	10.15	42.0	6.42	1.78	2.80	11.00
MEAN DM%					24.6	23.3	31.4	26.4

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78/R/RN/7

RESIDUAL PHOSPHATE

Object: Originally to study the fresh and residual effects of phosphate fertiliser on the yields of three arable crops grown in rotation. Since 1974 the effects on ley and on yield and pathogens of continuous wheat are also studied - Great Field IV and Sawyers I.

Sponsors: G.E.G. Mattingly, D.B. Slope.

The 19th year, ley (Great Field IV): wheat and ley (Sawyers I).

For previous years see 'Details' 1967 and 1973 and 74-77/R/RN/7.

Design: Great Field IV: 3 series each of 1 randomised block of 12 plots.
Sawyers I: 3 series each of 2 randomised blocks of 12 plots.

Whole plot dimensions:
Great Field IV: 4.27 x 18.3
Sawyers I: 4.27 x 20.1

Treatments:

P205	Rates and frequency of applying phosphate:-
NONE	0
	Annual dressings, kg P205:
29 ANN	29
57 ANN	57
115 ANN	115
172 ANN	172
	Triennial dressings, kg P205 (last applied 1978):
86 TRI	86
172 TRI	172
	Six-yearly dressings, kg P205 (last applied 1973):
344 SIX	344
688 SIX	688
1032 SIX	1032
	Single dressing, kg P205 (applied autumn 1959):
376 G(1)	376 as Gafsa rock phosphate
376 S(1)	376 as granular superphosphate

NOTES: (1) Since 1974 the original rotation of potatoes, barley, swedes on both fields has been changed. Blocks after barley were sown to continuous wheat on Sawyers I, to ley on Great Field IV. In 1978 one block was sown to ley on Sawyers I.
(2) Since 1960 all phosphate has been applied as superphosphate.
(3) The six-yearly dressings were applied half in autumn before ploughing, half in spring.

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Standard applications:
Leys: (Great Field IV only): Manures: K_2O at 150 kg as muriate of potash. (Sawyers I only): Manures: Chalk at 2.9 t, N at 60 kg 'Nitro-Chalk 25' and K_2O at 250 kg as muriate of potash. Weedkillers: Paraquat at 0.42 kg ion in 220 l.
Wheat: (Sawyers I only): Manures: K_2O at 90 kg as muriate of potash. N at 125 kg as 'Nitro-Chalk 25'. Weedkillers: Methabenzthiazuron at 3.1 kg in 220 l. Mecoprop with bromoxynil and ioxynil ('Brittox' at 3.5 kg) in 220 l.

Seed: Ley (Sawyers I only): Mixture of: Timothy (RvP Erecta), Meadow Fescue (S.215) and White Clover (N.2 Huia), sown at 24 kg.
Wheat: Cappelle sown at 200 kg.

Cultivations, etc.:-
Leys: (Great Field IV): Standard K applied: 22 Dec, 1977. Test P applied: 15 Feb, 1978. Cut three times: 5 June, 25 July, 6 Nov.
(Sawyers I): Chalk applied: 20 Sept, 1977. Ploughed: 20 Oct. Disc harrowed: 24 Oct. Standard N, K and test P applied: 19 May, 1978. Paraquat applied: 22 May. Heavy spring-tine cultivated twice, rotary harrowed twice, seed sown: 23 May. Topped: 27 July. Cut: 1 Sept, 30 Oct.
Wheat: (Sawyers I): Ploughed: 20 Oct, 1977. Disc harrowed: 24 Oct. Standard K applied: 25 Oct. Heavy spring-tine cultivated: 26 Oct. Test P applied, power harrowed, seed sown: 17 Nov. Methabenzthiazuron applied: 18 Nov. Standard N applied: 25 Apr, 1978. 'Brittox' applied: 11 May. Combine harvested: 30 Aug.

NOTE: All wheat plots were sampled for take-all in May and take-all and eyespot in July.

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78/R/RN/7 GREAT FIELD IV

SERIES I LEY

DRY MATTER TONNES/HECTARE

	CUT 1 (5/6/78)	CUT 2 (25/7/78)	CUT 3 (6/11/78)	TOTAL OF 3 CUTS
P205				
NONE	4.39	2.00	2.29	8.68
29 ANN	5.31	2.32	2.71	10.34
57 ANN	4.43	2.24	2.71	9.37
115 ANN	5.02	2.36	2.53	9.92
172 ANN	4.73	2.62	2.54	9.89
86 TRI	4.22	2.22	2.81	9.24
172 TRI	4.00	2.87	2.18	9.05
344 SIX	4.76	2.42	2.31	9.48
688 SIX	4.59	2.55	2.31	9.44
1032 SIX	4.41	2.50	2.13	9.04
376 G(1)	4.59	2.41	2.39	9.39
376 S(1)	3.81	2.43	2.11	8.36
MEAN	4.52	2.41	2.42	9.35
MEAN DM%	15.3	17.0	20.6	17.7

PLOT AREA HARVESTED 0.00186

SERIES II LEY

DRY MATTER TONNES/HECTARE

	CUT 1 (5/6/78)	CUT 2 (25/7/78)	CUT 3 (6/11/78)	TOTAL OF 3 CUTS
P205				
NONE	3.67	2.09	1.99	7.75
29 ANN	3.96	2.53	2.34	8.83
57 ANN	3.95	2.85	2.96	9.76
115 ANN	4.79	2.98	2.54	10.31
172 ANN	4.52	2.87	2.74	10.14
86 TRI	4.35	2.54	2.47	9.36
172 TRI	4.00	3.00	2.39	9.39
344 SIX	4.64	3.01	2.60	10.26
688 SIX	3.73	2.74	2.46	8.93
1032 SIX	3.46	2.57	2.42	8.45
376 G(1)	3.93	2.79	2.34	9.06
376 S(1)	4.10	2.46	2.03	8.59
MEAN	4.09	2.70	2.44	9.24
MEAN DM%	13.9	18.2	22.8	18.3

PLOT AREA HARVESTED 0.00186

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78/R/RN/7 GREAT FIELD IV

SERIES III LEY

DRY MATTER TONNES/HECTARE

	CUT 1 (5/6/78)	CUT 2 (25/7/78)	CUT 3 (6/11/78)	TOTAL OF 3 CUTS
P205				
NONE	3.78	2.04	1.41	7.24
29 ANN	4.25	2.53	1.87	8.65
57 ANN	4.20	2.83	2.46	9.48
115 ANN	4.72	2.87	2.76	10.35
172 ANN	3.73	2.77	2.16	8.66
86 TRI	4.04	2.71	2.17	8.93
172 TRI	3.79	2.78	2.30	8.87
344 SIX	3.91	3.03	2.36	9.30
688 SIX	4.21	2.98	2.68	9.87
1032 SIX	3.69	2.42	1.90	8.02
376 G(1)	3.64	2.17	2.02	7.83
376 S(1)	3.74	2.26	1.48	7.47
MEAN	3.98	2.62	2.13	8.72
MEAN DM%	14.0	18.2	23.6	18.6

PLOT AREA HARVESTED 0.00186

78/R/RN/7 SAWYERS I

SERIES III LEY

DRY MATTER TONNES/HECTARE

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

	CUT 1 (1/9/78)	CUT 2 (30/10/78)	TOTAL OF 2 CUTS
P205			
NONE	0.68	0.45	1.14
29 ANN	2.03	0.54	2.57
57 ANN	2.25	0.52	2.76
115 ANN	2.43	0.47	2.91
172 ANN	2.91	0.58	3.49
86 TRI	2.22	0.37	2.59
172 TRI	2.54	0.52	3.06
344 SIX	1.83	0.49	2.32
688 SIX	2.43	0.41	2.84
1032 SIX	2.52	0.51	3.03
376 G(1)	0.81	0.49	1.31
376 S(1)	1.16	0.43	1.59
MEAN	1.98	0.48	2.47
MEAN DM%	17.9	29.1	23.5

PLOT AREA HARVESTED 0.00204

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78/R/RN/7 SAWYERS I

WHEAT SERIES I 4TH CEREAL

GRAIN TONNES/HECTARE

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

P205	
NONE	2.90
29 ANN	4.02
57 ANN	4.07
115 ANN	4.08
172 ANN	4.28
86 TRI	3.98
172 TRI	4.43
344 SIX	4.39
688 SIX	5.03
1032 SIX	4.42
376 G(1)	3.28
376 S(1)	3.55
MEAN	4.04

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

TABLE	P205
SED	0.492

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

STRATUM	DF	SE	CV%
BLOCK.WP	11	0.492	12.2

GRAIN MEAN DM% 84.0

STRAW TONNES/HECTARE

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

P205	
NONE	1.65
29 ANN	2.32
57 ANN	2.26
115 ANN	2.45
172 ANN	2.14
86 TRI	2.03
172 TRI	2.87
344 SIX	2.50
688 SIX	2.79
1032 SIX	2.55
376 G(1)	2.04
376 S(1)	1.97
MEAN	2.30

STRAW MEAN DM% 90.1

PLOT AREA HARVESTED 0.00562

https://doi.org/10.23637/ERADOC-1-30

78/R/RN/7 SAWYERS I

WHEAT SERIES II 5TH CEREAL

GRAIN TONNES/HECTARE

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

P205	
NONE	2.27
29 ANN	2.94
57 ANN	3.60
115 ANN	3.52
172 ANN	4.08
86 TRI	3.44
172 TRI	3.55
344 SIX	2.67
688 SIX	3.21
1032 SIX	3.38
376 G(1)	2.60
376 S(1)	2.46
MEAN	3.14

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

TABLE	P205
SED	0.492

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

STRATUM	DF	SE	CV%
BLOCK.WP	11	0.492	12.2

GRAIN MEAN DM% 84.5

STRAW TONNES/HECTARE

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

P205	
NONE	1.46
29 ANN	1.66
57 ANN	1.98
115 ANN	2.13
172 ANN	2.40
86 TRI	1.89
172 TRI	2.13
344 SIX	1.80
688 SIX	1.93
1032 SIX	2.36
376 G(1)	1.60
376 S(1)	1.66
MEAN	1.92

STRAW MEAN DM% 90.2

PLOT AREA HARVESTED 0.00562

https://doi.org/10.23637/ERADOC-1-30

78/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, G.V. Dyke, J.A. Currie.

The 18th year, barley.

For previous years see 'Details' 1967 and 1973 and 74-77/R/RN/8.

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

Whole plot dimensions: 12.8 x 15.2.

Treatments: All combinations of:-

Whole plots

1. CULTIVTN — Primary cultivations annually:

PLOUGH	Ploughed: 6 Dec, 1977
ROTAVATE	Rotary cultivated: 9 Dec
DEEPTINE	Deep-tine cultivated twice: 5 Dec

2. WEEDCNTL(76) — Weed control to beans and potatoes in the rotation beans, wheat, potatoes, barley practised until 1976. Last applied to beans 1976:

MECHANCL	Mechanical
RESIDUAL	Residual weedkiller (duplicated)

Sub plots

3. WEEDKLLR(75) — Hormone weedkiller to cereals in the previous rotation, last applied to barley 1975 (basal hormone weedkiller to spring wheat 1977 and barley 1978):

NONE	None
HORMONE	Hormone weedkiller

4. WEEDKLLR(78) — Paraquat weedkiller to cereal stubbles: 2 Dec:

NONE
PARAQUAT

NOTE: The combinations of 3 and 4 are tested on half plots: WEEDKLLR(75) NONE, WEEDKLLR(78) NONE and WEEDKLLR(75) HORMONE, WEEDKLLR(78) PARAQUAT on one block, remaining combinations on the other.

EXTRA — plus three extra whole plot treatments:

SPNGTINE	Heavy spring-tine cultivated twice: 5 Dec, 1977. Given simazine to beans 1976, with sub plot tests 3 and 4 above.
(SH)PLGH	Shallow ploughed: 9 Dec, 1977. Given simazine to beans 1976 and paraquat to cereal stubbles with sub plot test 3 above.

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78/R/RN/8

STANDARD — Standard cultivations as considered best for each crop. Ploughed 6 Dec, 1977. Given simazine to beans 1976, with sub plot tests 3 and 4 above.

Basal applications: Manures: (20:14:14) at 440 kg, combine drilled. Weedkiller: Ioxynil plus mecoprop ('Actril C' at 7.0 l in 220 l). Fungicide: Tridemorph at 0.53 kg in 220 l.

Seed: Porthos, sown at 160 kg.

Cultivations, etc.:- Power harrowed: 5 Apr, 1978. Seed sown: 6 Apr. Rolled: 7 Apr. Weedkiller and fungicide applied: 26 May. Combine harvested: 8 Sept.

EXTRA PLOTS ONLY

GRAIN TONNES/HECTARE

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

	EXTRA	SPNGTINE	(SH)PLGH	STANDARD
WEEDKLLR(75)				
	NONE	5.64	5.55	5.74
	HORMONE	5.72	5.64	5.39
WEEDKLLR(78)				
	NONE	5.78		5.50
	PARAQUAT	5.58	5.59	5.63
	MEAN	5.68	5.59	5.56

GRAIN MEAN DM% 79.7

SUB PLOT AREA HARVESTED 0.00408

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78/R/RN/8

OMITTING EXTRA PLOTS

GRAIN TONNES/HECTARE

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

CULTIVTN	PLOUGH	ROTAVATE	DEEPTINE	MEAN
WEEDCNTL(76)				
MECHANCL	5.56	5.69	5.78	5.68
RESIDUAL	5.71	5.68	5.65	5.68
WEEDKLLR(75)				
NONE	5.67	5.69	5.77	5.71
HORMONE	5.65	5.68	5.62	5.65
WEEDKLLR(78)				
NONE	5.55	5.61	5.51	5.56
PARAQUAT	5.76	5.76	5.88	5.80
MEAN	5.66	5.68	5.69	5.68

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

TABLE	CULTIVTN	WEEDCNTL(76)	WEEDKLLR(75)	WEEDKLLR(78)
SED	0.119	0.103	0.063	0.063

TABLE	CULTIVTN WEEDCNTL(76)	CULTIVTN WEEDKLLR(75)	CULTIVTN WEEDKLLR(78)	
SED	0.206			MIN REP
	0.179	0.142	0.142	MAX-MIN
	0.146			MAX REP

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

CULTIVTN		0.110	0.110

	WEEDCNTL(76)
MIN REP	MECHANCL
MAX-MIN	MECHANCL V RESIDUAL
MAX REP	RESIDUAL

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

STRATUM	DF	SE	CV%
BLOCK.WP	11	0.206	3.6
BLOCK.WP.SP	10	0.190	3.3

GRAIN MEAN DM% 79.9

SUB PLOT AREA HARVESTED 0.00408

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78/W/RN/12

ORGANIC MANURING

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

Sponsor: G.E.G. Mattingly.

The 14th year, winter wheat, potatoes.

For previous years see 'Details' 1973 and 74-77/W/RN/12.

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

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. Organic manures were last applied in 1971, the leys were ploughed in autumn 1971 and 1972 before starting the rotation. The experiment now tests all combinations of:-

Whole plots

1. MANURE — Organic manures and fertilisers in the preliminary period:

FYM	Farmyard manure
STRAW	Straw
PEAT	Peat
GREENMNR	Green manures
FERT-FYM	Fertilisers equivant to FYM
FERT-STR	Fertilisers equivalent to straw
CLOVRLEY	Grass/clover ley, no N
GRASSLEY	Grass ley with N for each cut

Sub plots

2. N — Fertiliser nitrogen (kg N) as 'Nitro-Chalk 25':

WHEAT	POTATOES
0	0
30	75
60	150
90	225
120	300
150	375
180	450
210	525

Standard applications:
Winter wheat: Manures: 110 kg P_2O_5 as superphosphate, 60 kg K_2O as muriate of potash. Weedkillers: Mecoprop, bromoxynil, and ioxynil ('Brittox' at 3.5 kg in 280 l).

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78/W/RN/12

Potatoes: Manures: (0:20:20) at 1210 kg in winter, (0:20:20) at 1210 kg in spring. 60 kg Mg as kieserite. Weedkillers: Linuron at 1.3 kg plus paraquat at 0.42 kg ion in 280 l. Fungicides: Mancozeb at 1.3 kg on three occasions, in 280 l on the first, in 420 l on the second, in 420 l with insecticide on the third. Fentin acetate with maneb ('Fennite A' at 1.7 kg in 280 l). Insecticide: Pirimicarb at 0.14 kg, on one occasion with fungicide, in 420 l. Haulm desiccant: Undiluted BOV at 170 l.

Seed: Winter wheat: Maris Huntsman at 210 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-
Winter wheat: PK applied: 10 Nov, 1977. Ploughed: 11 Nov. Spring-tine cultivated with crumbler attached, seed sown: 14 Nov. N applied: 11 Apr, 1978. Weedkiller applied: 10 May. Combine harvested: 25 Aug.
Potatoes: Heavy spring-tine cultivated three times: 15 July, 1977, 18 July, 9 Aug. Ploughed: 30 Sept. Winter PK applied: 6 Jan, 1978. Reploughed: 9 Feb. Spring PK applied: 30 Mar. Deep-tine cultivated: 31 Mar. N applied: 14 Apr. Kieserite applied: 20 Apr. Rotary cultivated, potatoes planted: 24 Apr. Weedkillers applied: 15 May. Grubbed: 6 June. Earthed up: 9 June. Mancozeb applied: 5 July, 20 July. Mancozeb applied with insecticide: 11 Aug. Fentin acetate with maneb applied: 23 Aug. Haulm desiccant applied: 23 Sept. Lifted: 11 Oct.

NOTE: Because of an error in weighing, yield of one plot of potatoes, treatment combination MANURE FERT FYM, N 0, was lost. An estimated value was used in the analysis.

https://doi.org/10.23637/ERADOC-1-30 *pp 38*

78/W/RN/12

WHEAT

GRAIN TONNES/HECTARE

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

N / MANURE	0	30	60	90	120	150	180	210	MEAN
FYM	1.68	2.91	4.26	4.86	5.40	5.39	5.41	5.98	4.49
STRAW	1.44	3.83	3.88	4.78	5.15	5.11	3.84	4.67	4.09
PEAT	1.45	2.72	3.96	4.43	4.69	5.31	5.07	5.19	4.10
GREENMNR	1.36	2.53	3.98	4.70	4.76	4.89	5.09	5.34	4.08
FERT-FYM	1.35	2.50	3.65	4.36	4.81	4.91	5.09	5.43	4.01
FERT-STR	1.32	2.80	3.63	4.23	5.34	4.47	4.43	4.58	3.85
CLOVRLEY	1.85	3.16	4.48	5.23	5.22	5.33	5.09	5.33	4.46
GRASSLEY	1.50	3.34	4.47	4.98	5.20	4.88	5.05	5.03	4.31
MEAN	1.49	2.97	4.04	4.70	5.07	5.03	4.88	5.19	4.17

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

TABLE	MANURE	N	MANURE N
SED	0.452	0.194	0.683
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
MANURE			0.548

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

STRATUM	DF	SE	CV%
BLOCK.WP	7	0.452	10.8
BLOCK.WP.SP	56	0.548	13.1

GRAIN MEAN DM% 82.6

STRAW TONNES/HECTARE

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

N / MANURE	0	30	60	90	120	150	180	210	MEAN
FYM	1.04	2.34	3.05	3.17	4.18	3.19	3.39	3.94	3.04
STRAW	0.87	2.12	2.34	3.18	3.29	3.48	3.09	3.66	2.75
PEAT	0.76	2.10	3.07	3.16	2.94	3.41	3.33	3.87	2.83
GREENMNR	0.89	1.62	2.48	3.21	3.10	3.26	2.98	3.81	2.67
FERT-FYM	0.84	1.53	2.37	3.18	3.11	2.85	2.82	3.49	2.53
FERT-STR	0.83	1.85	2.37	3.20	3.49	3.12	3.12	3.40	2.67
CLOVRLEY	1.04	1.58	2.95	3.17	3.57	3.78	2.34	3.44	2.73
GRASSLEY	0.74	2.42	3.00	3.29	3.04	3.07	2.97	3.50	2.75
MEAN	0.88	1.95	2.70	3.20	3.34	3.27	3.00	3.64	2.75

STRAW MEAN DM% 89.6

SUB PLOT AREA HARVESTED 0.00173

https://doi.org/10.23637/ERADOC-1-30

78/W/RN/12

POTATOES

TOTAL TUBERS TONNES/HECTARE

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

N / MANURE	0	75	150	225	300	375	450	525	MEAN
FYM	21.8	30.7	37.8	49.0	49.0	44.7	49.3	50.8	41.6
STRAW	29.4	35.8	47.9	50.3	43.3	55.8	58.5	56.6	47.2
PEAT	9.2	20.5	21.8	35.3	39.9	45.1	42.2	45.8	32.5
GREENMNR	14.4	18.4	39.4	41.2	33.2	35.6	45.8	47.1	34.4
FERT-FYM	30.2	25.0	29.9	36.9	38.7	43.4	37.8	44.2	35.8
FERT-STR	24.5	25.4	29.9	38.8	43.6	46.4	49.1	44.4	37.8
CLOVRLEY	31.6	44.6	49.5	52.2	51.0	54.6	54.5	52.4	48.8
GRASSLEY	35.1	47.7	58.0	61.7	63.5	65.1	64.1	63.8	57.4
MEAN	24.5	31.0	39.3	45.7	45.3	48.8	50.2	50.6	41.9

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

TABLE	MANURE	N	MANURE N
SED	5.74	1.68	7.26
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
MANURE			4.75

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

STRATUM	DF	SE	CV%
BLOCK.WP	7	5.74	13.7
BLOCK.WP.SP	56	4.75	11.3

PERCENTAGE WARE 3.81 CM (1.5INCH) RIDDLE

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

N / MANURE	0	75	150	225	300	375	450	525	MEAN
FYM	94.8	95.3	96.5	96.6	97.1	95.7	96.9	96.6	96.2
STRAW	96.9	97.6	97.6	97.3	96.6	97.4	96.1	96.3	97.0
PEAT	86.9	91.1	95.3	95.0	95.9	94.7	95.8	97.3	94.0
GREENMNR	95.0	93.2	95.3	96.4	94.8	96.0	97.1	96.5	95.5
FERT-FYM	96.7	93.7	95.3	95.3	95.9	96.0	94.9	95.2	95.4
FERT-STR	95.8	95.1	92.8	96.4	96.0	95.7	95.6	96.9	95.5
CLOVRLEY	97.5	97.8	96.3	97.2	97.5	97.0	97.2	97.1	97.2
GRASSLEY	98.5	97.2	96.7	97.8	96.6	96.7	97.6	96.6	97.2
MEAN	95.3	95.1	95.7	96.5	96.3	96.1	96.4	96.6	96.0

SUB PLOT AREA HARVESTED 0.00087

https://doi.org/10.23637/ERADOC-1-30

78/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 13th year, winter wheat, barley.

For previous years see 'Details' 1973 and 74-77/W/RN/13.

Design: For each experiment: 2 randomised blocks of 6 plots, split into 4. ALDICARB tested on blocks.

Whole plot dimensions: 8.53 x 20.4.

Treatments:-
One experiment on winter wheat on part of the site of the classical wheat experiment 1877-1954
One experiment on barley on part of the site of the classical barley experiment 1877-1954
Factors tested on both experiments are the same but crop and nitrogen rates differ. All combinations of:-

Blocks

1. ALDICARB — Aldicarb, cumulative to 1977 dressing, worked into the seedbed (kg):

0
10

Whole plots

2. PREVCROP — Previous crops:

	1972	1973	1974	1975	1976	1977
C/L/P/C	C	C	C	L	P	C
L/P/C/C	C	C	L	P	C	C
P/C/C/C	C	L	P	C	C	C
C/C/C/C	L	P	C	C	C	C
C/C/L/C	P	C	C	C	L	C
C/C/C/C	C	C	C	C	C	C

Ley = 1 year ley P = Potatoes C = Cereal: wheat or barley. All plots in cereal from 1977.

Sub plots

3. N — Nitrogen fertiliser (kg N as 'Nitro-Chalk 25'):

Wheat	Barley
63	50
126	100
189	150
252	200

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78/W/RN/13

Standard applications:
Wheat: Manures: (0:20:20) at 310 kg, combine drilled. Weedkillers: Methabenzthiazuron at 1.5 kg in 280 l. Mecoprop, bromoxynil and ioxynil ('Brittox' at 3.5 l in 280 l).
Barley: Manures: (0:20:20) at 300 kg, combine drilled. Weedkillers: Mecoprop, bromoxynil and ioxynil ('Brittox' at 2.5 l in 280 l). Fungicide: Tridemorph at 0.53 kg applied with the weedkillers.

Seed: Wheat: Cappelle, sown at 210 kg.
Barley: Porthos, dressed with ethirimol, sown at 160 kg.

Cultivations, etc.:- All plots ploughed: 27 Sept, 1977.
Wheat: Aldicarb applied, rotary cultivated: 24 Oct, 1977. Spring-tine cultivated, seed sown: 25 Oct. Methabenzthiazuron applied: 29 Oct. N applied: 7 Apr, 1978. Mecoprop, bromoxynil and ioxynil applied: 10 May. Combine harvested: 25 Aug.
Barley: Spring-tine cultivated: 9 Mar, 1978. Aldicarb applied, rotary cultivated, spring-tine cultivated with crumbler attached, seed sown: 3 Apr. N applied, weedkillers and fungicide applied: 15 May. Combine harvested: 23 Aug.

https://doi.org/10.23637/ERADOC-1-30

78/W/RN/13

WHEAT

GRAIN TONNES/HECTARE

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

PREVCROP ALDICARB	C/L/P/C	L/P/C/C	P/C/C/C	C/C/C/C	C/C/L/C	C/C/C/C	MEAN
0	4.26	4.26	3.88	3.81	4.36	3.94	4.08
10	4.06	3.92	3.74	3.44	3.62	3.18	3.66
MEAN	4.16	4.09	3.81	3.62	3.99	3.56	3.87

N ALDICARB	63	126	189	252	MEAN
0	3.42	4.32	4.36	4.23	4.08
10	3.15	3.95	3.66	3.87	3.66
MEAN	3.29	4.14	4.01	4.05	3.87

N PREVCROP	63	126	189	252	MEAN
C/L/P/C	3.52	4.71	4.39	4.01	4.16
L/P/C/C	3.76	4.22	4.01	4.38	4.09
P/C/C/C	3.21	3.98	4.06	3.99	3.81
C/C/C/C	2.98	3.65	3.95	3.91	3.62
C/C/L/C	3.35	4.33	3.84	4.43	3.99
C/C/C/C	2.90	3.94	3.83	3.58	3.56
MEAN	3.29	4.14	4.01	4.05	3.87

N		63	126	189	252
ALDICARB	PREVCROP				
0	C/L/P/C	3.45	4.56	4.51	4.51
	L/P/C/C	3.92	4.79	4.49	3.83
	P/C/C/C	2.83	3.98	3.98	4.73
	C/C/C/C	3.47	3.70	4.29	3.77
	C/C/L/C	3.29	4.73	4.73	4.70
	C/C/C/C	3.57	4.18	4.18	3.83
10	C/L/P/C	3.59	4.87	4.26	3.51
	L/P/C/C	3.59	3.65	3.52	4.92
	P/C/C/C	3.60	3.97	4.14	3.25
	C/C/C/C	2.50	3.59	3.60	4.05
	C/C/L/C	3.41	3.93	2.96	4.17
	C/C/C/C	2.23	3.69	3.49	3.33

GRAIN MEAN DM% 82.4

SUB PLOT AREA HARVESTED 0.00277

https://doi.org/10.23637/ERADOC-1-30 *pp 43*

78/W/RN/13

BARLEY

GRAIN TONNES/HECTARE

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

PREVCROP / ALDICARB	C/L/P/C	L/P/C/C	P/C/C/C	C/C/C/C	C/C/L/C	C/C/C/C	MEAN
0	5.00	5.00	4.63	4.35	4.07	3.81	4.48
10	4.75	4.94	4.65	3.95	4.80	4.20	4.55
MEAN	4.88	4.97	4.64	4.15	4.43	4.01	4.51

N / ALDICARB	50	100	150	200	MEAN
0	3.02	4.61	5.22	5.05	4.48
10	2.87	4.74	5.17	5.42	4.55
MEAN	2.94	4.67	5.20	5.24	4.51

N / PREVCROP	50	100	150	200	MEAN
C/L/P/C	3.56	5.04	5.73	5.17	4.88
L/P/C/C	3.82	5.06	5.28	5.72	4.97
P/C/C/C	3.05	4.75	5.37	5.39	4.64
C/C/C/C	1.97	4.59	5.18	4.87	4.15
C/C/L/C	2.94	4.47	5.01	5.32	4.43
C/C/C/C	2.34	4.13	4.62	4.94	4.01
MEAN	2.94	4.67	5.20	5.24	4.51

N / ALDICARB / PREVCROP	50	100	150	200
0 C/L/P/C	4.06	4.89	6.06	5.00
L/P/C/C	3.85	5.28	5.46	5.39
P/C/C/C	3.30	4.46	5.21	5.54
C/C/C/C	2.39	4.76	5.23	5.03
C/C/L/C	2.49	4.21	4.85	4.72
C/C/C/C	2.05	4.08	4.51	4.62
10 C/L/P/C	3.06	5.20	5.40	5.35
L/P/C/C	3.78	4.84	5.09	6.05
P/C/C/C	2.79	5.04	5.53	5.24
C/C/C/C	1.55	4.42	5.12	4.71
C/C/L/C	3.38	4.74	5.17	5.91
C/C/C/C	2.63	4.18	4.73	5.27

GRAIN MEAN DM% 77.6

SUB PLOT AREA HARVESTED 0.00277

https://doi.org/10.23637/ERADOC-1-30

78/W/RN/14

LONG TERM PHOSPHATE

Object: To study the residual effects of superphosphate on a clover/grass ley - Woburn Stackyard III.

Sponsor: G.E.G. Mattingly.

The 11th year, clover/grass ley.

For previous years see 68/B/8(t), 69/W/RN/14, 70/W/RN/14(t), 71/W/RN/14(t), 72/W/RN/14(t) and 73-77/W/RN/14.

Design: 6 blocks of 6 plots, split into 2.

Whole plot dimensions: 8.53 x 15.8.

Treatments: All combinations of:-

Whole plots

1. P205RES(73) Residues of superphosphate applied autumn 1967 and spring 1973 (kg P205):

	1967	1973	Total
0	None	None	None (Duplicate plots)
360	188	172	360
720	376	344	720
1440	753	687	1440
2160	1130	1030	2160

Sub plots

2. P205RES(72) Residues of superphosphate applied in three equal dressings 1970-72 (kg P205, total):

0
376

Basal applications: Manures: K20 at 110 kg as muriate of potash. MgO at 30 kg as Epsom Salts.

Cultivations, etc.:- K applied: 10 Jan, 1978. Mg applied: 30 Mar. Cut twice: 13 June, 12 Sept.

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78/W/RN/14

1ST CUT (13/6/78) DRY MATTER TONNES/HECTARE

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

P205RES(73) / P205RES(72)	0	360	720	1440	2160	MEAN
0	3.64	3.52	3.62	3.54	2.98	3.49
376	4.09	3.90	3.47	3.46	2.66	3.61
MEAN	3.86	3.71	3.54	3.50	2.82	3.55

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

TABLE	P205RES(73)	P205RES(72)	P205RES(73) P205RES(72)	
REP	UNEQUAL	36	UNEQUAL	
SED	0.372		0.397	MIN REP
	0.322	0.081	0.344	MAX-MIN
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
P205RES(73)			0.198	MIN REP
			0.140	MAX REP

	P205RES(73)
MAX REP	0
MAX-MIN	0 V ANY OF REMAINDER
MIN REP	ANY OF REMAINDER

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

STRATUM	DF	SE	CV%
BLOCK.WP	26	0.643	18.1
BLOCK.WP.SP	31	0.343	9.7

1ST CUT MEAN DM% 20.1

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78/W/RN/14

2ND CUT (12/9/78) DRY MATTER TONNES/HECTARE

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

P205RES(73) / P205RES(72)	0	360	720	1440	2160	MEAN
0	1.92	1.93	2.12	1.98	1.91	1.96
376	2.27	2.06	2.04	1.83	1.66	2.02
MEAN	2.10	1.99	2.08	1.91	1.78	1.99

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

TABLE	P205RES(73)	P205RES(72)	P205RES(73) P205RES(72)	
REP	UNEQUAL	36	UNEQUAL	
SED	0.203		0.228	MIN REP
	0.176	0.060	0.198	MAX-MIN
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
P205RES(73)			0.148	MIN REP
			0.105	MAX REP

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

STRATUM	DF	SE	CV%
BLOCK.WP	26	0.351	17.6
BLOCK.WP.SP	31	0.256	12.9

2ND CUT MEAN DM% 21.7

https://doi.org/10.23637/ERADOC-1-30

78/W/RN/14

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

P205RES(73) / P205RES(72)	0	360	720	1440	2160	MEAN
0	5.56	5.45	5.74	5.52	4.88	5.45
376	6.37	5.97	5.51	5.29	4.32	5.64
MEAN	5.96	5.71	5.62	5.40	4.60	5.54

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

TABLE	P205RES(73)	P205RES(72)	P205RES(73) P205RES(72)	
REP	UNEQUAL	36	UNEQUAL	
SED	0.545		0.583	MIN REP
	0.472	0.120	0.505	MAX-MIN
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
P205RES(73)			0.293	MIN REP
			0.207	MAX REP

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

STRATUM	DF	SE	CV%
BLOCK.WP	26	0.944	17.0
BLOCK.WP.SP	31	0.508	9.2

TOTAL OF 2 CUTS MEAN DM% 2.8

PLOT AREA HARVESTED 0.00145

https://doi.org/10.23637/ERADOC-1-30 *pp 48*

78/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 barley - Woburn Butt Furlong.

Sponsor: J. McEwen.

The fifth year, spring barley.

For previous years see 74-77/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 cropping (1974-1977):

POTATOES	Wheat, sugar beet, barley, potatoes
WHEAT	Sugar beet, barley, potatoes, wheat
S BEET	Barley, potatoes, wheat, sugar beet
BARLEY	Potatoes, wheat, sugar beet, barley

Plots

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

	Extra PK	Subsoil (25-50 cm) treatment
- -	None	None
- SUB	None	Subsoiled
PKTOP -	To topsoil (0-25 cm)	None
- PKSUB	To subsoil	Subsoiled

NOTES: (1) The rates of P and K were 1930 kg P205, as superphosphate and 460 kg K20 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.

Standard applications:
Manures: PREVCROP WHEAT series only: Magnesian limestone at 5 tonnes. All series: (20:14:14) at 450 kg combine drilled. Weedkillers: Mecoprop, bromoxynil and ioxynil ('Brittox' at 2.5 kg in 340 l).

Seed: Porthos, dressed with ethirimol, sown at 160 kg.

https://doi.org/10.23637/ERADOC-1-30 *pp 49*

78/W/RN/16

Cultivations, etc.:- Magnesian limestone applied: 24 Oct, 1977. Ploughed: 21 Nov. Spring-tine cultivated with crumbler attached, seed sown: 9 Mar, 1978. Weedkiller applied: 15 May. Hand harvested: 16 Aug.

NOTE: Samples of grain were analysed for contents of N, P, K, Na, Ca and Mg.

GRAIN TONNES/HECTARE

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

PK SUB PREVCROP.	- -	- SUB	PKTOP -	- PKSUB	MEAN
POTATOES	5.75	7.06	6.82	7.43	6.77
WHEAT	4.68	4.78	4.97	5.82	5.06
S BEET	6.62	7.11	6.56	7.38	6.92
BARLEY	4.07	3.65	4.12	4.42	4.07
MEAN	5.28	5.65	5.62	6.26	5.70

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

TABLE	PK SUB	PREVCROP* PK SUB
SED	0.239	0.478

* ONLY WHEN COMPARING MEANS WITH SAME LEVELS OF PREVCROP

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

STRATUM	DF	SE	CV%
BLOCK.WP	6	0.348	6.1
BLOCK.WP.SP	24	0.585	10.3

GRAIN MEAN DM% 82.9

STRAW TONNES/HECTARE

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

PK SUB PREVCROP	- -	- SUB	PKTOP -	- PKSUB	MEAN
POTATOES	4.34	5.31	4.72	5.49	4.96
WHEAT	3.94	3.98	3.56	4.59	4.02
S BEET	4.71	5.80	4.47	5.51	5.12
BARLEY	3.23	3.11	3.26	3.79	3.35
MEAN	4.06	4.55	4.00	4.85	4.36

STRAW MEAN DM% 63.7

SUB PLOT AREA HARVESTED 0.00065

https://doi.org/10.23637/ERADOC-1-30 *pp 50*