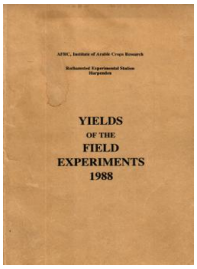
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ROTHAMSTED RESEARCH

Yields of the Field Experiments 1988

Full Table of Content



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Rothamsted Research (1989) *Default Title ;* Yields Of The Field Experiments 1988, pp 0 - 266 **- DOI: https://doi.org/10.23637/ERADOC-1-43**

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AFRC, Institute of Arable Crops Research

Rothamsted Experimental Station
Harpenden

YIELDS OF THE FIELD EXPERIMENTS 1988

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AFRC, Institute of Arable Crops Research

Rothamsted Experimental Station

Harpenden

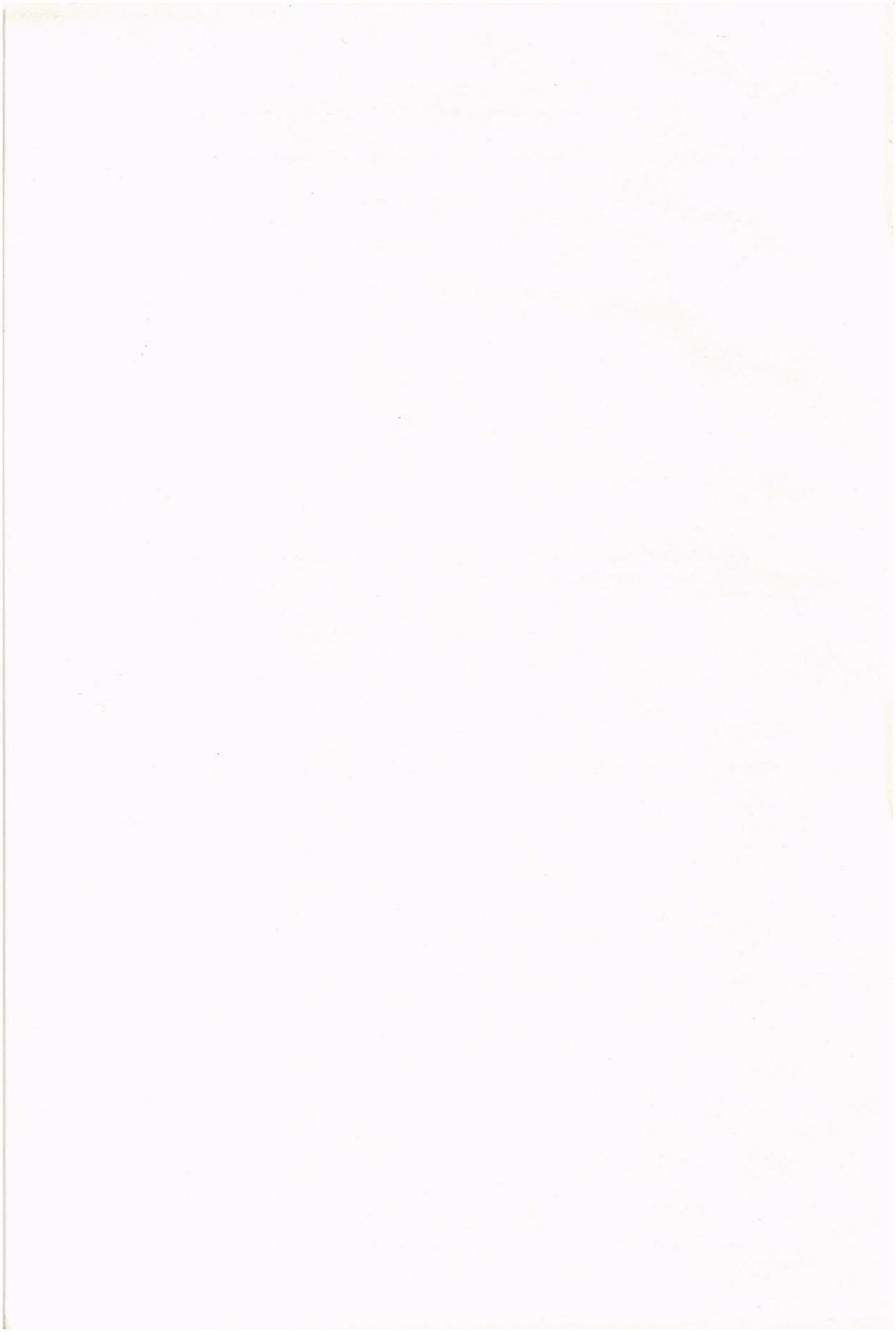
YIELDS of the FIELD EXPERIMENTS 1988

This report is produced by members of the Statistics Department and of the Field Experiments Section. It includes only experiments conducted at Rothamsted and Woburn. Only those experiments which have the determination of crop yields as an object are included. For many of these, other determinations are of equal or greater importance.

Price: Twelve pounds.

Published 1989

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CONTENTS 1988

			Page
CONVENTIONS			
EXPERIMENTS	**CLASSICALS**		
Broadbalk	W. wheat, potatoes	R/BK/1	9
Hoos Barley	S. barley	R/HB/2	14
Wheat & Fallow	W. wheat	R/WF/3	18
Exhaustion Land	S. barley	R/EX/4	19
Park Grass	Old grass	R/PG/5	22
Agdell	Ley	R/AG/6	27
Barnfield	Leys	R/BN/7	28
Garden Clover	Clover	R/GC/8	31
	ROTATIONS		
Ley/Arable	Old grass, leys, w. wheat	R/RN/1&2	33
Ley/Arable	Leys, s. barley, w. beans, w. wheat	W/RN/3	39
Market Garden	Clover	W/RN/4	48
Arable Reference Plots	W. barley, ley, potatoes, w. wheat, w. oats, old grass	R/RN/5	54
Cultivation/Weedkiller	W. barley	R/RN/8	59
Organic Manuring	W. wheat, potatoes	W/RN/12	61
Intensive Cereals	Potatoes	W/RN/13	65
Rates of P & K to the Subsoil	S. beans, w. wheat, potatoes, s. barley	R/RN/17	68
	CROP SEQUENCES		
Long Term Liming	Linseed	R&W/CS/10	76
Nematicides in Crop Sequence	Potatoes, w. wheat, s. barley	W/CS/34	81
Chemical Reference Plots	S. barley	R/CS/140	85
Seasonal Effects of Take-all	W. wheat, s. beans	R/CS/212	90
Minimum Cultivation & Deep PK	S. wheat, s. barley, s. oilseed rape	W/CS/245	92
Intensive Potatoes	Potatoes, s. barley	W/CS/273	104
Eyespot Resistance to MBC	W. wheat	R/CS/302	108
Long-term Straw Incorporation	W. wheat	R&W/CS/309	110
Effects of Shallow Straw Incorporation	W. wheat	R/CS/311	114
Straw Decomposition	W. wheat	R/CS/312	119
Cereal Sequences & Take-all	W. wheat, w. barley, w. triticale, w. oats, s. barley	R/CS/323	121
Comparison of Combinable Crops	W. wheat	R/CS/324	123
Amounts of Straw	W. wheat	R&W/CS/326	126
Control of Stem Nematode	Lucerne	R/CS/327	129
Deep-worked Soil & PCN	Potatoes	W/CS/328	134
Comparison of Combinable Crops	W. rape, w. oats, w. & s. beans, w. & s. peas, sunflowers, lupins, w. wheat	R/CS/333	137

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ANNUALS

WINTER WHEAT

Varieties	R/WW/1	140
N & Crop Physiology	R/WW/3	145
Factors Affecting Take-all	R/WW/4	147
Aphicide, N & Fungicide	R/WW/5	153
Control of Eyespot & Septoria	R/WW/6	155
Control of MBC-resistant Eyespot	R/WW/8	160
Autumn Pyrethroid & Polyphagous Predators	R/WW/10	162
Control of Volunteers	R/WW/12	164

SPRING WHEAT

Methods of Inoculating Take-all	R/WS/1	166

BARLEY

Factors Limiting Yield (w. barley)	R/B/1	168
Sowing Dates, Aphids & BYDV (w. barley)	R/B/2	185
Alarm Pheromone & BYDV (w. barley)	R/B/3	187
Varieties (w. barley)	R/B/5	189
Harvest Dates & Malting Quality (w. barley)	R/B/6	191
Varieties & N (s. barley)	R&W/B/9	193
Harvest Dates & Malting Quality (s. barley)	R/B/10	196

FIELD BEANS

Control of Chocolate Spot & Rust (w. beans)	R/BE/1	198
Varieties (w. beans)	R/BE/2	200
Varieties, Row Spacing & Plant Health (s. beans)	R/BE/4	202

LUPINS

Varieties, Sowing Dates & Seed Dressings (w. lupins)	R/LP/1	204
Desiccants & Fungicides (s. lupins)	R/LP/3	206

PEAS

Effects of Pea Seed-borne Mosaic Virus	R/PE/1	209

WINTER OILSEED RAPE

Factors Limiting Yield	R/RA/1	211
Seed Rates & Row Spacings	R/RA/2	218
Varieties, Pests & Diseases	R/RA/3	220
Times & Methods of Harvest	R/RA/4	223
Precision Sowing	R/RA/5	226
Straw Treatments Before Sowing	R/RA/6	229
Forms & Times of N	R/RA/7	233
Oversowing in Wheat	R/RA/8	236
Anti-feedants	R/RA/12	238

SUNFLOWERS

Early Varieties & Plant Health	R/SU/1	240
Seed Rates	R/SU/2	242
Fungicides & Botrytis	R/SU/3	244
Varieties & Sowing Dates	R/SU/4	246

https://doi.org/10.23637/ERADOC-1-43

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LINSEED

Insect Study	R/LN/2	248

POTATOES

Varieties	R&W/P/1	250

MIXED CROPS

Inputs for Winter Cereals (w. triticale, wheat, barley, rye)	R&W/M/1	253
Comparison of Combines (w. wheat, s. barley)	R/M/5	256
Factors Affecting Eyespot (w. wheat, barley)	R/M/6	259

MISCELLANEOUS DATA

METEOROLOGICAL RECORDS

Rothamsted, & Woburn		263

CONVERSION FACTORS

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CONVENTIONS 1988

For each experiment current treatments are shown, together with the factor and level names which are used in the tables. The program used for the analyses of these experiments limits level names to eight characters, and factor names similarly, though a suffix of up to 3 digits in brackets may be appended.

For each experiment, other than annuals, references are given to previous years. These refer to the '(Numerical)(Results) Yields of the Field Experiments' - (t) indicates a year when treatments were described. Since 1973 treatments have been described annually for all experiments and (t) is not used for these years.

For the classical and some long-term experiments reference is made to 'Details' - separate publications, giving full descriptions of treatments until 1967 & 1973, with full titles 'Details of the Classical and Long Term Experiments up to 1967' and 'Details of the Classical and Long Term Experiments up to 1973'.

The following conventions are observed unless otherwise stated.

All areas are in hectares. All plot dimensions are in metres.

All seed rates, rates of application of fertilizers, sprays etc. are per hectare.

All yields and plant numbers are per hectare.

The following abbreviations are used in variate headings:

Wheat, barley, oats, beans etc.

Grain:	Grain (at 85% dry matter)
Straw:	Straw (at 85% dry matter)

Sugar beet

Roots:	Roots (washed)
Sugar %:	Sugar percentage of washed roots

All crops

Mean D.M. %:	Mean dry matter % as harvested

For any other crop, details of abbreviations are given as necessary.

'Nitro-Chalk' refers to the grade containing 27.5% N unless otherwise stated. 'Nitram' contains 34.5% N.

Compound fertilizers indicated thus - (20:10:10) = compound fertilizer (20% N, 10% P205, 10% K20), granular unless otherwise stated.

Treatment of cereal seed with organomercury and/or gamma HCH should be assumed in this report, exceptions are noted.

https://doi.org/10.23637/ERADOC-1-43 *pp 9*

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Harvest areas for cereals

On most of those cereal experiments which are harvested by combine the 'blank-row' technique is used to distinguish the areas taken for yield from the discard areas. For example when seed is drilled in rows 7 in. (18 cm) apart appropriate coulters are prevented from sowing and 8 or 16 rows are left for yield according to the cutter-bar width of the combine to be used. If the row-spacing is other than 7 in. a similar arrangement is used but with a different number of rows.

The ends of plots are separated from each other or from headlands by 3 ft (91 cm) fallow paths made after the crop has established.

The 'Area harvested' in the 'Yields', when the blank-row technique is used, is the product:-

number of rows harvested x distance between rows x length of rows.

A series of experiments at Rothamsted showed that on average the yield of 16 rows (50 ft (15 m) long) was 7.8% greater with blank rows than without. (Experimental Husbandry 23 pp 16-20 (1972)).

If no rows are left blank and the plot is wider than the combine harvester so that discards are left uncut, the 'Area harvested' is the product:-

width of cutter bar x length of rows.

If the plot is narrower than the combine so that the whole area between paths is cut, the 'Area harvested' is the product:-

number of rows x distance between rows x length of rows.

We do not apply the adjustment used by some workers who take the harvested areas as width x length where each is measured to the centre of 'paths' up to a maximum of 18 in. (46 cm).

Tables of means

Tables of means are presented directly from computer output. Both factor and level names are presented in upper case characters. Vertical and horizontal lines are omitted e.g.:-

FACTOR C	LEVEL C1		LEVEL C2		LEVEL C3	
FACTOR B	LEVEL B1	LEVEL B2	LEVEL B1	LEVEL B2	LEVEL B1	LEVEL B2
FACTOR A						
LEVEL A1	*	*	*	*	*	*
LEVEL A2	*	*	*	*	*	*

Standard errors

NOTES: (1) This report gives standard errors of differences, not of means.

(2) Annotations (e.g. * min rep, max-min, max rep) to S.E.Ds are only explained the first time they occur in any experiment.

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88/R/BK/1

BROADBALK

Object: To study the effects of organic and inorganic manures on continuous w. wheat. From 1968 two three-year rotations were included: potatoes, beans, w. wheat and fallow, w. wheat, w. wheat. In 1979 the first rotation was changed to fallow, potatoes, w. wheat. In 1980 the second rotation reverted to continuous w. wheat. Since 1985 part of the second rotation has been added to the first to extend the rotation to fallow, potatoes, w. wheat, w. wheat, w. wheat.

The 145th year, w. wheat, fallow, potatoes.

For previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231, Station Report for 1968, Part 2, and 74-87/R/BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00311
	1	0.00572
	3,4,5 and 6	0.00473
	9	0.00497
Potatoes:	2	0.00348

Treatments:

Whole plots

PLOT Fertilizers and organic manures:-

	Plot	Treatments until 1967	Treatments from 1968	Treatments from 1985
01DN4PK	01	-	D N2 P K	D N4 P K
21DN2	21	D	D N2	D N2
22D	22	D	D	D
030	03	None	None	None
05F	05	P K Na Mg	P K (Na) Mg	PK Mg
06N1F	06	N1 P K Na Mg	N1 P K (Na) Mg	N1 P K Mg
07N2F	07	N2 P K Na Mg	N2 P K (Na) Mg	N2 P K Mg
08N3F	08	N3 P K Na Mg	N3 P K (Na) Mg	N3 P K Mg
09N4F	09	N*1 P K Na Mg	N4 P K (Na) Mg	N4 P K Mg
10N2	10	N2	N2	N2
11N2P	11	N2 P	N2 P	N2 P
12N2PNA	12	N2 P Na	N2 P Na	N2 P Na
13N2PK	13	N2 P K	N2 P K	N2 P K
14N2PKMG	14	N2 P Mg	N2 P K Mg	N2 P K Mg
15N5F	15	N2 P K Na Mg	N3 P K (Na) Mg	N5 P K Mg
16N6F	16	N*2 P K Na Mg	N2 P K (Na) Mg	N6 P K Mg
17N1+3FH	17	N2(A)	N2 1/2(P K (Na) Mg)	N1+3 1/2(PK Mg)+
18N0+3FH	18	P K Na Mg(A)	N2 1/2(P K (Na) Mg)	N0+3 1/2(PK Mg)+
19C	19	C	C	C
20NKMG	20	N2 K Na Mg	N2 K (Na) Mg	N2 K Mg

(A) Alternating

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\+ This change since 1980. Treatments shown are those to w. wheat; autumn N alternates. Potatoes receive N3 1/2 (PK Mg) on both Plots 17 and 18.

N1,N2,N3,N4,N5,N6: 48, 96, 144, 192, 240, 288 kg N (as sulphate of ammonia until 1967, except N* which was nitrate of soda. All as 'Nitro-Chalk' in spring from 1968 to 1985, as 'Nitram' since 1986.)

N0+3; N1+3: None in autumn + 144 kg N in spring; 48 kg N in autumn + 144 kg N in spring

P: 35 kg P as single superphosphate until 1987, triple superphosphate since and in 1974

K: 90 kg K as sulphate of potash

Na: 55 kg Na as sulphate of soda

(Na): 16 kg Na as sulphate of soda until 1973

Mg: 30 kg Mg annually to Plot 14, 35 kg Mg every third year to other plots since 1974. All as kieserite since 1974, previously as sulphate of magnesia annually

D: Farmyard manure at 35 tonnes

C: Castor meal to supply 96 kg N

F: P K (Na) Mg H: Half rate

Strips of sub plots: Until 1967 wheat alone was grown on the experiment, with some bare fallowing on strips of sub plots. From 1968, ten sub plots were started with the following cropping:-

SECTION	Section	68	69	70, 73 and 76	71, 74 and 77	72, 75 and 78	79	80	81	82	83	84	85	86	87	88
0/W37B	0*	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
1/W22B	1	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
POTATOES	2	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P
3/W1B	3	W	W	F	W	W	F	W	W	W	W	W	W	F	P	W
3/W1S	3	W	W	F	W	W	F	W	W	W	W	W	W	F	P	W
4/W3B	4	W	P	BE	W	P	P	W	F	P	W	F	P	W	W	W
5/W2B	5	W	F	W	W	F	W	W	W	W	W	W	F	P	W	W
6/W11B	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W	W
6/W11S	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W	W
-	7	P	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F
-	8+	W	W	W	W	W	W	W	F	W	W	W	W	W	W	F
9/W30B	9	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
9/W30S	9	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W

W = w. wheat, P = potatoes, BE = s. beans, F = fallow

* Straw incorporated since 1987. ** No sprays except weedkillers since 1985. + No weedkillers.

B = Brimstone, S = Squareheads Master

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88/R/BK/1

NOTES: (1) For a fuller record of treatments see 'Details' etc.
(2) Since autumn 1975, chalk is applied at 2.9 t each autumn to sets of Sections on a three-year cycle.
Year 1: Sections 1,2,3. Year 2: Sections 6,7,8 and 9.
Year 3: Sections 0,4,5. Chalk is applied to all plots of each section.

Standard applications:

W. wheat: Weedkillers: Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Diclofop-methyl at 1.1 kg with fluroxypyr at 0.15 kg in 260 l. Fungicides (not applied to section 6): Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 260 l applied with the growth regulator. Propiconazole at 0.12 kg and tridemorph at 0.25 kg with the pirimicarb in 200 l. Carbendazim at 0.25 kg and maneb at 1.6 kg with propiconazole at 0.12 kg in 200 l. Insecticide (not applied to section 6): Pirimicarb at 0.14 kg. Growth regulator (not applied to section 6): Chlormequat chloride at 1.3 kg.

Potatoes: Weedkiller: Linuron at 1.6 kg in 260 l. Fungicides: Mancozeb at 1.4 kg on five occasions, on the first two with the pirimicarb. Manganese zinc ethylene bisdithiocarbamate at 1.4 kg in 200 l. Fentin hydroxide at 0.27 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg.

Seed: W. wheat: Brimstone (sections 3, 4, 5, 6 and 9 only, dressed fonofos) and Squareheads Master, both sown at 180 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-

All Sections:
Triple superphosphate, sulphate of potash, sulphate of soda, kieserite, castor meal and FYM applied: 28 Sept, 1987. Ploughed: 30 Sept.

Cropped Sections:

W. wheat: Straw chopped (section 0): 9 Sept, 1987. Autumn N treatment applied: 28 Sept. Rotary harrowed, Brimstone seed sown: 5 Nov. Rotary harrowed, Squareheads Master seed sown: 6 Nov. Spring N treatments applied: 8 Apr, 1988. Fluroxypyr, clopyralid and bromoxynil applied: 26 Apr. Growth regulator with prochloraz and carbendazim applied (except to section 6), diclofop-methyl with fluroxypyr applied: 6 May. Propiconazole with tridemorph and pirimicarb applied (except to section 6): 6 June. Carbendazim, maneb and propiconazole applied (except to section 6): 23 June. Combine harvested Brimstone (except section 9): 5 Sept. Combine harvested Brimstone (section 9) and Squareheads Master: 6 Sept.

Potatoes: N treatments applied: 7 Apr, 1988. Heavy spring-tine cultivated, rotary harrowed, potatoes planted: 8 Apr. Rotary ridged: 25 Apr. Weedkiller applied: 5 May. Mancozeb with pirimicarb applied: 15 June, 30 June. Manganese zinc ethylene bisdithiocarbamate applied: 8 July. Mancozeb applied: 18 July, 1 Aug, 15 Aug. Fentin hydroxide applied: 30 Aug. Haulm mechanically destroyed: 5 Sept. Lifted: 15 Sept.

Fallow: Heavy spring-tine cultivated: 29 Apr, 1988. Cultivated with rotary grubber: 13 May, 13 June. Ploughed: 15 July. Disced and rolled: 29 July. Ploughed: 1 Aug.

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88/R/BK/1 W. WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	3/W1B	3/W1S	5/WB2	4/W3B	6/W11B	6/W11S	1/W22B	9W30B	9W30S	0/W37B
01DN4PK	9.25	*	8.16	7.59	6.52	*	*	*	*	*
21DN2	9.52	*	7.90	7.41	7.07	*	8.01	7.51	*	6.84
22D	6.49	*	3.91	3.43	2.46	*	4.10	5.19	*	3.61
030	2.87	1.98	0.85	0.87	0.73	0.73	0.68	0.35	0.80	0.73
05F	2.90	2.27	0.92	0.99	0.99	0.56	0.86	0.28	0.65	0.46
06N1F	5.58	4.62	3.42	4.33	3.51	1.97	2.88	3.35	2.71	4.48
07N2F	7.95	5.84	6.02	6.41	4.79	2.68	4.10	4.26	3.91	5.32
08N3F	8.49	5.26	5.29	6.67	5.19	3.06	5.60	5.92	4.43	5.77
09N4F	8.46	6.06	6.29	7.08	4.86	3.06	6.53	5.30	4.28	5.98
10N2	7.36	4.88	3.56	4.92	2.78	2.23	2.46	1.63	1.55	1.77
11N2P	6.27	5.10	4.29	5.05	3.09	2.14	2.62	1.29	0.74	1.57
12N2PNA	6.83	5.45	3.81	4.70	3.70	2.67	3.55	1.36	1.76	3.65
13N2PK	7.30	5.65	3.82	5.07	3.74	2.93	4.87	4.76	3.12	5.03
14N2PKMG	7.96	5.84	5.26	5.46	4.97	2.97	5.90	3.85	3.07	5.33
15N5F	8.23	5.75	7.13	6.73	4.29	3.38	6.60	5.58	4.29	6.41
16N6F	7.98	4.98	7.10	6.66	5.00	3.11	6.71	6.90	4.35	3.65
17N1+3FN	8.94	6.44	6.80	6.92	5.75	3.25	7.03	6.66	4.36	6.58
18N0+3FN	8.86	5.72	7.12	6.72	5.70	3.23	6.63	6.08	4.08	6.50
19C	5.21	4.11	1.30	2.93	0.69	1.39	2.18	0.55	1.49	1.74
20NKMG	*	*	*	*	*	*	1.32	*	*	1.59

GRAIN MEAN DM% 82.3

STRAW TONNES/HECTARE

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

SECTION PLOT	3/WIB	3/WIS	1/W22B
01DN4PK	7.88	*	*
21DN2	7.96	*	5.84
22D	3.06	*	3.56
030	0.95	1.49	0.40
05F	0.93	1.87	0.48
06N1F	2.86	5.02	2.73
07N2F	5.26	7.93	3.43
08N3F	6.17	9.10	3.48
09N4F	6.55	7.53	5.05
10N2	3.31	5.50	1.85
11N2P	3.26	4.85	2.13
12N2PNA	4.00	5.50	1.68
13N2PK	4.88	7.90	3.09
14N2PKMG	4.84	7.25	3.20
15N5F	6.44	9.23	4.67
16N6F	6.88	9.20	5.06
17N1+3FN	6.54	8.34	4.11
18N0+3FN	6.45	8.92	4.11
19C	2.20	3.95	2.24
20NKMG	*	*	1.09

STRAW MEAN DM% 84.7

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88/R/BK/1 POTATOES

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

PLOT	TOTAL TUBERS TONNES/ HECTARE	% WARE 3.81 CM (1.5 INCH) RIDDLE
01DN4PK	52.0	92.0
21DN2	48.6	90.0
22D	37.0	90.3
030	11.4	80.5
05F	17.8	86.1
06N1F	33.6	84.2
07N2F	40.4	87.9
08N3F	54.9	95.9
09N4F	49.2	93.9
10N2	8.4	66.3
11N2P	8.5	45.6
12N2PNA	12.3	62.4
13N2PK	27.0	79.8
14N2PKMG	43.5	89.2
15N5F	51.1	96.4
16N6F	51.6	96.1
17N1+3FH	27.1	92.7
18N1+3FH	36.7	94.5
19C	16.8	87.7

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88/R/HB/2

HOOS BARLEY

Object: To study the effects of organic and inorganic manures on continuous s. barley. From 1968 to 1978 a rotation of potatoes, beans and s. barley was practised. The rotation was discontinued in 1979 and the experiment reverted to continuous s. barley.

The 137th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-87/R/HB/2.

Treatments: All combinations of:-

1. **MANURE** Fertilizers and organic manures:

	Form of N 1852-1966	Additional treatments 1852-1979	Changes since 1980
---	None	-	-
-P-	None	P	-
--K	None	K(Na)Mg	-
-PK	None	PK(Na)Mg	-
A--	A	-	-
AP-	A	P	-
A-K	A	K(Na)Mg	-
APK	A	PK(Na)Mg	-
N----	N	-	-
NP---	N	P	-
N-K--	N	K(Na)Mg	-
NPK--	N	PK(Na)Mg	-
N--S-	N	Si	Si omitted
NP-S-	N	P Si	"
N-KS-	N	K(Na)MgSi	"
NPKS-	N	PK(Na)MgSi	"
N---S	N	-	Si added
NP--S	N	P	"
N-K-S	N	K(Na)Mg	"
NPK-S	N	PK(Na)Mg	"
N--SS	N	Si	-
NP-SS	N	P Si	-
N-KSS	N	K(Na)MgSi	-
NPKSS	N	PK(Na)MgSi	-
C(--)	C	-	PKMg omitted
C(P-)	C	P	"
C(-K)	C	K(Na)Mg	"
C(PK)	C	PK(Na)Mg	"
D	None	D	-
(D)	(D)	-	-
(A)	(Ashes)	-	-
-	None	-	-

https://doi.org/10.23637/ERADOC-1-43 *pp 16*

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88/R/HB/2

Form of N: A, sulphate of ammonia: N, nitrate of soda - each to supply 48 kg N: C, castor meal to supply 96 kg N
P: 35 kg P as single superphosphate (triple superphosphate in 1974 and 1988)
K: 90 kg K as sulphate of potash
(Na): 16 kg Na as sulphate of soda until 1973
Mg: 35 kg Mg, as kieserite every third year since 1974 (sulphate of magnesia annually until 1973)
Si: Silicate of soda at 450 kg
D: Farmyard manure at 35 tonnes. (D): until 1871 only
(Ashes): Weed ash 1852-1916, furnace ash 1917-1932, none since

2. **N** Nitrogen fertilizer (kg N), as 'Nitro-Chalk', since 1968 (cumulative N applications until 1973, on a cyclic system since 1974):

0
48
96
144

Plus extra plots testing all combinations of:-

1. **MANURE** Fertilizers other than magnesium:

551AN2PK	Plot 551 AN2PK
561--PK	Plot 561 --PK
571NN2--	Plot 571 NN2
581NN2--	Plot 581 NN2

N2: 96 kg N as 'Nitro-Chalk' since 1968. Other symbols as above.

2. **MGNESIUM** Magnesium fertilizer (kg Mg) as kieserite every third year since 1974:

0
35

NOTE: For a fuller record see 'Details' etc.

Basal applications: Weedkillers: Mecoprop at 2.4 kg with clopyralid at 0.05 kg and bromoxynil at 0.24 kg in 200 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l on two occasions.

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

Cultivations, etc.:- Silicate of soda, P and K applied: 11 Jan, 1988. FYM applied, ploughed: 15 Jan. Spring-tine cultivated, rotary harrowed, seed sown: 22 Feb. N applied: 12 Apr. Weedkillers applied: 10 May. Fungicides applied: 20 May, 17 June. Combine harvested: 15 Aug.

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88/R/HB/2

MAIN PLOTS

GRAIN TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.40	1.24	1.57	1.45	1.16
-P-	1.05	3.05	4.10	3.39	2.90
--K	1.18	2.40	1.82	3.47	2.22
-PK	1.11	3.92	5.00	6.59	4.16
A--	0.57	1.43	1.89	2.07	1.49
AP-	2.21	2.65	2.82	2.42	2.52
A-K	0.73	1.74	2.17	2.04	1.67
APK	1.45	2.89	5.06	6.39	3.95
N----	1.20	1.64	2.79	2.31	1.99
NP---	2.02	2.71	3.89	3.54	3.04
N-K--	0.84	1.77	1.99	3.18	1.95
NPK--	1.84	4.18	5.51	6.98	4.63
N--S-	1.17	1.99	2.21	3.22	2.15
NP-S-	1.34	4.28	4.43	4.91	3.74
N-KS-	1.33	3.23	4.63	3.56	3.19
NPKS-	1.68	3.78	5.49	6.89	4.46
N---S	1.00	2.07	2.23	2.87	2.04
NP--S	1.84	4.23	4.07	4.47	3.65
N-K-S	1.28	2.51	2.52	3.13	2.36
NPK-S	1.38	4.06	5.74	6.14	4.33
N--SS	1.44	1.87	2.33	1.84	1.87
NP-SS	1.41	3.74	4.00	3.97	3.28
N-KSS	1.64	3.78	2.90	3.15	2.87
NPKSS	1.45	3.90	5.29	5.72	4.09
C(--)	1.49	3.35	3.75	4.30	3.22
C(P-)	1.16	3.44	4.57	5.19	3.59
C(-K)	1.92	2.49	4.49	5.20	3.52
C(PK)	1.74	3.41	5.26	6.52	4.23
D	5.33	6.62	7.19	7.11	6.56
(D)	1.82	3.01	2.80	3.62	2.81
(A)	1.24	2.12	3.14	4.53	2.76
-	0.68	1.95	1.47	2.50	1.65
Mean	1.47	2.98	3.66	4.15	3.06

GRAIN MEAN DM% 80.4

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88/R/HB/2

MAIN PLOTS

STRAW TONNES/HECTARE

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

N	0	48	96	144	Mean	
MANURE						
---	0.29	0.93	1.25	1.58	1.01	1.16
-P-	0.53	1.26	1.63	2.04	1.36	2.90
--K	0.44	1.66	1.12	2.23	1.36	2.22
-PK	0.32	1.65	2.96	3.21	2.04	4.16
A--	0.31	1.13	0.87	1.08	0.85	1.49
AP-	1.06	1.23	1.46	1.31	1.26	2.52
A-K	0.29	1.57	1.56	2.16	1.39	1.67
APK	0.68	1.19	2.32	3.61	1.95	3.95
D	2.37	3.70	4.93	4.92	3.98	6.56
(D)	0.85	1.57	2.18	2.33	1.73	2.81
(A)	0.59	1.13	1.61	2.36	1.42	2.76
-	0.36	1.13	1.69	2.16	1.34	1.65
Mean	0.67	1.51	1.97	2.42	1.64	
	1.48	2.75	3.25	3.80	2.82	

STRAW MEAN DM% 73.9

PLOT AREA HARVESTED 0.00154

EXTRA PLOTS

GRAIN TONNES/HECTARE

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

MANURE	551AN2PK	561--PK	571NN2--	581NN2--	Mean
MGNESIUM					
0	4.95	0.54	3.65	1.35	2.62
35	5.28	0.61	3.25	1.96	2.78
Mean	5.11	0.58	3.45	1.66	2.70

GRAIN MEAN DM% 79.1

PLOT AREA HARVESTED 0.00329

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88/R/WF/3

WHEAT AND FALLOW

Object: To study the effects of fallowing on unmanured w. wheat - Hoosfield.

The 133rd year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-87/R/WF/3.

Whole plot dimensions: 9.60 x 211.

Treatments:
Each year there are two plots, one is sown to w. wheat, one is fallow; they alternate in successive years.

Seed: Brimstone, dressed fonofos, sown at 180 kg.

Cultivations, etc.:-
Wheat plot: Rotary harrowed, seed sown: 6 Nov, 1987. Combine harvested: 6 Sept, 1988.
Fallow plot: Ploughed: 14 Dec, 1987. Heavy spring-tine cultivated: 29 Apr, 1988. Cultivated by rotary grubber: 16 May, 13 June.

GRAIN AND STRAW TONNES/HECTARE

	GRAIN	STRAW
YIELD	1.00	0.60
MEAN DM%	83.0	84.9

~~PLOT AREA HARVESTED 0.02321~~
AREA HARVESTED 0.04309

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88/R/EX/4

EXHAUSTION LAND

Object: To study the residual effects of manures applied 1876-1901, and of additional phosphate applied since 1986, on the yield of continuous s. barley - Hoosfield.

The 133rd year, s. barley.

For previous years see 'Details' 1967, 1973 and 74-87/R/EX/4.

Treatments: All combinations of:-

Whole plots

1. **OLD RES** — Residues of manures applied annually 1876-1901:

O	None
D	Farmyard manure at 35 tonnes
N	96 kg N as ammonium salts
P	34 kg P as superphosphate
NPKNAMG	N and P as above plus 137 kg K as sulphate of potash, 16 kg Na as sulphate of soda, 11 kg Mg as sulphate of magnesia

2. **P** — Phosphate applied annually from 1986 as superphosphate until 1987, triple superphosphate since:

O	None
P1	44 kg
P2	87 kg
P3	131 kg

plus all combinations of:-

1. **OLD RES** — Residues of manures applied annually 1876-1901:

O	None
D	Farmyard manure at 35 tonnes
N*	96 kg N as nitrate of soda
PK	34 kg P as superphosphate, 137 kg K as sulphate of potash
N*PK	N, P and K as above

2. **N88** — Nitrogen fertilizer (kg N) as 'Nitro-Chalk' until 1985, as 'Nitram' since 1986 (basal until 1975, on a cyclic system since 1976):

0
48
96
144

NOTE: All plots of the combination OLD RES, P were given N at 144 kg as 'Nitram' and K at 83 kg as muriate of potash.

https://doi.org/10.23637/ERADOC-1-43 *pp 21*

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88/R/EX/4

Basal applications: Weedkillers: Glyphosate at 1.4 kg in 200 l. Mecoprop at 2.4 kg with clopyralid at 0.05 kg and bromoxynil at 0.24 kg in 200 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l on two occasions.

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

Cultivations, etc.:- Glyphosate applied: 17 Nov, 1987. P and K applied: 11 Dec. Ploughed: 14 Dec. Heavy spring-tine cultivated twice: 22 Feb, 1988, 23 Feb. Rotary harrowed, seed sown: 7 Mar. N applied: 13 Apr. Remaining weedkillers applied: 11 May. Fungicides applied: 17 May, 17 June. Combine harvested: 15 Aug.

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	3.04	6.01	6.68	6.77	5.63
D	5.48	6.99	7.16	7.17	6.70
N	2.34	6.33	6.93	7.15	5.69
P	5.05	6.93	7.12	7.16	6.57
NPKNAMG	4.69	6.79	7.22	7.21	6.48
Mean	4.12	6.61	7.02	7.09	6.21

GRAIN MEAN DM% 84.2

STRAW TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	1.47	3.23	3.04	3.56	2.83
D	2.68	3.74	3.75	3.26	3.36
N	1.27	3.34	3.94	3.25	2.95
P	2.78	4.00	4.45	3.91	3.78
NPKNAMG	2.23	3.28	3.19	3.50	3.05
Mean	2.09	3.52	3.67	3.50	3.19

STRAW MEAN DM% 87.4

PLOT AREA HARVESTED 0.00728

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88/R/EX/4

NITROGEN PLOTS

GRAIN TONNES/HECTARE

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

N88 / OLD RES	0	48	96	144	Mean
O	1.06	1.41	2.03	1.71	1.55
D	2.09	3.71	4.83	4.96	3.90
N*	1.13	1.35	1.80	2.33	1.65
PK	1.48	2.95	4.30	4.55	3.32
N*PK	1.80	2.36	3.64	4.43	3.06
Mean	1.51	2.36	3.32	3.59	2.70

GRAIN MEAN DM% 81.8

NITROGEN PLOTS

STRAW TONNES/HECTARE

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

N88 / OLD RES	0	48	96	144	Mean
O	0.29	0.58	0.72	0.71	0.58
D	0.63	1.61	2.19	2.04	1.62
N*	0.36	0.56	0.72	1.07	0.68
PK	0.64	1.48	2.04	2.41	1.64
N*PK	0.65	0.85	1.35	2.07	1.23
Mean	0.52	1.02	1.40	1.66	1.15

STRAW MEAN DM% 88.0

PLOT AREA HARVESTED 0.00728

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88/R/PG/5

PARK GRASS

Object: To study the effects of organic and inorganic manures and lime on old grass (for hay).

The 133rd year, hay.

For previous years see 'Details' 1967 and 1973 and 74-87/R/PG/5.

Treatments: Combinations of:-

Whole plots

1. **MANURE** Fertilizers and organic manures:

N1	Plot 1	N1
O(D)	Plot 2	None (D until 1863)
O/PLOT3	Plot 3	None
P	Plot 4-1	P
N2P	Plot 4-2	N2 P
N1MIN	Plot 6	N1 P K Na Mg
MIN	Plot 7	P K Na Mg
PNAMG	Plot 8	P Na Mg
N2MIN	Plot 9	N2 P K Na Mg
N2PNAMG	Plot 10	N2 P Na Mg
N3MIN	Plot 11-1	N3 P K Na Mg
N3MINSI	Plot 11-2	N3 P K Na Mg Si
O/PLOT12	Plot 12	None
D/F	Plot 13	D/F
N2*MIN	Plot 14	N2* P K Na Mg
MIN(N2*)	Plot 15	P K Na Mg (N2* until 1875)
N1*MIN	Plot 16	N1* P K Na Mg
N1*	Plot 17	N1*
N2KNAMG	Plot 18	N2 K Na Mg
D	Plot 19	D
D/N*PK	Plot 20	D/N*P K

N1, N2, N3:	48, 96, 144 kg N as sulphate of ammonia
N1*, N2*:	48, 96 kg N as nitrate of soda (30 kg N to Plot 20, only in years with no farmyard manure)
P:	35 kg P (15 kg P to Plot 20, only in years with no farmyard manure) as single superphosphate (triple superphosphate in 1974, 1987 and 1988)
K:	225 kg K (45 kg K to Plot 20, only in years with no farmyard manure) as sulphate of potash
Na:	15 kg Na as sulphate of soda
Mg:	10 kg Mg as sulphate of magnesia
Si:	Silicate of soda at 450 kg
D:	Farmyard manure at 35 tonnes every fourth year
F:	Fish meal every fourth year to supply 63 kg N
MIN:	P K Na Mg

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88/R/PG/5

Sub plots

2. **LIME** Liming:

A	a Ground chalk applied as necessary to achieve pH7
B	b Ground chalk applied as necessary to achieve pH6
C	c Ground chalk applied as necessary to achieve pH5
D	d None

NOTE: Lime was applied regularly, and at the same rate, to all a and b sub plots of Plots 1 to 17 (except 12) from 1924. Differential liming started in 1965 on certain b and c sub plots (except on Plot 12) and in 1976 on certain a sub plots (including Plot 12) and 12b.

Additional sub plots (Plots 18, 19 and 20 only) (tonnes $CaCO_3$ applied every fourth year 1920-1964):

N2KNAMG0	18-1	None
N2KNAMG2	18-2	13.5
N2KNAMG1	18-3	7.9
DO	19-1	None
D2	19-2	6.3
D1	19-3	1.1
D/N*PK0	20-1	None
D/N*PK2	20-2	5.6
D/N*PK1	20-3	1.1

Since 1965 Plot 18-1 has been split into two for treatments 'c' and 'd' above and Plot 18-3 split into two for treatments 'a' and 'b'. The remaining sub plots of Plots 18, 19 and 20 are treated as 'a'.

NOTE: For a fuller record of treatments see ' Details' etc.

Cultivations, etc.:- P applied: 11 Jan, 1988. Remaining mineral fertilizers applied: 17 Feb. N applied: 25 Apr. Cut: 14 June, 17 Nov.

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88/R/PG/5

1ST CUT (14/6/88) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	3.54	2.54	1.99	1.47	2.38
O(D)	2.72	3.43	1.58	1.58	2.32
O/PLOT3	2.49	3.30	1.33	1.40	2.13
P	3.42	3.81	2.73	2.37	3.08
N2P	3.67	3.29	3.41	2.23	3.15
N1MIN	4.78	4.64			4.71
MIN	5.03	5.16	5.16	4.37	4.93
PNAMG	2.82	3.47	3.44	3.32	3.26
N2MIN	5.73	5.51	5.48	2.64	4.84
N2PNAMG	4.09	4.09	4.08	2.25	3.63
N3MIN	6.26	6.20	5.49	4.46	5.60
N3MINSI	6.07	5.87	5.90	4.71	5.64
O/PLOT12	2.33	1.93	1.37	1.38	1.75
D/F	4.72	4.70	4.79	4.41	4.66
N2*MIN	5.38	5.77	5.37	4.98	5.37
MIN(N2*)	5.01	4.97	3.75	3.46	4.30
N1*MIN	5.50	5.61	4.30	3.53	4.73
N1*	3.45	3.45	2.89	2.62	3.10
N2KNAMG0			2.16	2.72	2.44
N2KNAMG2	2.74				2.74
N2KNAMG1	1.93	2.27			2.10
D0	4.05				4.05
D2	3.94				3.94
D1	3.94				3.94
D/N*PK0	5.41				5.41
D/N*PK2	5.02				5.02
D/N*PK1	4.55				4.55

1ST CUT MEAN DM% 22.2

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88/R/PG/5

2ND CUT (17/11/88) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	2.32	1.85	1.49	0.64	1.57
O(D)	2.02	2.15	1.31	1.37	1.71
O/PLOT3	1.47	1.82	1.06	1.49	1.46
P	2.00	2.25	1.77	1.69	1.93
N2P	1.29	1.26	1.55	0.50	1.15
N1MIN	2.22	2.18			2.20
MIN	2.65	2.16	2.72	2.56	2.52
PNAMG	2.08	2.68	2.44	2.48	2.42
N2MIN	2.47	3.01	1.62	1.29	2.10
N2PNAMG	1.65	1.87	1.57	0.87	1.49
N3MIN	2.87	2.49	2.05	3.02	2.61
N3MINSI	2.62	2.31	2.05	2.94	2.48
O/PLOT12	1.39	1.46	1.86	1.64	1.59
D/F	3.60	5.42	2.47	2.41	3.47
N2*MIN	2.56	2.85	1.89	1.81	2.28
MIN(N2*)	2.37	2.23	2.40	2.19	2.30
N1*MIN	2.09	2.32	2.16	1.90	2.12
N1*	1.86	1.98	1.53	2.08	1.87
N2KNAMG0			1.09	1.04	1.07
N2KNAMG2	3.39				3.39
N2KNAMG1	2.82	2.85			2.84
D0	2.96				2.96
D2	3.44				3.44
D1	2.92				2.92
D/N*PK0	3.20				3.20
D/N*PK2	4.65				4.65
D/N*PK1	3.05				3.05

2ND CUT MEAN DM% 21.8

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88/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	5.86	4.39	3.48	2.11	3.96
O(D)	4.73	5.58	2.88	2.95	4.04
O/PLOT3	3.95	5.12	2.39	2.89	3.59
P	5.42	6.05	4.50	4.06	5.01
N2P	4.96	4.55	4.97	2.73	4.30
N1MIN	7.00	6.82			6.91
MIN	7.68	7.32	7.88	6.93	7.45
PNAMG	4.90	6.14	5.88	5.80	5.68
N2MIN	8.20	8.53	7.11	3.94	6.94
N2PNAMG	5.74	5.95	5.65	3.12	5.11
N3MIN	9.14	8.68	7.54	7.48	8.21
N3MINSI	8.70	8.19	7.95	7.65	8.12
O/PLOT12	3.71	3.38	3.23	3.02	3.34
D/F	8.32	10.13	7.26	6.82	8.13
N2*MIN	7.93	8.62	7.26	6.79	7.65
MIN(N2*)	7.38	7.20	6.15	5.65	6.59
N1*MIN	7.59	7.92	6.46	5.43	6.85
N1*	5.31	5.44	4.42	4.70	4.97
N2KNAMG0			3.25	3.76	3.51
N2KNAMG2	6.13				6.13
N2KNAMG1	4.76	5.13			4.94
D0	7.01				7.01
D2	7.38				7.38
D1	6.86				6.86
D/N*PK0	8.61				8.61
D/N*PK2	9.67				9.67
D/N*PK1	7.60				7.60

TOTAL OF 2 CUTS MEAN DM% 22.0

PLOT AREA HARVESTED 0.00002

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88/R/AG/6

AGDELL

Object: To study, the residual values of phosphate and potash applied in the period 1848-1951 and further dressings since 1964.

The 19th year of revised scheme, ley.

For previous years see 'Details' 1967 and 1973, and 74-87/R/AG/6.

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

Basal applications: Manures: 'Nitram' at 380 kg and later at 180 kg.

Cultivations, etc.:- First N applied: 18 Apr, 1988. Cut: 2 June.
Second N applied: 6 June. Cut: 21 Nov.

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88/R/BN/7

BARNFIELD

Object: The experiment was designed to study the effects of organic and inorganic manures on continuous root crops. It has been progressively modified to study effects on other crops.

Sections 1 and 2 the fifth year of grass/clover. The 14th year of grass on the rest of the experiment.

For previous years see 'Details' 1967 and 1973 and 74-87/R/BN/7.

Plot dimensions: 10.7 x 55.9.

Treatments to grass: All combinations of:-

Whole plots

1. **MANURE** Fertilizers and organic manures:

D	D
DPK	D P K
PKMG	P K (Na) Mg
P	P
PK	P K
PMG	P (Na) Mg
O	O

P: 35 kg P as single superphosphate until 1987, triple superphosphate since and in 1974
K: 225 kg K as sulphate of potash
(Na): 90 kg Na as sodium chloride until 1973
Mg: 90 kg Mg as kieserite every fourth year since 1974 (sulphate of magnesia until 1973)
D: Farmyard manure at 35 tonnes (until 1975).

Quarter plots

2. **N PERCUT** Nitrogen fertilizer in 1988 (kg N per cut) as 'Nitram' and residues of forms of N previously each supplying 96 kg N per annum:

75	75, previously nitrate of soda, section 3
100	100, previously sulphate of ammonia, section 4
125	125, previously sulphate of ammonia + castor meal, section 5
150	150, previously castor meal, section 6

Castor meal last applied 1961, nitrate of soda and sulphate of ammonia until 1959.

plus one plot **MANURE** KMG 100

Treatments to grass/clover, sections 1 and 2 (not given nitrogen fertilizer):

MANURE Fertilizers and organic manures as for grass above, excluding KMG.

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

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88/R/BN/7

NOTES: (1) P K and D treatments were applied to Sections 1 and 2 until 1980. None were applied subsequently until the resumption of P and K treatments, only, from 1985.
(2) Yields were not taken from section 2.

Cultivations, etc.:-
All sections: P applied: 12 Jan, 1988. K applied: 14 Jan. Cut: 24 May, 21 Nov.
Grass (Sections 3, 4, 5 and 6) only: N applied: 5 Apr, 1988, 26 May.

GRASS

1ST CUT (24/5/88) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	5.48	5.02	5.28	5.35	5.28
DPK	5.78	5.02	5.46	5.70	5.49
PKMG	5.50	5.21	5.03	5.25	5.25
P	4.54	2.80	2.83	3.20	3.34
PK	5.71	5.06	5.18	5.15	5.28
PMG	4.28	2.73	2.81	2.69	3.13
0	4.04	3.22	2.84	2.82	3.23
Mean	5.05	4.15	4.20	4.31	4.43

MANURE KMG 100 5.20

Grand mean 4.45

1ST CUT MEAN DM% 21.2

2ND CUT (21/11/88) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	5.30	6.59	6.45	6.73	6.27
DPK	4.73	5.97	6.44	5.94	5.77
PKMG	3.56	4.90	5.19	5.18	4.71
P	2.32	1.52	1.83	2.02	1.92
PK	2.90	5.31	5.02	5.05	4.57
PMG	2.00	1.58	1.23	1.77	1.65
0	2.26	1.34	1.26	1.86	1.68
Mean	3.29	3.89	3.92	4.08	3.79

MANURE KMG 100 4.18

Grand mean 3.81

2ND CUT MEAN DM% 22.3

https://doi.org/10.23637/ERADOC-1-43 *pp 31*

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88/R/BN/7

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

N PERCUT MANURE	75	100	125	150	Mean
D	10.77	11.62	11.73	12.08	11.55
DPK	10.51	10.99	11.89	11.64	11.26
PKMG	9.06	10.11	10.22	10.44	9.96
P	6.86	4.32	4.66	5.22	5.26
PK	8.61	10.36	10.20	10.20	9.84
PMG	6.28	4.32	4.04	4.46	4.78
0	6.30	4.56	4.10	4.68	4.91
Mean	8.34	8.04	8.12	8.39	8.22

MANURE KMG 100 9.39

Grand mean 8.26

TOTAL OF 2 CUTS MEAN DM% 21.8

PLOT AREA HARVESTED 0.00568

GRASS/CLOVER

1ST CUT (24/5/88) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	3.09	3.29	2.67	1.78	2.48	1.80	1.20	2.33

1ST CUT MEAN DM% 21.1

2ND CUT (21/11/88) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	4.47	3.70	2.58	2.48	2.26	2.12	1.43	2.72

2ND CUT MEAN DM% 22.3

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	7.56	6.99	5.25	4.26	4.74	3.92	2.63	5.05

TOTAL OF 2 CUTS MEAN DM% 21.7

PLOT AREA HARVESTED 0.00568

https://doi.org/10.23637/ERADOC-1-43 *pp 32*

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88/R/GC/8

GARDEN CLOVER

Object: To study yields and pathogens of red clover grown continuously - Manor Garden.

Sponsor: J. McEwen.

The 135th year, red clover.

For previous years see 'Details' 1967 and 1973, and 74-87/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.02 x 1.42.

Treatments:

FUNGCIDE	Fungicide, to control Sclerotinia trifoliorum:
NONE	None
BENOMYL	Benomyl at 0.6 kg in 800 l on 30 Sept, 1987, 26 Oct, 27 Nov, 22 Dec and 5 Feb, 1988

Basal applications: Manures: Chalk at 1.25 t. (0:18:36) at 420 kg. Mg at 50 kg, as Epsom Salts. Nematicide: Aldicarb at 10 kg.

NOTE: Additional K was applied to replace that removed by the crop in 1987. **FUNGCIDE** NONE required 316 and 252 kg K2O to the first and second blocks respectively, **FUNGCIDE** BENOMYL 284 and 273 kg K2O. This was applied as muriate of potash, one third in spring 1988 and one third after the first and second cuts.

Seed: Hungaropoly, sown at 34 kg in 1987.

Cultivations, etc.:- PK and Mg applied: 28 Sept, 1987. Chalk applied: 30 Oct. K applied: 18 Feb, 1988. Aldicarb applied: 21 Apr. Cut and K applied: 1 June, 7 July. Cut: 18 Aug, 29 Sept.

https://doi.org/10.23637/ERADOC-1-43 *pp 33*

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88/R/GC/8

1ST CUT (1/6/88) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	7.31	7.27	7.29

1ST CUT MEAN DM% 13.8

2ND CUT (7/7/88) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	3.62	3.28	3.45

2ND CUT MEAN DM% 13.2

3RD CUT (18/8/88) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	2.99	2.88	2.93

3RD CUT MEAN DM% 15.9

4TH CUT (29/9/88) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	1.33	1.31	1.32

4TH CUT MEAN DM% 15.1

TOTAL OF 4 CUTS DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	15.25	14.74	14.99

TOTAL OF 4 CUTS MEAN DM% 14.5

PLOT AREA HARVESTED 0.00010

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88/R/RN/1 and 88/R/RN/2

LEY ARABLE

Object: To study the effects of three-year leys on the fertility of the soil as measured by a sequence of three arable test crops - Highfield and Fosters.

Sponsor: A.E. Johnston.

The 40th year, old grass, leys, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-87/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (88/R/RN/1)

FOSTERS — A site with little organic matter initially (88/R/RN/2)

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

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

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

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

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

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

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

C	Clover-grass ley
N	All-grass ley

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

https://doi.org/10.23637/ERADOC-1-43 *pp 35*

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88/R/RN/1 and 88/R/RN/2

Additional treatments to 1st test crop w. wheat:-

Sub plots

FYMRES70 Farmyard manure residues, last applied 1970:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertilizer in 1988 (kg N) as 'Nitram':

0
50
100
150

NOTE: Because of an error nitrogen treatments were not fully factorial with **FYMRES70** on Highfield.

Standard applications:

1st Treatment crops:

All crops: Weedkiller: Paraquat at 0.60 kg ion in 200 l.
Lucerne: Manures: (0:24:24) at 310 kg.
All-grass ley and 1-year hay: Manures: (0:18:36) at 420 kg. 'Nitram' at 220 kg. (25:0:16) at 300 kg.
Clover-grass ley: Manures: (0:18:36) at 420 kg.

1st Test crop:

W. wheat: Manures: (0:24:24), combine drilled at 210 kg. Weedkillers: Glyphosate at 1.4 kg in 500 l (to ex-lucerne, grass-ley and clover/grass ley plots only). Chlortoluron at 3.5 kg in 200 l. Fluroxypyr at 0.20 kg with isoproturon at 2.1 kg in 200 l.
Reseeded grass and old grass: Manures: (0:18:36) at 420 kg. All-grass half plots (25:0:16) at 300 kg in spring and after each cut except the last.

Seed: Lucerne: Vertus, sown at 31 kg.
All-grass ley: Meadow Fescue (17 kg) and Timothy Climax (17 kg), mixture sown at 34 kg.
Clover-grass ley: Meadow Fescue (4 kg), Timothy Climax (4 kg) and white clover (1 kg), mixture sown at 37 kg.
1-year hay: Londras Westerwolths Ryegrass, sown at 25 kg.
W. wheat: Avalon, sown at 180 kg.

https://doi.org/10.23637/ERADOC-1-43 *pp 36*

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88/R/RN/1 and 88/R/RN/2

Cultivations, etc.:-

1st Treatment crops:

All crops: Ploughed: 28 Sept, 1987. Paraquat applied: 11 Apr, 1988. Heavy spring-tine cultivated: 22 Apr.

Lucerne: PK applied: 11 May, 1988. Rotary harrowed, rolled, seed broadcast and harrowed in: 13 May. Cut: 18 Nov.

All-grass ley, clover-grass ley and 1-year hay: PK applied, N applied (except to clover-grass ley) and 1-year hay plots rotary harrowed and rolled: 11 May, 1988. All-grass ley and clover-grass ley plots rotary harrowed and rolled, all seed broadcast and harrowed in: 13 May. Cut: 18 July. NK applied (except to clover-grass ley): 21 July. Cut: 18 Nov.

1st Test crop wheat: Glyphosate applied (to ex-lucerne, grass-ley and clover/grass-ley plots): 19 Aug, 1987. Ploughed: 28 Sept. Rotary harrowed, PK applied, seed sown: 5 Oct. Chlortoluron applied: 6 Nov. N applied: 13 Apr, 1988. Fluroxypyr and isoproturon applied: 26 Apr. Combine harvested: 22 Aug.

Reseeded grass and old grass: PK applied: 12 Jan, 1988. NK applied to all-grass half plots: 5 Apr, 27 May, 21 July. Cut: 25 May, 18 July, 18 Nov.

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88/R/RN/1 AND 88/R/RN/2

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 2 CUTS	3.48	3.15
MEAN DM%	16.4	16.6
ALL-GRASS LEY		
TOTAL OF 2 CUTS	6.31	5.59
MEAN DM%	15.6	16.2
LUCERNE		
1 CUT ONLY	0.69	1.79
MEAN DM%	29.7	28.0
HAY		
TOTAL OF 2 CUTS	5.31	5.58
MEAN DM%	21.6	25.3

OLD GRASS	**HIGHFIELD**	
TOTAL OF 3 CUTS 40TH EXPTL YEAR	C	N
BLOCKS 1 & 4	5.54	10.02
BLOCK 2	5.41	10.68
MEAN DM%	19.2	18.6

RESEEDED GRASS

TOTAL OF 3 CUTS

		HIGHFIELD			FOSTERS	
	BLOCKS	C	N	BLOCKS	C	N
40TH EXPTL YEAR	1 & 4	5.48	10.69	1 & 3	6.57	11.16
40TH EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	5.04	12.02	2 & 4	6.45	10.15
MEAN DM%		18.5	18.9		18.9	21.0

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88/R/RN/1 HIGHFIELD W.WHEAT (1ST TEST CROP)

GRAIN TONNES/HECTARE

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

	N	0	50	100	150
ROTATION	**FYMRES70**				
LUCERNE	NONE	7.20	7.63	8.00	6.63
	FYM	5.58	7.69	6.33	7.62
CLOGRA	NONE	4.81	7.68	6.38	6.45
	FYM	6.38	7.43	6.62	7.78
GRASS	NONE	4.28	5.97	5.63	6.03
	FYM	4.39	5.13	6.14	5.71
ARABLE	NONE	3.79	*	6.39	6.17
	FYM	*	5.62	6.58	5.88

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00663

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88/R/RN/2 FOSTERS W.WHEAT (1ST TEST CROP)

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	Mean
ROTATION			
LUCERNE	9.02	8.52	8.77
CLOGRA	8.01	8.26	8.13
GRASS	6.30	6.41	6.35
ARABLE	6.26	6.09	6.18
Mean	7.40	7.32	7.36

N	0	50	100	150	Mean
ROTATION					
LUCERNE	8.19	8.94	9.19	8.77	8.77
CLOGRA	6.73	8.29	9.14	8.38	8.13
GRASS	4.77	6.37	7.01	7.26	6.35
ARABLE	3.55	6.21	7.35	7.59	6.18
Mean	5.81	7.45	8.17	8.00	7.36

N	0	50	100	150	Mean
FYMRES70					
NONE	5.93	7.45	8.15	8.06	7.40
FYM	5.69	7.46	8.19	7.94	7.32
Mean	5.81	7.45	8.17	8.00	7.36

N		0	50	100	150
ROTATION	FYMRES70				
LUCERNE	NONE	9.16	8.88	9.23	8.81
	FYM	7.23	9.01	9.14	8.73
CLOGRA	NONE	6.51	8.37	9.06	8.11
	FYM	6.95	8.22	9.22	8.65
GRASS	NONE	4.18	6.68	6.64	7.69
	FYM	5.36	6.06	7.37	6.83
ARABLE	NONE	3.86	5.85	7.68	7.62
	FYM	3.23	6.57	7.02	7.56

GRAIN MEAN DM% 82.4

PLOT AREA HARVESTED 0.00663

https://doi.org/10.23637/ERADOC-1-43 *pp 40*

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88/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 51st year, leys, w. beans, w. wheat, s. barley.

For previous years see 'Details' 1967 & 1973 and 74-87/W/RN/3.

Design: 5 series of 8 plots, split for treatments other than rotations.

Whole plot dimensions: 8.53 x 40.7.

Treatments: All phases of four five-course rotations were originally present:

ROTATION

LEY	Clover/grass ley:	L, L, L, P, W
CLO	All legume ley:	SA, SA, SA, P, W until 1971 then CL, CL, CL, P, W
A	Arable with roots:	P, R, C, P, W until 1971 then P, B, B, P, W
A H	Arable with hay:	P, R, H, P, W until 1971 then P, B, H, P, W

P = potatoes, R = w. rye, C = carrots, W = w. wheat, B = s. barley, H = hay, L = clover/grass ley, SA = sainfoin ley, CL = red clover ley

Rotations themselves followed different cycles:

On four plots in each block the rotations were repeated

On four plots in each block arable rotations alternated each five years with ley rotations

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

LN 3	(Previous LEY) LN, LN, LN, W, B
LC 3	(Previous CLO) LC, LC, LC, W, B
AF	(Previous A) F, F, BE, W, B
AB	(Previous A H) B, B, BE, W, B

LN1 to LN3 = three year grass ley with N, 1st year to 3rd year, LC = clover/grass ley no N, BE = beans (s. oats until 1980), F = fallow

https://doi.org/10.23637/ERADOC-1-43 *pp 41*

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88/W/RN/3

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

LLN	LN, LN, LN, LN, LN, LN, LN, LN, W, B
LLC	LC, LC, LC, LC, LC, LC, LC, LC, W, B

LLN1 to LLN8 = eight year grass ley with N, first year to eighth year, similarly for LLC

The new scheme started by sowing these new leys in spring 1976 on four phases and in spring 1977 on the fifth phase (2nd test crop in 1976).

Yields are taken only from the leys and the test crops.

Treatments to first test crop w. wheat, all combinations of:

Whole plots

1. **ROTATION** Rotations:

   LN 8
   LN 3
   LC 8
   LC 3
   AF
   AB

1/2 plots

2. **FYMRES62** Farmyard manure residues, last applied 1962:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

3. **N** Nitrogen fertilizer (kg N) as 'Nitro-Chalk':

   0
   70
   140
   210

Treatments to second test crop s. barley, all combinations of:

Whole plots

1. **ROTATION** Rotations:

   LN 8
   LN 3
   LC 8
   LC 3
   AF
   AB

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88/W/RN/3

1/2 plots

2. **FYMRES66** Farmyard manure residues, last applied 1966:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

3. **N** Nitrogen fertilizer (kg N) as 'Nitro-Chalk':

0
60
120
180

Treatments to leys:

FYM RES Farmyard manure residues:

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

Corrective K dressings (kg K2O) as muriate of potash, applied to first test crop w. wheat and long-term leys in the wheat block:

Continuous rotations	No FYM half plots	FYM half plots
LN	0	0
LC	0	0
AF	155	120
AB	265	275
Ex-alternating rotations		
LN 8 ploughed for w. wheat	0	0
LN 8 not ploughed	0	0
LC 8 ploughed for w. wheat	0	0
LC 8 not ploughed	95	40

Standard applications:-

Grass ley and clover/grass ley, 1st year: Manures: (0:18:36) at 420 kg. N at 76 kg to grass ley and 50 kg to clover/grass as 'Nitram'. Weedkiller: Glyphosate at 1.4 kg in 200 l.

Grass ley; 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: (0:18:36) at 560 kg. (25:0:16) at 300 kg in spring and after each cut except the last.

Clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: (0:18:36) at 560 kg. K2O at 40 kg as muriate of potash in spring and after each cut except the last.

S. barley, 1st and 2nd treatment crops: Manures: (20:10:10) at 400 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l, to 1st treatment crop only. Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 1.8 kg in 220 l. Fungicide: Tridemorph at 0.52 kg in 220 l.

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

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88/W/RN/3

Standard applications:-

W. beans, 3rd treatment crop: Weedkillers: Propyzamide at 0.85 kg in 200 l. Simazine at 0.85 kg in 200 l. Fungicide: Chlorothalonil at 1.5 kg in 220 l. Insecticide: Deltamethrin at 0.075 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 400 l.

Fallow, 1st treatment year only: Weedkiller: Glyphosate at 1.4 kg in 200 l.

W. wheat, 1st test crop: Manures: (0:24:24) at 260 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Isoproturon at 2.1 kg with mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 220 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 220 l. Insecticide: Carbofuran at 7.5 kg.

S. barley, 2nd test crop: Manures: (0:24:24) at 260 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Clopyralid at 0.07 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 220 l. Fungicide: Tridemorph at 0.52 kg in 220 l. Insecticide: Carbofuran at 7.5 kg.

Seed: Grass ley: Climax timothy at 19 kg and meadow fescue at 19 kg, mixture sown at 39 kg.

Clover/grass ley: Climax timothy at 19 kg, meadow fescue at 16 kg and Huia white clover at 4.7 kg, mixture sown at 39 kg.

S. barley: Klaxon, sown at 150 kg.

W. beans: Bourdon, dressed thiram and thiabendazole, sown at 250 kg.

W. wheat: Mercia, sown at 190 kg.

Cultivations, etc.:-

Treatment crops:

Grass ley and clover/grass ley, 1st year: Glyphosate applied: 22 Sept, 1987. Ploughed: 23 Feb, 1988. Rolled: 1 Mar. Manures applied: 25 Apr. Spring-tine cultivated, grass ley only: 18 May. Spike harrowed with crumbler attached, seed sown, rolled: 24 May. Topped: 19 July. Cut: 13 Sept.

Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Corrective K applied to 4th year only: 13 Nov, 1987. (0:18:36) applied: 10 Feb, 1988. Topped and produce removed: 17 Feb. Chain harrowed: 8 Mar. N K applied to grass ley, K applied to grass/clover ley: 18 Mar and 30 June. Cut: 16 June and 13 Sept.

S. barley, 1st and 2nd treatment crops: Glyphosate applied to 1st year only: 22 Sept, 1987. Ploughed: 23 Feb, 1988. Rolled: 1 Mar. NPK applied, rotary harrowed with crumbler attached, seed sown: 2 Mar. Clopyralid, bromoxynil and mecoprop applied: 20 May. Fungicide applied: 27 May. Combine harvested: 18 Aug.

W. beans, 3rd treatment crop: Seed broadcast, ploughed: 25 Nov, 1987. Propyzamide applied: 10 Dec. Simazine applied: 15 Dec. Insecticide applied: 5 May, 1988. Fungicide applied: 15 June. Desiccant applied: 6 Sept. Combine harvested: 10 Sept.

Fallow, 1st and 2nd treatment years: Glyphosate applied to 1st year only: 22 Sept, 1987. Ploughed: 23 Feb, 1988. Rolled: 1 Mar. Spring-tine cultivated: 18 May and 20 July.

Test crops:

W. wheat, 1st test crop: Glyphosate applied: 22 Sept, 1987. Ploughed: 5 Oct. PK applied: 22 Oct. Insecticide applied, rotary harrowed with crumbler attached, seed sown, harrowed: 23 Oct. Corrective K applied: 13 Nov. Isoproturon, mecoprop, ioxynil and bromoxynil applied, N treatments applied: 27 Apr, 1988. Fungicides applied: 22 June. Combine harvested: 26 Aug.

https://doi.org/10.23637/ERADOC-1-43 *pp 44*

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88/W/RN/3

Cultivations, etc.:-
Test crops:
S. barley, 2nd test crop: Glyphosate applied: 22 Sept, 1987. Ploughed: 23 Feb, 1988. Rolled: 1 Mar. Insecticide applied, PK applied, spike harrowed with crumbler attached, seed sown: 2 Mar. N treatments applied: 7 Mar. Clopyralid, bromoxynil and mecoprop applied: 6 May. Fungicide applied: 27 May. Combine harvested: 18 Aug.

LEYS

1ST CUTTING OCCASION (16/6/88) DRY MATTER TONNES/HECTARE

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

FYM RES / LEY	NONE	FYM	Mean
LC1	*	*	*
LC2	5.31	6.50	5.91
LC3	6.13	5.43	5.78
LN1	*	*	*
LN2	7.61	7.60	7.60
LN3	7.12	6.48	6.80
LLC1	*	*	*
LLC2	6.05	6.65	6.35
LLC3	6.46	5.74	6.10
LLC4	6.78	5.54	6.16
LLC5	6.74	7.55	7.14
LLC6	6.97	7.03	7.00
LLC7	6.62	5.12	5.87
LLC8	6.32	5.61	5.97
LLN1	*	*	*
LLN2	7.42	7.14	7.28
LLN3	7.17	6.74	6.96
LLN4	5.63	5.42	5.53
LLN5	6.90	6.93	6.92
LLN6	7.85	7.15	7.50
LLN7	8.00	8.78	8.39
LLN8	7.60	7.82	7.71
Mean	6.82	6.63	6.72

1ST CUT MEAN DM% 22.3

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88/W/RN/3

LEYS

2ND CUTTING OCCASION (13/9/88) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	2.42	2.05	2.23
LC2	3.19	3.25	3.22
LC3	3.09	3.72	3.40
LN1	3.00	3.41	3.20
LN2	3.18	3.11	3.14
LN3	3.82	4.23	4.02
LLC1	4.29	4.22	4.26
LLC2	3.13	3.52	3.33
LLC3	2.84	3.13	2.99
LLC4	6.45	4.63	5.54
LLC5	3.40	4.20	3.80
LLC6	2.88	4.22	3.55
LLC7	1.71	2.26	1.98
LLC8	3.36	3.84	3.60
LLN1	4.61	4.67	4.64
LLN2	3.42	3.63	3.53
LLN3	3.47	4.18	3.82
LLN4	2.86	3.03	2.95
LLN5	3.31	3.43	3.37
LLN6	5.60	4.75	5.17
LLN7	4.08	4.54	4.31
LLN8	4.59	4.51	4.55
Mean	3.58	3.75	3.66

2ND CUT MEAN DM% 27.8

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88/W/RN/3

LEYS

TOTAL OF 2 CUTTING OCCASIONS DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	2.42	2.05	2.23
LC2	8.50	9.75	9.13
LC3	9.22	9.16	9.19
LN1	3.00	3.41	3.20
LN2	10.78	10.71	10.75
LN3	10.94	10.71	10.83
LLC1	4.29	4.22	4.26
LLC2	9.18	10.18	9.68
LLC3	9.30	8.87	9.08
LLC4	13.23	10.17	11.70
LLC5	10.13	11.75	10.94
LLC6	9.85	11.26	10.55
LLC7	8.33	7.38	7.85
LLC8	9.68	9.45	9.56
LLN1	4.61	4.67	4.64
LLN2	10.85	10.77	10.81
LLN3	10.64	10.92	10.78
LLN4	8.49	8.45	8.47
LLN5	10.21	10.37	10.29
LLN6	13.45	11.91	12.68
LLN7	12.08	13.32	12.70
LLN8	12.19	12.33	12.26
Mean	9.15	9.17	9.16

TOTAL OF 2 CUTTING OCCASIONS MEAN DM% 24.9

PLOT AREA HARVESTED 0.00200

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88/W/RN/3

WINTER WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES62	NONE	FYM	Mean
ROTATION			
LN 8	6.29	6.59	6.44
LN 3	5.75	6.26	6.01
LC 8	7.25	6.31	6.78
LC 3	6.82	7.24	7.03
AF	5.84	5.62	5.73
AB	5.20	5.92	5.56
Mean	6.19	6.32	6.26

N	0	70	140	210	Mean
ROTATION					
LN 8	4.34	6.73	7.46	7.23	6.44
LN 3	4.01	6.77	7.12	6.14	6.01
LC 8	5.26	7.87	6.94	7.06	6.78
LC 3	5.68	7.39	7.54	7.51	7.03
AF	3.09	6.60	6.63	6.61	5.73
AB	2.98	6.28	6.77	6.20	5.56
Mean	4.23	6.94	7.07	6.79	6.26

N	0	70	140	210	Mean
FYMRES62					
NONE	4.29	6.90	7.01	6.55	6.19
FYM	4.16	6.98	7.13	7.03	6.32
Mean	4.23	6.94	7.07	6.79	6.26

N		0	70	140	210
ROTATION	FYMRES62				
LN 8	NONE	4.13	6.52	7.49	7.02
	FYM	4.55	6.93	7.42	7.44
LN 3	NONE	3.94	6.14	6.89	6.05
	FYM	4.08	7.40	7.34	6.22
LC 8	NONE	6.04	8.57	6.99	7.41
	FYM	4.48	7.17	6.88	6.72
LC 3	NONE	5.41	7.27	7.42	7.19
	FYM	5.96	7.52	7.65	7.84
AF	NONE	3.39	6.93	6.70	6.32
	FYM	2.79	6.27	6.55	6.89
AB	NONE	2.84	6.01	6.59	5.35
	FYM	3.12	6.56	6.95	7.05

GRAIN MEAN DM% 82.6

PLOT AREA HARVESTED 0.00251

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88/W/RN/3

SPRING BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES66	NONE	FYM	Mean
ROTATION			
LN 8	4.86	4.37	4.61
LN 3	4.52	4.28	4.40
LC 8	4.44	4.26	4.35
LC 3	4.41	4.33	4.37
AF	3.49	4.01	3.75
AB	3.60	4.04	3.82
Mean	4.22	4.21	4.22

N	0	60	120	180	Mean
ROTATION					
LN 8	3.93	4.90	5.00	4.63	4.61
LN 3	3.91	4.65	4.54	4.50	4.40
LC 8	3.92	4.70	4.33	4.45	4.35
LC 3	3.78	4.59	4.92	4.19	4.37
AF	2.01	3.64	4.70	4.64	3.75
AB	2.30	4.11	4.43	4.44	3.82
Mean	3.31	4.43	4.65	4.47	4.22

N	0	60	120	180	Mean
FYMRES66					
NONE	3.27	4.41	4.59	4.61	4.22
FYM	3.35	4.45	4.71	4.34	4.21
Mean	3.31	4.43	4.65	4.47	4.22

N		0	60	120	180
ROTATION	FYMRES66				
LN 8	NONE	4.13	4.59	5.37	5.36
	FYM	3.73	5.21	4.62	3.91
LN 3	NONE	4.06	4.79	4.56	4.66
	FYM	3.76	4.52	4.51	4.33
LC 8	NONE	3.69	5.20	4.61	4.26
	FYM	4.16	4.21	4.04	4.64
LC 3	NONE	3.69	4.83	4.85	4.28
	FYM	3.88	4.34	4.99	4.10
AF	NONE	1.76	3.32	4.07	4.81
	FYM	2.27	3.96	5.33	4.47
AB	NONE	2.30	3.75	4.10	4.26
	FYM	2.30	4.47	4.77	4.61

GRAIN MEAN DM% 84.1

PLOT AREA HARVESTED 0.00251

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88/W/RN/4

MARKET GARDEN

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

Sponsor: S.P. McGrath.

The 47th year, clover.

For previous years see 'Details' 1967 & 1973, 74-80/W/RN/4 and 83-87/W/RN/4.

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

Whole plot dimensions: 8.15 x 5.18.

Treatments:

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

Whole plots

1.	**OM RESID**	Residues of organic manures:
	FYM	Farmyard manure until 1967
	SEWAGE	Sewage sludge until 1961
	SEW COM	Sewage sludge, composted with straw, until 1961
	VEG COM	Vegetable compost until 1962, then farmyard manure until 1967
2.	**OM RATE**	Rates of organic manures (t per crop):
	25	
	50	
	EXTRA	plus one extra treatment (duplicated):
	NONE	No organic manures

Sub plots

3.	**N RESID**	Nitrogen (kg N) per cut in previous years:
	0	
	100	

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88/W/RN/4

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

Whole plots

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

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

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

25
50

EXTRA plus one extra treatment (duplicated):

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

Sub plots

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

0
100

NOTE: The crop failed to establish from the spring sowing and was therefore resown in July.

Basal applications:
Series A and B: Manures: K2O at 156 kg as muriate of potash. Weedkillers: Glyphosate at 1.0 kg in 220 l. Benazolin, 2,4-DB and MCPA (as 'Legumex Extra' at 7.0 l) in 220 l.

Seed: Blanca at 17 kg, resown at 22 kg.

Cultivations, etc.:- Ploughed: 11 Feb, 1988. Heavy spring-tine cultivated: 6 Apr. Basal K applied: 25 Apr. Rotary cultivated with crumbler attached, seed sown: 26 Apr. Glyphosate applied: 22 June. Ploughed: 7 July. Spike harrowed with crumbler attached, rolled, spike harrowed with crumbler attached, seed sown, rolled: 15 July. Benazolin, 2,4-DB and MCPA applied: 16 Aug. Cut: 7 Dec.

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88/W/RN/4 WHITE CLOVER SERIES A

1ST AND ONLY CUT (7/12/88) DRY MATTER TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	0.74	0.60	0.44	0.85	0.66
50	0.58	0.37	0.41	0.59	0.49
Mean	0.66	0.49	0.43	0.72	0.57

N RESID / OM RATE	0	100	Mean
25	0.50	0.82	0.66
50	0.34	0.64	0.49
Mean	0.42	0.73	0.57

N RESID / OM RESID	0	100	Mean
FYM	0.45	0.86	0.66
SEWAGE	0.36	0.61	0.49
SEW COM	0.36	0.49	0.43
VEG COM	0.50	0.95	0.72
Mean	0.42	0.73	0.57

OM RATE	N RESID / OM RESID	0	100
25	FYM	0.44	1.03
	SEWAGE	0.55	0.65
	SEW COM	0.40	0.49
	VEG COM	0.60	1.11
50	FYM	0.47	0.69
	SEWAGE	0.18	0.56
	SEW COM	0.33	0.50
	VEG COM	0.39	0.79

NONE	N RESID	0	100	Mean
		0.48	0.92	0.70

Grand mean 0.60

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

OM RESID	OM RATE	N RESID	OM RESID OM RATE
0.125	0.088	0.070	0.176

OM RESID N RESID	OM RATE N RESID	OM RESID OM RATE N RESID	NONENRES
0.159	0.112	0.225	0.140

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

OM RESID	0.140		
OM RATE		0.099	
OM RESID.OM RATE			0.197

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88/W/RN/4 WHITE CLOVER SERIES A

1ST AND ONLY CUT (7/12/88) DRY MATTER TONNES /HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.249	41.6
BLOCK.WP.SP	31	0.279	46.6

1ST CUT MEAN DM% 18.1

PLOT AREA HARVESTED 0.00052

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88/W/RN/4 WHITE CLOVER SERIES B

1ST AND ONLY CUT (7/12/88) DRY MATTER TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	1.02	1.21	0.79	0.93	0.99
50	1.73	0.58	0.74	0.70	0.94
Mean	1.38	0.89	0.76	0.81	0.96

N RESID / OM RATE	0	100	Mean
25	0.83	1.14	0.99
50	0.97	0.91	0.94
Mean	0.90	1.02	0.96

N RESID / OM RESID	0	100	Mean
FYM	1.43	1.32	1.38
SEWAGE	0.92	0.87	0.89
SEW COM	0.67	0.86	0.76
VEG COM	0.59	1.04	0.81
Mean	0.90	1.02	0.96

OM RATE	N RESID / OM RESID	0	100
25	FYM	0.75	1.29
	SEWAGE	1.31	1.10
	SEW COM	0.57	1.00
	VEG COM	0.69	1.17
50	FYM	2.11	1.35
	SEWAGE	0.52	0.64
	SEW COM	0.77	0.71
	VEG COM	0.48	0.92

PEAT	N RESID	0	100	Mean
		0.53	0.90	0.72

Grand mean 0.91

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

OM RESID	OM RATE	N RESID	OM RESID OM RATE
0.283	0.200	0.168	0.401

OM RESID N RESID	OM RATE N RESID	OM RESID OM RATE N RESID	PEATNRES
0.370	0.262	0.523	0.337

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

OM RESID	0.337
OM RATE	0.238
OM RESID.OM RATE	0.476

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88/W/RN/4 WHITE CLOVER SERIES B

1ST AND ONLY CUT (7/12/88) DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.566	62.0
BLOCK.WP.SP	31	0.673	73.7

1ST CUT MEAN DM% 26.6

PLOT AREA HARVESTED 0.00052

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88/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: A. Penny.

The 33rd year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980; w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 29th 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 32nd 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 69-87/R/RN/5.

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

Whole plot dimensions: 2.13 x 2.44.

Treatments: Fertilizers and farmyard manure:

MANURE

Original plots

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

N1, 2 (kg N): 20, 40 (ley): 100, 200 (w. wheat, w. barley and w. oats): 125, 250 (potatoes, and permanent grass) as 'Nitro-Chalk' (26% N)
P: 63 kg P_2O_5 as superphosphate
K: 250 kg K_2O as muriate of potash
D: 38 tonnes FYM (permanent grass): 100 tonnes (to potatoes only - 50 tonnes to potatoes and kale until 1980): none to other crops

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

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88/R/RN/5

Additional plots

MANURE	Fertilizers from 1980 to 1988 and in previous years:
1980-88	Until 1979
O	O
N2PK	N2 PK
N2PKMG	N2 PK MG CA
N2PKS	N2 PK CA S
N2PKMGS	N2 PK MG S
N1PKMGS	N2 PK CA MG S
N3PKMGS	N2 PK CA MG S TE

N: In 1988: N1: 20 kg (ley), 120 kg (w. wheat, w. barley and w. oats), 160 kg (potatoes). N2: 30 kg (ley), 160 kg (w. wheat, w. barley and w. oats), 240 kg (potatoes). N3: 40 kg (ley), 200 kg (w. wheat, w. barley and w. oats), 320 kg (potatoes). Until 1979 N2 = larger rate on original plots in these years. As urea in all years. Cereals receive 40 kg N in March, remainder in April.

P: 126 kg P_2O_5 as potassium dihydrogen phosphate.

K: 251 kg K_2O total. As potassium dihydrogen phosphate (83 kg K_2O) on all PK plots. In addition plots without S receive 168 kg K_2O as potassium chloride, plots with S receive 92 kg K_2O as potassium sulphate plus 76 kg K_2O as potassium chloride. Since 1978 all PK plots receive, in addition to the standard total, 126 kg K_2O for potatoes, applied in autumn as potassium chloride.

MG: 126 kg MgO as magnesium chloride.

CA: 126 kg CaO as calcium carbonate until 1979. In 1980 plots not previously given Ca received calcium carbonate at 7.5 t, except O which was given 5.0 t.

S: 30 kg S supplied by the potassium sulphate.

TE: Trace element mixture which included Mn, Cu, Zn, B, Mo, Ca and Fe.

Standard applications:

Original and additional plots:

All cereals: Weedkillers: Mecoprop at 0.72 kg, bromoxynil at 0.16 kg and ioxynil at 0.16 kg with dicamba at 0.025 kg, mecoprop at 0.11 kg and MCPA at 0.33 kg in 220 l. Fungicides: Prochloraz at 0.56 kg and carbendazim at 0.21 kg in 220 l. Tridemorph at 0.53 kg in 220 l. Propiconazole at 0.14 kg in 220 l. Chlorothalonil at 1.1 kg in 220 l on two occasions. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.37 kg in 220 l, (and on a second occasion to wheat only). Insecticide: Pirimicarb at 0.14 kg in 220 l. Growth regulators: Chlormequat at 1.6 kg in 220 l, (to wheat & oats). Mepiquat chloride at 0.86 kg and 2-chloroethylphosphonic acid at 0.44 kg in 220 l, (to barley).

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

Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 220 l. Fungicide: Mancozeb at 1.3 kg in 220 l on two occasions applied with the insecticide on the second. Applied on a third occasion to later-harvested plots only. Insecticide: Pirimicarb at 0.14 kg in 220 l and on a second occasion at 0.14 kg with the fungicide.

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88/R/RN/5

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

Cultivations, etc.:-

Original and additional plots:

All cereals: Weedkillers applied: 6 Nov, 1987. First N treatments applied: 7 Mar, 1988. Second N treatments applied: 12 Apr. Prochloraz and carbendazim applied, tridemorph applied: 21 Apr. Growth regulators applied to barley: 28 Apr, and to wheat and oats: 10 May. Propiconazole applied, first chlorothalonil applied: 10 May (to barley) and 25 May (to wheat and oats). Insecticide applied: 6 June. Carbendazim, maneb and tridemorph applied, second chlorothalonil applied: 13 June. Second carbendazim, maneb and tridemorph applied (to wheat only): 15 July.

W. wheat: P, K, Mg and S applied (to additional plots): 1 Oct, 1987. Rotary cultivated, P, K and Mg applied (to original plots), seed sown and raked in: 2 Oct. Hand harvested: 16 Aug, 1988.

W. barley: Rotary cultivated: 8 Sept, 1987. Rotary cultivated, P and K (to additional plots only) Mg and S applied, seed sown and raked in: 21 Sept. Hand harvested: 20 July, 1988.

W. oats: P, K and (to additional plots only) Mg and S applied: 9 Sept, 1987. Rotary cultivated, seed sown, raked level: 6 Oct. Hand harvested: 3 Aug, 1988.

Potatoes: FYM applied to original plots and all original plots dug by hand: 7 Dec, 1987. All additional plots dug by hand: 8 Dec. P, K and (to additional plots only), Mg and S applied: 9 Dec. N applied, rotary cultivated, potatoes planted: 14 Apr, 1988. Weedkillers applied: 10 May. Insecticide applied: 6 June. Fungicide applied: 23 June. Fungicide with insecticide applied: 15 July. Plots given neither FYM nor K on original plots and plot given no fertilizer on additional plots, harvested by hand, fungicide applied to remaining plots: 10 Aug. Remaining plots harvested by hand: 20 Sept.

Grass-clover ley: Rotary cultivated: 4 Aug, 1987. Rotary cultivated, seed sown and raked in: 21 Aug. Cut: 5 Nov. P, K and (to additional plots only), Mg and S applied: 18 Nov. N applied: 7 Mar, 1988. Cut: 19 May, 12 July and 2 Sept.

Permanent grass: P and K applied: 18 Nov, 1987. FYM and first N applied: 7 Mar, 1988. Cut, second N applied: 16 May. Cut, third N applied: 12 July. Cut: 2 Sept.

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88/R/RN/5

ORIGINAL PLOTS

TONNES/HECTARE

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

	W. WHEAT:		W. BARLEY:		LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
MANURE	GRAIN	STRAW	GRAIN	STRAW					
0	4.88	4.66	2.70	1.87	0.36	2.44	1.17	1.39	5.36
N1	6.51	6.74	2.16	3.21	0.39	4.90	1.27	0.90	7.47
P	3.24	3.58	2.98	2.01	0.80	3.00	1.88	2.25	7.92
N1P	3.84	5.71	2.15	3.24	0.87	5.04	1.11	1.09	8.11
K	4.10	4.05	3.26	2.54	0.53	2.73	1.44	1.45	6.14
N1K	7.46	8.45	5.32	4.81	0.51	4.63	1.45	1.28	7.88
PK	4.74	5.27	4.34	3.31	0.84	3.76	3.68	3.78	12.06
N1PK	8.37	9.01	9.28	7.11	0.96	5.30	2.36	3.82	12.44
N2PK	10.32	11.13	10.01	8.18	1.20	7.44	1.95	3.03	13.62
D	6.95	7.37	4.83	3.72	1.16	4.75	2.32	3.45	11.67
N1PKD	9.47	10.48	8.74	7.36	1.38	6.41	2.43	4.37	14.58
N2PKD	10.05	12.41	10.20	8.82	1.44	7.78	1.95	2.69	13.87
MEAN DM%	82.7	59.1	81.9	59.3	18.2	24.9	22.7	17.6	20.9

	W. OATS:		POTATOES:	PERMANENT GRASS : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE	GRAIN	STRAW	TOTAL TUBERS				
0	3.37	4.39	12.7	0.79	0.77	0.54	2.09
N1	6.18	8.54	9.8	1.78	1.33	1.42	4.53
P	3.13	4.36	8.5	0.84	0.95	0.55	2.34
N1P	7.05	9.09	7.5	2.42	1.68	1.66	5.76
K	3.01	4.65	34.6	0.92	0.97	0.67	2.57
N1K	5.95	8.42	34.4	2.34	2.02	1.49	5.86
PK	3.48	5.02	55.7	1.44	1.27	1.24	3.95
N1PK	7.41	10.94	68.8	3.01	2.38	2.11	7.51
N2PK	6.86	13.77	68.0	4.42	2.73	2.58	9.72
D	3.55	5.36	64.0	4.95	1.70	1.54	8.18
N1PKD	8.36	12.09	85.2	5.48	2.15	2.66	10.29
N2PKD	7.36	14.62	82.1	6.24	3.58	3.17	12.99
MEAN DM%	75.9	37.6	21.6	24.9	27.7	22.8	25.1

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88/R/RN/5

ADDITIONAL PLOTS

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

	W. WHEAT: GRAIN	W. WHEAT: STRAW	W. BARLEY: GRAIN	W. BARLEY: STRAW	W. OATS: GRAIN	W. OATS: STRAW	POTATOES: TOTAL TUBERS
MANURE							
0	4.40	4.57	3.25	2.44	2.37	3.84	11.3
N2PK	9.36	10.00	8.99	7.32	8.15	13.27	78.6
N2PKMG	7.34	10.34	8.68	7.67	7.07	13.57	73.8
N2PKS	9.27	9.62	9.55	7.57	7.09	10.78	71.9
N2PKMGS	8.93	9.30	9.09	7.68	8.11	11.68	68.6
N1PKMGS	8.41	9.35	9.34	7.04	7.62	12.38	75.3
N3PKMGS	9.76	10.74	9.79	8.35	7.37	13.33	79.2
MEAN DM%	83.5	52.8	83.0	63.6	74.6	38.9	22.0

	LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
MANURE					
0	0.53	3.05	1.09	1.25	5.92
N2PK	1.23	6.22	2.19	3.95	13.59
N2PKMG	1.04	5.71	2.46	3.54	12.75
N2PKS	1.10	5.70	2.47	4.21	13.48
N2PKMGS	1.17	6.34	2.47	4.00	13.98
N1PKMGS	1.01	5.12	2.76	4.09	12.99
N3PKMGS	1.11	6.04	2.15	3.92	13.22
MEAN DM%	17.3	23.7	20.9	15.8	19.4

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88/R/RN/8

CULTIVATION/WEEDKILLER

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

Sponsor: R. Moffitt.

The 28th year, w. barley.

For previous years see 'Details' 1967 and 1973 and 74-87/R/RN/8.

Design: 2 randomised blocks of 12 plots.

Whole plot dimensions: 12.8 x 12.2.

Treatments: All combinations of:-

Whole plots

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

PLOUGH	Ploughed: 18 Aug, 1987
ROTA DIG	Cultivated by rotary digger: 18 Aug
DEEPTINE	Deep-tine cultivated, twice: 18 Aug

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

NONE	None
CNVNTIAL	Conventional vertical tine
PARAPLOW	'Paraplow'

XTR BURN — plus three extra treatments with straw burnt since 1985, direct drilled until 1984, sprayed with paraquat at 0.60 kg ion in 500 l on 19 Aug, 1987 in addition to basal cultivating, differing in subsoiling in September 1982:

NONE	None
CNVNTIAL	Conventional vertical tine
PARAPLOW	'Paraplow'

NOTES: (1) Straw was chopped on 8 Aug, 1987 and was burnt and disced on XTR BURN on 21 Aug.
(2) The conventional vertical tine subsoiler had tines 76 cm apart and worked at a depth of about 50 cm.
(3) The 'Paraplow' had rigid tines set at a 45 degree angle. The tip of each tine was in line with the attachment of an adjacent tine. The tines were 51 cm apart and worked at a depth of about 38 cm.

Basal applications: Manures: 'Nitram' at 120 kg followed by 480 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Chlortoluron at 3.5 kg in 200 l.

Seed: Igri, sown at 150 kg.

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88/R/RN/8

Cultivations, etc.:- Glyphosate applied: 22 Sept, 1987. Heavy spring-tine cultivated, rotary harrowed, seed sown: 2 Oct. Chlortoluron applied: 6 Nov. First N applied: 1 Mar, 1988. Second N applied: 7 Apr. Combine harvested: 3 Aug.

GRAIN TONNES/HECTARE

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

SUBSOIL[82] CLT CHOP	NONE	CNVNTIAL	PARAPLOW	Mean
PLOUGH	5.81	5.37	5.52	5.57
ROTA DIG	5.41	4.85	5.58	5.28
DEEPTINE	5.40	5.35	5.12	5.29
Mean	5.54	5.19	5.40	5.38

XTR BURN	NONE	CNVNTIAL	PARAPLOW	Mean
	5.54	5.21	5.62	5.46

Grand mean 5.40

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

XTR BURN	CLT CHOP SUBSOIL[82]	CLT CHOP SUBSOIL[82]
0.300	0.173	0.173	0.300

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.300	5.6

GRAIN MEAN DM% 85.6

PLOT AREA HARVESTED 0.00280

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88/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 24th year, w. wheat, potatoes.

For previous years see 'Details' 1973 and 74-87/W/RN/12.

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

Whole plot dimensions: 8.53 x 30.5.

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

1st test crop of w. wheat tested all combinations of:

Whole plots

1. **TREATMNT** Previous treatments:

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

Sub plots

2. **N** Nitrogen fertilizer in 1988 (kg N) as 'Nitro-Chalk':

0
50
100
150
200
250

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88/W/RN/12

2nd test crop potatoes tested all combinations of:

Whole plots

1. **TREATMNT** Previous treatments, after w. wheat 1987:

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

Sub plots

2. **N** Nitrogen fertilizer in 1988 (kg N) as 'Nitro-Chalk':

0
70
140
210
280
350

Standard applications:

1st test crop:

W. wheat: Manures: (0:18:36) at 560 kg. Mn at 0.16 kg as manganese sulphate in 220 l. Weedkillers: Glyphosate at 1.4 kg in 200 l. Isoproturon at 2.1 kg with bromoxynil at 0.20 kg, ioxynil at 0.20 kg and mecoprop at 1.6 kg in 220 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 220 l. Insecticide: Carbofuran at 7.5 kg. Molluscicide: Methiocarb at 0.22 kg.

2nd test crop:

Potatoes: Manures: (0:18:36) at 1400 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Linuron at 1.5 kg in 220 l. Fungicides: Mancozeb at 1.4 kg in 220 l on five occasions applied with the pirimicarb on the first, second and fifth. Fentin hydroxide at 0.28 kg in 220 l. Insecticide: Pirimicarb at 0.14 kg on three occasions. Nematicide: Oxamyl at 5.0 kg. Desiccant: Diquat at 0.80 kg ion in 400 l.

Seed: W. wheat: Mercia, sown at 190 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-

W. wheat: Glyphosate applied: 22 Sept, 1987. Subsoiled, tines 56 cm deep and 142 cm apart: 6 Oct. Ploughed: 14 Oct. Methiocarb applied: 21 Oct. PK applied: 22 Oct. Carbofuran applied, power harrowed, seed sown, harrowed: 23 Oct. Isoproturon, bromoxynil, ioxynil and mecoprop applied: 26 Apr, 1988. N treatments applied: 27 Apr. Manganese applied: 5 May. Fungicides applied: 22 June. Combine harvested: 26 Aug.

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88/W/RN/12

Cultivations,etc.:-
Potatoes: Glyphosate applied: 22 Sept, 1987. Ploughed: 24 Feb, 1988. Heavy spring-tine cultivated: 5 Apr. PK applied: 8 Apr. N treatments applied: 14 Apr. Oxamyl applied, spring-tine cultivated: 20 Apr. Rotary harrowed, potatoes planted: 21 Apr. Rotary ridged, linuron applied: 13 May. Mancozeb applied: 15 July and 1 Aug. Mancozeb applied with pirimicarb: 14 June, 5 July and 15 Aug. Fentin hydroxide applied: 30 Aug. Desiccant applied: 15 Sept. Haulm mechanically destroyed: 29 Sept. Potatoes lifted: 19 Oct.

NOTES: (1) W. wheat: Because of water logging the yield of one plot was lost, with treatments FERT-FYM 0. An estimated value was used in the analysis.
(2) Potatoes: Because of a weighing error yields from two plots were lost. Those with treatment combinations

LC 6 LN	LC 6 LN
140	350

Estimated values were used in the analysis.

WINTER WHEAT

GRAIN TONNES/HECTARE

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

N / TREATMNT	0	50	100	150	200	250	Mean
LC 8 GM	4.42	5.78	6.41	5.66	5.77	6.83	5.81
LC 8 PT	3.89	5.45	6.04	6.85	6.35	6.21	5.80
LC 6 LC	4.39	6.16	7.13	6.27	6.96	7.04	6.32
LC 6 LN	4.30	6.91	6.85	6.36	7.53	6.22	6.36
FYM	3.94	5.44	5.69	5.82	6.60	6.63	5.68
STRAW	2.81	3.78	5.12	3.77	4.46	3.91	3.98
FERT-FYM	1.96	2.64	3.71	4.00	2.79	3.03	3.02
FERT-STR	2.30	3.18	4.26	3.72	4.67	4.81	3.82
Mean	3.50	4.92	5.65	5.31	5.64	5.58	5.10

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

TREATMNT	N	TREATMNT N
0.272	0.233	0.660

Except when comparing means with the same level(s) of **TREATMNT** 0.658

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.272	5.3
BLOCK.WP.SP	39	0.658	12.9

GRAIN MEAN DM% 79.5

SUB PLOT AREA HARVESTED 0.00252

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88/W/RN/12

POTATOES

TOTAL TUBERS TONNES/HECTARE

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

N TREATMNT	0	70	140	210	280	350	Mean
LC 8 GM	47.2	60.1	70.5	71.5	71.5	64.4	64.2
LC 8 PT	46.8	67.9	69.8	75.8	72.4	73.0	67.6
LC 6 LC	52.1	63.2	71.4	65.1	71.0	70.9	65.6
LC 6 LN	47.7	69.7	70.6	72.8	67.4	68.2	66.1
FYM	48.2	61.2	67.2	72.1	64.1	65.6	63.1
STRAW	41.7	58.0	63.4	60.3	62.4	63.6	58.2
FERT-FYM	26.4	49.1	53.3	54.3	56.4	54.4	49.0
FERT-STR	30.2	51.6	57.2	57.6	54.6	51.5	50.5
Mean	42.5	60.1	65.4	66.2	65.0	64.0	60.5

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

TREATMNT	N	TREATMNT N
2.95	1.34	4.56

Except when comparing means with the same level(s) of TREATMNT 3.80

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	2.95	4.9
BLOCK.WP.SP	38	3.80	6.3

SUB PLOT AREA HARVESTED 0.00137

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

N TREATMNT	0	70	140	210	280	350	Mean
LC 8 GM	97.2	98.0	98.2	98.7	98.3	97.2	97.9
LC 8 PT	95.6	98.4	98.0	98.5	97.9	97.9	97.7
LC 6 LC	97.3	97.8	98.2	98.4	98.5	98.2	98.1
LC 6 LN	97.1	98.2	98.4	98.2	96.7	97.3	97.7
FYM	96.1	98.0	98.5	97.7	98.3	97.8	97.8
STRAW	96.8	98.2	98.3	97.6	96.7	97.4	97.5
FERT-FYM	92.9	96.6	96.4	95.8	95.7	95.9	95.6
FERT-STR	94.7	96.4	97.4	97.0	96.3	95.7	96.3
Mean	96.0	97.7	97.9	97.7	97.3	97.2	97.3

SUB PLOT AREA HARVESTED 0.00137

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88/W/RN/13

INTENSIVE CEREALS

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

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

The 23rd year, potatoes.

For previous years see 'Details' 1973 and 74-87/W/RN/13.

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

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

Whole plots

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

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

Sub plots

2. **N** Nitrogen fertilizer in 1988 (kg N) as 'Nitro-Chalk':

   0
   70
   140
   210
   280
   350

Basal applications: Manures: (0:18:36) at 1400 kg. Mg at 100 kg as kieserite. Weedkillers: Glyphosate at 1.4 kg in 200 l. Linuron at 1.5 kg in 220 l. Fungicides: Mancozeb at 1.4 kg in 220 l on five occasions, applied with the pirimicarb on the first, second and fifth. Fentin hydroxide at 0.28 kg in 220 l. Nematicide: Oxamyl at 5.0 kg. Insecticide: Pirimicarb at 0.14 kg on three occasions. Desiccant: Diquat at 0.80 kg ion in 400 l.

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88/W/RN/13

Seed: Pentland Crown.

Cultivations, etc.:- Glyphosate applied: 22 Sept, 1987. Ploughed: 22 Feb, 1988. Heavy spring-tine cultivated: 5 Apr. PK applied: 8 Apr. N treatments applied, oxamyl applied, spring-tine cultivated: 20 Apr. Mg applied, rotary harrowed, potatoes planted: 21 Apr. Rotary ridged, linuron applied: 13 May. Mancozeb applied: 15 July and 1 Aug. Mancozeb applied with pirimicarb: 14 June, 5 July and 15 Aug. Fentin hydroxide applied: 30 Aug. Desiccant applied: 15 Sept. Haulm mechanically destroyed: 29 Sept. Potatoes lifted: 26 Oct.

TOTAL TUBERS TONNES/HECTARE

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

N	0	70	140	210	280	350	Mean
LEY AGE							
1 YEAR	37.5	52.6	64.6	60.4	59.4	62.9	56.2
2 YEARS	41.9	57.8	66.2	59.9	64.5	63.3	58.9
3 YEARS	44.9	59.9	64.7	67.6	65.8	63.4	61.0
4 YEARS	46.8	58.1	66.0	67.6	67.9	62.9	61.5
5 YEARS	43.6	61.1	68.6	75.8	69.1	64.9	63.9
6 YEARS	47.5	66.5	64.2	71.1	65.8	67.9	63.8
Mean	43.7	59.3	65.7	67.1	65.4	64.2	60.9

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

LEY AGE	**N**	**LEY AGE N**
2.08	1.73	4.40

Except when comparing means with the same level(s) of **LEY AGE** 4.25

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	2.94	4.8
BLOCK.WP.SP	90	6.01	9.9

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88/W/RN/13

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

N	0	70	140	210	280	350	Mean
LEY AGE							
1 YEAR	94.2	96.5	97.5	96.9	96.9	97.3	96.6
2 YEARS	96.0	97.8	98.0	98.2	98.3	97.5	97.6
3 YEARS	96.7	97.4	98.1	97.3	98.4	97.3	97.5
4 YEARS	95.5	96.9	98.1	97.5	97.5	96.6	97.0
5 YEARS	95.4	97.6	97.9	98.0	98.0	97.5	97.4
6 YEARS	96.1	98.0	97.7	97.7	97.9	97.4	97.5
Mean	95.7	97.4	97.9	97.6	97.8	97.3	97.3

SUB PLOT AREA HARVESTED 0.00090

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88/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 eighth year, potatoes, s. barley, s. beans, w. wheat.

For previous years see 81-87/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 A plots, treatments repeated annually, and F plots treatments repeated four yearly:

	P_2O_5 (kg)	K_2O (kg)	Tool	
- - -	0	0	Plough	(duplicated)
P6 K6 T	1000	500 to topsoil	"	(")
- - S	0	0	Wye double-digger	(triplicated)
- - SA	0	0	" " "	(duplicated)
- - SF	0	0	" " "	
P2 - SA	63	0 to subsoil	" " "	
P3 - SF	125	0 " "	" " "	
P4 - S	250	0 " "	" " "	
P5 - S	500	0 " "	" " "	
P5 - SF	500	0 " "	" " "	
P6 - S	1000	0 " "	" " "	
- K2 SA	0	31 " "	" " "	
- K3 SF	0	63 " "	" " "	
- K4 S	0	125 " "	" " "	
- K5 S	0	250 " "	" " "	
- K5 SF	0	250 " "	" " "	
- K6 S	0	350 " "	" " "	
P1 K1 SA	31	16 " "	" " "	
P1 K3 SA	31	63 " "	" " "	
P2 K2 SA	63	31 " "	" " "	
P3 K1 SA	125	16 " "	" " "	
P3 K3 SA	125	63 " "	" " "	
P3 K4 SF	125	125 " "	" " "	
P4 K3 SF	250	63 " "	" " "	
P4 K4 S	250	125 " "	" " "	
P4 K5 S	250	250 " "	" " "	
P4 K5 SF	250	250 " "	" " "	
P4 K6 S	250	350 " "	" " "	
P5 K4 S	500	125 " "	" " "	
P5 K4 SF	500	125 " "	" " "	
P5 K5 S	500	250 " "	" " "	
P5 K6 S	500	350 " "	" " "	
P6 K4 S	1000	125 " "	" " "	
P6 K5 S	1000	250 " "	" " "	
P6 K6 S	1000	350 " "	" " "	

https://doi.org/10.23637/ERADOC-1-43 *pp 70*

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88/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 were conventionally ploughed each autumn unless the Wye double-digging treatment was due.
(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. Weedkiller: Linuron at 1.6 kg in 260 l. Fungicides: Mancozeb at 1.4 kg in 200 l on five occasions, applied with the insecticide on the first two occasions. Manganese zinc ethylene bisdithiocarbamate at 1.4 kg in 200 l. Fentin hydroxide at 0.27 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.

S. barley: Manures: (20:10:10) at 630 kg. Weedkillers: Mecoprop at 2.4 kg with clopyralid at 0.05 kg and bromoxynil at 0.24 kg in 200 l. Fungicides: Fenpropimorph at 0.75 kg in 200 l. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

S. beans: Weedkiller: Simazine at 1.2 kg in 200 l. Insecticide: Phorate at 4.5 kg.

W. wheat: Manures: (0:18:36) at 350 kg. 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

Seed: Potatoes: Pentland Crown.
S. barley: Klaxon, sown at 160 kg.
S. beans: Minden, sown at 250 kg.
W. wheat: Avalon, sown at 200 kg.

Cultivations, etc.:-

All crops: Treatments applied by double-digger: 3 Nov, 1987 and 10 Nov. Ploughed: 13 Nov.

Potatoes: NPK+Mg applied, rotary harrowed, potatoes planted: 6 Apr, 1988. Rotary ridged: 25 Apr. Linuron applied: 5 May. Mancozeb with pirimicarb applied: 15 June, 30 June. Manganese zinc ethylene bisdithiocarbamate applied: 8 July. Mancozeb applied: 18 July, 1 Aug, 15 Aug. Fentin hydroxide applied: 30 Aug. Haulm mechanically destroyed: 14 Sept. Desiccant applied: 19 Sept. Lifted: 1 Nov.

S. barley: Heavy spring-tine cultivated twice: 7 Mar, 1988. NPK applied, heavy spring-tine cultivated, rotary harrowed, seed sown: 8 Mar. Weedkillers applied: 11 May. Fenpropimorph applied: 17 May. Remaining fungicide applied: 20 June. Combine harvested: 15 Aug.

S. beans: Heavy spring-tine cultivated: 7 Mar, 1988. Phorate applied, heavy spring-tine cultivated: 8 Mar. Rotary harrowed, seed sown: 10 Mar. Weedkiller applied: 17 Mar. Combine harvested: 19 Sept.

https://doi.org/10.23637/ERADOC-1-43 *pp 71*

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88/R/RN/17

Cultivations, etc.:-

W. wheat: PK applied: 16 Nov, 1987. Rotary harrowed, seed sown: 17 Nov. Chlortoluron applied: 30 Nov. First N applied: 1 Mar, 1988. Second N applied: 21 Apr. Remaining weedkillers applied: 26 Apr. Fungicides applied: 20 June. Combine harvested: 23 Aug.

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88/R/RN/17

SERIES II POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	63.1
P6 K6 T	67.4
- - S	65.2
- - SA	60.7
- - SF	61.0
P2 - SA	62.6
P3 - SF	60.4
P4 - S	62.9
P5 - S	64.9
P5 - SF	64.9
P6 - S	58.1
- K2 SA	65.8
- K3 SF	67.9
- K4 S	64.2
- K5 S	67.9
- K5 SF	64.1
- K6 S	66.3
P1 K1 SA	61.7
P1 K3 SA	62.0
P2 K2 SA	59.4
P3 K1 SA	65.7
P3 K3 SA	64.5
P3 K4 SF	58.7
P4 K3 SF	60.9
P4 K4 S	62.0
P4 K5 S	63.1
P4 K5 SF	69.6
P4 K6 S	69.5
P5 K4 S	61.1
P5 K4 SF	63.9
P5 K5 S	62.1
P5 K6 S	64.9
P6 K4 S	59.6
P6 K5 S	62.8
P6 K6 S	67.1
Mean	63.7

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

TREATMNT	
3.72	min.rep
3.04	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	2.63	4.1

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88/R/RN/17

SERIES II POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	98.9
P6 K6 T	98.9
- - S	98.3
- - SA	98.5
- - SF	97.8
P2 - SA	98.4
P3 - SF	99.0
P4 - S	98.6
P5 - S	99.1
P5 - SF	97.3
P6 - S	97.7
- K2 SA	98.5
- K3 SF	97.5
- K4 S	99.0
- K5 S	98.8
- K5 SF	99.1
- K6 S	98.4
P1 K1 SA	98.1
P1 K3 SA	98.8
P2 K2 SA	97.9
P3 K1 SA	98.4
P3 K3 SA	98.1
P3 K4 SF	99.2
P4 K3 SF	98.5
P4 K4 S	98.9
P4 K5 S	97.7
P4 K5 SF	98.5
P4 K6 S	99.0
P5 K4 S	98.4
P5 K4 SF	98.4
P5 K5 S	98.3
P5 K6 S	99.2
P6 K4 S	97.3
P6 K5 S	98.0
P6 K6 S	98.4
Mean	98.4

PLOT AREA HARVESTED 0.00210

* SEDs apply only to - - -, P6 K6 T, - - S and - - SA

	TREATMNT
max-min	- - S v any of remainder
min.rep	any of remainder

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88/R/RN/17

SERIES III BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.21
P6 K6 T	7.11
- - S	6.89
- - SA	6.83
- - SF	7.00
P2 - SA	6.75
P3 - SF	6.75
P4 - S	7.28
P5 - S	6.74
P5 - SF	6.98
P6 - S	7.37
- K2 SA	7.16
- K3 SF	7.14
- K4 S	6.85
- K5 S	7.44
- K5 SF	6.98
- K6 S	6.93
P1 K1 SA	6.93
P1 K3 SA	7.28
P2 K2 SA	7.00
P3 K1 SA	6.95
P3 K3 SA	7.09
P3 K4 SF	6.88
P4 K3 SF	6.75
P4 K4 S	7.16
P4 K5 S	6.81
P4 K5 SF	7.04
P4 K6 S	7.30
P5 K4 S	7.01
P5 K4 SF	6.83
P5 K5 S	7.06
P5 K6 S	6.73
P6 K4 S	6.58
P6 K5 S	6.55
P6 K6 S	6.86
Mean	6.98

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

TREATMNT	
0.356	min.rep
0.291	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.252	3.6

GRAIN MEAN DM% 85.1 PLOT AREA HARVESTED 0.00286

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88/R/RN/17

SERIES IV BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	6.78
P6 K6 T	7.31
- - S	6.88
- - SA	6.63
- - SF	6.92
P2 - SA	7.15
P3 - SF	7.60
P4 - S	7.03
P5 - S	6.45
P5 - SF	7.43
P6 - S	6.66
- K2 SA	6.84
- K3 SF	6.82
- K4 S	6.68
- K5 S	6.89
- K5 SF	6.88
- K6 S	6.56
P1 K1 SA	6.98
P1 K3 SA	7.04
P2 K2 SA	6.99
P3 K1 SA	6.69
P3 K3 SA	6.78
P3 K4 SF	7.42
P4 K3 SF	7.08
P4 K4 S	6.81
P4 K5 S	6.67
P4 K5 SF	6.83
P4 K6 S	7.43
P5 K4 S	7.13
P5 K4 SF	6.94
P5 K5 S	6.94
P5 K6 S	7.00
P6 K4 S	6.72
P6 K5 S	7.56
P6 K6 S	7.09
Mean	6.95

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

TREATMNT	
0.220	min.rep
0.179	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.155	2.2

GRAIN MEAN DM% 86.1 PLOT AREA HARVESTED 0.00386

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88/R/RN/17

SERIES I WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.96
P6 K6 T	7.75
- - S	7.73
- - SA	7.62
- - SF	7.30
P2 - SA	8.13
P3 - SF	6.70
P4 - S	7.61
P5 - S	7.57
P5 - SF	7.30
P6 - S	7.66
- K2 SA	8.47
- K3 SF	8.24
- K4 S	8.46
- K5 S	7.46
- K5 SF	7.94
- K6 S	7.57
P1 K1 SA	7.64
P1 K3 SA	7.85
P2 K2 SA	8.14
P3 K1 SA	8.14
P3 K3 SA	7.98
P3 K4 SF	7.86
P4 K3 SF	7.93
P4 K4 S	7.83
P4 K5 S	7.52
P4 K5 SF	7.59
P4 K6 S	7.62
P5 K4 S	8.33
P5 K4 SF	7.92
P5 K5 S	7.68
P5 K6 S	8.63
P6 K4 S	7.76
P6 K5 S	8.29
P6 K6 S	7.44
Mean	7.81

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

TREATMNT	
0.180	min.rep
0.147	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.127	1.6

GRAIN MEAN DM% 83.1 PLOT AREA HARVESTED 0.00286

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88/R/CS/10 and 88/W/CS/10

LONG TERM LIMING

Object: To study the effects of different amounts of lime and phosphate on the yields and compositions of a sequence of crops. Rothamsted (R) Sawyers I and Woburn (W) Stackyard C.

Sponsor: S.P. McGrath.

The 27th year, linseed.

For previous years see 'Details' 1967, 1973 and 74-87/R&W/CS/10.

Design: 2 randomised blocks of 16 plots split into 2.

Whole plot dimensions: 6.40 x 18.3.

Treatments: All combinations of:-

Whole plots

1. **CHALK** Residual effects of ground chalk (tonnes CaCO3) (total applied 1962-87):

		Rothamsted total		Woburn total	
R	W	1962-78	1982-87	1962-78	1982-87
0	0	0	0	0	0
15	9	7	8	6	3
24.5	25.5	15	9.5	14	11.5
52.5	45.5	30	22.5	23	22.5

2. **P** Effects of P fertilizer applied:

	Until 1978	1981	1982	1983		1988	
	R & W	R & W	R & W	R	W	R	W
0	0	0	0	0	0	0	0
P1	0	P1	P1	0	P2	P1	P1
P2	P	P1	0	P2	P2	P1	P1
P3	P	P3	P1	P2	P4	P3	P3

Rates 1981-83 P1, P2, P3, P4 = 25, 50, 75, 100 kg P as superphosphate

Sub plots

3. **MANGNESE** Manganese, cumulative to earlier applications:

0	None
MN	Manganese sprays

NOTES: (1) Until 1978 test P was applied cumulatively, rates varied with crop, K was also applied cumulatively, to P1 and P3 plots. Since 1981 K has been applied basally (none in 1986 and 1987).

(2) On Sawyers I (R) manganese was applied at 0.15 kg Mn, as manganese chelate, in 260 l on 20 June, 1988, repeated in 200 l on 19 July.

(3) On Stackyard C (W) manganese was applied at 0.16 kg Mn in 220 l on 15 June and at 0.15 kg Mn with sulphur at 0.12 kg S in 220 l on 15 July.

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88/R/CS/10 and 88/W/CS/10

Basal applications:

Sawyers I (R): Manures: 'Nitram' at 250 kg. Muriate of potash at 160 kg. Kieserite at 270 kg. Weedkiller: Trifluralin at 1.1 kg in 450 l. Desiccant: Diquat 0.60 kg ion applied with a wetting agent ('Agral' at 0.50 l) in 240 l.

Stackyard C (W): Manures: 'Nitram' at 250 kg. Muriate of potash at 160 kg. Kieserite at 110 kg. Weedkillers: Trifluralin at 0.84 kg in 200 l. Linuron at 0.26 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 400 l.

Seed: Antares, dressed iprodione and benomyl, sown at 87 kg (R).
Antares, dressed benomyl, sown at 80 kg (W).

Cultivations, etc.:-

Sawyers I (R): P treatments, K and Mg applied: 14 Dec, 1987. Ploughed: 15 Dec. Heavy spring-tine cultivated: 5 Apr, 1988. N applied: 7 Apr. Weedkiller applied, spring-tine cultivated twice: 12 Apr. Rotary harrowed, seed sown, harrowed: 13 Apr. Desiccant applied: 19 Sept. Combine harvested: 24 Oct.

Stackyard C (W): P treatments, K and Mg applied: 10 Feb, 1988. Ploughed: 23 Feb. Heavy spring-tine cultivated: 5 Apr. N applied, spike harrowed with crumbler attached, trifluralin applied, spike harrowed with crumbler attached, seed sown: 22 Apr. Linuron applied: 5 May. Desiccant applied: 21 Sept. Combine harvested: 1 Nov.

NOTE: At Rothamsted treatment combinations with **CHALK** 0 did not give a measurable yield.

88/R/CS/10 SAWYERS I (R)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

P / CHALK	0	P1	P2	P3	Mean
15	2.53	2.57	2.78	2.89	2.69
24.5	2.57	2.90	2.76	2.84	2.77
52.5	2.62	2.81	2.62	2.59	2.66
Mean	2.57	2.76	2.72	2.77	2.70

MANGNESE / CHALK	0	MN	Mean
15	2.73	2.65	2.69
24.5	2.78	2.76	2.77
52.5	2.65	2.66	2.66
Mean	2.72	2.69	2.70

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88/R/CS/10 SAWYERS I (R)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

MANGNESE	O	MN	Mean
P			
0	2.60	2.55	2.57
P1	2.83	2.69	2.76
P2	2.67	2.77	2.72
P3	2.79	2.76	2.77
Mean	2.72	2.69	2.70

CHALK	MANGNESE P	O	MN
15	0	2.59	2.48
	P1	2.52	2.62
	P2	2.85	2.70
	P3	2.95	2.82
24.5	0	2.55	2.59
	P1	3.07	2.73
	P2	2.62	2.90
	P3	2.88	2.80
52.5	0	2.66	2.57
	P1	2.91	2.71
	P2	2.53	2.72
	P3	2.52	2.65

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

CHALK	P	MANGNESE	CHALK P
0.136	0.157	0.047	0.272

CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
0.148	0.171	0.295

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

CHALK	0.082
P	0.094
CHALK.P	0.163

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.272	10.1
BLOCK.WP.SP	12	0.163	6.0

GRAIN MEAN DM% 59.8

SUB PLOT AREA HARVESTED 0.00177

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88/W/CS/10 STACKYARD C (W)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
0	0.82	1.07	1.72	1.65	1.31
9	2.40	2.90	2.81	2.94	2.76
25.5	2.69	2.69	2.68	3.00	2.77
45.5	2.26	2.48	2.41	2.74	2.47
Mean	2.04	2.29	2.41	2.58	2.33

MANGNESE	O	MN	Mean
CHALK			
0	1.27	1.36	1.31
9	2.77	2.75	2.76
25.5	2.81	2.72	2.77
45.5	2.42	2.53	2.47
Mean	2.32	2.34	2.33

MANGNESE	O	MN	Mean
P			
0	2.00	2.08	2.04
P1	2.34	2.23	2.29
P2	2.36	2.45	2.41
P3	2.56	2.61	2.58
Mean	2.32	2.34	2.33

MANGNESE	O	MN
CHALK	P	
0	0	0.74	0.90
	P1	0.97	1.16
	P2	1.62	1.81
	P3	1.73	1.57
9	0	2.34	2.46
	P1	2.96	2.85
	P2	2.81	2.82
	P3	2.99	2.88
25.5	0	2.82	2.57
	P1	2.85	2.53
	P2	2.64	2.72
	P3	2.93	3.08
45.5	0	2.11	2.41
	P1	2.59	2.37
	P2	2.39	2.43
	P3	2.59	2.89

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88/W/CS/10 STACKYARD C (W)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	CHALK	P	MANGNESE	CHALK P
	0.154	0.154	0.057	0.308

	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
	0.174	0.174	0.348

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

CHALK	0.114
P	0.114
CHALK.P	0.229

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.308	13.2
BLOCK.WP.SP	16	0.229	9.8

GRAIN MEAN DM% 83.7

SUB PLOT AREA HARVESTED 0.00185

https://doi.org/10.23637/ERADOC-1-43 *pp 82*

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88/W/CS/34

NEMATICIDES IN CROP SEQUENCE

Object: To study the effects of a range of nematicides on the incidence of Globodera rostochiensis and the yield of potatoes. Residual effects of previous treatments are studied in wheat and barley - Woburn Great Hill II and III.

Sponsor: A.G. Whitehead.

The 18th year, potatoes, w. wheat, s. barley.

For previous years see 71/W/CS/34(t), 72/W/CS/34(t) and 73-87/W/CS/34.

Design: 4 series of 3 blocks of 10 plots.

Whole plot dimensions: 4.27 x 9.14.

Treatments: The experiment has four series with the following cropping:-

	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
Series I	P	P*	SB	B	P	P*	W	B	P	P*	B	B	P	P*	W	B	P	P	W
Series II	P	P	P*	SB	B	P	P*	W	B	P	P*	W	B	P	P*	B	B	P	P
Series III	B	P	P	P*	SB	B	P	P*	W	B	P	P*	W	B	P	P*	W	B	P
Series IV	B	P	P	P	P*	SB	B	P	P*	W	B	P	P*	W	B	P	P*	W	B

P = potatoes, SB = sugar beet, B = s. barley, W = w. wheat

* Treatments applied to potatoes, subsequent crops test residual effects. In 1987 and 1988 new treatments were not applied to Series I and Series II respectively and in 1988 yields were not taken from potatoes on Series II and III.

Treatments to w. wheat (Series I): All combinations of:-

1. **NEMACIDE[83]** Nematicides applied 1983:

   FMC65201
   FMC67825
   OXAMYL

2. **RATE** Rates of nematicide (kg a.i.):

   2.8
   5.6
   11.2

plus one untreated plot

RATE

0.0

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88/W/CS/34

Treatments to s. barley (Series IV):

1. **NEMACIDE[86]** Residues of nematicides and rates (a.i.) applied 1986:

AL 3.3	Aldicarb at 3.3 kg
AL 6.6	Aldicarb at 6.6 kg
AL S 3.3	Aldicarb, slow release formulation at 3.3 kg
AL S 6.6	Aldicarb, slow release formulation at 6.6 kg
ETH 7.5	Ethoprophos at 7.5 kg
MB 5.0	'MB 41380' at 5.0 kg
MB 7.5	'MB 41380' at 7.5 kg
MB 10.0	'MB 41380' at 10.0 kg
OX 5.0	Oxamyl at 5.0 kg
NONE	None

Standard applications:

Potatoes (Series II and III): Manures: (10:10:15+4.5 Mg) at 2400 kg. Weedkiller: Linuron at 1.5 kg in 220 l. Fungicides: Mancozeb at 1.4 kg on five occasions, applied with the pirimicarb on the first, second and last occasions, in 220 l. Fentin hydroxide at 0.28 kg in 220 l. Insecticide: Pirimicarb at 0.14 kg on three occasions. Nematicide: Oxamyl at 5.0 kg, Series II only. Desiccant: Diquat at 0.80 kg ion in 400 l.

W. wheat (Series I): Manures: Chalk at 5.0 t. N at 40 kg and later at 117 kg, applied as 'Nitram'. Weedkillers: Isoproturon at 2.1 kg with mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 220 l. Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with carbendazim at 0.12 kg in 220 l.

S. barley (Series IV): Manures: Chalk at 5.0 t. (20:10:10) at 580 kg. Weedkillers: Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 220 l. Fungicides: Tridemorph at 0.52 kg in 220 l. Propiconazole at 0.12 kg with carbendazim at 0.12 kg in 220 l.

Seed: Potatoes: Pentland Crown.
W. wheat: Avalon, sown at 190 kg.
S. barley: Klaxon, sown at 150 kg.

Cultivations, etc.:-

Potatoes (Series II and III): Ploughed: 2 Mar, 1988. Heavy spring-tine cultivated: 5 Apr. NPK Mg applied: 7 Apr. Oxamyl applied; Series II only, rotary cultivated, potatoes planted: 21 Apr. Rotary ridged, linuron applied: 13 May. Mancozeb applied: 15 July and 1 Aug. Mancozeb with pirimicarb applied: 14 June, 5 July and 15 Aug. Fentin hydroxide applied: 30 Aug. Desiccant applied: 6 Sept. Haulm mechanically destroyed: 16 Sept. Lifted: 26 Sept.

W. wheat (Series I): Chalk applied, spring-tine cultivated twice, seed sown, spring-tine cultivated: 14 Oct, 1987. N applied: 8 Mar, 1988 and 5 May. Isoproturon, bromoxynil, ioxynil and mecoprop applied: 26 Apr. Clopyralid, bromoxynil and mecoprop applied: 6 May. Fungicides applied: 18 June. Combine harvested: 26 Aug.

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88/W/CS/34

Cultivations, etc.:-
S. barley (Series IV): Chalk applied: 14 Oct, 1987. Ploughed, NPK applied, spike harrowed with crumbler attached, seed sown: 2 Mar, 1988. Weedkillers applied: 6 May. Tridemorph applied: 27 May. Propiconazole and carbendazim applied: 18 June. Combine harvested: 17 Aug.

W.WHEAT SERIES I

GRAIN TONNES/HECTARE

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

RATE / **NEMACIDE[83]**	2.8	5.6	11.2	Mean
FMC65201	3.99	3.87	3.57	3.81
FMC67825	3.75	4.29	3.97	4.00
OXAMYL	4.03	3.72	4.09	3.95
Mean	3.92	3.96	3.87	3.92

RATE 0.0 3.41

Grand mean 3.87

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

NEMACIDE[83]	**RATE**	**NEMACIDE[83]** **RATE** **&** **RATE** 0.0
0.244	0.244	0.423

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.518	13.4

GRAIN MEAN DM% 85.0

PLOT AREA HARVESTED 0.00251

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88/W/CS/34

S.BARLEY SERIES IV

GRAIN TONNES/HECTARE

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

NEMACIDE[86]

AL 3.3	5.14
AL 6.6	4.82
AL S 3.3	4.88
AL S 6.6	4.85
ETH 7.5	4.84
MB 5.0	4.73
MB 7.5	4.50
MB 10.0	4.46
OX 5.0	4.98
NONE	4.64
Mean	4.78

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

NEMACIDE[86]
0.382

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.468	9.8

GRAIN MEAN DM% 86.8

PLOT AREA HARVESTED 0.00251

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88/R/CS/140

CHEMICAL REFERENCE PLOTS

Object: To study the persistence in soil of agricultural chemicals applied annually, singly and in combination and their effects on soil microflora and on yield of continuous s. barley - Long Hoos V 3.

Sponsors: R.H. Bromilow, R. Macdonald.

The 15th year, s. barley.

For previous years see 74-87/R/CS/140.

Design: Single replicate of 32 plots.

Whole plot dimensions: 4.06 x 4.57.

Treatments, applied cumulatively except as stated:

All combinations of:-

1.	**WEEDKLLR**	Weedkiller in autumn:
	NONE	None
	GLYPHOS	Glyphosate at 1.4 kg to barley stubble each autumn from 1979 to 1984, at 0.72 kg in 1985, at 0.54 kg in 1986 and at 1.3 kg in 1987
2.	**FUNGCIDE[1]**	Fungicide in autumn:
	NONE	None
	TRIADIM	Triadimefon at 0.25 kg in autumn 1981, 1982, 1984, 1985, 1986 and 1987, 0.28 kg in autumn 1983
3.	**FUNGCIDE[2]**	Fungicide in spring:
	NONE	None
	BENOMYL	Benomyl at 4 kg to seedbed
4.	**INSCTCDE**	Insecticide:
	NONE	None
	CHLORFEN	Chlorfenvinphos at 2 kg to the seedbed
5.	**NEMACIDE**	Nematicide:
	NONE	None
	ALDICARB	Aldicarb at 6 kg to the seedbed

NOTE: Glyphosate and triadimefon were applied in 220 l on 5 Oct, 1987 and 30 Oct respectively. Other treatments were applied on 7 Apr, 1988.

Basal applications: Manure: 'Nitro-Chalk' at 550 kg. Weedkillers: Bentazone at 0.80 kg, dichlorprop at 1.1 kg and MCPA at 0.64 kg in 220 l.

Seed: Doublet, seed not dressed, sown at 160 kg.

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88/R/CS/140

Cultivations, etc.:- Ploughed: 27 Nov, 1987. N applied: 29 Feb, 1988. Spring-tine cultivated, seedbed treatments applied, rotary harrowed and seed sown: 7 Apr. Weedkillers applied: 5 May. Combine harvested: 22 Aug.

GRAIN TONNES/HECTARE

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

FUNGCIDE[1]	NONE	TRIADIM	Mean
WEEDKLLR			
NONE	4.31	4.17	4.24
GLYPHOS	4.29	4.38	4.34
Mean	4.30	4.28	4.29

FUNGCIDE[2]	NONE	BENOMYL	Mean
WEEDKLLR			
NONE	4.25	4.24	4.24
GLYPHOS	4.31	4.36	4.34
Mean	4.28	4.30	4.29

FUNGCIDE[2]	NONE	BENOMYL	Mean
FUNGCIDE[1]			
NONE	4.24	4.37	4.30
TRIADIM	4.32	4.24	4.28
Mean	4.28	4.30	4.29

INSCTCDE	NONE	CHLORFEN	Mean
WEEDKLLR			
NONE	4.25	4.24	4.24
GLYPHOS	4.29	4.38	4.34
Mean	4.27	4.31	4.29

INSCTCDE	NONE	CHLORFEN	Mean
FUNGCIDE[1]			
NONE	4.24	4.37	4.30
TRIADIM	4.30	4.25	4.28
Mean	4.27	4.31	4.29

INSCTCDE	NONE	CHLORFEN	Mean
FUNGCIDE[2]			
NONE	4.24	4.32	4.28
BENOMYL	4.30	4.30	4.30
Mean	4.27	4.31	4.29

NEMACIDE	NONE	ALDICARB	Mean
WEEDKLLR			
NONE	4.05	4.44	4.24
GLYPHOS	4.21	4.47	4.34
Mean	4.13	4.45	4.29

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88/R/CS/140

GRAIN TONNES/HECTARE

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

NEMACIDE	NONE	ALDICARB	Mean
FUNGCIDE[1]			
NONE	4.08	4.53	4.30
TRIADIM	4.18	4.38	4.28
Mean	4.13	4.45	4.29

NEMACIDE	NONE	ALDICARB	Mean
FUNGCIDE[2]			
NONE	4.16	4.40	4.28
BENOMYL	4.10	4.50	4.30
Mean	4.13	4.45	4.29

NEMACIDE	NONE	ALDICARB	Mean
INSCTCDE			
NONE	4.05	4.50	4.27
CHLORFEN	4.21	4.41	4.31
Mean	4.13	4.45	4.29

	FUNGCIDE[2]	NONE	BENOMYL
WEEDKLLR	**FUNGCIDE[1]**		
NONE	NONE	4.30	4.33
	TRIADIM	4.20	4.15
GLYPHOS	NONE	4.19	4.40
	TRIADIM	4.43	4.33

	INSCTCDE	NONE	CHLORFEN
WEEDKLLR	**FUNGCIDE[1]**		
NONE	NONE	4.24	4.38
	TRIADIM	4.26	4.09
GLYPHOS	NONE	4.24	4.35
	TRIADIM	4.34	4.41

	INSCTCDE	NONE	CHLORFEN
WEEDKLLR	**FUNGCIDE[2]**		
NONE	NONE	4.26	4.24
	BENOMYL	4.24	4.23
GLYPHOS	NONE	4.22	4.39
	BENOMYL	4.36	4.37

	INSCTCDE	NONE	CHLORFEN
FUNGCIDE[1]	**FUNGCIDE[2]**		
NONE	NONE	4.13	4.36
	BENOMYL	4.36	4.37
TRIADIM	NONE	4.36	4.27
	BENOMYL	4.24	4.23

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88/R/CS/140

GRAIN TONNES/HECTARE

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

WEEDKLLR	NEMACIDE FUNGCIDE[1]	NONE	ALDICARB
NONE	NONE	4.05	4.58
	TRIADIM	4.06	4.29
GLYPHOS	NONE	4.12	4.47
	TRIADIM	4.30	4.46

WEEDKLLR	NEMACIDE FUNGCIDE[2]	NONE	ALDICARB
NONE	NONE	4.05	4.46
	BENOMYL	4.06	4.41
GLYPHOS	NONE	4.27	4.35
	BENOMYL	4.15	4.58

FUNGCIDE[1]	NEMACIDE FUNGCIDE[2]	NONE	ALDICARB
NONE	NONE	4.03	4.46
	BENOMYL	4.14	4.59
TRIADIM	NONE	4.28	4.35
	BENOMYL	4.07	4.40

WEEDKLLR	NEMACIDE INSCTCDE	NONE	ALDICARB
NONE	NONE	3.99	4.52
	CHLORFEN	4.12	4.36
GLYPHOS	NONE	4.11	4.47
	CHLORFEN	4.30	4.46

FUNGCIDE[1]	NEMACIDE INSCTCDE	NONE	ALDICARB
NONE	NONE	3.94	4.54
	CHLORFEN	4.22	4.51
TRIADIM	NONE	4.16	4.45
	CHLORFEN	4.20	4.31

FUNGCIDE[2]	NEMACIDE INSCTCDE	NONE	ALDICARB
NONE	NONE	4.02	4.47
	CHLORFEN	4.30	4.34
BENOMYL	NONE	4.08	4.52
	CHLORFEN	4.12	4.48

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88/R/CS/140

GRAIN TONNES/HECTARE

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

Margins of two factor tables	0.063
Two factor tables	0.089
Three factor tables	0.126

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

Stratum	d.f.	s.e.	cv%
WP	6	0.178	4.1

GRAIN MEAN DM% 85.2

PLOT AREA HARVESTED 0.00075

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88/R/CS/212

SEASONAL EFFECTS OF TAKE-ALL

Object: To study the incidence of take-all (Gaeumannomyces graminis) in continuous w. wheat and in first, second and third w. wheats after a break - Great Harpenden I.

Sponsors: D. Hornby, R.J. Gutteridge.

The 11th year, s. beans, w. wheat.

For previous years see 78-87/R/CS/212.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 5.33 x 10.7.

Treatments:

PREVCROP Previous crops before w. wheat 1988:

	78	79	80	81	82	83	84	85	86	87
W8 W W	W	W	W	W	W	W	W	W	W	W
W1 W BE	BE	W	W	BE	W	W	BE	W	W	BE
BE BE W	W	BE	W	W	BE	W	W	BE	BE	W
W2 BE W	W	W	BE	W	W	BE	W	W	BE	W
W8 BE W	W	W	W	W	W	W	W	W	BE	W
W1 W W	BE	W	W	BE	W	W	BE	W	W	W
W2 W W	W	W	BE	W	W	BE	W	W	W	W

BE = s. beans, W = w. wheat

NOTE: One additional crop sequence was in s. beans 1988, yields not taken.

Standard applications:

W. wheat: Manures: 'Nitram' at 410 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Fluroxypyr at 0.20 kg with isoproturon at 2.1 kg in 200 l.

Seed: W. wheat: Avalon, sown at 180 kg.
S. beans: Minden, sown at 200 kg.

Cultivations, etc.:-

Both crops: Ploughed: 24 Sept, 1987. Rotary harrowed: 5 Oct.
W. wheat: Seed sown: 5 Oct, 1987. Chlortoluron applied: 6 Nov. N applied: 14 Apr, 1988. Fluroxypyr and isoproturon applied: 26 Apr. Combine harvested: 23 Aug.
S. beans: Heavy spring-tine cultivated, rotary harrowed, seed sown: 11 Mar, 1988.

NOTE: Plant and soil samples were taken frequently during the season for assessment of take-all.

https://doi.org/10.23637/ERADOC-1-43 *pp 92*

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88/R/CS/212

GRAIN TONNES/HECTARE

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

PREVCROP	
W8 W W	6.21
W1 W BE	6.61
BE BE W	7.43
W2 BE W	7.07
W8 BE W	7.07
W1 W W	6.79
W2 W W	6.82
Mean	6.86

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

PREVCROP
0.438

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.537	7.8

GRAIN MEAN DM% 82.5

PLOT AREA HARVESTED 0.00291

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88/W/CS/245

MINIMUM CULTIVATION AND DEEP PK

Object: To study the effects of thorough subsoil disturbance and the incorporation of P and K into the subsoil on wheat, barley and oilseed rape either sown conventionally or direct drilled - Woburn Warren Field I and II.

Sponsors: A.E. Johnston, J. McEwen, R.D. Prew, P.H. Nicholls, C.J. Rawlinson.

The ninth year, s. oilseed rape, s. wheat and s. barley.

For previous years see 80-87/W/CS/245.

Column plot dimensions: 4.27 x 57.6.

Design: 3 series each of 20 x 4 criss cross.

Treatments: All combinations of:-

Series:

1. **SER CROP** Series, crops and previous cropping:

SER1 OSR	Series I, s. oilseed rape in rotation after s. barley and w. wheat
SER2 SW11	Series II, s. wheat, 11th cereal after a break crop
SER3 SB11	Series III, s. barley, 11th cereal after a break crop

Column plots: All combinations (duplicated) of:

2. **PK SUB** Extra PK and subsoil treatments:

---	None, mouldboard ploughed
--S	None, subsoiled
PKS	PK to subsoil

3. **YEAR** Years of applying PK SUB:

1980	In autumn 1979
1980/3/6	In autumn 1979, autumn 1982 and autumn 1985

4. **DRILL** Drills and associated cultivations:

CNVNTIAL	Mouldboard ploughed, conventionally drilled
DIRECT	Direct drilled (duplicated) (conventionally drilled in years when factor 2 involves autumn ploughing)

https://doi.org/10.23637/ERADOC-1-43 *pp 94*

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88/W/CS/245

Row plots:

5. **N PATH** Nitrogen fertilizer as 'Nitram' in spring, and pathogen control:

S. rape

125 ENHD	125 kg N enhanced pathogen control
200 ENHD	200 kg N enhanced pathogen control
275 ENHD	275 kg N enhanced pathogen control
200 STND	200 kg N standard pathogen control

S. wheat

75 ENHD	75 kg N enhanced pathogen control
150 ENHD	150 kg N enhanced pathogen control
225 ENMD	225 kg N enhanced pathogen control
150 STND	150 kg N standard pathogen control

S. barley

75 ENMD	75 kg N enhanced pathogen control
150 ENHD	150 kg N enhanced pathogen control
150/225E	150 kg N enhanced pathogen control (225 kg N in w. crops in previous years)
150 STND	150 kg N standard pathogen control

plus two extra column plot treatments, in all combinations with row plots above:-

EXTRA

TPK 80 D	PK applied to topsoil and mouldboard ploughed in autumn 1979, direct drilled since
TPK 80 C	PK as above, mouldboard ploughed, conventionally drilled each year

NOTES: (1) Rates of extra P and K were 500 kg P_2O_5, as superphosphate, 250 kg K_2O as muriate of potash.

(2) 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.

(3) The topsoil PK dressing was equally divided before and after ploughing.

(4) Standard pathogen control in 1988 was conventional seed dressing. Enhanced pathogen control had in addition, on Series I only, deltamethrin at 0.075 kg in 220 l: 5 May, 1988, azinphos-methyl at 0.28 kg and demeton-S-methyl sulphone at 0.084 kg in 340 l applied: 13 June, vinclozalin at 0.50 kg in 220 l applied: 2 Aug, triazophos at 0.42 kg in 220 l applied: 2 Aug and, on Series II and III, propiconazole at 0.12 kg and tridemorph at 0.25 kg in 220 l, applied: 7 June and 12 July.

(5) All plots with the combination YEAR 1980/3/6; DRILL DIRECT were mouldboard ploughed and conventionally drilled in error in 1987.

https://doi.org/10.23637/ERADOC-1-43 *pp 95*

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88/W/CS/245

Standard applications:

Series I, s. oilseed rape: Weedkillers: TCA at 12 kg. Clopyralid at 0.07 kg and propyzamide at 0.70 kg in 200 l. Diquat at 0.60 kg ion, applied with a wetting agent ('Agral' at 0.1 l) in 200 l, applied twice. Propachlor at 4.3 kg in 450 l. Desiccant: Diquat at 0.60 kg ion in 400 l.

Series II, s. wheat and Series III, s. barley: Manures: (5:15:30) at 336 kg. Weedkillers: Paraquat at 0.80 kg ion in 200 l applied twice. Clopyralid at 0.05 kg and bromoxynil at 0.24 kg with mecoprop at 0.60 kg in 220 l.

Seed: Series I, s. rape: Topas, sown at 9.0 kg.
Series II, s. wheat: Alexandria, sown at 220 kg.
Series III, s. barley: Klaxon, sown at 150 kg.

Cultivations, etc.:-

Series I, s. rape: Straw burnt on plots: 10 Sept, 1987. Spring-tine cultivated: 11 Sept. Ploughed treatment applied and these plots harrowed and disced, all plots spring-tine cultivated: 14 Sept. Ploughed treatment disced six times, all plots harrowed and rolled: 17 Sept. TCA applied, harrowed, w. rape sown, harrowed: 18 Sept. Clopyralid and propyzamide applied: 10 Dec. N treatments applied: 8 Mar, 1988. Diquat applied to failed w. rape: 18 Mar and 5 Apr. Heavy spring-tine cultivated: 31 Mar. Spike harrowed twice, with crumbler attached: 6 Apr. S. rape sown and rolled: 7 Apr. Propachlor applied: 11 Apr. Desiccant applied: 6 Sept. Combine harvested: 9 Sept.

Series II and III, s. wheat and s. barley: Straw burnt on plots: 21 Sept, 1987. Ploughed treatment applied, all plots heavy spring-tine cultivated: 24 Sept. Disced: 30 Sept. Paraquat applied: 2 Mar, 1988 and 5 Apr. Spring-tine cultivated: 5 Mar. Heavy spring-tine cultivated: 31 Mar. Spike harrowed twice with crumbler attached: 6 Apr. Seed sown and NPK applied, rolled: 8 Apr. N treatments applied: 6 May. Clopyralid, bromoxynil and mecoprop applied: 23 May. Combine harvested: 22 Aug (s. barley), 5 Sept (s. wheat).

https://doi.org/10.23637/ERADOC-1-43 *pp 96*

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88/W/CS/245 SPRING OILSEED RAPE SERIES I

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PK SUB / N PATH	---	--S	PKS	Mean
125 ENHD	2.38	2.33	2.30	2.34
200 ENHD	2.91	3.07	2.92	2.97
275 EHND	3.20	3.40	3.07	3.23
200 STND	2.86	2.64	2.65	2.72
Mean	2.84	2.86	2.73	2.81

YEAR / N PATH	1980	1980/3/6	Mean
125 ENHD	2.42	2.26	2.34
200 ENHD	2.99	2.95	2.97
275 EHND	3.13	3.32	3.23
200 STND	2.69	2.74	2.72
Mean	2.81	2.82	2.81

YEAR / PK SUB	1980	1980/3/6	Mean
---	2.89	2.78	2.84
--S	2.83	2.90	2.86
PKS	2.70	2.77	2.73
Mean	2.81	2.82	2.81

DRILL / N PATH	CNVNTIAL	DIRECT	Mean
125 ENHD	2.30	2.36	2.34
200 ENHD	3.16	2.87	2.97
275 EHND	3.35	3.16	3.23
200 STND	2.72	2.72	2.72
Mean	2.88	2.78	2.81

DRILL / PK SUB	CNVNTIAL	DIRECT	Mean
---	2.94	2.79	2.84
--S	2.89	2.85	2.86
PKS	2.82	2.69	2.73
Mean	2.88	2.78	2.81

DRILL / YEAR	CNVNTIAL	DIRECT	Mean
1980	2.86	2.78	2.81
1980/3/6	2.90	2.77	2.82
Mean	2.88	2.78	2.81

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88/W/CS/245 SPRING OILSEED RAPE SERIES I

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1980/3/6	1980	1980/3/6	1980	1980/3/6
N PATH						
125 ENHD	2.49	2.27	2.38	2.28	2.37	2.22
200 ENHD	3.12	2.70	2.92	3.23	2.92	2.92
275 EHND	3.09	3.32	3.30	3.51	3.02	3.13
200 STND	2.88	2.84	2.72	2.57	2.48	2.82

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
125 ENHD	2.34	2.40	2.29	2.35	2.26	2.31
200 ENHD	3.09	2.82	3.29	2.96	3.10	2.83
275 EHND	3.43	3.09	3.35	3.43	3.28	2.97
200 STND	2.89	2.85	2.64	2.64	2.63	2.66

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
125 ENHD	2.26	2.49	2.33	2.22
200 ENHD	3.16	2.90	3.16	2.85
275 EHND	3.36	3.02	3.35	3.30
200 STND	2.66	2.71	2.78	2.72

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	2.92	2.88	2.96	2.70
--S	2.67	2.91	3.11	2.79
PKS	2.99	2.55	2.65	2.84

N PATH	125 ENHD	200 ENHD	275 EHND	200 STND	Mean
EXTRA					
TPK 80 D	2.69	3.34	3.58	2.18	2.95
TPK 80 C	2.28	3.01	3.79	2.96	3.01
Mean	2.49	3.17	3.69	2.57	2.98

		YEAR	1980		1980/3/6	
N PATH	PK SUB	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
125 ENHD	---		2.27	2.60	2.41	2.20
	--S		2.11	2.52	2.47	2.18
	PKS		2.41	2.35	2.12	2.28
200 ENHD	---		3.28	3.03	2.91	2.60
	--S		2.91	2.92	3.67	3.01
	PKS		3.31	2.73	2.89	2.94
275 EHND	---		3.25	3.00	3.61	3.17
	--S		3.07	3.41	3.63	3.45
	PKS		3.77	2.64	2.80	3.29
200 STND	---		2.89	2.88	2.89	2.82
	--S		2.62	2.77	2.67	2.52
	PKS		2.48	2.48	2.78	2.83

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88/W/CS/245 SPRING OILSEED RAPE SERIES I

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

EXTRA	PK SUB	YEAR	DRILL	
0.343	0.140	0.114	0.121	
N PATH* PK SUB	**N PATH* YEAR**	**PK SUB YEAR**	**N PATH* DRILL**	
0.200	0.164	0.198	0.174	
PK SUB DRILL	**YEAR DRILL**	**N PATH* EXTRA**	**N PATH* PK SUB YEAR**	
0.242	0.198			min.rep
0.210	0.171	0.491	0.283	max-min
0.171	0.140			max.rep
N PATH* PK SUB DRILL	**N PATH* YEAR DRILL**	**PK SUB YEAR DRILL**	**N PATH* PK SUB YEAR DRILL**	
0.347	0.283	0.343	0.491	min.rep
0.301	0.245	0.297	0.425	max-min
0.245	0.200	0.242	0.347	max.rep

* Within the same level of **N PATH** only

	DRILL
Min.rep	CNVNTIAL
Max-rep	DIRECT
Max.min	DIRECT v CNVNTIAL

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

Stratum	d.f.	s.e.	CV%
WP1	6	0.242	8.6
WP1.WP2	18	0.287	10.1

GRAIN MEAN DM% 83.6

SUB PLOT AREA HARVESTED 0.00341

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88/W/CS/245 SPRING WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB N PATH	---	--S	PKS	Mean
75 ENHD	5.55	5.38	5.61	5.52
150 ENHD	6.91	6.79	6.94	6.88
225 ENHD	7.49	7.60	7.47	7.52
150 STND	6.01	6.05	6.03	6.03
Mean	6.49	6.45	6.51	6.49

YEAR N PATH	1980	1980/3/6	Mean
75 ENHD	5.77	5.26	5.52
150 ENHD	7.01	6.75	6.88
225 ENHD	7.51	7.53	7.52
150 STND	6.34	5.72	6.03
Mean	6.66	6.31	6.49

YEAR PK SUB	1980	1980/3/6	Mean
---	6.61	6.36	6.49
--S	6.56	6.35	6.45
PKS	6.79	6.23	6.51
Mean	6.66	6.31	6.49

DRILL N PATH	CNVNTIAL	DIRECT	Mean
75 ENHD	5.59	5.48	5.52
150 ENHD	7.14	6.75	6.88
225 ENHD	7.92	7.32	7.52
150 STND	6.38	5.85	6.03
Mean	6.76	6.35	6.49

DRILL PK SUB	CNVNTIAL	DIRECT	Mean
---	6.76	6.36	6.49
--S	6.59	6.39	6.45
PKS	6.93	6.30	6.51
Mean	6.76	6.35	6.49

DRILL YEAR	CNVNTIAL	DIRECT	Mean
1980	6.69	6.64	6.66
1980/3/6	6.83	6.06	6.31
Mean	6.76	6.35	6.49

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88/W/CS/245 SPRING WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1980/3/6	1980	1980/3/6	1980	1980/3/6
N PATH						
75 ENHD	5.74	5.37	5.47	5.30	6.10	5.13
150 ENHD	7.02	6.79	6.94	6.63	7.07	6.82
225 ENHD	7.44	7.54	7.69	7.50	7.39	7.54
150 STND	6.26	5.76	6.14	5.95	6.62	5.44

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
75 ENHD	5.63	5.51	5.33	5.41	5.81	5.51
150 ENHD	7.22	6.75	6.82	6.77	7.39	6.72
225 ENHD	7.90	7.28	7.98	7.41	7.88	7.26
150 STND	6.27	5.88	6.22	5.96	6.65	5.72

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	5.63	5.83	5.55	5.12
150 ENHD	7.04	7.00	7.25	6.49
225 ENHD	7.83	7.34	8.01	7.29
150 STND	6.27	6.38	6.49	5.33

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	6.91	6.46	6.60	6.25
--S	6.28	6.70	6.89	6.07
PKS	6.88	6.75	6.99	5.85

N PATH	75 ENHD	150 ENHD	225 ENHD	150 STND	Mean
EXTRA					
TPK 80 D	5.43	6.10	6.26	5.31	5.78
TPK 80 C	5.99	7.44	8.45	6.68	7.14
Mean	5.71	6.77	7.36	6.00	6.46

		YEAR	1980		1980/3/6	
N PATH	PK SUB	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
75 ENHD	---		5.79	5.71	5.48	5.31
	--S		5.07	5.66	5.59	5.15
	PKS		6.03	6.13	5.59	4.90
150 ENHD	---		7.42	6.82	7.02	6.68
	--S		6.61	7.10	7.03	6.43
	PKS		7.07	7.07	7.71	6.37
225 ENHD	---		8.22	7.05	7.58	7.52
	--S		7.69	7.69	8.26	7.12
	PKS		7.57	7.30	8.19	7.22
150 STND	---		6.22	6.28	6.33	5.48
	--S		5.74	6.34	6.69	5.58
	PKS		6.85	6.51	6.46	4.93

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88/W/CS/245 SPRING WHEAT SERIES II

GRAIN TONNES/HECTARE

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

EXTRA	PK SUB	YEAR	DRILL	
0.307	0.126	0.102	0.109	
N PATH* PK SUB	**N PATH* YEAR**	**PK SUB YEAR**	**N PATH* DRILL**	
0.201	0.164	0.178	0.174	
PK SUB DRILL	**YEAR DRILL**	**N PATH* EXTRA**	**N PATH* PK SUB YEAR**	
0.217	0.178			min.rep
0.188	0.154	0.492	0.284	max-min
0.154	0.126			max.rep
N PATH* PK SUB DRILL	**N PATH* YEAR DRILL**	**PK SUB YEAR DRILL**	**N PATH* PK SUB YEAR DRILL**	
0.348	0.284	0.307	0.492	min.rep
0.301	0.246	0.266	0.426	max-min
0.246	0.201	0.217	0.348	max.rep

* Within the same level of **N PATH** only

	DRILL
Min.rep	CNVNTIAL
Max-rep	DIRECT
Max.min	DIRECT v CNVNTIAL

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

Stratum	d.f.	s.e.	CV%
WP1	6	0.217	3.4
WP1.WP2	18	0.314	4.8

GRAIN MEAN DM% 82.6

SUB PLOT AREA HARVESTED 0.00341

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88/W/CS/245 SPRING BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB N PATH	---	--S	PKS	Mean
75 ENHD	5.61	5.62	5.63	5.62
150 ENHD	6.23	6.24	6.15	6.21
150/225E	6.16	6.36	6.06	6.20
150 STND	5.15	5.05	5.04	5.08
Mean	5.79	5.82	5.72	5.78

YEAR N PATH	1980	1980/3/6	Mean
75 ENHD	5.84	5.40	5.62
150 ENHD	6.33	6.08	6.21
150/225E	6.28	6.11	6.20
150 STND	5.05	5.11	5.08
Mean	5.87	5.68	5.78

YEAR PK SUB	1980	1980/3/6	Mean
---	5.83	5.74	5.79
--S	6.00	5.64	5.82
PKS	5.79	5.65	5.72
Mean	5.87	5.68	5.78

DRILL N PATH	CNVNTIAL	DIRECT	Mean
75 ENHD	5.59	5.63	5.62
150 ENHD	6.14	6.24	6.21
150/225E	6.21	6.19	6.20
150 STND	5.17	5.03	5.08
Mean	5.78	5.78	5.78

DRILL PK SUB	CNVNTIAL	DIRECT	Mean
---	5.83	5.77	5.79
--S	5.74	5.86	5.82
PKS	5.76	5.70	5.72
Mean	5.78	5.78	5.78

DRILL YEAR	CNVNTIAL	DIRECT	Mean
1980	5.84	5.89	5.87
1980/3/6	5.72	5.66	5.68
Mean	5.78	5.78	5.78

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88/W/CS/245 SPRING BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1980/3/6	1980	1980/3/6	1980	1980/3/6
N PATH						
75 ENHD	5.70	5.51	5.96	5.28	5.85	5.42
150 ENHD	6.36	6.10	6.42	6.07	6.22	6.08
150/225E	6.18	6.15	6.54	6.18	6.12	6.00
150 STND	5.10	5.19	5.07	5.03	4.97	5.11

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
75 ENHD	5.64	5.59	5.53	5.66	5.61	5.65
150 ENHD	6.17	6.26	6.10	6.31	6.14	6.16
150/225E	6.18	6.16	6.30	6.39	6.14	6.03
150 STND	5.34	5.05	5.02	5.07	5.17	4.97

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	5.61	5.95	5.58	5.32
150 ENHD	6.16	6.42	6.11	6.07
150/225E	6.35	6.24	6.06	6.14
150 STND	5.23	4.95	5.12	5.11

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	5.85	5.83	5.82	5.70
--S	6.01	5.99	5.47	5.73
PKS	5.66	5.85	5.86	5.55

N PATH	75 ENHD	150 ENHD	150/225E	150 STND	Mean
EXTRA					
TPK 80 D	6.29	6.41	5.97	5.21	5.97
TPK 80 C	5.88	5.87	6.05	5.34	5.79
Mean	6.08	6.14	6.01	5.28	5.88

		YEAR	1980		1980/3/6	
N PATH	PK SUB	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
75 ENHD	---		5.42	5.85	5.86	5.34
	--S		5.77	6.05	5.29	5.27
	PKS		5.64	5.95	5.57	5.34
150 ENHD	---		6.22	6.43	6.12	6.10
	--S		6.38	6.43	5.82	6.19
	PKS		5.89	6.39	6.39	5.93
150/225E	---		6.29	6.12	6.06	6.20
	--S		6.63	6.50	5.98	6.29
	PKS		6.14	6.12	6.13	5.94
150 STND	---		5.46	4.91	5.22	5.18
	--S		5.25	4.98	4.78	5.16
	PKS		4.97	4.96	5.36	4.98

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88/W/CS/245 SPRING BARLEY SERIES III

GRAIN TONNES/HECTARE

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

EXTRA	PK SUB	YEAR	DRILL	
0.247	0.101	0.082	0.087	
N PATH* **PK SUB**	**N PATH*** **YEAR**	**PK SUB** **YEAR**	**N PATH*** **DRILL**	
0.146	0.119	0.142	0.126	
PK SUB **DRILL**	**YEAR** **DRILL**	**N PATH*** **EXTRA**	**N PATH*** **PK SUB** **YEAR**	
0.174	0.143			min.rep
0.151	0.124	0.357	0.206	max-min
0.123	0.101			max.rep
N PATH* **PK SUB** **DRILL**	**N PATH*** **YEAR** **DRILL**	**PK SUB** **YEAR** **DRILL**	**N PATH*** **PK SUB** **YEAR** **DRILL**	
0.252	0.206	0.247	0.357	min.rep
0.218	0.179	0.214	0.309	max-min
0.178	0.146	0.174	0.252	max.rep

* Within the same level of **N PATH** only

	DRILL
Min.rep	CNVNTIAL
Max-rep	DIRECT
Max.min	DIRECT v CNVNTIAL

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

Stratum	d.f.	s.e.	CV%
WP1	6	0.174	3.0
WP1.WP2	18	0.210	3.6

GRAIN MEAN DM% 82.3

SUB PLOT AREA HARVESTED 0.00341

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88/W/CS/273

INTENSIVE POTATOES

Object: To study the effects of a range of frequencies of cropping on the occurrence of pests and diseases and on the yield of potatoes - Woburn Lansome III.

Sponsors: A.G. Whitehead, T.M. Addiscott, I.F. Henderson, G.A. Hide.

The seventh year, s. barley, potatoes.

For previous years see 82-87/W/CS/273.

Design: 2 randomised blocks of 6 plots split into 8.

Whole plot dimensions: 9.00 x 24.7.

Treatments: All combinations of:-

Whole plots

1. **VAR SEQ** Sequence of potato varieties in 1982-88, all s. barley when potatoes not grown:

	1982	1984	1986	1988
D P D P	Desiree	Maris Piper	Desiree	Maris Piper
O D P D	None	Desiree	Maris Piper	Desiree
D D D D	Desiree	Desiree	Desiree	Desiree
O D D D	None	Desiree	Desiree	Desiree
O D O D	None	Desiree	None	Desiree
O O O D	None	None	None	Desiree

Sub plots, two replicates of:-

2. **SD TREAT** Seed treatment:

NONE	None
TOL+PRO	Tolclofos methyl at 250 g and prochloraz at 35 g per tonne of tubers

3. **NEMACIDE** Nematicide:

NONE	None
OXAMYL	Oxamyl at 5.0 kg, worked in to seedbed, 5.5 kg in 1988

NOTES: (1) Additional plots were sown to s. barley for cropping sequences with differing frequencies of potatoes. Barley yields were not taken.

(2) Irrigation was applied to the potatoes as follows (mm water):

20 June	12.5
24 June	12.5
5 Aug	12.5
16 Aug	12.5
Total	50

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88/W/CS/273

Standard applications:
Potatoes: Manures: (0:18:36) at 420 kg. (10:10:15+4.5 Mg) at 3000 kg. Weedkiller: Linuron at 1.5 kg in 220 l. Fungicides: Mancozeb at 1.4 kg in 220 l on five occasions, with the pirimicarb on the first, second and fifth occasions. Fentin hydroxide at 0.28 kg in 220 l. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 400 l.
S. barley: Manure: 'Nitram' at 340 kg. Weedkillers: Bromoxynil at 0.24 kg, clopyralid at 0.05 kg with mecoprop at 1.8 kg in 220 l. Fungicide: Tridemorph at 0.52 kg in 220 l.

Seed: Potatoes: Desiree and Maris Piper, phorate applied at planting. S. barley: Klaxon sown at 150 kg.

Cultivations, etc.:-
Potatoes: PK applied: 9 Feb, 1988. Ploughed: 10 Feb. NPK Mg applied: 6 Apr. Subsoiled with 25 cm wide wings on tines 38 cm deep and 66 cm apart: 14 Apr. Oxamyl treatment applied and rotary cultivated: 18 Apr. Rotary cultivated, potatoes planted, phorate applied to ridges: 19 Apr. Rotary ridged: 11 May. Weedkiller applied: 13 May. Mancozeb applied: 15 July, 1 Aug. Mancozeb with pirimicarb applied: 14 June, 5 July and 15 Aug. Fentin hydroxide applied: 30 Aug. Desiccant applied: 6 Sept. Haulm mechanically destroyed: 16 Sept. Lifted: 7 Oct.
S. barley: Ploughed: 10 Feb, 1988. Subsoiled with 25 cm wide wings on tines 38 cm deep and 66 cm apart: 14 Apr. Spike harrowed with crumbler attached, seed sown: 22 Apr. N applied: 11 May. Weedkillers applied: 20 May. Fungicide applied: 27 May. Combine harvested: 23 Aug.

NOTE: Soil samples were taken before nematicides were applied and after harvest for cyst and egg counts of Globodera rostochiensis.

TOTAL TUBERS TONNES/HECTARE

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

SD VAR	TREAT SEQ	NONE	TOL+PRO	Mean
D P	D P	38.4	38.9	38.6
O D	P D	46.6	40.9	43.8
D D	D D	31.2	33.2	32.2
O D	D D	32.3	37.1	34.7
O D	O D	39.2	40.3	39.7
O O	O D	53.8	52.7	53.2
	Mean	40.3	40.5	40.4

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88/W/CS/273

TOTAL TUBERS TONNES/HECTARE

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

NEMACIDE	NONE	OXAMYL	Mean
VAR SEQ			
D P D P	34.0	43.3	38.6
O D P D	41.6	45.9	43.8
D D D D	21.6	42.8	32.2
O D D D	25.2	44.3	34.7
O D O D	32.5	46.9	39.7
O O O D	51.5	55.0	53.2
Mean	34.4	46.4	40.4

NEMACIDE	NONE	OXAMYL	Mean
SD TREAT			
NONE	34.5	46.0	40.3
TOL+PRO	34.3	46.8	40.5
Mean	34.4	46.4	40.4

SD TREAT	NONE		TOL+PRO	
NEMACIDE	NONE	OXAMYL	NONE	OXAMYL
VAR SEQ				
D P D P	33.0	43.7	35.0	42.8
O D P D	46.4	46.9	36.8	45.0
D D D D	19.9	42.6	23.2	43.1
O D D D	22.8	41.9	27.6	46.7
O D O D	33.2	45.1	31.8	48.8
O O O D	51.8	55.7	51.2	54.2

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

	VAR SEQ	SD TREAT	NEMACIDE	VAR SEQ SD TREAT
	2.92	1.28	1.28	3.67
Except when comparing means with the same level(s) of				
VAR SEQ				3.14

	VAR SEQ NEMACIDE	SD TREAT NEMACIDE	VAR SEQ SD TREAT NEMACIDE
	3.67	1.81	4.83
Except when comparing means with the same level(s) of			
VAR SEQ	3.14		4.44

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	5	2.92	7.2
BLOCK.WP.SP	66	6.27	15.5

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88/W/CS/273

PERCENTAGE WARE 4.44 CM (1.75 INCH) RIDDLE

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

SD TREAT	NONE	TOL+PRO	Mean
VAR SEQ			
D P D P	64.2	63.6	63.9
O D P D	71.2	65.9	68.6
D D D D	60.2	60.3	60.3
O D D D	63.6	66.6	65.1
O D O D	64.4	66.7	65.6
O O O D	75.8	75.3	75.5
Mean	66.5	66.4	66.5

NEMACIDE	NONE	OXAMYL	Mean
VAR SEQ			
D P D P	66.5	61.3	63.9
O D P D	67.9	69.3	68.6
D D D D	52.9	67.6	60.3
O D D D	56.4	73.8	65.1
O D O D	58.9	72.2	65.6
O O O D	76.4	74.7	75.5
Mean	63.2	69.8	66.5

NEMACIDE	NONE	OXAMYL	Mean
SD TREAT			
NONE	63.2	69.9	66.5
TOL+PRO	63.1	69.7	66.4
Mean	63.2	69.8	66.5

SD TREAT	NONE		TOL+PRO	
NEMACIDE	NONE	OXAMYL	NONE	OXAMYL
VAR SEQ				
D P D P	64.9	63.4	68.2	59.1
O D P D	71.5	71.0	64.3	67.6
D D D D	53.5	66.9	52.4	68.3
O D D D	55.6	71.5	57.1	76.2
O D O D	58.2	70.5	59.6	73.9
O O O D	75.5	76.0	77.3	73.3

SUB PLOT AREA HARVESTED 0.00075

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88/R/CS/302

EYESPOT RESISTANCE TO MBC

Object: To study the development of resistance to MBC fungicides in eyespot and the ability of resistant strains to survive, spread and infect - Meadow.

Sponsors: G.L. Bateman, B.D.L. Fitt.

The fourth year, w. wheat.

For previous years see 85-87/R/CS/302.

Design: 2 randomised blocks of 4 plots split into 6.

Whole plot dimensions: 12.0 x 24.0.

Treatments: All combinations of:-

Whole plots

1. **FUNGCIDE** Fungicides applied cumulatively to 1985, 1986 and 1987 treatments:

NONE	None
CARB	Carbendazim at 0.25 kg
PRO	Prochloraz at 0.40 kg
CARB+PRO	Carbendazim at 0.15 kg + prochloraz at 0.40 kg

Sub plots

2. **EYE INOC** Eyespot inoculum, applied in first year only:

NATURAL	Natural background population (duplicated)
W 19R 1S	Inoculated with wheat strains in proportion 19 resistant to one sensitive
W 1R 19S	As above but one resistant to 19 sensitive
R 19R 1S	Inoculated with rye strains, 19 resistant to one sensitive
R 1R 19S	As above but one resistant to 19 sensitive

NOTES: (1) Fungicide treatments were applied in 200 l on 10 Dec, 1987 and 11 Apr, 1988.
(2) The eyespot inoculum was colonised on oat seed and this was broadcast in October, 1984.

Basal applications: Manures: 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Chlortoluron at 3.5 kg with bromoxynil at 0.19 kg and ioxynil at 0.19 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l.

Seed: Avalon, sown at 180 kg.

https://doi.org/10.23637/ERADOC-1-43 *pp 110*

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88/R/CS/302

Cultivations, etc.:- Paraquat applied: 25 Sept, 1987. Cultivated by rotary grubber: 28 Sept. Rotary harrowed, seed sown: 5 Oct. Chlortoluron, bromoxynil and ioxynil applied: 6 Nov. First N applied: 29 Feb, 1988. Second N applied: 21 Apr. Fluroxypyr, clopyralid and bromoxynil applied: 26 Apr. Combine harvested: 23 Aug.

NOTE: Eyespot and sharp eyespot were assessed in July.

GRAIN TONNES/HECTARE

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

EYE INOC / **FUNGCIDE**	NATURAL	W 19R 1S	W 1R 19S	R 19R 1S	R 1R 19S	Mean
NONE	5.97	5.98	6.06	5.32	6.02	5.89
CARB	6.15	5.90	5.81	5.64	6.17	5.97
PRO	6.72	6.19	6.60	6.65	6.36	6.54
CARB+PRO	6.39	6.60	6.43	6.75	6.64	6.53
Mean	6.31	6.17	6.23	6.09	6.30	6.23

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

EYE INOC	**FUNGCIDE** **EYE INOC**	
0.179	0.359	min.rep
0.155	0.311	max-min

	EYE INOC
max-min	NATURAL v any of the remainder
min.rep	any of the remainder

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	24	0.359	5.8

GRAIN MEAN DM% 85.1

SUB PLOT AREA HARVESTED 0.00134

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88/R/CS/309 and 88/W/CS/309

LONG-TERM STRAW INCORPORATION

Object: To study the effects of mixing and depths of incorporation of straw on straw decomposition, soil nitrogen content, soil physical condition, pests, diseases and on the establishment, growth and yield of w. wheat - Rothamsted (R) Great Knott III and Woburn (W) Far Field I.

Sponsors: R.D. Prew, E.T.G. Bacon, D.G. Christian, M.J. Goss, R.J. Gutteridge, S.H.T. Harper, J.F. Jenkyn, A.E. Johnston, B.R. Kerry, R. Moffitt, W. Powell, A.D. Todd.

Associate sponsor: D.S. Powlson.

The fourth year, w. wheat.

For previous years see 85-87/R&W/CS/309.

Design: 4 randomised blocks of 12 plots (R).
2 randomised blocks of 12 plots (W).

Whole plot dimensions: 9.0 x 28.0 (R).
9.0 x 30.0 (W).

Treatments, applied cumulatively in successive years: All combinations of:-

1. **STRAW** Treatments to straw from previous wheat:

BURNT	Burnt
CHOPPED	Chopped and spread (duplicated)

2. **CULTIVTN** Cultivations:

TINE 10	Tine cultivated to 10 cm depth
TN10PL20	Tine cultivated to 10 cm depth, ploughed to 20 cm
TN10TN20	Tine cultivated to 10 cm depth and again to 20 cm
PLOUGH20	Ploughed to 20 cm depth

NOTES: (1) Straw was chopped by trailed straw chopper and spread on 20 Aug, 1987 (R), 21 Sept (W) and burnt 21 Aug (R), 9 Sept (W).
(2) A heavy spring-tine cultivator was used to cultivate to 10 cm depth, on 24 Aug, (R), 2 Oct (W). A chisel plough was used to cultivate to 20 cm depth, on 24 Aug (R) and a deep-tine cultivator to 20 cm on 2 Oct (W).
(3) Ploughed plots were ploughed to 20 cm depth on: 24 Aug (R), 2 Oct (W).

Basal applications:
Great Knott III (R): Manures: 'Nitram' at 120 kg followed by 580 kg. Weedkillers: Tri-allate at 2.2 kg. Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.1 kg in 200 l. Fluroxypyr at 0.20 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Tridemorph at 0.25 kg and propiconazole at 0.12 kg in 200 l. Carbendazim at 0.25 kg and maneb at 1.6 kg with propiconazole at 0.12 kg in 200 l.

https://doi.org/10.23637/ERADOC-1-43 *pp 112*

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88/R/CS/309 and 88/W/CS/309

Basal applications:
Far Field I (W): Manures: 'Nitram' at 120 kg followed by 580 kg. Weedkillers: Glyphosate at 1.1 kg in 200 l, followed by 0.27 kg in 200 l, followed by 1.1 kg in 200 l. Isoproturon at 2.1 kg with mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 220 l. Fungicides: Tridemorph at 0.25 kg and propiconazole at 0.12 kg in 220 l.

Seed: Mission, sown at 180 kg (R), 200 kg (W).

Cultivations, etc.:-
Great Knott III (R): Paraquat applied: 29 Sept, 1987. Spring-tine cultivated: 23 Oct. Seed sown, harrowed: 24 Oct. Tri-allate applied: 8 Dec. N applied: 24 Feb, 1988 and 22 Apr. Isoproturon applied: 17 Mar. Fluroxypyr, prochloraz and carbendazim applied: 6 May. Propiconazole and tridemorph applied: 3 June. Carbendazim, maneb and propiconazole applied: 23 June. Combine harvested: 25 Aug.
Far Field I (W): Glyphosate applied: 25 Sept, 1987 and 22 Oct. Heavy spring-tine cultivated: 3 Oct. Spike harrowed with crumbler attached: 29 Oct. Spring-tine cultivated: 7 Dec. Spike harrowed with crumbler attached, seed sown: 9 Dec. N applied: 8 Mar, 1988 and 3 May. Isoproturon, mecoprop, bromoxynil and ioxynil applied: 26 Apr. Fungicide applied: 22 June. Glyphosate applied: 16 Aug. Combine harvested: 25 Aug.

NOTES: (1) Establishment counts were made in the autumn and total dry matter was measured in spring.
(2) Fungal diseases and pests were assessed at intervals during the season.
(3) Components of yield were measured and numbers of volunteer ears assessed.

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88/R/CS/309 GREAT KNOTT III (R)

GRAIN TONNES/HECTARE

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

CULTIVTN / STRAW	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
BURNT	7.37	6.65	7.54	6.73	7.07
CHOPPED	7.70	6.94	7.75	6.90	7.33
Mean	7.59	6.84	7.68	6.85	7.24

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

STRAW	CULTIVTN	STRAW CULTIVTN	
		0.256	min.rep
0.111	0.148	0.221	max-min
		0.181	max.rep

STRAW	
min.rep	BURNT only
max-min	BURNT v CHOPPED
max.rep	CHOPPED only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	37	0.362	5.0

GRAIN MEAN DM% 80.6

PLOT AREA HARVESTED 0.00621

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88/W/CS/309 FAR FIELD I (W)

GRAIN TONNES/HECTARE

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

CULTIVTN	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
STRAW					
BURNT	4.49	3.43	5.33	3.67	4.23
CHOPPED	4.35	3.86	4.33	3.95	4.12
Mean	4.40	3.72	4.66	3.86	4.16

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

STRAW	CULTIVTN	STRAW CULTIVTN	
		0.657	min.rep
0.285	0.380	0.569	max-min
		0.465	max.rep

	STRAW
min.rep	BURNT only
max-min	BURNT v CHOPPED
max.rep	CHOPPED only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.657	15.8

GRAIN MEAN DM% 83.4

PLOT AREA HARVESTED 0.00884

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88/R/CS/311

EFFECTS OF SHALLOW STRAW INCORPORATION

Object: To study the effects of shallow straw incorporation on straw decomposition, toxin production, pests and diseases and on the establishment, growth and yield of winter wheat - West Barnfield I.

Sponsors: R.D. Prew, D.G. Christian, R.J. Gutteridge, S.H.T. Harper, J.F. Jenkyn, A.E. Johnston, B.R. Kerry, R. Moffitt, W. Powell, A.D. Todd.

The fourth year, w. wheat.

For previous years see 85-87/R/CS/311.

Design: Single replicate of 3 x a half replicate of 2 x 2 x 2 x 2 x 2.

Whole plot dimensions: 9.0 x 57.0.

Treatments: Combinations of:-

Whole plots

1. **STRAW**		Treatments to straw of previous wheat:
	BURNT	Burnt and then disced on 21 Aug, 1987
	BALED	Baled and removed on 20 Aug
	CHOPPED	Chopped on 21 Aug
2. **CULTTIME**		Time of cultivation, to 10 cm depth:
	EARLY	Cultivated by rotary grubber on 1 Sept, 1987
	LATER	Cultivated by rotary grubber on 16 Sept

Sub plots

3. **AUT N**		Autumn N as 'Nitram' applied just before cultivation:
	0	None
	50	50 kg N on 29 Aug, 1987 (CULTTIME EARLY), 16 Sept (CULTTIME LATER)
4. **FUNGCIDE**		Fungicides:
	O	None
	FULL	Full programme:- Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l on 21 Apr, 1988 Propiconazole at 0.125 kg in 260 l on 25 May Propiconazole at 0.125 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 260 l on 20 June
5. **INSCTCDE**		Insecticides:
	O	None
	FON+PIR	Fonofos at 1.4 kg in 200 l on 21 Jan, 1988 and pirimicarb at 0.14 kg in 260 l on 20 June, 1988

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88/R/CS/311

6. **MOLLCIDE** Residual effects of molluscicide applied for 1987 crop:

0	None
METHCARB	Methiocarb at 0.22 kg in autumn 1986

Basal applications: Manures: 'Nitram' at 120 kg and later at 580 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l and later at 1.1 kg in 200 l. Tri-allate at 2.2 kg. Isoproturon at 2.1 kg in 200 l. Fluroxypyr at 0.20 kg in 200 l.

Seed: Mission, sown at 180 kg.

Cultivations, etc.:- First glyphosate applied: 30 Sept, 1987. Spring-tine cultivated, seed sown: 26 Oct. Tri-allate applied: 9 Dec. First N applied: 24 Feb, 1988. Isoproturon applied: 17 Mar. Second N applied: 22 Apr. Fluroxypyr applied: 6 May. Second glyphosate applied: 9 Aug. Combine harvested: 25 Aug.

NOTE: Growth was measured and incidence of pests and diseases was assessed at intervals during the season. Ears of volunteers were counted prior to harvest and components of yield were measured.

GRAIN TONNES/HECTARE

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

CULTTIME	EARLY	LATER	Mean
STRAW			
BURNT	7.03	7.15	7.09
BALED	6.42	6.55	6.49
CHOPPED	5.79	6.44	6.12
Mean	6.41	6.71	6.56

AUT N	0	50	Mean
STRAW			
BURNT	7.11	7.07	7.09
BALED	6.31	6.66	6.49
CHOPPED	5.88	6.36	6.12
Mean	6.43	6.69	6.56

AUT N	0	50	Mean
CULTTIME			
EARLY	6.26	6.57	6.41
LATER	6.61	6.82	6.71
Mean	6.43	6.69	6.56

MOLLCIDE	0	METHCARB	Mean
STRAW			
BURNT	7.12	7.06	7.09
BALED	6.58	6.39	6.49
CHOPPED	5.97	6.26	6.12
Mean	6.56	6.57	6.56

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88/R/CS/311

GRAIN TONNES/HECTARE

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

MOLLCIDE	O	METHCARB	Mean
CULTTIME			
EARLY	6.34	6.49	6.41
LATER	6.77	6.65	6.71
Mean	6.56	6.57	6.56

MOLLCIDE	O	METHCARB	Mean
AUT N			
0	6.46	6.41	6.43
50	6.65	6.74	6.69
Mean	6.56	6.57	6.56

FUNGCIDE	O	FULL	Mean
STRAW			
BURNT	6.32	7.86	7.09
BALED	5.94	7.04	6.49
CHOPPED	5.46	6.77	6.12
Mean	5.91	7.22	6.56

FUNGCIDE	O	FULL	Mean
CULTTIME			
EARLY	5.72	7.11	6.41
LATER	6.10	7.33	6.71
Mean	5.91	7.22	6.56

FUNGCIDE	O	FULL	Mean
AUT N			
0	5.77	7.10	6.43
50	6.05	7.34	6.69
Mean	5.91	7.22	6.56

FUNGCIDE	O	FULL	Mean
MOLLCIDE			
O	5.84	7.28	6.56
METHCARB	5.98	7.16	6.57
Mean	5.91	7.22	6.56

INSCTCDE	O	FON+PIR	Mean
STRAW			
BURNT	6.84	7.34	7.09
BALED	6.30	6.67	6.49
CHOPPED	5.84	6.40	6.12
Mean	6.32	6.80	6.56

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88/R/CS/311

GRAIN TONNES/HECTARE

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

INSCTCDE	O	FON+PIR	Mean
CULTTIME			
EARLY	6.15	6.68	6.41
LATER	6.49	6.93	6.71
Mean	6.32	6.80	6.56

INSCTCDE	O	FON+PIR	Mean
AUT N			
0	6.14	6.72	6.43
50	6.51	6.88	6.69
Mean	6.32	6.80	6.56

INSCTCDE	O	FON+PIR	Mean
MOLLCIDE			
O	6.30	6.82	6.56
METHCARB	6.35	6.79	6.57
Mean	6.32	6.80	6.56

INSCTCDE	O	FON+PIR	Mean
FUNGCIDE			
O	5.65	6.17	5.91
FULL	7.00	7.44	7.22
Mean	6.32	6.80	6.56

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88/R/CS/311

GRAIN TONNES/HECTARE

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

AUT N	FUNGCIDE	INSCTCDE	MOLLCIDE
0.110	0.110	0.110	0.110

STRAW* AUT N	CULTTIME* AUT N	STRAW* FUNGCIDE	CULTTIME* FUNGCIDE
0.191	0.156	0.191	0.156

AUT N FUNGCIDE	STRAW* INSCTCDE	CULTTIME* INSCTCDE	AUT N INSCTCDE
0.156	0.191	0.156	0.156

FUNGCIDE INSCTCDE	STRAW* MOLLCIDE	CULTTIME* MOLLCIDE	AUT N MOLLCIDE
0.156	0.191	0.156	0.156

FUNGCIDE MOLLCIDE	INSCTCDE MOLLCIDE
0.156	0.156

* Within the same level of **STRAW**, **CULTTIME** or **STRAW.CULTTIME** only

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

Stratum	d.f.	s.e.	cv%
WP.SP	20	0.383	5.8

GRAIN MEAN DM% 78.7

SUB PLOT AREA HARVESTED 0.00276

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88/R/CS/312

STRAW DECOMPOSITION

Object: To test the effects of two basidiomycetes on the decomposition of wheat straw from a preceding crop and on the establishment and yield of a following crop - West Barnfield I.

Sponsor: S.H.T. Harper.

The fourth year, w. wheat.

For previous years see 85-87/R/CS/312.

Design: 4 randomised blocks of 4 plots.

Whole plot area: 4.5 x 12.0.

Treatments: All combinations of treatments applied to chopped straw in the field, cumulative to applications in the previous years:

1. **TREATMNT[1]** Treatment one:

NONE	None
BASID 1	Basidiomycete 1, cumulative to this treatment in 1987 and to whey at 15 kg in 1985 and 1986

2. **TREATMNT[2]** Treatment two:

NONE	None
BASID 2	Basidiomycete 2, cumulative to this treatment in 1987 and to a fungal accelerator in 1985 and 1986

NOTES: (1) Basidiomycetes 1 and 2 were naturally occurring fungi found in soil at Rothamsted and Woburn respectively.
(2) The basidiomycete fungus was colonised on wheat seed and this was spread on the surface at 1 seed per square cm on 18 Sept, 1987.
(3) Straw was chopped by a trailed straw chopper and incorporated to a depth of about 10 cm by a rotary grubber.

Basal applications: Manures: 'Nitram' at 120 kg followed by 580 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l followed by 1.1 kg in 200 l. Tri-allate at 2.2 kg. Isoproturon at 2.1 kg in 200 l. Fluroxypyr at 0.20 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg in 260 l. Carbendazim at 0.25 kg and maneb at 1.6 kg with propiconazole at 0.12 kg in 260 l. Insecticides: Fonofos at 1.4 kg in 200 l. Pirimicarb at 0.14 kg in 260 l. Molluscicide: Methiocarb at 0.22 kg.

Seed: Mission, sown at 180 kg.

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88/R/CS/312

Cultivations, etc.:- Straw chopped: 21 Aug, 1987. Cultivated with rotary grubber: 16 Sept. First glyphosate applied: 30 Sept. Methiocarb applied, spring-tine cultivated, seed sown: 26 Oct. Tri-allate applied: 9 Dec. Fonofos applied: 21 Jan, 1988. First N applied: 24 Feb. Isoproturon applied: 17 Mar. Prochloraz and carbendazim applied: 21 Apr. Second N applied: 22 Apr. Fluroxypyr applied: 6 May. Propiconazole applied: 25 May. Propiconazole with carbendazim and maneb applied, pirimicarb applied separately: 20 June. Second glyphosate applied: 9 Aug. Combine harvested: 25 Aug.

NOTE: Samples of straw were taken throughout the season for observations on the rate of decomposition.

GRAIN TONNES/HECTARE

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

TREATMNT[2]	NONE	BASID 2	Mean
TREATMNT[1]			
NONE	7.83	7.95	7.89
BASID 1	7.45	7.68	7.57
Mean	7.64	7.81	7.73

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

TREATMNT[1]	**TREATMNT[2]**	**TREATMNT[1] TREATMNT[2]**
0.264	0.264	0.374

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.529	6.8

GRAIN MEAN DM% 78.7

PLOT AREA HARVESTED 0.00276

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88/R/CS/323

CEREAL SEQUENCES AND TAKE-ALL

Object: To study the effects on take-all (Gaeumannomyces graminis) and yield of including triticale in cereal sequences - West Barnfield II.

Sponsors: R.J. Gutteridge, D. Hornby, R.D. Prew.

The first year, w. barley, w. oats, w. triticale, w. wheat, s. barley.

Design: 3 randomised blocks of 26 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

CROPS	Crops:
W BARLEY	W. barley (6 plots per block)
W OATS	W. oats (3 plots per block)
W TRITIC	W. triticale (7 plots per block)
W WHEAT	W. wheat (9 plots per block)
S BARLEY	S. barley (1 plot per block)

Standard applications: Manures: (0:18:36) at 280 kg. 'Nitram' at 90 kg to all w. cereals followed by 490 kg (w. wheat), 430 kg (w. barley), 350 kg (w. oats and w. triticale). 'Nitram' at 350 kg to s. barley. Weedkillers: Methabenzthiazuron at 2.4 kg in 200 l (not to s. barley). Fluroxypyr at 0.20 kg in 200 l (not to s. barley). Fluroxypyr at 0.15 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg in 200 l.

SEED: Winter barley: Magie, sown at 150 kg.
Winter oats: Peniarth, sown at 190 kg.
Winter triticale: Cumulus, sown at 180 kg.
Winter wheat: Mercia, sown at 180 kg.
Spring barley: Klaxon, sown at 160 kg.

Cultivations, etc.:-
All crops: PK applied: 24 Sept, 1987. Ploughed: 25 Sept. Rotary harrowed: 30 Sept. Fluroxypyr with prochloraz and carbendazim applied: 6 May, 1988. Propiconazole applied: 25 May.
All winter crops: Rotary harrowed, seed sown: 1 Oct, 1987. Methabenzthiazuron applied: 3 Oct. First N applied: 1 Mar, 1988. Fluroxypyr alone applied: 17 Mar. Second N applied: 15 Apr. Combine harvested: 4 Aug (w. barley), 23 Aug (w. wheat), 26 Aug (w. oats and triticale).
S. barley: N applied, rotary harrowed, seed sown: 7 Mar, 1988. Combine harvested: 16 Aug.
Previous crops: W. beans 1986, s. oilseed rape, 1987.

NOTES: (1) Plant samples were taken at the end of June to assess take-all.
(2) Because of a harvesting error the yield of one plot of S BARLEY was lost. An estimated value was used in the analysis.

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88/R/CS/323

W.WHEAT, W.BARLEY, W.TRITICALE, W.OATS, S.BARLEY

GRAIN TONNES/HECTARE

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

CROPS	
W BARLEY	9.24
W OATS	5.77
W TRITIC	9.92
W WHEAT	9.61
S BARLEY	6.01
Mean	8.11

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

W OATS	0.184			
W TRITIC	0.145	0.180		
W WHEAT	0.137	0.173	0.131	
S BARLEY	0.281	0.300	0.278	0.274
	W BARLEY	W OATS	W TRITIC	W WHEAT

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

BLOCK.WP	70	0.451	5.0

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00275

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88/R/CS/324

COMPARISON OF COMBINABLE CROPS

Object: To compare yields and other attributes of a range of combinable crops and to study their effects on a following crop of w. wheat - Long Hoos VI/VII 2.

Sponsors: J. McEwen, D.P. Yeoman, R.J. Darby, M.V. Hewitt.

The second year, w. wheat, s. wheat.

For previous year see 87/R/CS/324.

Design: 3 randomised blocks of 10 plots split into 2.

Whole plot dimensions: 2.5 x 8.0.

Treatments: All combinations of:-

Whole plots

1. **PREVCROP** Crops in 1987:

W OATS	W. oats
W RAPE	W. oilseed rape
W PEAS	W. peas, Pisum sativum
W WHEAT	W. wheat
S BEANS	S. field beans, Vicia faba
S LUPINS	S. lupins, Lupinus albus
S PEAS	S. peas, Pisum sativum
SNFLOWER	Sunflower
FALLOW B	Fallow (after w. field beans that failed)
FALLOW	Fallow

Sub plots

2. **SPRING N** Nitrogen fertilizer applied on 14 Apr, 1988:

0	None
N	Applied, amount depending on quantity in crop and soil in spring

NOTES: (1) Amounts of N applied (kg N) as 'Nitro-Chalk' were:

After PREVCROP	W PEAS	190
	W RAPE, S PEAS	200
	FALLOW B	210
	S BEANS	220
	W WHEAT, FALLOW	240
	W OATS	250

(2) W. wheat after PREVCROP S LUPINS and SNFLOWER failed and was resown to s. wheat given 125 kg N to SPRING N N.

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88/R/CS/324

Standard applications:

After all treatments except after lupins and sunflowers (w. wheat only): Weedkillers: Paraquat at 0.60 kg ion in 220 l. Terbutryne at 2.8 kg in 220 l. Mecoprop at 1.8 kg (after s. beans only) in 220 l. Mecoprop at 3.0 kg with isoproturon at 2.1 kg and (after oats only) diclofop-methyl at 1.1 kg in 220 l. Cyanazine at 0.46 kg, clopyralid at 0.078 kg with mecoprop at 1.8 kg in 220 l. Flamprop-M-isopropyl at 0.70 kg (after oats only) in 220 l. Fungicides: Prochloraz at 0.27 kg and carbendazim at 0.10 kg applied with the cyanazine, clopyralid and mecoprop. Propiconazole at 0.12 kg applied with the flamprop-M-isopropyl (after oats only). Fenpropimorph at 0.75 kg and chlorothalonil at 1.0 kg in 220 l. Carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l. Pirimicarb at 0.14 kg applied with the fenpropimorph and chlorothalonil.

After s. lupins and sunflowers (s. wheat only): Weedkillers: Terbutryne at 2.8 kg in 220 l (after sunflowers only). Mecoprop at 3.0 kg with isoproturon at 2.1 kg in 220 l. Bentazone at 0.80 kg, dichlorprop at 1.1 kg and MCPA at 0.64 kg in 220 l. Fungicides: Fenpropimorph at 0.75 kg and chlorothalonil at 1.0 kg in 220 l. Carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l to sunflowers only. Pirimicarb at 1.4 kg applied with the fenpropimorph and chlorothalonil.

Seed: W. wheat: Mercia, sown at 200 kg.
S. wheat: Alexandria, sown at 180 kg.

Cultivations, etc.:-

After w. oats, w. rape, w. peas, w. wheat, s. beans, s. peas and fallow (w. wheat only): Paraquat applied, rotary harrowed twice, w. wheat sown: 24 Sept, 1987. Terbutryne applied: 25 Sept. Mecoprop applied (after beans only): 15 Dec. Deltamethrin applied: 21 Jan, 1988. Mecoprop, isoproturon and (after oats only) diclofop-methyl applied: 30 Mar. Cyanazine, clopyralid, mecoprop, prochloraz and carbendazim applied: 28 Apr. Flamprop-M-isopropyl and propiconazole applied (after oats only): 5 May. Fenpropimorph, chlorothalonil and pirimicarb applied: 25 May. Carbendazim and maneb applied: 20 June. Combine harvested: 25 Aug.

After s. lupins and sunflowers (s. wheat only): Rotary harrowed, w. wheat sown: 29 Oct, 1987 (after sunflowers only). Terbutryne applied: 30 Oct (after sunflowers only). Spring-tine cultivated: 18 Nov (after lupins only). Rotary harrowed, w. wheat sown: 30 Nov (after lupins only). Deltamethrin applied: 21 Jan, 1988 (after sunflowers only). Mecoprop and isoproturon applied: 30 Apr. Rotary harrowed, resown with s. wheat: 8 Apr. Bentazone, dichlorprop and MCPA applied: 20 May. Fenpropimorph, chlorothalonil and pirimicarb applied: 25 May. Carbendazim and maneb applied: 20 June. Combine harvested: 12 Sept.

https://doi.org/10.23637/ERADOC-1-43 *pp 126*

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88/R/CS/324

GRAIN TONNES/HECTARE

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

SPRING N	0	N	Mean
PREVCROP			
W OATS	1.06	8.00	4.53
W RAPE	3.07	9.51	6.29
W PEAS	3.21	9.32	6.26
W WHEAT	1.10	7.59	4.34
S BEANS	3.69	9.52	6.60
S LUPINS	3.06	4.53	3.80
S PEAS	3.58	9.01	6.29
SNFLOWER	1.09	5.00	3.04
FALLOW B	3.74	9.20	6.47
FALLOW	3.03	9.12	6.07
Mean	2.66	8.08	5.37

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

	PREVCROP	SPRING N	PREVCROP SPRING N
	0.313	0.104	0.390
Except when comparing means with the same level(s) of PREVCROP			0.328

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.384	7.1
BLOCK.WP.SP	20	0.401	7.5

GRAIN MEAN DM% 79.6

SUB PLOT AREA HARVESTED 0.00058

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88/R/CS/326 and 88/W/CS/326

AMOUNTS OF STRAW

Object: To study the effects of a range of amounts of straw incorporated into the soil on w.wheat - Rothamsted (R) Great Knott III, Woburn (W) Far Field I.

Sponsors: D.G. Christian, J.F. Jenkyn, E.T.G. Bacon, R.D. Prew.

The second year, w. wheat.

For previous year see 87/R&W/CS/326.

Design: 4 randomised blocks of 4 plots (R).
3 randomised blocks of 4 plots (W).

Whole plot dimensions: 3.0 x 13.5 (R).
3.0 x 14.5 (W).

Treatments:

STRAW Amounts of straw incorporated into seedbed (t ha 85% DM), cumulative to dressings in 1987:

		R	W
NONE	None	-	-
NORMAL	Normal	6.8	4.6
2 NORMAL	Twice normal	13.6	9.2
4 NORMAL	Four times normal	27.2	18.4

NOTES: (1) Straw was chopped by trailed straw chopper and spread on 21 Aug, 1987 (R), 21 Sept (W). Straw treatments were applied on 21 Aug (R), 10 Sept (W).
(2) At Rothamsted straw was incorporated by 'I.E.R. Mixaplough' on 4 Sept. At Woburn it was heavy-tine cultivated in to 10 cm twice on 3 Oct, power harrowed with crumbler attached on 29 Oct.

Basal applications:
Great Knott III (R): Manures: 'Nitram' at 116 kg followed by 580 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Tri-allate at 2.2 kg. Isoproturon at 2.1 kg in 200 l. Fluroxypyr at 0.20 kg in 200 l applied with the prochloraz and carbendazim. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l. Carbendazim at 0.25 kg, maneb at 1.6 kg with propiconazole at 0.12 kg in 200 l.
Far Field I (W): Manures: 'Nitram' at 116 kg followed by 580 kg. Weedkillers: Glyphosate at 1.1 kg in 200 l, followed by 0.27 kg in 200 l, followed by 1.1 kg in 200 l. Isoproturon at 2.1 kg with bromoxynil at 0.20 kg, ioxynil at 0.20 kg and mecoprop at 1.6 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.25 kg in 220 l.

Seed: Mission, sown at 180 kg (R), 200 kg (W).

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88/R/CS/326 and 88/W/CS/326

Cultivations, etc.:-

Great Knott III (R): Paraquat applied: 29 Sept, 1987. Spring-tine cultivated: 23 Oct. Seed sown, harrowed: 24 Oct. Tri-allate applied: 8 Dec. N applied: 24 Feb, 1988 and 22 Apr. Isoproturon applied: 17 Mar. Fluroxypyr, prochloraz and carbendazim applied: 6 May. Propiconazole and tridemorph applied: 3 June. Carbendazim, maneb and propiconazole applied: 23 June. Combine harvested: 25 Aug.

Far Field I (W): Glyphosate applied: 25 Sept, 1987. Heavy spring-tine cultivated twice to 10 cm: 3 Oct. Glyphosate applied: 22 Oct. Power harrowed with crumbler attached: 29 Oct. Spring-tine cultivated: 7 Dec. Spike harrowed with crumbler attached, seed sown: 9 Dec. N applied: 8 Mar, 1988 and 3 May. Isoproturon, bromoxynil, ioxynil and mecoprop applied: 26 Apr. Fungicides applied: 22 June. Glyphosate applied: 16 Aug. Combine harvested: 25 Aug.

NOTES: (1) Establishment counts and dry weights were determined (R only). Shoot numbers and dry weight at growth stage 30, dry weights and fertile ear numbers after anthesis and harvest index were measured at both sites.

(2) Foliar diseases and foot and root rots were assessed in summer.

88/R/CS/326 GREAT KNOTT III (R)

GRAIN TONNES/HECTARE

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

STRAW	
NONE	6.76
NORMAL	6.89
2 NORMAL	6.95
4 NORMAL	6.93
Mean	6.88

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

STRAW
0.182

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.257	3.7

GRAIN MEAN DM% 79.8

PLOT AREA HARVESTED 0.00310

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88/W/CS/326 FAR FIELD I (W)

GRAIN TONNES/HECTARE

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

	STRAW
NONE	5.58
NORMAL	5.27
2 NORMAL	5.15
4 NORMAL	5.39
Mean	5.34

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

STRAW
0.342

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.419	7.8

GRAIN MEAN DM% 83.3

PLOT AREA HARVESTED 0.00442

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88/R/CS/327

CONTROL OF STEM NEMATODE

Object: To study the effects of rates of carbofuran and row spacings on the incidence of stem nematode (Ditylenchus dipsaci) and yield of four varieties of lucerne - Long Hoos IV 3.

Sponsor: A.G. Whitehead.

The first year, lucerne.

Design: 2 randomised blocks of 20 plots.

Whole plot dimensions: 1.22 x 8.84.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

   EUROPE
   EUVA
   VELA
   VERTUS

2. **CARBRATE** Rates of carbofuran (kg):

   0.0
   1.5

3. **ROWSPACE** Spacings between rows (cm):

   15 15 (6 inches)
   30 30 (12 inches)

plus four extra treatments:

CA3 RO15 Varieties given 3 kg carbofuran, on 15 cm row spacing:

EUROPE
EUVA
VELA
VERTUS

NOTE: Carbofuran was applied on 7 Apr, 1988 at sowing.

Basal applications: Manures: Chalk at 2.9 t. Muriate of potash at 520 kg. Weedkillers: Paraquat at 0.60 kg ion in 220 l. 2,4-DB at 2.1 kg in 220 l. Carbetamide at 2.1 kg in 220 l.

Seed: Varieties, inoculated with Rhizobium, sown at 11 kg on 30 cm rows, 22 kg on 15 cm rows.

Cultivations, etc.:- K applied: 29 Sept, 1987. Chalk applied: 2 Oct. Paraquat applied: 31 Mar, 1988. Inoculum applied as infected lucerne, spring-tine cultivated: 6 Apr. Rotary harrowed, seed sown: 7 Apr. Rolled: 8 Apr. 2, 4-DB applied: 15 June. Cut: 1 Aug and 1 Nov. Carbetamide applied: 19 Oct.

https://doi.org/10.23637/ERADOC-1-43 *pp 131*

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88/R/CS/327

NOTE: Plant samples were taken before the first cut to assess stem nematode damage.

1ST CUT (1/8/88) DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
VARIETY			
EUROPE	3.59	3.87	3.73
EUVA	3.45	4.27	3.86
VELA	3.24	3.72	3.48
VERTUS	2.85	3.46	3.16
Mean	3.28	3.83	3.56

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	4.34	3.11	3.73
EUVA	4.25	3.46	3.86
VELA	3.84	3.13	3.48
VERTUS	3.81	2.51	3.16
Mean	4.06	3.05	3.56

ROWSPACE	15	30	Mean
CARBRATE			
0.0	3.66	2.91	3.28
1.5	4.47	3.19	3.83
Mean	4.06	3.05	3.56

	ROWSPACE	15	30
VARIETY	CARBRATE		
EUROPE	0.0	4.03	3.15
	1.5	4.66	3.07
EUVA	0.0	3.88	3.01
	1.5	4.62	3.91
VELA	0.0	3.35	3.14
	1.5	4.34	3.11
VERTUS	0.0	3.36	2.35
	1.5	4.26	2.67

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	3.82	4.34	4.63	3.01	3.95

GRAND MEAN 3.64

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.566	0.283	0.200	0.200

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.400	0.400	0.283	0.566

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88/R/CS/327

1ST CUT (1/8/88) DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.566	15.6

IST CUT MEAN DM% 16.7

2ND CUT (1/11/88) DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
VARIETY			
EUROPE	2.07	2.19	2.13
EUVA	1.84	2.13	1.98
VELA	1.72	2.22	1.97
VERTUS	1.97	2.08	2.02
Mean	1.90	2.15	2.03

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	2.12	2.14	2.13
EUVA	2.04	1.92	1.98
VELA	1.93	2.02	1.97
VERTUS	2.13	1.91	2.02
Mean	2.06	2.00	2.03

ROWSPACE	15	30	Mean
CARBRATE			
0.0	1.97	1.83	1.90
1.5	2.14	2.17	2.15
Mean	2.06	2.00	2.03

	ROWSPACE	15	30
VARIETY	**CARBRATE**		
EUROPE	0.0	2.17	1.97
	1.5	2.08	2.30
EUVA	0.0	1.87	1.81
	1.5	2.22	2.03
VELA	0.0	1.72	1.72
	1.5	2.14	2.31
VERTUS	0.0	2.12	1.81
	1.5	2.13	2.02

CA3 R015	EUROPE	EUVA	VELA	VERTUS	Mean
	2.32	2.03	2.18	2.19	2.18

GRAND MEAN 2.06

https://doi.org/10.23637/ERADOC-1-43 **pp 133**

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88/R/CS/327

2ND CUT (1/11/88) DRY MATTER TONNES/HECTARE

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.222	0.111	0.078	0.078

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.157	0.157	0.111	0.222

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.222	10.8

2ND CUT MEAN DM% 26.0

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

CARBRATE / VARIETY	0.0	1.5	Mean
EUROPE	5.66	6.05	5.86
EUVA	5.29	6.39	5.84
VELA	4.97	5.95	5.46
VERTUS	4.82	5.54	5.18
Mean	5.18	5.98	5.58

ROWSPACE / VARIETY	15	30	Mean
EUROPE	6.47	5.25	5.86
EUVA	6.30	5.39	5.84
VELA	5.77	5.14	5.46
VERTUS	5.94	4.42	5.18
Mean	6.12	5.05	5.58

ROWSPACE / CARBRATE	15	30	Mean
0.0	5.63	4.74	5.18
1.5	6.61	5.36	5.98
Mean	6.12	5.05	5.58

https://doi.org/10.23637/ERADOC-1-43 *pp 134*

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88/R/CS/327

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

VARIETY	ROWSPACE / CARBRATE	15	30
EUROPE	0.0	6.20	5.12
	1.5	6.74	5.37
EUVA	0.0	5.75	4.82
	1.5	6.84	5.95
VELA	0.0	5.07	4.87
	1.5	6.47	5.42
VERTUS	0.0	5.49	4.16
	1.5	6.39	4.69

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	6.15	6.36	6.82	5.20	6.13

GRAND MEAN 5.69

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.638	0.319	0.225	0.225

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.451	0.451	0.319	0.638

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.638	11.2

TOTAL OF 2 CUTS MEAN DM% 21.3

PLOT AREA HARVESTED 0.00045

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88/W/CS/328

DEEP-WORKED SOIL AND PCN

Object: To study the effects of deep working of soil, on a site infested with potato cyst-nematode (PCN), on varieties resistant or susceptible to PCN, with and without a nematicide - Stackyard A II.

Sponsor: A.G. Whitehead.

The second year, potatoes.

For previous year see 87/W/CS/328.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 8.0.

Treatments: All combinations of:-

1. **SOIL TRT** Soil treatment:

NONE	None
SUBSOIL	Subsoiled, with 25 cm wide wings on tines 38 cm deep and 66 cm apart, applied twice with tines on the second pass between those of the first pass, on 14 Apr, 1988

2. **NEMACIDE** Nematicides:

NONE	None
OXAMYL	Oxamyl at 5.6 kg worked into seedbed on 14 Apr

3. **VARIETY** Varieties:

CARA	Cara
DESIREE	Desiree

Basal applications: Manures: (10:10:15+4.5 Mg) at 2400 kg. Weedkiller: Metribuzin at 0.70 kg in 220 l. Fungicides: Mancozeb at 1.4 kg on five occasions in 220 l, applied with the pirimicarb on the first, second and fifth occasions. Fentin hydroxide at 0.28 kg in 220 l. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 400 l.

Cultivations, etc.:- Ploughed: 22 Feb, 1988. Heavy spring-tine cultivated: 5 Apr. NPK Mg applied: 7 Apr. Rotary cultivated, potatoes planted: 14 Apr. Rotary ridged, weedkiller applied: 13 May. Mancozeb applied: 15 July, 1 Aug. Mancozeb with pirimicarb applied: 14 June, 5 July, 15 Aug. Fentin hydroxide applied: 30 Aug. Desiccant applied: 6 Sept. Haulm mechanically destroyed: 16 Sept. Potatoes lifted: 12 Oct.

NOTE: Soil samples were taken before nematicides were applied and after harvest for cyst and egg counts of Globodera rostochiensis.

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88/W/CS/328

TOTAL TUBERS TONNES/HECTARE

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

NEMACIDE	NONE	OXAMYL	Mean
SOIL TRT			
NONE	24.8	36.3	30.6
SUBSOIL	21.0	39.6	30.3
Mean	22.9	38.0	30.4

VARIETY	CARA	DESIREE	Mean
SOIL TRT			
NONE	37.6	23.6	30.6
SUBSOIL	36.2	24.3	30.3
Mean	36.9	23.9	30.4

VARIETY	CARA	DESIREE	Mean
NEMACIDE			
NONE	30.4	15.4	22.9
OXAMYL	43.4	32.5	38.0
Mean	36.9	23.9	30.4

NEMACIDE	NONE		OXAMYL	
SOIL TRT **VARIETY**	CARA	DESIREE	CARA	DESIREE
NONE	35.1	14.5	40.1	32.6
SUBSOIL	25.7	16.3	46.8	32.3

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

SOIL TRT	**NEMACIDE**	**VARIETY**	**SOIL TRT** **NEMACIDE**
1.49	1.49	1.49	2.11

SOIL TRT **VARIETY**	**NEMACIDE** **VARIETY**	**SOIL TRT** **NEMACIDE** **VARIETY**
2.11	2.11	2.98

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	3.65	12.0

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88/W/CS/328

PERCENTAGE WARE 4CM (1.57 INCH) RIDDLE

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

NEMACIDE	NONE	OXAMYL	Mean
SOIL TRT			
NONE	87.1	91.4	89.3
SUBSOIL	85.8	93.3	89.6
Mean	86.5	92.4	89.4

VARIETY	CARA	DESIREE	Mean
SOIL TRT			
NONE	94.2	84.3	89.3
SUBSOIL	94.2	84.9	89.6
Mean	94.2	84.6	89.4

VARIETY	CARA	DESIREE	Mean
NEMACIDE			
NONE	94.7	78.2	86.5
OXAMYL	93.7	91.1	92.4
Mean	94.2	84.6	89.4

	NEMACIDE	NONE		OXAMYL	
SOIL TRT	**VARIETY**	CARA	DESIREE	CARA	DESIREE
NONE		95.8	78.5	92.7	90.2
SUBSOIL		93.7	77.9	94.7	92.0

PLOT AREA HARVESTED 0.00120

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88/R/CS/333

COMPARISON OF COMBINABLE CROPS

Object: To compare yields and other attributes of a range of combinable crops and to study their effects on a following crop of w. wheat - Long Hoos VI/VII 1.

Sponsors: J. McEwen, D.P. Yeoman, R.J. Darby, M.V. Hewitt.

The first year, w. beans, w. oats, w. peas, w. oilseed rape, w. wheat, s. beans, s. lupins, s. peas, sunflowers and fallow.

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 2.5 x 8.0.

Treatments:

CROP	Crops:
W BEANS	W. beans
W OATS	W. oats
W PEAS	W. peas
W RAPE	W. rape
W WHEAT	W. wheat
S BEANS	S. beans
S LUPINS	S. lupins, Lupinus albus
S PEAS	S. peas
SNFLOWER	Sunflowers

NOTE: There were three additional treatments from which yields were not taken. A cultivated fallow, an uncultivated fallow with paraquat and grass, cut with produce returned.

Standard applications:

W. beans and w. peas: Weedkillers: Trietazine at 1.2 kg and simazine at 0.17 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the deltamethrin in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg in 220 l, applied on a second occasion, with the pirimicarb, to w. peas only. Insecticides: Deltamethrin at 0.075 kg. Pirimicarb at 0.14 kg.

W. rape: Manure: N at 200 kg as 'Nitro-Chalk'. Weedkillers: Tebutam at 3.6 kg in 220 l. Clopyralid at 0.07 kg and propyzamide at 0.70 kg in 220 l. Fungicide: Iprodione at 0.50 kg applied with the insecticide in 220 l. Insecticide: Deltamethrin at 0.075 kg.

W. wheat and w. oats: Manure: N at 230 kg (w. wheat) and 120 kg (w. oats) as 'Nitro-Chalk'. Weedkillers: Terbutryne at 2.8 kg in 220 l to w. wheat only. Cyanazine at 0.46 kg, clopyralid at 0.08 kg with mecoprop at 1.8 kg applied with the prochloraz and carbendazim in 220 l. Fungicides: Prochloraz at 0.27 kg, carbendazim at 0.10 kg. Fenpropimorph at 0.75 kg with chlorothalonil at 1.0 kg applied with the pirimicarb in 220 l. Carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l. Pirimicarb at 0.14 kg.

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88/R/CS/333

Standard applications:

S. beans: Weedkillers: Trietazine at 1.2 kg, simazine at 0.17 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the insecticide in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg in 220 l. Insecticide: Deltamethrin at 0.075 kg.

S. lupins: Weedkillers: Terbutryne at 0.98 kg, terbuthylazine at 0.42 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the deltamethrin in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg applied with the pirimicarb in 220 l. Insecticides: Deltamethrin at 0.075 kg. Pirimicarb at 0.14 kg.

S. peas: Weedkillers: Terbutryne at 0.98 kg, terbuthylazine at 0.42 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the deltamethrin in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg in 220 l on five occasions, applied with the pirimicarb on the second. Insecticides: Deltamethrin at 0.075 kg. Pirimicarb at 0.14 kg.

Sunflowers: Weedkillers: Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg.

Cultivated fallow: None.

Uncultivated fallow: Weedkiller: Paraquat on four occasions, at 1.0, 0.60, 0.40, 0.60 kg ion respectively in 220 l.

Seed: W. beans: Bourdon, sown at 220 kg.
W. oats: Peniarth, sown at 180 kg.
W. peas: Frijaune, sown at 220 kg.
w. rape: Ariana, sown at 8 kg.
W. wheat: Mercia, sown at 200 kg.
S. beans: Minden, sown at 240 kg.
S. lupins: Vladimir, sown at 210 kg.
S. peas: Progreta, sown at 230 kg.
Sunflowers: Asmer, sown at 120,000 seeds per hectare.
Grass (R): Manhattan PRG at 27 kg.

Cultivations, etc.:-

W. beans and w. peas: Deep-tine cultivated, w. beans only: 6 Oct, 1987. Ploughed: 27 Oct. Rotary harrowed, seed sown: 29 Oct. Trietazine and simazine applied: 30 Oct. Benomyl and deltamethrin applied: 25 May, 1988. Chlorothalonil and benomyl applied: 30 June, repeated, with pirimicarb, to w. peas only: 18 July. Combine harvested, w. peas: 2 Aug, w. beans: 8 Sept.

W. rape: Rotary harrowed twice, seed sown: 21 Sept, 1987. Tebutam applied: 25 Sept. Clopyralid and propyzamide applied: 27 Nov. N applied: 19 Feb, 1988. Fungicide and insecticide applied: 25 May. Combine harvested: 22 Aug.

W. wheat and w. oats: Rotary harrowed twice, and seed sown, w. wheat only: 24 Sept, 1987. Terbutryne applied, w. wheat only: 25 Sept. Deep-tine cultivated, rotary harrowed, seed sown, w. oats only: 6 Oct. Deltamethrin applied: 21 Jan, 1988. N applied: 18 Apr. Cyanazine, clopyralid, mecoprop, prochloraz and carbendazim applied: 28 Apr. Fenpropimorph, chlorothalonil and pirimicarb applied: 25 May. Carbendazim and maneb applied: 20 June. Combine harvested, w. oats: 16 Aug, w. wheat: 2 Sept.

S. beans: Ploughed: 27 Oct, 1987. Spring-tine cultivated, seed sown: 28 Mar, 1988. Weedkillers applied: 30 Mar. Benomyl and deltamethrin applied: 25 May. Chlorothalonil and benomyl applied: 30 June. Combine harvested: 8 Sept.

https://doi.org/10.23637/ERADOC-1-43 *pp 140*

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88/R/CS/333

Cultivations, etc.:-

S. lupins: Ploughed: 27 Oct, 1987. Spring-tine cultivated, seed sown: 28 Mar, 1988. Weedkillers applied: 30 Mar. Benomyl and deltamethrin applied: 25 May. Chlorothalonil, benomyl and pirimicarb applied: 15 July. Hand harvested: 4 Oct.

S. peas: Ploughed: 27 Oct, 1987. Spring-tine cultivated, seed sown: 29 Mar, 1988. Weedkillers applied: 30 Mar. Benomyl and deltamethrin applied: 25 May. Chlorothalonil and benomyl applied: 30 June, 2 Aug, 11 Aug, 23 Aug and with pirimicarb: 18 July. Combine harvested: 5 Sept.

Sunflowers: Ploughed: 27 Oct, 1987. Trifluralin applied, rotary harrowed, seed sown: 8 Apr, 1988. Linuron applied: 11 Apr. Combine harvested: 8 Sept.

Cultivated fallow: Ploughed: 27 Oct, 1987. Rotary cultivated: 26 May, 1988 and 4 Aug.

Uncultivated fallow: Paraquat applied: 15 Dec, 1987, 5 May, 1988, 15 June and 16 Aug.

Grass: Rotary harrowed: 17 Sept, 1987. Rotary harrowed, seed sown: 21 Sept. Topped: 23 May, 1988, 15 June and 4 Aug.

Previous crops: S. barley 1986 and 1987.

GRAIN TONNES/HECTARE

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

CROP	
W BEANS	5.92
W OATS	5.23
W PEAS	0.54
W RAPE	2.20
W WHEAT	8.12
S BEANS	4.56
S LUPINS	0.09
S PEAS	2.97
SNFLOWER	0.71
Mean	3.37

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

CROP
0.454

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	16	0.557	16.5

GRAIN MEAN DM% 73.6

PLOT AREA HARVESTED 0.00125 W RAPE
0.00123 W WHEAT, W OATS
0.00115 OTHER CROPS

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88/R/WW/1

WINTER WHEAT

VARIETIES

Object: To study a selection of newer varieties of w. wheat on land in rotation (pathogen free) and after wheat (pathogen infected) - Great Harpenden I (pathogen free RH) and Great Knott I (pathogen infected RD).

Sponsors: R. Moffitt, R.J. Gutteridge.

Design: One block of 4 whole plots split into 10 sub-plots.

Sub plot dimensions: 3.0 x 12.0.

Treatments: All combinations of:-

Whole plots

1. **INSCTCDE** Insecticide:

NONE	None
PIRIMICA	Pirimicarb at 0.14 kg in 200 l on 24 June, 1988

2. **FOLIAR N** Foliar applied urea:

NONE	None
UREA	Aqueous urea at 40 kg N in 210 l on 5 July.

Sub plots

3. **VARIETY** Varieties:

APOLLO	Apollo
AVALON	Avalon
FORTRESS	Fortress
GALAHAD	Galahad
HORNET	Hornet
MERCIA	Mercia
PARADE	Parade
RENDEZVO	Rendezvous
SLEJPNER	Slejpner
URBAN	Urban

Basal applications:

Great Harpenden I (RH): Manures: 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Diclofop-methyl at 1.1 kg in 200 l. Fungicides: Carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l. Propiconazole at 0.12 kg in 200 l.

Great Knott I (RD): Manures: 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Diclofop-methyl at 1.1 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

Seed: Varieties sown at 180 kg on both sites.

https://doi.org/10.23637/ERADOC-1-43 *pp 142*

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88/R/WW/1

Cultivations, etc.:-

Both sites: Rotary harrowed, seed sown: 7 Nov, 1987. First N applied: 1 Mar, 1988. Second N applied: 22 Apr. Combine harvested: 26 Aug.
Great Harpenden I (RH): Ploughed: 29 Sept, 1987. Fluroxypyr, clopyralid and bromoxynil applied: 25 Apr, 1988. Diclofop-methyl applied: 6 May. Carbendazim and maneb applied: 20 June. Propiconazole applied: 21 June. Previous crops: W. wheat 1986, w. beans 1987.
Great Knott I (RD): Glyphosate applied: 29 Sept, 1987. Ploughed: 6 Oct Diclofop-methyl with prochloraz and carbendazim applied: 6 May, 1988. Propiconazole and tridemorph applied: 20 June. Previous crops: Potatoes 1986,w. wheat 1987.

NOTE: Aphids were counted in June and July.

88/R/WW/1 GREAT HARPENDEN I (RH)

GRAIN TONNES/HECTARE

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

FOLIAR N	NONE	UREA	Mean
VARIETY			
APOLLO	7.51	7.16	7.33
AVALON	7.44	7.05	7.25
FORTRESS	8.20	7.35	7.77
GALAHAD	7.80	8.05	7.92
HORNET	7.78	7.54	7.66
MERCIA	8.15	7.83	7.99
PARADE	8.46	7.70	8.08
RENDEZVO	8.84	8.76	8.80
SLEJPNER	7.24	7.23	7.24
URBAN	7.23	6.97	7.10
Mean	7.87	7.56	7.71

INSCTCDE	NONE	PIRIMICA	Mean
VARIETY			
APOLLO	7.65	7.02	7.33
AVALON	7.41	7.08	7.25
FORTRESS	7.74	7.81	7.77
GALAHAD	7.93	7.92	7.92
HORNET	7.86	7.46	7.66
MERCIA	8.21	7.77	7.99
PARADE	8.56	7.60	8.08
RENDEZVO	8.83	8.77	8.80
SLEJPNER	7.37	7.10	7.24
URBAN	7.38	6.83	7.10
Mean	7.89	7.54	7.71

INSCTCDE	NONE	PIRIMICA	Mean
FOLIAR N			
NONE	7.72	8.01	7.87
UREA	8.07	7.06	7.56
Mean	7.89	7.54	7.71

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88/R/WW/1 GREAT HARPENDEN I (RH)

GRAIN TONNES/HECTARE

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

VARIETY	INSCTCDE FOLIAR N	NONE	PIRIMICA
APOLLO	NONE	7.33	7.68
	UREA	7.96	6.36
AVALON	NONE	6.95	7.94
	UREA	7.88	6.23
FORTRESS	NONE	7.98	8.42
	UREA	7.49	7.21
GALAHAD	NONE	7.76	7.84
	UREA	8.10	8.00
HORNET	NONE	7.78	7.78
	UREA	7.94	7.13
MERCIA	NONE	8.16	8.14
	UREA	8.26	7.41
PARADE	NONE	8.25	8.68
	UREA	8.88	6.51
RENDEZVO	NONE	8.64	9.04
	UREA	9.02	8.49
SLEJPNER	NONE	7.22	7.27
	UREA	7.53	6.93
URBAN	NONE	7.12	7.35
	UREA	7.64	6.30

GRAIN MEAN DM% 82.0

SUB PLOT AREA HARVESTED 0.00245

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88/R/WW/1 GREAT KNOTT I (RD)

GRAIN TONNES/HECTARE

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

FOLIAR N	NONE	UREA	Mean
VARIETY			
APOLLO	9.78	9.36	9.57
AVALON	8.43	8.34	8.39
FORTRESS	9.51	9.25	9.38
GALAHAD	8.88	9.30	9.09
HORNET	10.18	9.88	10.03
MERCIA	9.37	9.27	9.32
PARADE	9.77	9.49	9.63
RENDEZVO	9.39	9.78	9.58
SLEJPNER	9.17	9.19	9.18
URBAN	7.80	7.81	7.81
Mean	9.23	9.17	9.20

INSCTCDE	NONE	PIRIMICA	Mean
VARIETY			
APOLLO	9.54	9.60	9.57
AVALON	8.26	8.51	8.39
FORTRESS	9.65	9.11	9.38
GALAHAD	9.17	9.01	9.09
HORNET	10.04	10.02	10.03
MERCIA	9.42	9.22	9.32
PARADE	9.70	9.56	9.63
RENDEZVO	9.82	9.35	9.58
SLEJPNER	9.56	8.81	9.18
URBAN	7.84	7.78	7.81
Mean	9.30	9.09	9.20

INSCTCDE	NONE	PIRIMICA	Mean
FOLIAR N			
NONE	9.37	9.09	9.23
UREA	9.23	9.10	9.17
Mean	9.30	9.09	9.20

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88/R/WW/1 GREAT KNOTT I (RD)

GRAIN TONNES/HECTARE

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

VARIETY	INSCTCDE FOLIAR N	NONE	PIRIMICA
APOLLO	NONE	9.89	9.68
	UREA	9.19	9.53
AVALON	NONE	8.23	8.63
	UREA	8.30	8.39
FORTRESS	NONE	9.82	9.20
	UREA	9.48	9.01
GALAHAD	NONE	9.22	8.55
	UREA	9.13	9.47
HORNET	NONE	9.82	10.53
	UREA	10.26	9.50
MERCIA	NONE	9.40	9.35
	UREA	9.45	9.08
PARADE	NONE	9.82	9.72
	UREA	9.58	9.41
RENDEZVO	NONE	9.95	8.83
	UREA	9.70	9.86
SLEJPNER	NONE	9.69	8.66
	UREA	9.43	8.95
URBAN	NONE	7.90	7.71
	UREA	7.78	7.84

GRAIN MEAN DM% 80.6

SUB PLOT AREA HARVESTED 0.00245

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88/R/WW/3

WINTER WHEAT

N AND CROP PHYSIOLOGY

Object: To study, in crops given optimal or less than optimal N, the dynamics of late N within the plant, the effects on flag leaf photosynthesis and protein retention and the N status of individual organs - Little Knott I.

Sponsors: G.F.J. Milford, D.W. Lawlor.

Associate sponsors: D.S. Powlson, R.A.Leigh.

Design: 3 randomised blocks of 9 plots.

Whole plot dimensions: 3.0 x 16.0.

Treatments: All combinations of:-

1. **N RATE** Rate of nitrogen fertilizer (kg N) applied as 'Nitro-Chalk', divided equally on 2 Mar 1988, 30 Mar, 22 Apr and 13 May:

   0
   80
   200

2. **LATE N** Nitrogen fertilizer applied late:

0	None
NLEAF	To foliage, 40 kg N as urea in 225 l in two equal applications on 24 May, 1988 and 25 May
NSOIL	To soil, 40 kg N as prilled urea on 25 May

Basal applications: Weedkillers: Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Diclofop-methyl at 1.1 kg in 260 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg and tridemorph at 0.25 kg on two occasions, in 200 l and 260 l respectively.

Seed: Avalon, sown at 180 kg.

Cultivations, etc.:- Ploughed: 22 Sept, 1987. Rotary harrowed, seed sown: 24 Oct. Prochloraz and carbendazim applied: 21 Apr, 1988. Fluroxypyr, clopyralid and bromoxynil applied: 26 Apr. Diclofop-methyl applied: 6 May. Propiconazole and tridemorph applied: 20 May, 21 June. Combine harvested: 23 Aug. Previous crops: S. barley 1986, w. oats 1987.

NOTE: Samples were taken for measurements of crop and grain growth and N content, weekly from April until maturity.

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88/R/WW/3

GRAIN TONNES/HECTARE

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

LATE N N RATE	NONE	NLEAF	NSOIL	Mean
0	2.23	3.47	3.37	3.03
80	5.64	5.85	6.01	5.83
200	7.70	8.23	7.93	7.96
Mean	5.19	5.85	5.77	5.60

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

N RATE	LATE N	N RATE LATE N
0.198	0.198	0.344

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	16	0.421	7.5

GRAIN MEAN DM% 82.4

PLOT AREA HARVESTED 0.00161

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88/R/WW/4

WINTER WHEAT

FACTORS AFFECTING TAKE-ALL

Object: To study the effects of a range of factors on the incidence of take-all and on the yield of w. wheat - Harwoods Piece.

Sponsors: D. Hornby, G.L. Bateman, R.J. Gutteridge.

Design: A single replicate of 2 x 2 x 2 x 2 x 2 x 2.

Whole plot dimensions: 3.0 x 10.0.

Treatments: All combinations of:-

1. **SOWDATE** — Dates of sowing:

21 SEPT	21 September, 1987
26 OCT	26 October

2. **SOILFUNG** — Application of fungicide to the seedbed:

NONE	None
NUARIMOL	Nuarimol at 1.1 kg in 375 l

3. **SEEDRESS** — Seed dressings:

ORGANO M	Organo mercury
TRIADIME	Triadimenol plus fuberidazole

4. **AUTUMN N** — N application to the seedbed:

0	None
60	60 kg N as 'Nitro-Chalk' on 21 Sept, 1987 or 26 Oct for successive SOWDATES

5. **N TIME** — Spring application of 200 kg N:

SINGLE	Single application on 8 Apr, 1988
DIVIDED	40 kg early on 16 Feb, 160 kg later, on 8 Apr

6. **N FORM** — Forms of spring nitrogen:

SUL AMM	Sulphate of ammonia
AMM NITR	Ammonium nitrate as 'Nitro-Chalk'

Basal applications: Manures: Muriate of potash at 420 kg. Weedkillers: Fluroxypyr at 0.20 kg with metsulfuron-methyl at 0.006 kg in 200 l. Diclofop-methyl at 1.1 kg in 200 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 260 l.

Seed: Avalon, sown at 170 kg.

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88/R/WW/4

Cultivations, etc.:- Muriate of potash applied: 2 Sept, 1987. Ploughed: 7 Sept. Rotary harrowed: 19 Sept. SOWDATE 21 SEPT plots rotary harrowed, seed sown: 21 Sept. SOWDATE 26 OCT plots rotary harrowed, seed sown: 26 Oct. Fluroxypyr with metsulfuron-methyl applied: 25 Apr, 1988. Diclofop-methyl applied: 6 May. Fungicides applied: 21 June. Combine harvested: 23 Aug. Previous crops: W. wheat 1986 and 1987.

NOTE: Plant samples were taken in mid-March, the end of April and the beginning of July to assess take-all. Eyespot and sharp eyespot were assessed in July. Components of yield were measured and quality assessments were made on the grain.

GRAIN TONNES/HECTARE

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

SOILFUNG	NONE	NUARIMOL	Mean
SOWDATE			
21 SEPT	6.81	7.24	7.02
26 OCT	8.49	8.08	8.28
Mean	7.65	7.66	7.65

SEEDRESS	ORGANO M	TRIADIME	Mean
SOWDATE			
21 SEPT	6.61	7.43	7.02
26 OCT	8.35	8.22	8.28
Mean	7.48	7.83	7.65

SEEDRESS	ORGANO M	TRIADIME	Mean
SOILFUNG			
NONE	7.38	7.92	7.65
NUARIMOL	7.58	7.74	7.66
Mean	7.48	7.83	7.65

AUTUMN N	0	60	Mean
SOWDATE			
21 SEPT	6.62	7.42	7.02
26 OCT	8.20	8.37	8.28
Mean	7.41	7.90	7.65

AUTUMN N	0	60	Mean
SOILFUNG			
NONE	7.23	8.07	7.65
NUARIMOL	7.59	7.73	7.66
Mean	7.41	7.90	7.65

AUTUMN N	0	60	Mean
SEEDRESS			
ORGANO M	7.15	7.82	7.48
TRIADIME	7.67	7.98	7.83
Mean	7.41	7.90	7.65

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88/R/WW/4

GRAIN TONNES/HECTARE

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

N TIME SOWDATE	SINGLE	DIVIDED	Mean
21 SEPT	6.85	7.19	7.02
26 OCT	8.13	8.44	8.28
Mean	7.49	7.81	7.65

N TIME SOILFUNG	SINGLE	DIVIDED	Mean
NONE	7.46	7.84	7.65
NUARIMOL	7.52	7.79	7.66
Mean	7.49	7.81	7.65

N TIME SEEDRESS	SINGLE	DIVIDED	Mean
ORGANO M	7.31	7.66	7.48
TRIADIME	7.68	7.97	7.83
Mean	7.49	7.81	7.65

N TIME AUTUMN N	SINGLE	DIVIDED	Mean
0	7.19	7.63	7.41
60	7.80	8.00	7.90
Mean	7.49	7.81	7.65

N FORM SOWDATE	SUL AMM	AMM NITR	Mean
21 SEPT	7.17	6.87	7.02
26 OCT	8.33	8.24	8.28
Mean	7.75	7.56	7.65

N FORM SOILFUNG	SUL AMM	AMM NITR	Mean
NONE	7.72	7.58	7.65
NUARIMOL	7.78	7.54	7.66
Mean	7.75	7.56	7.65

N FORM SEEDRESS	SUL AMM	AMM NITR	Mean
ORGANO M	7.40	7.56	7.48
TRIADIME	8.09	7.56	7.83
Mean	7.75	7.56	7.65

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88/R/WW/4

GRAIN TONNES/HECTARE

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

N FORM	SUL AMM	AMM NITR	Mean
AUTUMN N			
0	7.44	7.37	7.41
60	8.05	7.74	7.90
Mean	7.75	7.56	7.65

N FORM	SUL AMM	AMM NITR	Mean
N TIME			
SINGLE	7.53	7.45	7.49
DIVIDED	7.97	7.66	7.81
Mean	7.75	7.56	7.65

SOILFUNG	NONE		NUARIMOL	
SOWDATE SEEDRESS	ORGANO M	TRIADIME	ORGANO M	TRIADIME
21 SEPT	6.32	7.29	6.90	7.58
26 OCT	8.44	8.54	8.26	7.89

SOILFUNG	NONE		NUARIMOL	
SOWDATE AUTUMN N	0	60	0	60
21 SEPT	6.05	7.56	7.19	7.29
26 OCT	8.41	8.57	7.99	8.17

SEEDRESS	ORGANO M		TRIADIME	
SOWDATE AUTUMN N	0	60	0	60
21 SEPT	6.11	7.10	7.12	7.75
26 OCT	8.18	8.53	8.22	8.21

SEEDRESS	ORGANO M		TRIADIME	
SOILFUNG AUTUMN N	0	60	0	60
NONE	6.81	7.95	7.65	8.18
NUARIMOL	7.48	7.68	7.69	7.78

SOILFUNG	NONE		NUARIMOL	
SOWDATE N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
21 SEPT	6.76	6.85	6.94	7.53
26 OCT	8.16	8.82	8.11	8.05

SEEDRESS	ORGANO M		TRIADIME	
SOWDATE N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
21 SEPT	6.47	6.74	7.23	7.64
26 OCT	8.14	8.57	8.12	8.31

SEEDRESS	ORGANO M		TRIADIME	
SOILFUNG N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
NONE	7.28	7.49	7.64	8.19
NUARIMOL	7.33	7.82	7.71	7.76

AUTUMN N	0		60	
SOWDATE N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
21 SEPT	6.39	6.85	7.32	7.53
26 OCT	7.99	8.41	8.27	8.47

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88/R/WW/4

GRAIN TONNES/HECTARE

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

AUTUMN N	0		60	
SOILFUNG N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
NONE	6.98	7.48	7.95	8.19
NUARIMOL	7.40	7.77	7.65	7.80

AUTUMN N	0		60	
SEEDRESS N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
ORGANO M	7.04	7.26	7.58	8.06
TRIADIME	7.34	8.00	8.02	7.94

SOILFUNG	NONE		NUARIMOL	
SOWDATE N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
21 SEPT	6.93	6.68	7.40	7.07
26 OCT	8.51	8.48	8.15	8.00

SEEDRESS	ORGANO M		TRIADIME	
SOWDATE N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
21 SEPT	6.58	6.64	7.76	7.11
26 OCT	8.23	8.47	8.43	8.00

SEEDRESS	ORGANO M		TRIADIME	
SOILFUNG N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
NONE	7.28	7.48	8.16	7.67
NUARIMOL	7.52	7.63	8.03	7.44

AUTUMN N	0		60	
SOWDATE N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
21 SEPT	6.58	6.66	7.76	7.09
26 OCT	8.31	8.09	8.35	8.39

AUTUMN N	0		60	
SOILFUNG N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
NONE	7.23	7.23	8.21	7.92
NUARIMOL	7.66	7.52	7.90	7.56

AUTUMN N	0		60	
SEEDRESS N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
ORGANO M	7.04	7.25	7.76	7.87
TRIADIME	7.84	7.50	8.35	7.61

N TIME	SINGLE		DIVIDED	
SOWDATE N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
21 SEPT	6.96	6.75	7.38	7.00
26 OCT	8.11	8.16	8.55	8.32

SINGLE		DIVIDED		
SOILFUNG N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
NONE	7.49	7.44	7.95	7.72
NUARIMOL	7.58	7.47	7.98	7.60

N TIME	SINGLE		DIVIDED	
SEEDRESS N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
ORGANO M	7.20	7.41	7.61	7.71
TRIADIME	7.86	7.50	8.33	7.62

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88/R/WW/4

GRAIN TONNES/HECTARE

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

	N TIME	SINGLE		DIVIDED	
AUTUMN N	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
0		7.17	7.20	7.72	7.54
60		7.89	7.70	8.22	7.78

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

Margins of two factor tables	0.192
Two factor tables	0.271
Three factor tables	0.384

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.768	10.0

GRAIN MEAN DM% 84.4

PLOT AREA HARVESTED 0.00271

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88/R/WW/5

WINTER WHEAT

APHICIDE, N AND FUNGICIDE

Object: To determine the economic thresholds for cereal aphids with different levels of inputs - Sawyers II.

Sponsor: N. Carter.

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 3.0 x 12.0.

Treatments: All combinations of:-

1. **APHICIDE** — Aphicide:

   - NONE — None
   - PIRIMICA — Pirimicarb applied at 0.14 kg in 260 l on 6 May, 1988, in 200 l on 20 May and in 260 l on 6 June, 20 June and 12 July

2. **N RATE** — Nitrogen fertilizer (kg N) as 'Nitram' on 22 Apr, 1988:

   - 105
   - 140
   - 175

3. **FUNGCIDE** — Fungicides:

   - NONE — None
   - 31+39+65 — Fungicide sprays at growth stages 31, 39 and 65:
     - G.S. 31 - Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l on 21 Apr, 1988
     - G.S. 40 - Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l on 20 May
     - G.S. 65 - Fenpropimorph at 0.75 kg with chlorothalonil at 1.0 kg in 260 l on 20 June

Basal applications: Weedkillers: Chlortoluron at 3.5 kg in 200 l. Mecoprop at 3.0 kg in 200 l. Growth regulator: Chlormequat at 1.3 kg in 260 l.

Seed: Avalon, sown at 180 kg.

Cultivations, etc.:- Deep-tine cultivated: 5 Oct, 1987. Heavy spring-tine cultivated, spring-tine cultivated, rotary harrowed, seed sown: 6 Oct. Chlortoluron applied: 8 Nov. Mecoprop applied: 25 Apr, 1988. Growth regulator applied: 6 May. Combine harvested: 23 Aug. Previous crops: W. barley 1986, potatoes 1987.

NOTE: Aphids were counted from mid-May until late July. Plant dry weights were measured at anthesis. Disease assessments were made in late June and late July. Components of yield were measured.

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88/R/WW/5

GRAIN TONNES/HECTARE

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

N RATE	105	140	175	Mean
APHICIDE				
NONE	7.79	8.29	8.49	8.19
PIRIMICA	8.44	8.83	9.15	8.81
Mean	8.12	8.56	8.82	8.50

FUNGCIDE	NONE	31+39+65	Mean
APHICIDE			
NONE	7.85	8.54	8.19
PIRIMICA	8.55	9.06	8.81
Mean	8.20	8.80	8.50

FUNGCIDE	NONE	31+39+65	Mean
N RATE			
105	7.94	8.29	8.12
140	8.25	8.88	8.56
175	8.41	9.23	8.82
Mean	8.20	8.80	8.50

	FUNGCIDE	NONE	31+39+65
APHICIDE	N RATE		
NONE	105	7.56	8.02
	140	7.86	8.73
	175	8.13	8.86
PIRIMICA	105	8.33	8.55
	140	8.63	9.04
	175	8.70	9.60

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

APHICIDE	N RATE	FUNGCIDE	APHICIDE N RATE
0.135	0.166	0.135	0.235

APHICIDE FUNGCIDE	N RATE FUNGCIDE	APHICIDE N RATE FUNGCIDE
0.192	0.235	0.332

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	22	0.406	4.8

GRAIN MEAN DM% 83.5

PLOT AREA HARVESTED 0.00331

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88/R/WW/6

WINTER WHEAT

CONTROL OF EYESPOT AND SEPTORIA

Object: To test effects of different strategies on disease control and yield under different degrees of risk from eyespot and Septoria - Bylands/Black Horse I.

Sponsors: A. Goulds, B.D.L. Fitt.

Associate Sponsors: J.F. Jenkyn, D.J. Royle (LARS).

Design: 3 whole plots divided into 40 sub-plots arranged as 4 replicates of 10 treatments.

Whole plot dimensions: 9.0 x 12.0.

Treatments: All combinations of:-

Whole plots

1.	**VARIETY**	Variety:
	AVALON	Avalon
	LONGBOW	Longbow
	RENDEZVO	Rendezvous

Sub plots

2.	**FUNGCIDE**	Fungicides applied according to growth stage or disease forecast:
	0	None
	F1	Prochloraz to Avalon on 21 Apr, 1988 (G.S.30/31), to Longbow on 11 May (G.S.32/33) and to Rendezvous on 20 May (G.S.37). Rendezvous also received propiconazole on 7 June (G.S.57/59) and benodanil on 26 May (G.S.41) and 14 June (G.S.59)
	F2	Prochloraz on 17 May (G.S.37) and propiconazole on 16 June (G.S.67)
	F3	Prochloraz on 21 Apr (duplicated)
	F4	Prochloraz on 21 Apr, propiconazole on 25 May (G.S.39)
	F5	Prochloraz on 21 Apr, propiconazole on 7 June
	F6	Prochloraz on 20 May (duplicated)
	F7	Prochloraz on 20 May, propiconazole on 7 June

NOTES: (1) **FUNGCIDE** F1 was applied in accordance with ADAS eyespot forecast except that the variety RENDEZVO did not reach the target and on this variety the treatment was replaced by those shown.
(2) Prochloraz was applied at 0.40 kg in 200 l.
(3) Propiconazole was applied at 0.12 kg in 200 l on 25 May and 16 June and in 260 l on 7 June.
(4) Benodanil was applied at 1.0 kg in 220 l.

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88/R/WW/6

Basal applications: Manures: Chalk at 5.0 t. 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l. Insecticide: Fonofos at 1.4 kg in 200 l.

Seed: Varieties, sown at 190 kg.

Cultivations, etc.:- Chalk applied: 15 Sept, 1987. Paraquat applied: 28 Sept. Ploughed: 13 Oct. Rotary harrowed, seed sown: 14 Oct. Isoproturon applied: 7 Nov. Insecticide applied: 14 Jan, 1988. First N applied: 29 Feb. Second N applied: 21 Apr. Remaining weedkillers applied: 25 Apr. Fungicide applied: 5 July. Combine harvested: 30 Aug. Previous crops: W. oilseed rape 1986, w. wheat 1987.

NOTE: Eyespot was assessed on plants at weekly intervals from early April until the beginning of August.

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88/R/WW/6 AVALON

GRAIN TONNES/HECTARE

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

FUNGCIDE	
O	7.32
F1	8.05
F2	8.78
F3	8.18
F4	8.99
F5	8.54
F6	7.97
F7	8.35
Mean	8.23

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

FUNGCIDE	
0.319	min.rep
0.276	max-min
0.225	max.rep

	FUNGCIDE
max.rep	F3 v F6
max-min	F3 or F6 v any of remainder
min.rep	any of remainder

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	29	0.451	5.5

GRAIN MEAN DM% 84.2

PLOT AREA HARVESTED 0.00331

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88/R/WW/6 LONGBOW

GRAIN TONNES/HECTARE

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

FUNGCIDE	
O	7.79
F1	8.61
F2	9.14
F3	8.79
F4	9.44
F5	9.58
F6	8.20
F7	9.34
Mean	8.79

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

FUNGCIDE	
0.375	min.rep
0.325	max-min
0.265	max.rep

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	29	0.531	6.0

GRAIN MEAN DM% 84.6

PLOT AREA HARVESTED 0.00331

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88/R/WW/6 RENDEZVOUS

GRAIN TONNES/HECTARE

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

FUNGCIDE	
O	7.88
F1	8.82
F2	9.58
F3	8.46
F4	8.91
F5	9.10
F6	8.82
F7	9.03
Mean	8.79

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

FUNGCIDE	
0.289	min.rep
0.250	max-min
0.204	max.rep

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	29	0.408	4.6

GRAIN MEAN DM% 84.6

PLOT AREA HARVESTED 0.00331

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88/R/WW/8

WINTER WHEAT

CONTROL OF MBC-RESISTANT EYESPOT

Object: To investigate the control of MBC-resistant eyespot by methyl N-(3,5,dichlorophenyl) - carbamate (MDPC) - Sawyers II.

Sponsors: G.L. Bateman, D.W. Hollomon (LARS).

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments: All combinations of:-

1. **INOCULUM** Type of inoculum applied:

RESI	MBC-resistant eyespot
SENS	MBC-sensitive eyespot

2. **FUNGCIDE** Type of fungicide applied:

NONE	None
CAR	Carbendazim at 0.25 kg
CAR+MDPC	Carbendazim at 0.25 kg + MDPC at 1.0 kg
MDPC	MDPC at 1.0 kg

NOTES: (1) The inoculum was colonised on autoclaved oat seed and broadcast just after emergence.
(2) Fungicide treatments were applied in 220 l on 17 Apr, 1988.

Basal applications: Manures: 'Nitram' at 400 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Mecoprop at 3.0 kg in 200 l.

Seed: Avalon, sown at 180 kg.

Cultivations, etc.:- Deep-tine cultivated: 5 Oct, 1987. Heavy spring-tine cultivated, spring-tine cultivated, rotary harrowed, seed sown: 6 Oct. Chlortoluron applied: 8 Nov. N applied: 22 Apr, 1988. Mecoprop applied: 25 Apr. Combine harvested: 23 Aug. Previous crops: W. wheat 1986, potatoes 1987.

NOTE: Eyespot was assessed at the beginning of April and in July.

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88/R/WW/8

GRAIN TONNES/HECTARE

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

FUNGCIDE INOCULUM	NONE	CAR	CAR+MDPC	MDPC	Mean
RESI	8.43	8.38	8.24	8.32	8.35
SENS	7.88	7.81	8.37	8.15	8.05
Mean	8.16	8.10	8.31	8.23	8.20

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

INOCULUM	FUNGCIDE	INOCULUM FUNGCIDE
0.144	0.204	0.289

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.353	4.3

GRAIN MEAN DM% 83.4

SUB PLOT AREA HARVESTED 0.00201 (1st block) or 0.00273 (other blocks)

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88/R/WW/10

WINTER WHEAT

AUTUMN PYRETHROID AND POLYPHAGOUS PREDATORS

Object: To assess the effects of pyrethroids on populations of non-target beneficial insects and the consequences of any such effects on summer aphid populations - Black Horse I N.

Sponsors: N. Carter, W. Powell.

Associate Sponsor: D. Cooper (MAFF).

Design: 3 blocks of 4 plots.

Whole plot dimensions: 8.0 x 60.0.

Treatments:

INS BARR	Insecticide and polythene barriers:
0 0	No insecticides, no barriers
0 BARR	No insecticide, with polythene barriers
DE BARR	Deltamethrin on 24 Oct, 1987, with barriers
DL BARR	Deltamethrin on 13 Nov, with barriers

NOTES: (1) Deltamethrin was applied at 0.0062 kg in 200 l.
(2) The polythene barriers were erected around the plots, to prevent movement of ground insects, in early October, 1987.

Basal applications: Manures: Chalk at 5.0 t. 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Fungicides: Carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l.

Seed: Mercia, sown at 180 kg.

Cultivations, etc.:- Disced: 9 Sept, 1987. Chalk applied: 15 Sept. Heavy spring-tine cultivated, spring-tine cultivated: 24 Sept. Seed sown: 26 Sept. Chlortoluron applied: 3 Oct. First N applied: 29 Feb, 1988. Remaining weedkillers applied: 14 Apr. Second N applied: 21 Apr. Fungicides applied: 20 June. Combine harvested: 18 Aug. Previous crops: W. barley 1986, w. oilseed rape 1987.

NOTE: Ground insect numbers were estimated from pitfall traps from October to July. Aphid samples were taken in autumn and fortnightly from April until late July. Plant samples were taken for shoot borer estimates in April and visual assessments of BYDV made in mid-June.

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88/R/WW/10

GRAIN TONNES/HECTARE

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

INS BARR	0 0	0 BARR	DE BARR	DL BARR	MEAN
	6.51	6.38	6.60	6.58	6.52

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

INS BARR
0.095

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.116	1.8

GRAIN MEAN DM% 85.7

PLOT AREA HARVESTED 0.00353

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88/R/WW/12

WINTER WHEAT

CONTROL OF VOLUNTEERS

Object: To compare methods of volunteer control in cereal crops - Summerdells II.

Sponsors: R. Moffitt, D.G. Christian.

Design: 3 replicates of 6 x 3 criss-cross.

Column plot dimensions: 6.0 x 23.0.

Treatments: All combinations of:-

1. **PRIMCULT** Primary cultivations:

NONE	None until just before sowing
DYNDRIVE	'Bomford Dynadrive'
DISC	Disc
PLOUGH	Plough
ROTAVATE	Rotary cultivate
TINE	Tine

2. **PRSOWCON** Pre-sowing volunteer control:

GLYPHOS	Glyphosate at 0.27 kg in 200 l on 24 Oct, 1987
PARAQUAT	Paraquat at 0.60 kg ion in 200 l on 24 Oct
ROT HARR	Rotary harrow on 7 Nov

NOTES: (1) Primary cultivation treatments were carried out on 18 Aug, 1987, disc and tine treatments were cultivated twice, the others once.
(2) All plots were disced twice and rotary harrowed on 7 Nov.
(3) The 'Bomford Dynadrive' has a frame similar to a rotary cultivator but it has two rotating shafts containing flat, slightly twisted, spade shape tines. The front shaft drives the rear, it is fitted with twice the number of blades and rotates at about one third the speed of the rear shaft.

Basal applications: Manures: (0:18:36) at 690 kg. 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l.

Seed: Mercia, sown at 180 kg.

Cultivations, etc.:- PK applied: 24 Aug, 1987. Seed sown: 7 Nov. First N applied: 2 Mar, 1988. Second N applied: 22 Apr. Weedkillers applied: 26 Apr. Combine harvested: 5 Sept. Previous crops: W. barley 1986 and 1987.

NOTE: Volunteer plants were counted in autumn 1987, before the new crop emerged and at anthesis. Numbers of barley grains in harvested produce were counted.

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88/R/WW/12

GRAIN TONNES/HECTARE

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

PRIMCULT	NONE	DYNDRIVE	DISC	PLOUGH	ROTAVATE	TINE	Mean
PRSOWCON							
GLYPHOS	6.08	5.87	5.47	6.37	5.61	5.84	5.87
PARAQUAT	6.36	6.23	6.04	6.36	6.16	6.10	6.21
ROT HARR	5.86	5.95	5.71	6.56	5.69	5.89	5.94
Mean	6.10	6.02	5.74	6.43	5.82	5.95	6.01

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

	PRIMCULT	**PRSOWCON**	**PRIMCULT PRSOWCON**
	0.317	0.072	0.347
Except when comparing means with the same level(s) of			
PRIMCULT			0.171
PRSOWCON			0.346

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP1	10	0.389	6.5
BLOCK.WP2	4	0.088	1.5
BLOCK.WP1.WP2	20	0.208	3.5

GRAIN MEAN DM% 84.2

SUB PLOT AREA HARVESTED 0.00217

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88/R/WS/1

SPRING WHEAT

METHODS OF INOCULATING TAKE-ALL

Object: To compare a range of inoculation methods for establishing differences in take-all severity with even distribution of infection - Hoosfield.

Sponsors: G.L. Bateman, D. Hornby, P.B. Barraclough.

Design: 3 randomised blocks of 9 plots.

Whole plot dimensions: 3.0 x 12.0.

Treatments: Combinations of:-

1. **CULTINOC** Cultivation sequence and method of inoculation:

MULTNIL	Multiple cultivation, no inoculum
MULTBPL	Multiple cultivation, inoculum broadcast before ploughing on 29 Mar, 1988
MULTDR4	Multiple cultivation, inoculum applied by fertilizer drill at 10 cm on 18 Apr
MULTDR2	Multiple cultivation, inoculum applied by fertilizer drill at 5 cm on 18 Apr
MULTCDR	Multiple cultivation, inoculum combine drilled with seed on 19 Apr
SIMPNIL	Simplified cultivation, no inoculum
SIMPRG6	Simplified cultivation, inoculum broadcast before rotagrubbing to 15 cm on 18 Apr
SIMPRV4	Simplified cultivation, inoculum broadcast before rotavating to 10 cm on 18 Apr
SIMPRV2	Simplified cultivation, inoculum broadcast before rotavating to 5 cm on 18 Apr

NOTES: (1) Inoculum were colonised on autoclaved oat seed.
(2) The Multiple cultivation sequence was: plough, fertilizer drill to 10 cm, fertilizer drill to 5 cm, rotary harrow to 5 cm, drill at 4 cm.
(3) The Simplified cultivation sequence was: plough, rotagrub or rotavate as above, drill at 4 cm.
(4) All plots were flat rolled and rotary harrowed to 5 cm (twice) on 14 Apr, 1988 and rotary harrowed to 10 cm on 18 Apr.

Basal applications: Manures: 'Nitram' at 480 kg. Weedkillers: Clopyralid at 0.05 kg and bromoxynil at 0.24 kg with fluroxypyr at 0.20 kg in 200 l. Fungicides: Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

Seed: Alexandria, sown at 240 kg.

Cultivations, etc.:- Ploughed: 29 Mar, 1988. Seed sown: 19 Apr. N applied: 28 Apr. Weedkillers applied: 14 June. Fungicides applied: 8 July. Combine harvested: 16 Sept. Previous crops: S. barley 1986, sunflowers 1987.

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88/R/WS/1

NOTE: Take-all was assessed at fortnightly intervals from the end of May until mid-August. Soil cores were taken in May to check the distribution of the inoculum in the soil.

GRAIN TONNES/HECTARE

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

CULTINOC	
MULTNIL	6.78
MULTBPL	6.26
MULTDR4	4.73
MULTDR2	4.46
MULTCDR	3.87
SIMPNIL	6.77
SIMPRG6	3.98
SIMPRV4	4.31
SIMPRV2	3.80
Mean	5.00

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

CULTINOC
0.377

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	16	0.462	9.2

GRAIN MEAN DM% 79.9

PLOT AREA HARVESTED 0.00255

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88/R/B/1

WINTER BARLEY

FACTORS LIMITING YIELD

Object: To study the effects of a range of factors on the quality and yield of winter barley - Great Harpenden II.

Sponsors: J.F. Jenkyn, R.J.Gutteridge, R.T. Plumb, D.G. Christian, R.J. Darby, S.H.T. Harper, L.A. Mullen, N. Carter, G.J.S. Ross.

Associate sponsors: B.R. Kerry, G.F.J. Milford, Dr. E.D. Baxter (Brewing Research Foundation).

Design: A single replicate of 2 x 2 x 2 x 2 x 2 x 2 + 24 extra plots.

Whole plot dimensions: 3.0 x 15.2.

Treatments: All combinations of the following, all sown early (25 Sept, 1987) and given cypermethrin at 0.025 kg in 220 l on 3 Nov:

1. **PREVCROP** — Previous cropping:

BARLEY	S. beans 1985, w. wheat 1986, w. barley 1987
OATS	S. beans 1985, w. wheat 1986, w. oats 1987

2. **WINTER N** — Nitrogen fertilizer in winter (kg N) as urea (46% N):

0	None
NOV+FEB	On 17 Nov, 1987 33 to BARLEY, 54 to OATS, on 18 Feb, 1988 25 to BARLEY and OATS

3. **SPRING N** — Nitrogen fertilizer in spring (kg N) as 'Nitro-Chalk':

   125
   200

4. **N TIME** — Timing of spring nitrogen application:

14 MAR	14 March, 1988
13 APR	13 April

5. **E FUNG** — Early fungicides:

NONE	None
TFSD	Triadimenol and fuberidazole seed dressing

6. **L FUNG** — Late fungicides:

NONE	None
SPRAYS	Foliar sprays of prochloraz at 0.40 kg, carbendazim at 0.15 kg and tridemorph at 0.52 kg in 220 l on 12 Apr, 1988. Propiconazole at 0.12 kg and tridemorph at 0.22 kg in 220 l on 27 May

https://doi.org/10.23637/ERADOC-1-43 *pp 170*

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plus all combinations of the following all after barley and given late fungicides and 125 kg N in spring, not given cypermethrin in the autumn:

1. **SOWDATEV**

25 SEPT	25 September, 1987
26 OCT	26 October

2. **WINTR NV** Nitrogen fertilizer in winter (kg N) as urea (46 %N):

0	None
33+25	33 on 17 Nov, 1987, 25 on 18 Feb, 1988

3. **E FUNGV** Early fungicides:

NONE	None
TFSD	Triadimenol and fuberidazole seed dressing

4. **N TIMEV** Timing of spring nitrogen application:

14 MAR	14 March, 1988
13 APR	13 April

plus 2 extra treatments following fallow, sown 25 September and given early and late fungicides, cypermethrin, 125 kg spring nitrogen but not given winter nitrogen:

N TIMEF Timing of spring nitrogen application:

14 MAR	14 March, 1988 (duplicated)
13 APR	13 April (duplicated)

plus 1 extra treatment following barley, sown 25 September given early and late fungicides, cypermethrin, 200 kg spring nitrogen in April:

WINTER NX Extra winter nitrogen (kg N):

58+25	58 kg on 17 Nov, 1987, 25 kg on 18 Feb, 1988 (duplicated)

plus 1 extra treatment following barley, sown 25 September, and given early and late fungicides, cypermethrin but no nitrogen:

EXTRA NO

0+0+0	No nitrogen (duplicated)

Basal applications: Weedkillers: Glyphosate at 0.27 kg in 200 l. Chlortoluron at 3.5 kg in 200 l. Diclofop-methyl at 0.95 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Growth regulators: Mepiquat chloride at 0.61 kg and 2-chloroethylphosphonic acid at 0.31 kg with a wetting agent ('Cittowet' at 0.08 l) in 200 l.

Seed: Magie, sown at 300 seeds per square metre.

https://doi.org/10.23637/ERADOC-1-43 *pp 171*

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88/R/B/1

Cultivations, etc.:- Rotary cultivated (fallow and barley plots only): 19 Aug, 1987. Glyphosate applied: 18 Sept. Cultivated by rotary grubber: 23 Sept. Early-sown plots rotary harrowed, seed sown: 25 Sept. Later-sown plots rotary harrowed, seed sown: 26 Oct. Chlortoluron applied: 6 Nov. Diclofop-methyl applied: 18 Nov. Remaining weedkillers applied: 25 Apr, 1988. Growth regulators with wetting agent applied: 26 Apr. Combine harvested: 4 Aug. Previous crops: W. wheat 1986, w. barley, w. oats, fallow 1987.

NOTES: (1) Soil was sampled to measure nitrate and ammonium contents in October, 1987, November and February, 1988. Crop samples were taken to measure nitrate N concentrations from November to July.
(2) Plants were sampled in March, April, June and July to measure plant and shoot numbers, dry weights and nitrogen uptakes. After harvest thousand grain weights were measured.
(3) Leaf diseases, take-all, eyespot, barley yellow dwarf virus and aphid incidence were assessed.
(4) A cage was erected over the crop from early June to maturity to prevent damage by birds.

GRAIN TONNES/HECTARE

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

WINTER N	0	NOV+FEB	Mean
PREVCROP			
BARLEY	5.38	5.73	5.56
OATS	6.08	6.56	6.32
Mean	5.73	6.15	5.94

SPRING N	125	200	Mean
PREVCROP			
BARLEY	5.26	5.86	5.56
OATS	6.19	6.45	6.32
Mean	5.72	6.15	5.94

SPRING N	125	200	Mean
WINTER N			
0	5.55	5.91	5.73
NOV+FEB	5.90	6.40	6.15
Mean	5.72	6.15	5.94

N TIME	14 MAR	13 APR	Mean
PREVCROP			
BARLEY	5.68	5.43	5.56
OATS	6.25	6.39	6.32
Mean	5.96	5.91	5.94

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88/R/B/1

GRAIN TONNES/HECTARE

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

N TIME	14 MAR	13 APR	Mean
WINTER N			
0	5.85	5.61	5.73
NOV+FEB	6.08	6.21	6.15
Mean	5.96	5.91	5.94

N TIME	14 MAR	13 APR	Mean
SPRING N			
125	5.74	5.70	5.72
200	6.19	6.12	6.15
Mean	5.96	5.91	5.94

E FUNG	NONE	TFSD	Mean
PREVCROP			
BARLEY	5.60	5.51	5.56
OATS	6.18	6.46	6.32
Mean	5.89	5.98	5.94

E FUNG	NONE	TFSD	Mean
WINTER N			
0	5.70	5.76	5.73
NOV+FEB	6.09	6.20	6.15
Mean	5.89	5.98	5.94

E FUNG	NONE	TFSD	Mean
SPRING N			
125	5.69	5.75	5.72
200	6.10	6.21	6.15
Mean	5.89	5.98	5.94

E FUNG	NONE	TFSD	Mean
N TIME			
14 MAR	5.80	6.13	5.96
13 APR	5.99	5.83	5.91
Mean	5.89	5.98	5.94

L FUNG	NONE	SPRAYS	Mean
PREVCROP			
BARLEY	5.27	5.84	5.56
OATS	5.85	6.79	6.32
Mean	5.56	6.31	5.94

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88/R/B/1

GRAIN TONNES/HECTARE

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

L FUNG	NONE	SPRAYS	Mean
WINTER N			
0	5.37	6.08	5.73
NOV+FEB	5.75	6.54	6.15
Mean	5.56	6.31	5.94

L FUNG	NONE	SPRAYS	Mean
SPRING N			
125	5.52	5.92	5.72
200	5.60	6.71	6.15
Mean	5.56	6.31	5.94

L FUNG	NONE	SPRAYS	Mean
N TIME			
14 MAR	5.43	6.50	5.96
13 APR	5.69	6.13	5.91
Mean	5.56	6.31	5.94

L FUNG	NONE	SPRAYS	Mean
E FUNG			
NONE	5.51	6.28	5.89
TFSD	5.61	6.35	5.98
Mean	5.56	6.31	5.94

	SPRING N	125	200
PREVCROP	**WINTER N**		
BARLEY	0	5.15	5.61
	NOV+FEB	5.36	6.10
OATS	0	5.94	6.21
	NOV+FEB	6.43	6.69

	N TIME	14 MAR	13 APR
PREVCROP	**WINTER N**		
BARLEY	0	5.61	5.15
	NOV+FEB	5.75	5.71
OATS	0	6.09	6.06
	NOV+FEB	6.41	6.71

	N TIME	14 MAR	13 APR
PREVCROP	**SPRING N**		
BARLEY	125	5.37	5.14
	200	5.98	5.73
OATS	125	6.11	6.26
	200	6.39	6.51

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88/R/B/1

GRAIN TONNES/HECTARE

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

	N TIME	14 MAR	13 APR
WINTER N	**SPRING N**		
0	125	5.71	5.38
	200	5.99	5.83
NOV+FEB	125	5.78	6.02
	200	6.38	6.41

	E FUNG	NONE	TFSD
PREVCROP	**WINTER N**		
BARLEY	0	5.41	5.35
	NOV+FEB	5.79	5.67
OATS	0	5.98	6.17
	NOV+FEB	6.39	6.74

	E FUNG	NONE	TFSD
PREVCROP	**SPRING N**		
BARLEY	125	5.38	5.13
	200	5.83	5.88
OATS	125	6.01	6.37
	200	6.36	6.54

	E FUNG	NONE	TFSD
WINTER N	**SPRING N**		
0	125	5.55	5.54
	200	5.84	5.98
NOV+FEB	125	5.83	5.97
	200	6.36	6.44

	E FUNG	NONE	TFSD
PREVCROP	**N TIME**		
BARLEY	14 MAR	5.53	5.83
	13 APR	5.68	5.18
OATS	14 MAR	6.07	6.43
	13 APR	6.30	6.48

	E FUNG	NONE	TFSD
WINTER N	**N TIME**		
0	14 MAR	5.66	6.04
	13 APR	5.73	5.49
NOV+FEB	14 MAR	5.93	6.23
	13 APR	6.25	6.18

	E FUNG	NONE	TFSD
SPRING N	**N TIME**		
125	14 MAR	5.56	5.93
	13 APR	5.83	5.58
200	14 MAR	6.04	6.33
	13 APR	6.16	6.09

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88/R/B/1

GRAIN TONNES/HECTARE

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

L FUNG		NONE	SPRAYS
PREVCROP	WINTER N		
BARLEY	0	5.15	5.61
	NOV+FEB	5.39	6.08
OATS	0	5.60	6.56
	NOV+FEB	6.11	7.01

L FUNG		NONE	SPRAYS
PREVCROP	SPRING N		
BARLEY	125	5.21	5.30
	200	5.32	6.39
OATS	125	5.82	6.55
	200	5.88	7.02

L FUNG		NONE	SPRAYS
WINTER N	SPRING N		
0	125	5.41	5.68
	200	5.33	6.49
NOV+FEB	125	5.63	6.17
	200	5.87	6.92

L FUNG		NONE	SPRAYS
PREVCROP	N TIME		
BARLEY	14 MAR	5.23	6.13
	13 APR	5.31	5.56
OATS	14 MAR	5.63	6.87
	13 APR	6.08	6.70

L FUNG		NONE	SPRAYS
WINTER N	N TIME		
0	14 MAR	5.24	6.46
	13 APR	5.51	5.71
NOV+FEB	14 MAR	5.62	6.54
	13 APR	5.88	6.55

L FUNG		NONE	SPRAYS
SPRING N	N TIME		
125	14 MAR	5.47	6.02
	13 APR	5.57	5.83
200	14 MAR	5.39	6.99
	13 APR	5.82	6.42

L FUNG		NONE	SPRAYS
PREVCROP	E FUNG		
BARLEY	NONE	5.36	5.85
	TFSD	5.17	5.84
OATS	NONE	5.66	6.71
	TFSD	6.05	6.86

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88/R/B/1

GRAIN TONNES/HECTARE

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

WINTER N	L FUNG / E FUNG	NONE	SPRAYS
0	NONE	5.29	6.11
	TFSD	5.46	6.06
NOV+FEB	NONE	5.74	6.45
	TFSD	5.76	6.64

SPRING N	L FUNG / E FUNG	NONE	SPRAYS
125	NONE	5.55	5.83
	TFSD	5.48	6.02
200	NONE	5.47	6.72
	TFSD	5.73	6.69

N TIME	L FUNG / E FUNG	NONE	SPRAYS
14 MAR	NONE	5.24	6.36
	TFSD	5.61	6.65
13 APR	NONE	5.78	6.20
	TFSD	5.60	6.06

WINTR NV / SOWDATEV	0	33+25	Mean
25 SEPT	5.82	6.16	5.99
26 OCT	5.28	5.89	5.59
Mean	5.55	6.03	5.79

E FUNGV / SOWDATEV	NONE	TFSD	Mean
25 SEPT	5.92	6.06	5.99
26 OCT	5.58	5.59	5.59
Mean	5.75	5.83	5.79

E FUNGV / WINTR NV	NONE	TFSD	Mean
0	5.67	5.43	5.55
33+25	5.83	6.23	6.03
Mean	5.75	5.83	5.79

N TIMEV / SOWDATEV	14 MAR	13 APR	Mean
25 SEPT	6.34	5.65	5.99
26 OCT	5.57	5.60	5.59
Mean	5.96	5.62	5.79

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88/R/B/1

GRAIN TONNES/HECTARE

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

N TIMEV WINTR NV	14 MAR	13 APR	Mean
0	5.64	5.46	5.55
33+25	6.27	5.79	6.03
Mean	5.96	5.62	5.79

N TIMEV E FUNGV	14 MAR	13 APR	Mean
NONE	6.07	5.43	5.75
TFSD	5.84	5.82	5.83
Mean	5.96	5.62	5.79

SOWDATEV	E FUNGV WINTR NV	NONE	TFSD
25 SEPT	0	5.81	5.84
	33+25	6.03	6.29
26 OCT	0	5.54	5.02
	33+25	5.62	6.16

SOWDATEV	N TIMEV WINTR NV	14 MAR	13 APR
25 SEPT	0	6.20	5.44
	33+25	6.48	5.85
26 OCT	0	5.09	5.48
	33+25	6.06	5.72

SOWDATEV	N TIMEV E FUNGV	14 MAR	13 APR
25 SEPT	NONE	6.35	5.48
	TFSD	6.32	5.81
26 OCT	NONE	5.78	5.38
	TFSD	5.36	5.82

WINTR NV	N TIMEV E FUNGV	14 MAR	13 APR
0	NONE	5.96	5.39
	TFSD	5.33	5.53
33+25	NONE	6.18	5.47
	TFSD	6.35	6.10

SOWDATEV	WINTR NV	N TIMEV E FUNGV	14 MAR	13 APR
25 SEPT	0	NONE	6.05	5.56
		TFSD	6.34	5.33
	33+25	NONE	6.66	5.41
		TFSD	6.29	6.29
26 OCT	0	NONE	5.86	5.23
		TFSD	4.32	5.73
	33+25	NONE	5.71	5.54
		TFSD	6.41	5.91

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88/R/B/1

GRAIN TONNES/HECTARE

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

N TIMEF	14 MAR	13 APR	Mean
	6.04	6.32	6.18

WINTER NX	58+25
	6.00

EXTRA NO	0+0+0
	1.68

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

(not including extra plots)

Margin of two factor tables	0.123
Two factor tables	0.174
Three factor tables	0.246

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

Stratum	d.f.	s.e.	cv%
WP	22	0.492	8.3

GRAIN MEAN DM% 80.9

STRAW TONNES/HECTARE

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

WINTER N	0	NOV+FEB	Mean
PREVCROP			
BARLEY	3.01	3.29	3.15
OATS	3.89	4.07	3.98
Mean	3.45	3.68	3.57

SPRING N	125	200	Mean
PREVCROP			
BARLEY	3.04	3.26	3.15
OATS	3.85	4.11	3.98
Mean	3.45	3.68	3.57

SPRING N	125	200	Mean
WINTER N			
0	3.35	3.56	3.45
NOV+FEB	3.55	3.81	3.68
Mean	3.45	3.68	3.57

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88/R/B/1

STRAW TONNES/HECTARE

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

N TIME	14 MAR	13 APR	Mean
PREVCROP			
BARLEY	3.21	3.09	3.15
OATS	3.86	4.09	3.98
Mean	3.54	3.59	3.57

N TIME	14 MAR	13 APR	Mean
WINTER N			
0	3.41	3.49	3.45
NOV+FEB	3.67	3.69	3.68
Mean	3.54	3.59	3.57

N TIME	14 MAR	13 APR	Mean
SPRING N			
125	3.37	3.52	3.45
200	3.71	3.66	3.68
Mean	3.54	3.59	3.57

E FUNG	NONE	TFSD	Mean
PREVCROP			
BARLEY	3.17	3.13	3.15
OATS	3.90	4.06	3.98
Mean	3.54	3.59	3.57

E FUNG	NONE	TFSD	Mean
WINTER N			
0	3.40	3.50	3.45
NOV+FEB	3.67	3.69	3.68
Mean	3.54	3.59	3.57

E FUNG	NONE	TFSD	Mean
SPRING N			
125	3.44	3.45	3.45
200	3.63	3.74	3.68
Mean	3.54	3.59	3.57

E FUNG	NONE	TFSD	Mean
N TIME			
14 MAR	3.60	3.47	3.54
13 APR	3.47	3.72	3.59
Mean	3.54	3.59	3.57

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88/R/B/1

STRAW TONNES/HECTARE

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

L FUNG	NONE	SPRAYS	Mean
PREVCROP			
BARLEY	2.86	3.44	3.15
OATS	3.73	4.23	3.98
Mean	3.29	3.84	3.57

L FUNG	NONE	SPRAYS	Mean
WINTER N			
0	3.21	3.70	3.45
NOV+FEB	3.38	3.97	3.68
Mean	3.29	3.84	3.57

L FUNG	NONE	SPRAYS	Mean
SPRING N			
125	3.23	3.67	3.45
200	3.36	4.01	3.68
Mean	3.29	3.84	3.57

L FUNG	NONE	SPRAYS	Mean
N TIME			
14 MAR	3.14	3.94	3.54
13 APR	3.45	3.73	3.59
Mean	3.29	3.84	3.57

L FUNG	NONE	SPRAYS	Mean
E FUNG			
NONE	3.27	3.81	3.54
TFSD	3.32	3.87	3.59
Mean	3.29	3.84	3.57

SPRING N		125	200
PREVCROP	**WINTER N**		
BARLEY	0	2.92	3.11
	NOV+FEB	3.17	3.41
OATS	0	3.77	4.01
	NOV+FEB	3.92	4.21

N TIME		14 MAR	13 APR
PREVCROP	**WINTER N**		
BARLEY	0	3.00	3.03
	NOV+FEB	3.43	3.15
OATS	0	3.82	3.96
	NOV+FEB	3.91	4.23

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88/R/B/1

STRAW TONNES/HECTARE

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

	N TIME	14 MAR	13 APR
PREVCROP	SPRING N		
BARLEY	125	3.04	3.05
	200	3.39	3.13
OATS	125	3.70	4.00
	200	4.03	4.19

	N TIME	14 MAR	13 APR
WINTER N	SPRING N		
0	125	3.16	3.53
	200	3.66	3.46
NOV+FEB	125	3.57	3.52
	200	3.76	3.86

	E FUNG	NONE	TFSD
PREVCROP	WINTER N		
BARLEY	0	2.90	3.13
	NOV+FEB	3.45	3.13
OATS	0	3.91	3.87
	NOV+FEB	3.89	4.25

	E FUNG	NONE	TFSD
PREVCROP	SPRING N		
BARLEY	125	3.11	2.98
	200	3.24	3.28
OATS	125	3.78	3.91
	200	4.01	4.21

	E FUNG	NONE	TFSD
WINTER N	SPRING N		
0	125	3.23	3.46
	200	3.58	3.54
NOV+FEB	125	3.66	3.43
	200	3.68	3.94

	E FUNG	NONE	TFSD
PREVCROP	N TIME		
BARLEY	14 MAR	3.29	3.13
	13 APR	3.05	3.12
OATS	14 MAR	3.92	3.81
	13 APR	3.88	4.31

	E FUNG	NONE	TFSD
WINTER N	N TIME		
0	14 MAR	3.42	3.39
	13 APR	3.38	3.61
NOV+FEB	14 MAR	3.78	3.55
	13 APR	3.55	3.83

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88/R/B/1

STRAW TONNES/HECTARE

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

	E FUNG	NONE	TFSD
SPRING N	**N TIME**		
125	14 MAR	3.45	3.28
	13 APR	3.44	3.61
200	14 MAR	3.76	3.66
	13 APR	3.50	3.82

	L FUNG	NONE	SPRAYS
PREVCROP	**WINTER N**		
BARLEY	0	2.78	3.25
	NOV+FEB	2.94	3.64
OATS	0	3.63	4.15
	NOV+FEB	3.83	4.31

	L FUNG	NONE	SPRAYS
PREVCROP	**SPRING N**		
BARLEY	125	2.79	3.30
	200	2.93	3.59
OATS	125	3.66	4.04
	200	3.80	4.42

	L FUNG	NONE	SPRAYS
WINTER N	**SPRING N**		
0	125	3.11	3.58
	200	3.30	3.82
NOV+FEB	125	3.34	3.75
	200	3.43	4.19

	L FUNG	NONE	SPRAYS
PREVCROP	**N TIME**		
BARLEY	14 MAR	2.83	3.60
	13 APR	2.89	3.29
OATS	14 MAR	3.45	4.28
	13 APR	4.01	4.18

	L FUNG	NONE	SPRAYS
WINTER N	**N TIME**		
0	14 MAR	2.99	3.83
	13 APR	3.42	3.57
NOV+FEB	14 MAR	3.28	4.05
	13 APR	3.48	3.89

	L FUNG	NONE	SPRAYS
SPRING N	**N TIME**		
125	14 MAR	3.16	3.57
	13 APR	3.29	3.76
200	14 MAR	3.12	4.31
	13 APR	3.61	3.71

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88/R/B/1

STRAW TONNES/HECTARE

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

PREVCROP	L FUNG / E FUNG	NONE	SPRAYS
BARLEY	NONE	2.88	3.46
	TFSD	2.84	3.42
OATS	NONE	3.65	4.15
	TFSD	3.81	4.31

WINTER N	L FUNG / E FUNG	NONE	SPRAYS
0	NONE	3.18	3.63
	TFSD	3.23	3.76
NOV+FEB	NONE	3.35	3.98
	TFSD	3.41	3.97

SPRING N	L FUNG / E FUNG	NONE	SPRAYS
125	NONE	3.27	3.62
	TFSD	3.18	3.71
200	NONE	3.26	3.99
	TFSD	3.46	4.02

N TIME	L FUNG / E FUNG	NONE	SPRAYS
14 MAR	NONE	3.15	4.06
	TFSD	3.12	3.82
13 APR	NONE	3.38	3.56
	TFSD	3.53	3.91

WINTR NV / SOWDATEV	0	33+25	Mean
25 SEPT	3.39	3.61	3.50
26 OCT	3.70	3.90	3.80
Mean	3.54	3.75	3.65

E FUNGV / SOWDATEV	NONE	TFSD	Mean
25 SEPT	3.34	3.66	3.50
26 OCT	3.50	4.10	3.80
Mean	3.42	3.88	3.65

E FUNGV / WINTR NV	NONE	TFSD	Mean
0	3.32	3.77	3.54
33+25	3.52	3.99	3.75
Mean	3.42	3.88	3.65

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88/R/B/1

STRAW TONNES/HECTARE

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

N TIMEV	14 MAR	13 APR	Mean
SOWDATEV			
25 SEPT	3.83	3.17	3.50
26 OCT	3.84	3.76	3.80
Mean	3.83	3.47	3.65

N TIMEV	14 MAR	13 APR	Mean
WINTR NV			
0	3.58	3.51	3.54
33+25	4.08	3.43	3.75
Mean	3.83	3.47	3.65

N TIMEV	14 MAR	13 APR	Mean
E FUNGV			
NONE	3.68	3.16	3.42
TFSD	3.98	3.77	3.88
Mean	3.83	3.47	3.65

	E FUNGV	NONE	TFSD
SOWDATEV	**WINTR NV**		
25 SEPT	0	3.29	3.50
	33+25	3.39	3.82
26 OCT	0	3.35	4.04
	33+25	3.65	4.15

	N TIMEV	14 MAR	13 APR
SOWDATEV	**WINTR NV**		
25 SEPT	0	3.59	3.19
	33+25	4.06	3.15
26 OCT	0	3.58	3.82
	33+25	4.10	3.70

	N TIMEV	14 MAR	13 APR
SOWDATEV	**E FUNGV**		
25 SEPT	NONE	3.69	2.98
	TFSD	3.96	3.36
26 OCT	NONE	3.67	3.33
	TFSD	4.01	4.18

	N TIMEV	14 MAR	13 APR
WINTR NV	**E FUNGV**		
0	NONE	3.41	3.22
	TFSD	3.76	3.79
33+25	NONE	3.95	3.09
	TFSD	4.21	3.76

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88/R/B/1

STRAW TONNES/HECTARE

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

SOWDATEV	WINTR NV	N TIMEV E FUNGV	14 MAR	13 APR
25 SEPT	0	NONE	3.33	3.24
		TFSD	3.85	3.15
	33+25	NONE	4.05	2.73
		TFSD	4.07	3.57
26 OCT	0	NONE	3.49	3.21
		TFSD	3.67	4.42
	33+25	NONE	3.85	3.46
		TFSD	4.35	3.95

N TIMEF	14 MAR	13 APR	Mean
	3.30	3.85	3.58

WINTER NX	58+25
	3.76

EXTRA NO	0+0+0
	0.76

STRAW MEAN DM% 86.9

PLOT AREA HARVESTED 0.00210

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88/R/B/2

WINTER BARLEY

SOWING DATES, APHIDS AND BYDV

Object: To study the relationship of aphid numbers in suction trap samples to crop populations and the incidence of BYDV on winter barley sown on a range of dates - Great Field II.

Sponsors: N. Carter, R.T. Plumb.

Design: 4 randomised blocks of 10 plots.

Whole plot dimensions: 3.0 x 23.0.

Treatments: All combinations of:-

1. **SOWDATE** Dates of sowing:

10 SEPT	10 September, 1987
21 SEPT	21 September
30 SEPT	30 September
14 OCT	14 October
26 OCT	26 October

2. **APHICIDE** Aphicide:

NONE	None
CYPERMET	Cypermethrin at 0.025 kg in 380 l on 13 Nov, 1987

NOTES: (1) All SOWDATE treatments were rotary harrowed on the day of sowing.
(2) The crop was netted against birds from late June until maturity.

Basal applications: Manures: 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Isoproturon at 2.1 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- Spring-tine cultivated: 15 Aug, 1987. Glyphosate applied: 8 Sept. Heavy spring-tine cultivated twice: 10 Sept. N applied: 2 Mar, 1988, 8 Apr. Fluroxypyr with clopyralid and bromoxynil applied: 25 Apr. Isoproturon with prochloraz and carbendazim applied: 6 May. Propiconazole and tridemorph applied: 3 June. Combine harvested: 4 Aug. Previous crops: W. barley 1986 and 1987.

NOTE: Aphids were counted from late September to February and again in May. Visual estimates of BYDV were made at the end of April. Components of yield were measured. Take-all was assessed in summer.

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88/R/B/2

GRAIN TONNES/HECTARE

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

APHICIDE SOWDATE	NONE	CYPERMET	Mean
10 SEPT	3.85	3.81	3.83
21 SEPT	5.28	5.36	5.32
30 SEPT	5.60	5.07	5.34
14 OCT	1.25	1.82	1.53
26 OCT	3.94	3.42	3.68
Mean	3.98	3.90	3.94

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

SOWDATE	APHICIDE	SOWDATE APHICIDE
0.318	0.201	0.450

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	27	0.636	16.1

GRAIN MEAN DM% 73.6

PLOT AREA HARVESTED 0.00230

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88/R/B/3

WINTER BARLEY

ALARM PHEROMONE AND BYDV

Object: To determine whether the use of aphid alarm pheromone allows control of BYDV to be achieved with a decreased rate of insecticide - Scout N.

Sponsors: D.C. Griffiths, L.E. Smart, R.T. Plumb.

Design: 4 randomised blocks of 6 plots.

Whole plot dimensions: 6.0 x 8.0.

Treatments:

INS PHE	Sprays of insecticide and alarm pheromone:
NONE	None
A	Alarm pheromone
FEN1	Fenvalerate at 9.55 g
FEN1+A	Fenvalerate at 9.55 g + alarm pheromone
FEN2	Fenvalerate at 19.1 g
FEN2+A	Fenvalerate at 19.1 g + alarm pheromone

NOTES: (1) Treatments were applied in 200 l on 22 Oct, 1987.
(2) The alarm pheromone was E-beta-farnesene applied at 0.20 kg.

Basal applications: Manures: 'Nitram' at 120 kg and later at 480 kg. Weedkillers: Chlortoluron at 3.5 kg with bromoxynil at 0.19 kg and ioxynil at 0.19 kg in 200 l. Fluroxypyr at 0.20 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- Disced: 14 Aug, 1987. Ploughed, rotary harrowed, seed sown: 22 Sept. Chlortoluron, bromoxynil and ioxynil applied: 6 Nov. First N applied: 29 Feb, 1988. Second N applied: 7 Apr. Fluroxypyr with prochloraz and carbendazim applied: 6 May. Remaining fungicides applied: 20 May. Combine harvested: 3 Aug. Previous crops: W. barley 1986 and 1987.

NOTE: Aphids were counted soon after treatment and again in April 1988. Observations were made during the season of incidence of BYDV.

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88/R/B/3

GRAIN TONNES/HECTARE

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

INS PHE	NONE	A	FEN1	FEN1+A	FEN2	FEN2+A	Mean
	7.09	7.48	7.74	8.03	8.04	7.74	7.69

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

INS PHE
0.324

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.458	6.0

GRAIN MEAN DM% 84.5

PLOT AREA HARVESTED 0.00163

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88/R/B/5

WINTER BARLEY

VARIETIES

Object: To study the yields of some of the newer winter barley varieties - Great Harpenden II.

Sponsors: R. Moffitt, J.F. Jenkyn.

Design: 4 randomised blocks of 12 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

VARIETY	Varieties:
GERBEL	Gerbel (6 row)
IGRI	Igri
KASKADE	Kaskade
MAGIE	Magie
MG 33+0	Magie with 33 kg extra N applied on 17 Nov, 1987
MG 0+25	Magie with 25 kg extra N applied on 18 Feb, 1988
MG 33+25	Magie with extra N applied on both the above dates
MG S600	Magie with 'Seamac 600' spray
MARINKA	Marinka
PIRATE	Pirate (6 row)
PLAISANT	Plaisant (6 row)
VIXEN	Vixen

NOTES: (1) The extra N for **VARIETY** MG was applied as urea.
(2) The 'Seamac 600' was applied at 5.6 l in 220 l on 11 Apr, 1988.

Basal applications: Manures: 'Nitram' at 580 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Chlortoluron at 3.5 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l. Growth regulators: Mepiquat chloride at 0.61 kg and 2-chloroethylphosphonic acid at 0.31 kg with a wetting agent ('Cittowet' at 0.08 l) in 200 l.

Seed: Varieties, sown at 150 kg.

Cultivations, etc.:- Cultivated by rotary grubber: 18 Aug, 1987. Glyphosate applied: 18 Sept. Rotary harrowed: 29 Sept. Rotary harrowed, seed sown: 30 Sept. Chlortoluron applied: 6 Nov. N applied: 18 Mar, 1988. Prochloraz and carbendazim applied: 21 Apr. Remaining weedkillers applied: 25 Apr. Growth regulators with wetting agent applied: 26 Apr. Remaining fungicides applied: 26 May. Combine harvested: 3 Aug. Previous crops: W. wheat 1986, w. barley 1987.

NOTES: (1) Samples were taken for disease assessment in June.
(2) Malting quality was assessed on the grain from some treatments.

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88/R/B/5

GRAIN TONNES/HECTARE

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

VARIETY	
GERBEL	7.21
IGRI	6.95
KASCADE	6.18
MAGIE	5.99
MG 33+0	6.01
MG 0+25	6.60
MG 33+25	6.48
MG S600	6.26
MARINKA	7.32
PIRATE	7.66
PLAISANT	6.72
VIXEN	7.42
Mean	6.73

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

VARIETY
0.334

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	33	0.473	7.0

GRAIN MEAN DM% 85.3

PLOT AREA HARVESTED 0.00203

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88/R/B/6

WINTER BARLEY

HARVEST DATES AND MALTING QUALITY

Object: To investigate the effects of harvest dates on yield and malting quality of winter barley - Appletree.

Sponsor: J.F. Jenkyn.

Design: 4 randomised blocks of 5 plots.

Whole plot dimensions: 3.0 x 14.0.

Treatments:

HARVDATE	Harvest dates:
V EARLY	Very early on 27 July, 1988
EARLY	Early on 5 Aug
OPTIMUM	Optimum on 12 Aug
LATE	Late on 18 Aug
V LATE	Very late on 26 Aug

Basal applications: Manures: 'Nitram' at 120 kg and later at 250 kg. Weedkillers: Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

Seed: Magie, sown at 160 kg.

Cultivations, etc.:- Cultivated by rotary grubber: 26 Sept, 1987. Ploughed, rotary harrowed, seed sown: 7 Nov. First N applied: 2 Mar, 1988. Second N applied: 8 Apr. Prochloraz and carbendazim applied: 21 Apr. Weedkillers applied: 26 Apr. Remaining fungicides applied: 17 May. Previous crops: Potatoes 1986, w. wheat 1987.

NOTE: Malting quality was assessed on the grain.

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88/R/B/6

GRAIN TONNES/HECTARE

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

HARVDATE	
V EARLY	6.41
EARLY	6.67
OPTIMUM	6.53
LATE	6.77
V LATE	6.57
Mean	6.59

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

HARVDATE
0.173

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.244	3.7

GRAND MEAN DM% 80.3

PLOT AREA HARVESTED 0.00434

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88/R/B/9 and 88/W/B/9

SPRING BARLEY

VARIETIES AND N

Object: To study the yields of some of the newer varieties of s. barley at two rates of nitrogen - Rothamsted (R) Highfield V and Woburn (W) Horsepool Lane Close E.

Sponsor: R. Moffitt.

Design: 3 (R) and 2 (W) randomised blocks of 2 plots split into 13.

Sub-plot dimensions: (R) 3.0 x 10.0. (W) 4.0 x 8.0.

Treatments: All combinations of:-

Whole plots

1. **N** Nitrogen fertilizer (kg N), as 'Nitram':

(R)	(W)
125	117
170	157

Sub plots

2. **VARIETY** Varieties:

BLENHEIM	Blenheim
CAMEO	Cameo
CORNICHE	Corniche
DIGGER	Digger
DOUBLET	Doublet
FERGIE	Fergie
JOLENE	Jolene
KLAXON	Klaxon
NATASHA	Natasha
PRISMA	Prisma
REGATTA	Regatta
TRIUMPH	Triumph
TRIUMPHB	Triumph + 'Baytan' seed dressing

Basal applications:
Highfield V (R): Manures: (0:18:36) at 690 kg. FYM at 35 t.
Weedkillers: Mecoprop at 2.4 kg with clopyralid at 0.05 kg and bromoxynil at 0.24 kg in 200 l. Glyphosate at 1.1 kg in 200 l.
Fungicides: Tridemorph at 0.52 kg in 200 l. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.
Horsepool Lane Close E (W): Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with mecoprop at 2.1 kg in 220 l.
Fungicide: Tridemorph at 0.52 kg in 220 l.

Seed: Highfield V (R): Sown at 160 kg.
Horsepool Lane Close E (W): Sown at 150 kg.

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88/R/B/9 and 88/W/B/9

Cultivations, etc.:-

Highfield V (R): PK applied: 15 Oct, 1987. FYM applied: 15 Dec. Ploughed: 18 Dec. Heavy spring-tine cultivated: 1 Mar, 1988. Rolled: 8 Mar. Rotary harrowed, seed sown, harrowed: 31 Mar. N treatments applied: 28 Apr. Weedkillers other than glyphosate applied: 10 May. Tridemorph applied: 27 May. Propiconazole and tridemorph applied: 16 June. Glyphosate applied: 9 Aug. Combine harvested: 17 Aug. Previous crops: S. barley and potatoes 1986, s. barley 1987.

Horsepool Lane Close E (W): Ploughed: 10 Mar. Disced twice: 29 Mar, 30 Mar. Spike harrowed with crumbler attached, rotary harrowed with crumbler attached, seed sown: 31 Mar. N treatments applied: 3 May. Weedkillers applied: 17 May. Fungicide applied: 27 May. Combine harvested: 22 Aug. Previous crops: Potatoes 1986, s. barley 1987.

88/R/B/9 HIGHFIELD V (R)

GRAIN TONNES/HECTARE

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

N	125	170	Mean
VARIETY			
BLENHEIM	7.12	6.96	7.04
CAMEO	7.30	7.03	7.16
CORNICHE	6.03	6.26	6.14
DIGGER	6.20	6.56	6.38
DOUBLET	6.35	6.58	6.46
FERGIE	6.33	5.51	5.92
JOLENE	6.10	6.65	6.37
KLAXON	6.45	6.39	6.42
NATASHA	6.36	6.77	6.57
PRISMA	6.05	6.26	6.15
REGATTA	6.68	6.29	6.49
TRIUMPH	6.49	6.30	6.39
TRIUMPHB	6.05	5.74	5.90
Mean	6.42	6.41	6.41

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

VARIETY	N*
	VARIETY
0.304	0.430

* Within the same level of **N** only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	48	0.527	8.2

GRAIN MEAN DM% 82.3

SUB PLOT AREA HARVESTED 0.00204

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88/W/B/9 HORSEPOOL LANE CLOSE E (W)

GRAIN TONNES/HECTARE

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

N	117	157	Mean
VARIETY			
BLENHEIM	4.86	4.97	4.91
CAMEO	4.86	5.24	5.05
CORNICHE	4.85	4.91	4.88
DIGGER	4.69	4.99	4.84
DOUBLET	4.66	4.70	4.68
FERGIE	4.50	4.91	4.71
JOLENE	4.82	4.78	4.80
KLAXON	4.71	5.53	5.12
NATASHA	4.33	4.29	4.31
PRISMA	3.79	3.30	3.55
REGATTA	5.06	4.63	4.84
TRIUMPH	4.95	4.26	4.61
TRIUMPHB	4.57	3.83	4.20
Mean	4.66	4.64	4.65

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

VARIETY	N*
	VARIETY
0.337	0.476

* Within the same level of **N** only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	24	0.476	10.2

GRAIN MEAN DM% 81.4

SUB PLOT AREA HARVESTED 0.00220

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88/R/B/10

SPRING BARLEY

HARVEST DATES AND MALTING QUALITY

Object: To investigate the effects of harvest date on yield and malting quality of spring barley - Bones Close.

Sponsor: J.F. Jenkyn.

Design: 4 randomised blocks of 5 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments:

HARVDATE	Date of harvest:
NOGRN	Green tissue virtually absent
NOGRN+10	Green tissue virtually absent + 10 days
OPT	Optimum maturity
OPT+10	Optimum maturity + 10 days
OPT+20	Optimum maturity + 20 days

NOTE: Above stages were targets. Actual dates of harvest were 12 Aug, 1988, 18 Aug, 26 Aug, 5 Sept, 13 Sept.

Basal applications: Manures: 'Nitram' at 220 kg. Weedkillers: Mecoprop at 2.4 kg with clopyralid at 0.05 kg and bromoxynil at 0.24 kg in 200 l. Fungicides: Fenpropimorph at 0.75 kg in 200 l. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l.

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

Cultivations, etc.:- Cultivated by rotary digger and deep-tine cultivated with vibrating tines about 60 cm apart, 45 cm deep: 12 Dec, 1987. Heavy spring-tine cultivated, N applied, rotary harrowed, seed sown: 7 Mar, 1988. Weedkillers applied: 11 May. Fenpropimorph applied: 17 May. Remaining fungicides applied: 16 June. Previous crops: W. barley 1986, potatoes 1987.

NOTE: Malting quality was assessed on the grain.

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88/R/B/10

GRAIN TONNES/HECTARE

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

HARVDATE	
NOGRN	8.70
NOGRN+10	8.57
OPT	8.17
OPT+10	7.86
OPT+20	7.81
Mean	8.22

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

HARVDATE
0.334

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.472	5.7

GRAIN MEAN DM% 79.7

PLOT AREA HARVESTED 0.00378

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88/R/BE/1

WINTER BEANS

CONTROL OF CHOCOLATE SPOT AND RUST

Object: To compare maneb plus mancozeb with benomyl plus chlorothalonil for the control of chocolate spot (Botrytis spp.) and rust (Uromyces viciae-fabae) on w. beans sown at two densities - New Zealand.

Sponsors: J. McEwen, D.P. Yeoman.

Design: 2 randomised blocks of 18 plots.

Whole plot dimensions: 6.0 x 10.0.

Treatments: All combinations of:-

1. **SEEDRATE** Seeds sown per square metre:

   12
   36

2. **CS FUNG** Fungicides applied to control chocolate spot until first rust pustules seen:

NONE	None
BEN+CHL	Benomyl at 0.50 kg plus chlorothalonil at 1.0 kg with a wetting agent ('Enhance' at 0.03 l) on 20 June, 1988
MAN+MANC	Maneb plus mancozeb each at 0.80 kg on 20 June

3. **RUSTFUNG** Fungicides applied to control rust, first applied as soon as rust pustules seen:

NONE	None
BEN+CHL	Benomyl at 0.50 kg plus chlorothalonil at 1.0 kg with a wetting agent ('Agral' at 0.06 l) on 29 June
MAN+MANC	Maneb plus mancozeb each at 0.80 kg on 29 June

NOTE: All spray treatments were applied in 200 l.

Basal applications: Weedkillers: Paraquat at 0.60 kg ion in 200 l. Propyzamide at 0.85 kg with simazine at 1.2 kg in 200 l. Insecticide: Deltamethrin at 0.0079 kg in 200 l on two occasions.

Seed: Bourdon, dressed with thiram.

Cultivations, etc.:- Paraquat applied: 22 Oct, 1987. Seed broadcast and ploughed in: 23 Oct. Disced: 26 Oct. Remaining weedkillers applied: 5 Nov. Insecticide applied: 26 Apr, 1988, 17 May. Combine harvested: 3 Oct. Previous crops: W. wheat 1986 and 1987.

NOTE: Establishment counts were made in autumn, disease assessments were made in July and August and components of yield were measured at maturity.

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88/R/BE/1

GRAIN TONNES/HECTARE

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

CS FUNG	NONE	BEN+CHL	MAN+MANC	Mean
SEEDRATE				
12	5.43	6.68	5.89	6.00
36	5.70	6.14	6.21	6.01
Mean	5.56	6.41	6.05	6.01

RUSTFUNG	NONE	BEN+CHL	MAN+MANC	Mean
SEEDRATE				
12	5.82	5.72	6.47	6.00
36	5.77	6.20	6.06	6.01
Mean	5.80	5.96	6.27	6.01

RUSTFUNG	NONE	BEN+CHL	MAN+MANC	Mean
CS FUNG				
NONE	5.12	5.27	6.30	5.56
BEN+CHL	6.43	6.55	6.24	6.41
MAN+MANC	5.84	6.06	6.25	6.05
Mean	5.80	5.96	6.27	6.01

	RUSTFUNG	NONE	BEN+CHL	MAN+MANC
SEEDRATE	CS FUNG			
12	NONE	4.89	4.89	6.51
	BEN+CHL	7.11	6.64	6.28
	MAN+MANC	5.45	5.63	6.61
36	NONE	5.34	5.65	6.10
	BEN+CHL	5.75	6.47	6.20
	MAN+MANC	6.23	6.48	5.90

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

SEEDRATE	CS FUNG	RUSTFUNG	SEEDRATE CS FUNG
0.160	0.196	0.196	0.277

SEEDRATE RUSTFUNG	CS FUNG RUSTFUNG	SEEDRATE CS FUNG RUSTFUNG
0.277	0.339	0.480

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	17	0.480	8.0

GRAIN MEAN DM% 77.5

PLOT AREA HARVESTED 0.00330

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88/R/BE/2

WINTER BEANS

VARIETIES

Object: To compare three varieties of winter beans - New Zealand.

Sponsors: J. McEwen, D.P. Yeoman.

Design: 6 randomised blocks of 3 plots.

Whole plot dimensions: 6.0 x 10.0.

Treatments:

VARIETY Varieties, sown at 24 seeds per square metre on 23 Oct, 1987:

BANNER
BOURDON
PUNCH

Basal applications: Weedkillers: Paraquat at 0.60 kg ion in 200 l. Propyzamide at 0.85 kg with simazine at 1.2 kg in 200 l. Fungicides: Benomyl at 0.50 kg with chlorothalonil at 1.0 kg and a wetting agent ('Enhance' at 0.03 l) in 200 l. Insecticide: Deltamethrin at 0.0079 kg in 200 l on two occasions.

Cultivations, etc.:- Paraquat applied: 22 Oct, 1987. Seed broadcast and ploughed in: 23 Oct. Disced: 26 Oct. Remaining weedkillers applied: 5 Nov. Insecticide applied: 26 Apr, 1988, 17 May. Fungicides with wetting agent applied: 20 June. Combine harvested: 3 Oct. Previous crops: W. wheat 1986 and 1987.

NOTE: Establishment counts were made in autumn and components of yield measured at maturity.

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88/R/BE/2

GRAIN TONNES/HECTARE

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

VARIETY	BANNER	BOURDON	PUNCH	Mean
	5.24	5.47	5.98	5.57

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

VARIETY
0.182

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.315	5.7

GRAIN MEAN DM% 79.8

PLOT AREA HARVESTED 0.00330

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88/R/BE/4

SPRING BEANS

VARIETIES, ROW SPACING AND PLANT HEALTH

Object: To compare four varieties of spring-sown field beans at two row spacings and two amounts of pest and disease control - Long Hoos I/II.

Sponsors: J. McEwen, D.P. Yeoman.

Design: 3 randomised blocks of 16 plots.

Whole plot dimensions: 6.0 x 10.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties sown at 60 seeds per square metre:

   ALFRED
   MINDEN
   TICOL
   TROY

2. **ROW SPAC** Spacing between rows (cm):

   12
   48

3. **PATHCONT** Pest and pathogen control:

   STANDARD None
   ENHANCED Economic enhanced to include:
   Deltamethrin at 0.0079 kg in 200 l on 26 Apr, 1988 and 17 May.
   Pirimicarb at 0.14 kg in 200 l on 20 May.
   Benomyl at 0.50 kg with chlorothalonil at 1.0 kg and a wetting agent ('Enhance' at 0.03 l) in 200 l on 20 June.
   Maneb at 0.80 kg and mancozeb at 0.80 kg in 200 l on 29 June.

Basal applications: Weedkillers: Trietazine at 1.2 kg and simazine at 0.17 kg in 200 l.

Cultivations, etc.:- Ploughed: 1 Dec, 1987. Heavy spring-tine cultivated twice: 7 Mar, 1988. Rotary harrowed, seed sown: 9 Mar. Weedkillers applied: 17 Mar. Combine harvested: 20 Sept. Previous crops: W. wheat 1986 and 1987.

NOTE: Establishment counts were made. Disease assessments were made in July and August. At maturity, plant heights, lodging and components of yield were assessed.

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88/R/BE/4

GRAIN TONNES/HECTARE

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

ROW SPAC	12	48	Mean
VARIETY			
ALFRED	6.17	5.99	6.08
MINDEN	5.84	5.56	5.70
TICOL	4.54	4.68	4.61
TROY	4.86	5.28	5.07
Mean	5.35	5.38	5.36

PATHCONT	STANDARD	ENHANCED	Mean
VARIETY			
ALFRED	4.90	7.26	6.08
MINDEN	5.30	6.10	5.70
TICOL	3.97	5.25	4.61
TROY	4.33	5.81	5.07
Mean	4.62	6.10	5.36

PATHCONT	STANDARD	ENHANCED	Mean
ROW SPAC			
12	4.70	6.00	5.35
48	4.54	6.21	5.38
Mean	4.62	6.10	5.36

ROW SPAC	12		48	
VARIETY PATHCONT	STANDARD	ENHANCED	STANDARD	ENHANCED
ALFRED	5.16	7.18	4.64	7.34
MINDEN	5.45	6.22	5.14	5.98
TICOL	3.88	5.21	4.07	5.28
TROY	4.33	5.39	4.33	6.22

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

VARIETY	ROW SPAC	PATHCONT	VARIETY ROW SPAC
0.171	0.121	0.121	0.242

VARIETY PATHCONT	ROW SPAC PATHCONT	VARIETY ROW SPAC PATHCONT
0.242	0.171	0.342

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.419	7.8

GRAIN MEAN DM% 84.3

PLOT AREA HARVESTED ROW SPAC 12 0.00330
ROW SPAC 48 0.00312

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88/R/LP/1

WINTER LUPINS

VARIETIES, SOWING DATES AND SEED DRESSINGS

Object: To compare three varieties of lupin (Lupinus albus) sown at two sowing dates with and without a seed dressing - Long Hoos V 6.

Sponsors: J. McEwen, H.L. Jones, D.P. Yeoman, A.W. Ferguson, J.F. Jenkyn.

Design: 2 randomised blocks of 12 plots.

Whole plot dimensions: 1.8 x 9.0.

Treatments: All combinations of:-

Whole plots

1. **VARIETY**	Varieties:	
	LUCKY	Lucky
	VLADIMIR	Vladimir
2. **SOW DATE**	Dates of sowing:	
	26 OCT	26 October, 1987
	3 DEC	3 December
3. **SEEDRESS**	Seed dressing:	
	NONE	None
	FO+CA+TH	Fosetyl-aluminium, captan and thiabendazole

plus three extra treatments

C8 EXTRA	All variety C8:
C8FSE	Sown 26 Oct seed dressed with fosetyl-aluminium, captan and thiabendazole (duplicated)
C8FSL	Sown 3 Dec seed dressed with fosetyl-aluminium, captan and thiabendazole
C8SL	Sown 3 Dec, no seed dressing

Basal applications: Manures: (0:18:36) at 1040 kg. Chalk at 2.9 t. Weedkillers: Paraquat at 0.80 kg ion in 220 l. Monolinuron at 0.46 kg and paraquat at 0.33 kg ion in 220 l. Fungicides: Benomyl at 0.50 kg in 220 l applied with the deltamethrin. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg in 220 l applied with the pirimicarb. Insecticides: Deltamethrin at 0.075 kg. Pirimicarb at 0.14 kg.

Seed: Sown at 200 kg.

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88/R/LP/1

Cultivations, etc: PK applied: 30 Sept, 1987. Chalk applied: 2 Oct. Paraquat applied: 5 Oct. Monolinuron and paraquat applied after each sowing: 30 Oct, 8 Dec respectively. Benomyl and deltamethrin applied: 25 May, 1988. Chlorothalonil, benomyl and pirimicarb applied: 18 July. Combine harvested VLADIMIR: 14 Oct. Hand harvested LUCKY: 19 Oct. Stationary threshed LUCKY: 27 Oct. Hand harvested C8: 9 and 12 Dec. Stationary threshed C8: 12 and 13 Dec. Previous crops: Lupins 1986, fallow 1987.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRESS	NONE	FO+CA+TH	Mean
VARIETY			
LUCKY	0.89	0.73	0.81
VLADIMIR	0.05	0.03	0.04
Mean	0.47	0.38	0.42

SOW DATE	26 OCT	3 DEC	Mean
VARIETY			
LUCKY	1.16	0.46	0.81
VLADIMIR	0.06	0.02	0.04
Mean	0.61	0.24	0.42

SOW DATE	26 OCT	3 DEC	Mean
SEEDRESS			
NONE	0.67	0.27	0.47
FO+CA+TH	0.55	0.21	0.38
Mean	0.61	0.24	0.42

	SOW DATE	26 OCT	3 DEC
VARIETY	**SEEDRESS**		
LUCKY	NONE	1.27	0.51
	FO+CA+TH	1.05	0.41
VLADIMIR	NONE	0.07	0.03
	FO+CA+TH	0.06	0.00

C8 EXTRA	C8FSE	C8FSL	C8SL	Mean
	2.12	1.98	2.18	2.10

GRAND MEAN 0.98

MEAN DM% 60.0

PLOT AREA HARVESTED **C8 EXTRA** 0.00065

PLOT AREA HARVESTED OTHER VARIETIES 0.00162

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88/R/LP/3

LUPINS

DESICCANTS AND FUNGICIDES

Object: To study the effects of times of applying desiccants and fungicides on senescence, grain quality and yield of lupins (Lupinus albus) - Long Hoos III 5.

Sponsors: H.L. Jones, J. Lacey.

Design: 2 randomised blocks of 30 plots.

Whole plot dimensions: 2.4 x 5.0.

Treatments: All combinations of:-

1. **DESICCNT** Desiccants:

DIQUAT	Diquat at 0.15 kg ion
MET+FEN	Metoxuron at 2.0 kg plus fentin hydroxide at 0.20 kg
GLYPHOS	Glyphosate at 1.08 kg
NACL	Sodium chloride at 6.25 kg

2. **FUNGCIDE** Fungicide applied 10 days before desiccant (29 Sept, 1988, 10 Oct, 20 Oct):

NONE	None
PROPICON	Propiconazole at 0.125 kg

3. **APP TIME** Times of applying desiccants:

EARLY	When leaf fall complete (10 Oct)
MIDDLE	10 days after EARLY (20 Oct)
LATE	18 days after EARLY (28 Oct)

plus an extra treatment given no desiccants or fungicides:

EXTRA

NONE	None (septuplicated)

NOTES: (1) All spray treatments were applied in 220 l.
(2) Additional planned treatments with fungicides alone were omitted.

Basal applications: Manure: Chalk at 2.9 t. Weedkillers: Terbutryne at 0.98 kg and terbuthylazine at 0.42 kg in 220 l. Metamitron at 1.4 kg in 220 l applied with the benomyl and pirimicarb. Fungicides: Benomyl at 0.56 kg when applied with the metamitron and the first pirimicarb and at 1.0 kg applied with chlorothalonil at 1.0 kg in 220 l applied with the second pirimicarb. Insecticide: Pirimicarb at 0.14 kg applied on two occasions.

Seed: Vladimir, sown at 210 kg.

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88/R/LP/3

Cultivations, etc.:- Chalk applied: 1 Oct, 1987. Ploughed: 11 Dec. Spring-tine cultivated twice, seed sown, rolled: 11 Mar, 1988. Terbutryne and terbuthylazine applied: 17 Mar. Metamitron, benomyl and pirimicarb applied: 20 June. Chlorothalonil, benomyl and pirimicarb applied: 15 July. Combine harvested: 4 Nov. Previous crops: Cabbages 1986, fallow 1987.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE	NONE	PROPICON	Mean
DESICCNT			
DIQUAT	1.80	1.72	1.76
MET+FEN	1.85	1.92	1.88
GLYPHOS	1.80	1.80	1.80
NACL	1.87	1.99	1.93
Mean	1.83	1.86	1.84

APP TIME	EARLY	MIDDLE	LATE	Mean
DESICCNT				
DIQUAT	2.04	1.89	1.36	1.76
MET+FEN	1.97	1.94	1.74	1.88
GLYPHOS	1.70	1.74	1.95	1.80
NACL	1.70	2.07	2.03	1.93
Mean	1.85	1.91	1.77	1.84

APP TIME	EARLY	MIDDLE	LATE	Mean
FUNGCIDE				
NONE	1.89	1.78	1.82	1.83
PROPICON	1.82	2.04	1.71	1.86
Mean	1.85	1.91	1.77	1.84

	APP TIME	EARLY	MIDDLE	LATE
DESICCNT	**FUNGCIDE**			
DIQUAT	NONE	2.03	1.79	1.58
	PROPICON	2.05	1.98	1.13
MET+FEN	NONE	1.72	1.82	2.02
	PROPICON	2.23	2.06	1.47
GLYPHOS	NONE	1.92	1.53	1.94
	PROPICON	1.48	1.96	1.96
NACL	NONE	1.88	1.99	1.75
	PROPICON	1.52	2.14	2.30

EXTRA NONE	1.77
Grand mean	1.83

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88/R/LP/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

DESICCNT	FUNGCIDE	APP TIME	DESICCNT FUNGCIDE
0.188	0.133	0.163	0.266

DESICCNT APP TIME	FUNGCIDE APP TIME	DESICCNT FUNGCIDE APP TIME
0.326	0.231	0.461

SED for comparing NONE with any item in
DESICCNT.FUNGCIDE.APP TIME table is 0.352

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	34	0.461	25.2

GRAIN MEAN DM% 78.2

PLOT AREA HARVESTED 0.00072

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88/R/PE/1

PEAS

EFFECTS OF PEA SEED-BORNE MOSAIC VIRUS

Object: To study the transmission, symptoms and effects on yield of pea seed-borne mosaic virus in two varieties of peas with and without insecticide - Long Hoos IV 6.

Sponsors: A.J. Cockbain, D. Wang.

Design: 4 randomised blocks of 2 whole plots split into 3.

Whole plot dimensions: 9.2 x 5.0.

Treatments: All combinations of:-

Whole plots

1. **INSCTCDE** Insecticide:

NONE	None
PH+CY+PI	Phorate at 1.7 kg to the seedbed on 26 Apr, 1988. Cypermethrin at 0.025 kg with pirimicarb at 0.14 kg in 220 l on 1 and 20 June, 5 July

Sub plots

2. **VAR INF** Varieties and infection:

PROGR H	Progreta, healthy stock
WAVER H	Waverex, healthy stock
WAVER I	Waverex, seed infected with 4% pea seed-borne mosaic virus

NOTE: Plots were netted against birds from early June to harvest.

Basal applications: Manure: Chalk at 2.9 t. Weedkillers: Terbutryne at 0.98 kg and terbuthylazine at 0.42 kg in 220 l. Fungicides: Benomyl at 0.50 kg with chlorothalonil at 1.0 kg in 220 l on four occasions. Desiccant: Diquat at 0.60 kg ion in 220 l.

Seed: All sown at 600,000 seeds per hectare:
Progreta at 200 kg.
Waverex (healthy) at 66 kg.
Waverex (infected) at 54 kg.

Cultivations, etc.:- Chalk applied: 2 Oct, 1987. Ploughed: 14 Dec. Rotary harrowed, seed sown: 26 Apr, 1988. Weedkillers applied: 27 Apr. Fungicides applied: 30 June, 2, 11, 23 Aug. Desiccant applied: 5 Sept. Combine harvested: 9 Sept. Previous crops: Maize 1986, fallow 1987.

NOTE: Aphid numbers were assessed during the growing season. Virus incidence was assessed in the plants during the season and in the seed from all plots after harvest.

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88/R/PE/1

GRAIN TONNES/HECTARE

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

VAR INF INSCTCDE	PROGR H	WAVER H	WAVER I	Mean
NONE	2.81	2.49	1.22	2.17
PH+CY+PI	3.65	2.87	2.30	2.94
Mean	3.23	2.68	1.76	2.56

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

VAR INF	INSCTCDE* VAR INF
0.158	0.223

* Within the same level of **INSCTCDE** only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	12	0.316	12.4

GRAIN MEAN DM% 77.8

SUB PLOT AREA HARVESTED 0.00072

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88/R/RA/1

WINTER OILSEED RAPE

FACTORS LIMITING YIELD

Object: To study the effects of a range of factors on the incidence of pests and diseases and on the growth and yield of w. oilseed rape - Black Horse II.

Sponsors: C.J. Rawlinson, R.J. Darby, P.G.N. Digby, K. Evans, J.E. Leach, I.H. Williams, D.P. Yeoman.

Associate sponsors: P.B. Barraclough, J. Lacey, S.P. McGrath, A.H. Weir.

Design: A half replicate of 2 x 2 x 2 x 2 x 2 x 2 x 2 + 3 replicates of 2 x 6 + 12 extra plots.

Whole plot dimensions: 3.0 x 21.0.

Treatments: Combinations of:-

1. **VARIETY**	Varieties, sown at 8 kg in rows 17 cm apart:	
	ARIANA	
	BIENVENU	
2. **SOW DATE**	Dates of sowing:	
	19 AUG	19 August, 1987
	10 SEP	10 September
3. **N RATE**	Amounts of N fertilizer (kg N), as 'Nitro-Chalk', in addition to a basal application of 50 kg N as 'Nitram' to the seedbed:	
	150	
	250	
4. **N DIVIS**	Division of N fertilizer application:	
	SINGLE	All on 16 Feb, 1988
	DIVIDED	50 kg to N RATE 150, 75 kg to N RATE 250 on 16 Feb, remainder on 17 Mar
5. **GROWREG**	Growth regulator:	
	NONE	None
	TRIAPEN	Triapenthenol at 0.70 kg in 220 l on 8 Apr, 1988 to SOWDATE 19 AUG and on 18 Apr to SOWDATE 10 SEPT
6. **INSCTCDE**	Insecticides:	
	NONE	None
	DE+MA+TR	Deltamethrin at 0.0062 kg in 220 l on 5 Oct, 1987 and 9 Oct Malathion at 1.26 kg in 220 l on 8 Apr, 1988 and 18 Apr Triazophos at 0.42 kg in 220 l on 14 June

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88/R/RA/1

7. **FUNGCIDE** Fungicide in autumn, spring and summer:

NONE	None
PR+IP	Prochloraz in autumn and in spring at 0.50 kg in 220 l on 27 Nov, 1987 and 5 Apr, 1988, iprodione in summer at 0.50 kg in 220 l on 14 June

plus combinations of the following (Ariana, sown later in rows 17 cm apart and all given seedbed nitrogen, divided nitrogen, growth regulator, insecticides and fungicides):

1. **SEEDRA N** Seed rate, (kg):

8
16

2. **N RATE N** Amounts of N fertilizer (kg N) as divided applications on 16 Feb and 17 Mar:

0+0
25+25
25+75
50+100
75+175
125+225

plus two extra treatments (Ariana, sown later at 16 kg in rows 12 cm apart and all given seedbed nitrogen, divided nitrogen, growth regulator, insecticides and fungicides):

N RATE P Amounts of N fertilizer as divided applications on 16 Feb and 17 Mar (kg N):

25+25
125+225

plus two extra treatments (all Ariana, sown later, at 8 kg in rows 17 cm apart and given 150 kg as divided nitrogen, given fungicides as above and oxamyl at 5 kg to the seedbed)

TR IN OX	Growth regulator or insecticide given to oxamyl treated plots
TR+OX	Triapenthenol in spring, no insecticide
IN+OX	Insecticide in autumn and spring, no growth regulator

NOTE: A planned test of foliar nutrients was omitted in error.

Basal applications: Manures: 'Nitram' at 140 kg. Weedkillers: TCA at 16.2 kg in 200 l. Paraquat at 0.40 kg ion in 200 l (to SOWDATE 10 SEP only). Metazachlor at 0.75 kg and later at 0.50 kg in 380 l (to SOWDATE 19 AUG) and at 1.2 kg in 380 l (to SOWDATE 10 SEP). Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Varieties, dressed gamma HCH, thiram and fenpropimorph.

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88/R/RA/1

Cultivations, etc.:- Ploughed: 12 Aug, 1987. Disced: 17 Aug. TCA applied, N applied: 18 Aug. Seed sown for SOWDATE 19 AUG: 19 Aug. First metazachlor applied to SOWDATE 19 AUG: 21 Aug. Paraquat applied (to SOWDATE 10 SEP): 9 Sept. Oxamyl treatments applied, harrowed in, seed sown for SOWDATE 10 SEP: 10 Sept. Second metazachlor applied to SOWDATE 19 AUG and only application to SOWDATE 10 SEP: 2 Oct. VARIETY BIENVENU, SOWDATE 19 AUG plots desiccant with wetting agent applied: 19 July, 1988. These plots combine harvested, remaining plots desiccant with wetting agent applied: 26 July. These remaining plots combine harvested: 1 Aug. Previous crops: W. wheat 1986, w. barley 1987.

NOTE: Detailed observations were made during the season on diseases, pests, N in plants and soil, dry matter accumulation, leaf areas, light interception and lodging. Microflora of leaf and pods were assessed up to harvest and some seed analysed for glucosinolate content. Percentage of oil in grain was measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOW DATE	19 AUG	10 SEP	Mean
VARIETY			
ARIANA	3.19	3.16	3.17
BIENVENU	3.58	3.63	3.61
Mean	3.38	3.40	3.39

N RATE	150	250	Mean
VARIETY			
ARIANA	3.12	3.23	3.17
BIENVENU	3.57	3.64	3.61
Mean	3.35	3.43	3.39

N RATE	150	250	Mean
SOW DATE			
19 AUG	3.26	3.50	3.38
10 SEP	3.43	3.37	3.40
Mean	3.35	3.43	3.39

N DIVIS	SINGLE	DIVIDED	Mean
VARIETY			
ARIANA	3.12	3.23	3.17
BIENVENU	3.65	3.56	3.61
Mean	3.38	3.40	3.39

N DIVIS	SINGLE	DIVIDED	Mean
SOW DATE			
19 AUG	3.43	3.34	3.38
10 SEP	3.34	3.46	3.40
Mean	3.38	3.40	3.39

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88/R/RA/1

GRAIN (AT (90% DRY MATTER) TONNES/HECTARE

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

N DIVIS / N RATE	SINGLE	DIVIDED	Mean
150	3.34	3.35	3.35
250	3.43	3.44	3.43
Mean	3.38	3.40	3.39

GROWREG / VARIETY	NONE	TRIAPEN	Mean
ARIANA	2.98	3.37	3.17
BIENVENU	3.48	3.74	3.61
Mean	3.23	3.55	3.39

GROWREG / SOW DATE	NONE	TRIAPEN	Mean
19 AUG	3.23	3.53	3.38
10 SEP	3.22	3.58	3.40
Mean	3.23	3.55	3.39

GROWREG / N RATE	NONE	TRIAPEN	Mean
150	3.23	3.46	3.35
250	3.22	3.65	3.43
Mean	3.23	3.55	3.39

GROWREG / N DIVIS	NONE	TRIAPEN	Mean
SINGLE	3.18	3.59	3.38
DIVIDED	3.27	3.52	3.40
Mean	3.23	3.55	3.39

INSCTCDE / VARIETY	NONE	DE+MA+TR	Mean
ARIANA	3.10	3.25	3.17
BIENVENU	3.48	3.73	3.61
Mean	3.29	3.49	3.39

INSCTCDE / SOW DATE	NONE	DE+MA+TR	Mean
19 AUG	3.21	3.55	3.38
10 SEP	3.37	3.43	3.40
Mean	3.29	3.49	3.39

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88/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

INSCTCDE N RATE	NONE	DE+MA+TR	Mean
150	3.24	3.45	3.35
250	3.34	3.53	3.43
Mean	3.29	3.49	3.39

INSCTCDE N DIVIS	NONE	DE+MA+TR	Mean
SINGLE	3.30	3.47	3.38
DIVIDED	3.28	3.51	3.40
Mean	3.29	3.49	3.39

INSCTCDE GROWREG	NONE	DE+MA+TR	Mean
NONE	3.21	3.24	3.23
TRIAPEN	3.37	3.74	3.55
Mean	3.29	3.49	3.39

FUNGCIDE VARIETY	NONE	PR+IP	Mean
ARIANA	2.84	3.51	3.17
BIENVENU	3.20	4.01	3.61
Mean	3.02	3.76	3.39

FUNGCIDE SOW DATE	NONE	PR+IP	Mean
19 AUG	3.08	3.68	3.38
10 SEP	2.96	3.83	3.40
Mean	3.02	3.76	3.39

FUNGCIDE N RATE	NONE	PR+IP	Mean
150	3.01	3.68	3.35
250	3.04	3.83	3.43
Mean	3.02	3.76	3.39

FUNGCIDE N DIVIS	NONE	PR+IP	Mean
SINGLE	3.00	3.76	3.38
DIVIDED	3.05	3.75	3.40
Mean	3.02	3.76	3.39

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88/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE GROWREG	NONE	PR+IP	Mean
NONE	2.84	3.61	3.23
TRIAPEN	3.21	3.90	3.55
Mean	3.02	3.76	3.39

FUNGCIDE INSCTCDE	NONE	PR+IP	Mean
NONE	3.00	3.59	3.29
DE+MA+TR	3.05	3.93	3.49
Mean	3.02	3.76	3.39

SEEDRA N N RATE N	8	16	Mean
0+0	2.73	2.55	2.64
25+25	3.38	3.12	3.25
25+75	3.39	3.54	3.47
50+100	3.86	3.67	3.76
75+175	4.03	3.98	4.00
125+225	3.95	3.87	3.91
Mean	3.56	3.45	3.51

N RATE P	25+25	125+225	Mean
	3.18	4.05	3.62

TR IN OX	TR+OX	IN+OX	Mean
	4.79	3.91	4.35

GRAIN MEAN 3.47

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88/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	VARIETY	SOW DATE	N RATE	N DIVIS
	0.036	0.036	0.080	0.080
	GROWREG	INSCTCDE	FUNGCIDE	VARIETY SOW DATE
	0.080	0.080	0.080	0.051
	VARIETY N RATE	SOW DATE N RATE	VARIETY N DIVIS	SOW DATE N DIVIS
	0.087	0.087	0.087	0.087
Except when comparing means with the same level(s) of				
VARIETY	0.113		0.113	
SOW DATE		0.113		0.113

	N RATE N DIVIS	VARIETY GROWREG	SOW DATE GROWREG	N RATE GROWREG
	0.113	0.087	0.087	0.113
Except when comparing means with the same level(s) of				
VARIETY		0.113		
SOW DATE			0.113	
N RATE				0.087
GROWREG				0.087

	N DIVIS GROWREG	VARIETY INSCTCDE	SOW DATE INSCTCDE	N RATE INSCTCDE
	0.113	0.087	0.087	0.113
Except when comparing means with the same level(s) of				
VARIETY		0.113		
SOW DATE			0.113	

	N DIVIS INSCTCDE	GROWREG INSCTCDE	VARIETY FUNGCIDE	SOW DATE FUNGCIDE
	0.113	0.113	0.087	0.087
Except when comparing means with the same level(s) of				
VARIETY			0.113	
SOW DATE				0.113

	N RATE FUNGCIDE	N DIVIS FUNGCIDE	GROWREG FUNGCIDE	INSCTCDE FUNGCIDE
	0.113	0.113	0.113	0.113
Except when comparing means with the same level(s) of				
N RATE	0.087			
GROWREG			0.087	
FUNGCIDE	0.087		0.087	

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.072	2.1
BLOCK.WP.SP	26	0.318	9.4

GRAND MEAN DM% 78.4 PLOT AREA HARVESTED 0.00299

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88/R/RA/2

WINTER OILSEED RAPE

SEED RATES AND ROW SPACINGS

Object: To compare cv. Ariana on a range of row-widths and seed rates - Whittlocks.

Sponsor: D.P. Yeoman.

Design: 3 randomised blocks of 11 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

1. **SEEDRATE** Seed rates:

   4 KG
   6 KG
   8 KG

2. **ROWSPACE** Row spacings:

   17.5 CM
   35 CM
   52.5 CM

plus two extra treatments, sown at 2 kg seed rate:-

EXTRA	Row spacings:
2 KG 35	35 cm
2 KG 52.5	52.5 cm

Basal applications: Manures: 'Nitram' at 140 kg and later at 720 kg. Weedkillers: Paraquat at 0.40 kg ion in 200 l. Metazachlor at 1.2 kg in 200 l. Insecticides: Azinphos methyl at 0.40 kg and demeton-s-methyl sulphone at 0.12 kg in 300 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

Cultivations, etc.:- Paraquat applied: 8 Sept, 1987. First N applied, heavy spring-tine cultivated: 14 Sept. Rotary harrowed, seed sown: 15 Sept. Metazachlor applied: 1 Oct. Second N applied: 19 Feb, 1988. Insecticides applied: 18 Apr. Desiccant with wetting agent applied: 20 July. Combine harvested: 27 July. Previous crops: W. wheat 1986, w. barley 1987.

NOTE: Plant counts were made at establishment and in spring.

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88/R/RA/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

ROWSPACE	17.5 CM	35 CM	52.5 CM	Mean
SEEDRATE				
4 KG	2.92	3.83	3.32	3.36
6 KG	3.64	3.16	3.52	3.44
8 KG	3.29	3.00	3.27	3.18
Mean	3.28	3.33	3.37	3.33

EXTRA	2 KG 35	2 KG 52.5	Mean
	3.45	3.97	3.71

GRAND MEAN 3.40

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

SEEDRATE	ROWSPACE	SEEDRATE ROWSPACE & EXTRA
0.206	0.206	0.356

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.436	12.8

MEAN DM% 72.2

PLOT AREA HARVESTED 0.00345

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88/R/RA/3

WINTER OILSEED RAPE

VARIETIES, PESTS AND DISEASES

Object: To investigate the effects of full pest and disease control on a range of low glucosinolate varieties compared with Bienvenu - Black Horse II.

Sponsors: C.J. Rawlinson, I.H. Williams.

Design: 2 randomised blocks of 24 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

1.	**VARIETY**	Varieties:
	ARIANA	Ariana
	BIENVENU	Bienvenu
	COBRA	Cobra
	NRPB 2	NRPB 0087-2
	PBI 1	PBI 1
	PBI 3	PBI 3
2.	**INSCTCDE**	Insecticides:
	NONE	None
	FULL	Deltamethrin at 0.0062 kg in 200 l on 13 Nov, 1987. Azinphos methyl at 0.40 kg and demeton-S-methyl sulphone at 0.12 kg in 300 l on 18 Apr, 1988. Triazophos at 0.42 kg in 200 l on 16 June.
3.	**FUNGCIDE**	Fungicides:
	NONE	None
	FULL	Prochloraz at 0.50 kg in 200 l on 18 Nov, 1987 and 11 Apr, 1988. Iprodione at 0.50 kg in 200 l on 16 June.

Basal applications: Manures: 'Nitram' at 140 kg, later at 260 kg and a third time at 460 kg. Weedkiller: Metazachlor at 1.2 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 500 l.

Seed: Varieties, sown at 8.0 kg.

Cultivations, etc.:- Ploughed: 12 Aug, 1987. First N applied: 18 Aug. Disced: 9 Sept. Seed sown: 17 Sept. Weedkillers applied: 5 Oct. Second N applied: 1 Mar, 1988. Third N applied: 7 Apr. Desiccant with wetting agent applied: 27 July. Combine harvested: 1 Aug. Previous crops: W. wheat 1986, w. barley 1987.

NOTE: Disease assessments were made on eight occasions throughout the season and pest numbers were recorded in autumn, spring and summer. Glucosinolate contents, plant tissues and seed, were measured throughout the season.

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88/R/RA/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

INSCTCDE VARIETY	NONE	FULL	Mean
ARIANA	3.59	3.50	3.54
BIENVENU	3.80	4.24	4.02
COBRA	3.44	3.97	3.70
NRPB 2	3.31	3.81	3.56
PBI 1	3.76	3.82	3.79
PBI 3	3.68	3.98	3.83
Mean	3.60	3.89	3.74

FUNGCIDE VARIETY	NONE	FULL	Mean
ARIANA	3.19	3.90	3.54
BIENVENU	3.76	4.29	4.02
COBRA	3.20	4.21	3.70
NRPB 2	3.11	4.01	3.56
PBI 1	3.17	4.41	3.79
PBI 3	3.10	4.56	3.83
Mean	3.26	4.23	3.74

FUNGCIDE INSCTCDE	NONE	FULL	Mean
NONE	3.05	4.15	3.60
FULL	3.47	4.31	3.89
Mean	3.26	4.23	3.74

INSCTCDE	NONE		FULL	
VARIETY FUNGCIDE	NONE	FULL	NONE	FULL
ARIANA	3.02	4.16	3.36	3.64
BIENVENU	3.72	3.88	3.79	4.70
COBRA	2.68	4.20	3.71	4.22
NRPB 2	2.83	3.79	3.40	4.22
PBI 1	3.13	4.40	3.22	4.42
PBI 3	2.89	4.47	3.31	4.65

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88/R/RA/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VARIETY	INSCTCDE	FUNGCIDE	VARIETY INSCTCDE
0.159	0.092	0.092	0.225

VARIETY FUNGCIDE	INSCTCDE FUNGCIDE	VARIETY INSCTCDE FUNGCIDE & EXTRA
0.225	0.130	0.318

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	24	0.318	8.5

GRAIN MEAN DM% 78.1

PLOT AREA HARVESTED 0.00299

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88/R/RA/4

WINTER OILSEED RAPE

TIMES AND METHODS OF HARVEST

Object: To investigate the effects of fungicide and times and methods of harvest on the yield and glucosinolate content of the seed - Whittlocks.

Sponsors: C.J. Rawlinson, G.F.J. Milford.

Design: 4 blocks of 2 whole plots each split into 2 sub-plots each split into 3 sub-sub-plots plus 24 extra sub-sub-plots.

Whole plot dimensions: 78.0 x 14.0.

Treatments: All combinations of:-

Whole plots

1. **FUNGCIDE** Fungicide at stem extension:

NONE	None
PROCHLOR	Prochloraz at 0.50 kg in 200 l on 11 Apr, 1988

Sub plots

2. **HAR METH** Method of harvest:

DESICATE	Desiccated with diquat
SWATHE	Swathed before combining

Sub sub plots

3. **HAR TIME** Time of harvest:

EARLY	20 July, 1988
NORMAL	28 July
LATE	2 Aug

plus eight extra sub plots, to test combining direct, without prior treatment, within **FUNGCIDE**, each divided into 3 sub sub plots for the intended test of **HAR TIME**. Conditions did not permit the sub sub plot test so this became:

FUNG DIR

0	No prochloraz, combined direct, no prior treatment, harvested late (12 sub sub plots)
PROCHLOR	Prochloraz at 0.50 kg in 200 l, combined direct, no prior treatment, harvested late (12 sub sub plots)

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88/R/RA/4

NOTES: (1) The **HAR METH** DESICATE plots were desiccated on 12 July, 1988 19 July and 1 Aug respectively for early, normal and late HAR TIME using diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.
(2) The **HAR METH** SWATHE plots were swathed on the same dates on which desiccation was done.

Basal applications: Manures: 'Nitram' at 140 kg and later at 720 kg. Weedkillers: Paraquat at 0.40 kg ion in 200 l. Metazachlor at 1.2 kg in 200 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph, sown at 8.0 kg.

Cultivations, etc.:- Paraquat applied: 8 Sept, 1987. First N applied, heavy spring-tine cultivated: 14 Sept. Rotary harrowed: 15 Sept. Seed sown: 16 Sept. Metazachlor applied: 1 Oct. Second N applied: 19 Feb, 1988. Previous crops: W. wheat 1986, w. barley 1987.

NOTE: Seed samples were taken frequently from early July until harvest for glucosinolate analysis. Disease assessments were made on several occasions during July and August.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

HAR METH	DESICATE	SWATHE	Mean
FUNGCIDE			
NONE	2.23	1.90	2.07
PROCHLOR	2.50	2.15	2.33
Mean	2.36	2.03	2.20

HAR TIME	EARLY	NORMAL	LATE	Mean
FUNGCIDE				
NONE	1.91	2.13	2.16	2.07
PROCHLOR	2.18	2.40	2.40	2.33
Mean	2.04	2.27	2.28	2.20

HAR TIME	EARLY	NORMAL	LATE	Mean
HAR METH				
DESICATE	2.13	2.47	2.49	2.36
SWATHE	1.95	2.06	2.07	2.03
Mean	2.04	2.27	2.28	2.20

FUNGCIDE	**HAR METH**	**HAR TIME**	EARLY	NORMAL	LATE
NONE	DESICATE		2.03	2.28	2.37
	SWATHE		1.78	1.98	1.95
PROCHLOR	DESICATE		2.23	2.66	2.61
	SWATHE		2.13	2.15	2.18

FUNG DIR	0	PROCHLOR	MEAN
	2.39	2.55	2.47

GRAND MEAN 2.29

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88/R/RA/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

HAR METH	HAR TIME	FUNGCIDE* HAR METH
0.053	0.105	0.075

FUNGCIDE* HAR TIME	HAR METH HAR TIME	FUNGCIDE* HAR METH HAR TIME
0.148	0.132	0.186

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

HAR METH	0.148
FUNGCIDE.HAR METH	0.209

* Within the same level of FUNGCIDE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	12	0.105	4.6
BLOCK.WP.SP.SSP	40	0.296	12.9

GRAIN MEAN DM% 69.1

SUB PLOT AREA HARVESTED	HAR METH	SWATHE	0.00518
		OTHERS	0.00322

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88/R/RA/5

WINTER OILSEED RAPE

PRECISION SOWING

Object: To compare three drills at four seed rates on two sowing dates with and without an insecticide - Whittlocks.

Sponsor: D.P. Yeoman.

Design: 2 replicates of 32 plots arranged in 4 blocks of 16 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations (duplicated) of:-

1. **DRILL** — Drills used to sow seed:

ALPHA AC	Alpha Accord sown in rows 12.5 cm apart, seeds randomly spaced
CNVNTIAL	Conventional, sown in rows 17.6 cm apart, seeds randomly spaced
STANHAY	Stanhay, sown in rows 25 cm apart, seeds precisely spaced

2. **SOW DATE** — Dates of sowing:

21 AUG	21 August, 1987
11 SEP	11 September

3. **SEEDRATE** — Seed rates:

   4 KG
   8 KG

Plus all combinations (duplicated) of:-

1. **A SDRTX** — Alpha Accord sowing at extra seed rates:

   2 KG
   16 KG

2. **SOWDATEX** — Dates of sowing:

   21 AUG
   11 SEP

NOTE: A planned test of deltamethrin in autumn was omitted.

Basal applications: Manures: 'Nitram' at 140 kg and later at 720 kg. Weedkillers: TCA at 16 kg in 200 l. Metazachlor at 1.2 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

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88/R/RA/5

Cultivations, etc.:- Disced twice, first N applied: 19 Aug, 1987. TCA applied, harrowed twice, rotary harrowed: 20 Aug. **SOW DATE** 21 AUG seed sown: 21 Aug. **SOW DATE** 11 SEP rotary harrowed, seed sown: 11 Sept. Metazachlor applied: 1 Oct. Second N applied: 19 Feb, 1988. Desiccant with wetting agent applied: 20 July. Combine harvested: 27 July. Previous crops: W. wheat 1986, w. barley 1987.

NOTE: Plant counts were made at establishment and in spring.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOW DATE	21 AUG	11 SEP	Mean
DRILL			
ALPHA C	2.32	3.25	2.79
CNVNTIAL	2.96	3.47	3.22
STANHAY	2.75	3.27	3.01
Mean	2.68	3.33	3.00

SEEDRATE	4 KG	8 KG	Mean
DRILL			
ALPHA C	2.89	2.68	2.79
CNVNTIAL	3.39	3.05	3.22
STANHAY	3.03	2.99	3.01
Mean	3.10	2.91	3.00

SEEDRATE	4 KG	8 KG	Mean
SOW DATE			
21 AUG	2.87	2.49	2.68
11 SEP	3.34	3.33	3.33
Mean	3.10	2.91	3.00

SOW DATE	21 AUG		11 SEP	
DRILL SEEDRATE	4 KG	8 KG	4 KG	8 KG
ALPHA C	2.27	2.36	3.51	3.00
CNVNTIAL	3.28	2.64	3.49	3.46
STANHAY	3.05	2.46	3.01	3.53

SOWDATEX A SDRTX	21 AUG	11 SEP	Mean
2 KG	2.92	3.61	3.26
16 KG	1.94	2.75	2.35
Mean	2.43	3.18	2.81

GRAND MEAN 2.95

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88/R/RA/5

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

DRILL	SOW DATE	SEEDRATE	DRILL SOW DATE
0.162	0.133	0.133	0.230

DRILL SEEDRATE	SOW DATE SEEDRATE	DRILL SOW DATE SEEDRATE	A SDRTX
0.230	0.187	0.325	0.230

SOWDATEX	A SDRTX SOWDATEX
0.230	0.325

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	47	0.459	15.5

MEAN DM% 80.0

PLOT AREA HARVESTED 0.00345

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88/R/RA/6

WINTER OILSEED RAPE

STRAW TREATMENTS BEFORE SOWING

Object: To study the effects of a range of methods of treating cereal straw on the establishment and yield of w. oilseed rape sown on two dates, with and without seedbed N - Whittlocks.

Sponsors: R.J. Darby, D.P Yeoman.

Design: 2 randomised blocks of 6 plots split into 2 sub plots each split into 2 sub sub plots.

Whole plot dimensions: 6.0 x 31.0.

Treatments: All combinations of:-

Whole plots

1. **STR DISP** Disposal of straw:

BURN	Burnt 14 Aug, 1987
CHOP	Chopped 18 Aug
BALE	Baled 14 Aug and bales removed

2. **CULTIVTN** Method of primary cultivation:

TINE CULT	Tine cultivated, without inversion
PLOUGH	Ploughed 18 Aug, 1987

Sub plots

3. **SOW DATE** Dates of sowing:

20 AUG	20 Aug, 1987
11 SEPT	11 Sept

Sub sub plots

4. **SDBED N** Seedbed nitrogen (kg N) as 'Nitram' on 19 Aug, 1987:

0
50

NOTES: (1) All plots were rotary harrowed on 19 Aug, 1987.
(2) **STR DISP** BURN plots were disced on 15 Aug.
(3) **CULTIVTN** TINE CULT plots were cultivated by rotary grubber and **CULTIVTN** PLOUGH plots were disced on 19 Aug.
(4) All plots were harrowed before drilling. **SOW DATE** 11 SEPT plots were also rotary harrowed before drilling. All plots were harrowed in and rolled after drilling.
(5) **SOW DATE** 20 AUG plots were sprayed with metazachlor at 0.75 kg in 380 l on 21 Aug, 1987 and at 0.50 kg in 200 l on 1 Oct. **SOW DATE** 11 SEPT plots received metazachlor at 1.2 kg in 200 l on 1 Oct.

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88/R/RA/6

Basal applications: Manures: 'Nitram' at 580 kg. Weedkiller: TCA at 16 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Bienvenu, dressed gamma HCH, thiram and fenpropimorph, sown at 8.0 kg.

Cultivations, etc.:- Weedkiller applied: 20 Aug, 1987. N applied: 18 Feb, 1988. Desiccant with wetting agent applied: 20 July. Combine harvested: 26 July. Previous crops: W. wheat 1986, w. barley 1987.

NOTE: Emergence counts were made in autumn and plant counts in mid-March. Percentages of oil in the grain were measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

CULTIVTN	TINE CULT	PLOUGH	Mean
STR DISP			
BURN	3.05	3.20	3.12
CHOP	3.35	3.16	3.25
BALE	3.19	3.33	3.26
Mean	3.20	3.23	3.21

SOW DATE	20 AUG	11 SEPT	Mean
STR DISP			
BURN	2.79	3.45	3.12
CHOP	2.77	3.74	3.25
BALE	2.77	3.76	3.26
Mean	2.78	3.65	3.21

SOW DATE	20 AUG	11 SEPT	Mean
CULTIVTN			
TINE CULT	2.74	3.65	3.20
PLOUGH	2.82	3.64	3.23
Mean	2.78	3.65	3.21

SDBED N	0	50	Mean
STR DISP			
BURN	3.19	3.06	3.12
CHOP	3.35	3.16	3.25
BALE	3.25	3.28	3.26
Mean	3.26	3.16	3.21

SDBED N	0	50	Mean
CULTIVTN			
TINE CULT	3.21	3.18	3.20
PLOUGH	3.31	3.14	3.23
Mean	3.26	3.16	3.21

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88/R/RA/6

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SDBED N	0	50	Mean
SOW DATE			
20 AUG	2.84	2.72	2.78
11 SEPT	3.69	3.61	3.65
Mean	3.26	3.16	3.21

	CULTIVTN	TINE CULT		PLOUGH	
STR DISP	SOW DATE	20 AUG	11 SEPT	20 AUG	11 SEPT
BURN		3.03	3.06	2.55	3.84
CHOP		2.53	4.17	3.01	3.31
BALE		2.66	3.73	2.88	3.78

	CULTIVTN	TINE CULT		PLOUGH	
STR DISP	SDBED N	0	50	0	50
BURN		3.13	2.96	3.25	3.15
CHOP		3.52	3.18	3.18	3.13
BALE		2.99	3.40	3.51	3.15

	SOW DATE	20 AUG		11 SEPT	
STR DISP	SDBED N	0	50	0	50
BURN		2.70	2.89	3.68	3.22
CHOP		2.95	2.59	3.75	3.73
BALE		2.86	2.68	3.64	3.87

	SOW DATE	20 AUG		11 SEPT	
CULTIVTN	SDBED N	0	50	0	50
TINE CULT		2.79	2.70	3.64	3.67
PLOUGH		2.89	2.74	3.74	3.55

		SOW DATE	20 AUG		11 SEPT	
STR DISP	CULTIVTN	SDBED N	0	50	0	50
BURN	TINE CULT		2.86	3.20	3.39	2.73
	PLOUGH		2.54	2.57	3.96	3.72
CHOP	TINE CULT		2.87	2.20	4.17	4.17
	PLOUGH		3.04	2.98	3.33	3.28
BALE	TINE CULT		2.63	2.69	3.34	4.12
	PLOUGH		3.09	2.67	3.93	3.63

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88/R/RA/6

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	STR DISP	CULTIVTN	SOW DATE	SDBED N
	0.044	0.036	0.252	0.093

	STR DISP CULTIVTN	STR DISP SOW DATE	CULTIVTN SOW DATE	STR DISP SDBED N
	0.062	0.312	0.254	0.122
Except when comparing means with the same level(s) of				
STR DISP		0.436		0.160
CULTIVTN			0.356	

	CULTIVTN SDBED N	SOW DATE SDBED N	STR DISP CULTIVTN SOW DATE	STR DISP CULTIVTN SDBED N
	0.099	0.268	0.441	0.172
Except when comparing means with the same level(s) of				
CULTIVTN	0.131			
SOW DATE		0.131		
STR DISP.CULTIVTN			0.617	0.227

	STR DISP SOW DATE SDBED N	CULTIVTN SOW DATE SDBED N	STR DISP CULTIVTN SOW DATE SDBED N
	0.351	0.286	0.496
Except when comparing means with the same level(s) of			
STR DISP	0.465		
CULTIVTN		0.380	
STR DISP.CULTIVTN			0.658
STR DISP.SOW DATE	0.227		
CULTIVTN.SOW DATE		0.185	
STR DISP.SDBED N	0.465		
CULTIVTN.SDBED N		0.380	
STR DISP.CULTIVTN.SOW DATE			0.321
STR DISP.CULTIVTN.SDBED N			0.658

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	5	0.062	1.9
BLOCK.WP.SP1	6	0.617	19.2
BLOCK.WP.SP1.SP2	12	0.321	10.0

GRAIN MEAN DM% 79.7

PLOT AREA HARVESTED 0.00345

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88/R/RA/7

WINTER OILSEED RAPE

FORMS AND TIMES OF N

Object: To compare the effects of single and divided dressings of urea and 'Nitro-Chalk' on the yield of 2 varieties of w. oilseed rape - Whittlocks.

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

Design: 2 randomised blocks of 2 plots split into 15 sub plots.

Whole plot dimensions: 30.0 x 31.0.

Treatments: All combinations of:-

Whole plots

1. **VARIETY** Variety:

   ARIANA
   MIKADO

Sub plots

2. **N FORM** Forms of nitrogen fertilizer:

AMM NIT	Ammonium nitrate (as 'Nitro-Chalk')
UREA	Prilled urea

3. **N TIME** Times of applying a total dressing of 200 kg N:

4 - - -	All on 22 Feb, 1988
3 1 - -	Three quarters on 22 Feb, one quarter on 17 Mar
3 - 1 -	Three quarters on 22 Feb, one quarter on 6 Apr
2 2 - -	Half on 22 Feb, half on 17 Mar
2 - 2 -	Half on 22 Feb, half on 6 Apr
2 1 1 -	Half on 22 Feb, quarter on 17 Mar, quarter on 6 Apr
1 1 1 1	One quarter on 22 Feb and 17 Mar and 6 Apr and 26 Apr

plus two extra treatments

EXTRA

NONE AR	No nitrogen fertilizer ARIANA
NONE MI	No nitrogen fertilizer MIKADO

Basal applications: Weedkillers: Paraquat at 0.40 kg ion in 200 l. Metazachlor at 1.2 kg in 200 l. Desiccant (to **VARIETY** ARIANA only): Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Dressed gamma HCH, thiram and fenpropimorph, sown at 8.0 kg.

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88/R/RA/7

Cultivations, etc.:- Paraquat applied: 8 Sept, 1987. Heavy spring-tine cultivated: 14 Sept. Rotary harrowed, seed sown: 15 Sept. Metazachlor applied: 1 Oct. Combine harvested (**VARIETY** MIKADO), desiccant with wetting agent applied (**VARIETY** ARIANA): 20 July, 1988. Combine harvested (**VARIETY** ARIANA): 27 July. Previous crops: W. wheat 1986, w. barley 1987.

NOTE: Percentages of oil and N in the grain were measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N FORM / **N TIME**	AMM NIT	UREA	Mean
4 - - -	3.45	3.53	3.49
3 1 - -	3.52	3.33	3.43
3 - 1 -	3.43	3.24	3.33
2 2 - -	3.40	3.19	3.30
2 - 2 -	3.37	3.39	3.38
2 1 1 -	3.41	3.13	3.27
1 1 1 1	3.57	3.44	3.51
Mean	3.45	3.32	3.39

VARIETY / **N TIME**	ARIANA	MIKADO	Mean
4 - - -	3.04	3.94	3.49
3 1 - -	2.87	3.98	3.43
3 - 1 -	2.82	3.84	3.33
2 2 - -	2.73	3.86	3.30
2 - 2 -	2.85	3.91	3.38
2 1 1 -	2.73	3.81	3.27
1 1 1 1	3.00	4.01	3.51
Mean	2.87	3.91	3.39

VARIETY / **N FORM**	ARIANA	MIKADO	Mean
AMM NIT	2.97	3.94	3.45
UREA	2.76	3.88	3.32
Mean	2.87	3.91	3.39

N TIME	**N FORM** / **VARIETY**	AMM NIT ARIANA	AMM NIT MIKADO	UREA ARIANA	UREA MIKADO
4 - - -		2.94	3.97	3.14	3.91
3 1 - -		3.03	4.01	2.71	3.96
3 - 1 -		3.02	3.84	2.63	3.85
2 2 - -		2.83	3.98	2.64	3.75
2 - 2 -		2.80	3.94	2.90	3.88
2 1 1 -		3.03	3.80	2.44	3.83
1 1 1 1		3.11	4.02	2.88	4.00

EXTRA	NONE AR	NONE MI	Mean
	2.10	2.61	2.35

GRAND MEAN 3.32

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88/R/RA/7

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

EXTRA	N TIME	N FORM
0.282	0.141	0.075

N TIME N FORM	N TIME* VARIETY	N FORM* VARIETY	N TIME* N FORM VARIETY
0.199	0.199	0.106	0.282

* Within the same level of **VARIETY** only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	28	0.282	8.5

MEAN DM% 78.6

SUB PLOT AREA HARVESTED 0.00345

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88/R/RA/8

WINTER OILSEED RAPE

OVERSOWING IN WHEAT

Object: To study the establishment of rape after wheat by oversowing into the wheat - Delafield.

Sponsors: R.J. Darby, D.P. Yeoman.

Design: 3 randomised blocks of 6 whole plots split into 2 sub plots.

Whole plot dimensions: 8.0 x 15.0.

Treatments: All combinations of:-

Whole plots

1.	**SOWING**	Methods of sowing and straw disposal:
	OVERS BA	Oversown on 3 Sept, 1987, straw baled on 8 Sept and bales removed
	OVERS CH	Oversown on 3 Sept, straw chopped and spread on 8 Sept
	CONVEN S	Straw baled on 8 Sept and bales removed, conventionally sown into conventionally prepared seedbed
2.	**SEEDRATE**	Seed rate (kg):
	8	
	16	

Sub plots

N RATE	Nitrogen fertilizer as 'Nitram':
0	None
50	50 kg N to seedbed (post-sowing to OVERS BA and OVERS CH) on 14 Sept, 1987.

NOTES: (1) Oversowing was done into standing wheat. The wheat was harvested the next day.
(2) **SOWING** CONVEN S plots were cultivated by rotary grubber on 14 Sept 1987, rotary harrowed and the seed sown on 15 Sept.

Basal applications: Manures: 'Nitram' at 580 kg. Weedkillers: Metazachlor at 1.2 kg in 200 l. Fluazifop-p-butyl at 0.18 kg with a wetting agent ('Enhance' at 0.20 l) in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

Cultivations, etc.:- Metazachlor applied: 1 Oct, 1987. Fluazifop-p-butyl with wetting agent applied: 24 Oct. Basal N applied: 18 Feb, 1988. Desiccant with wetting agent applied: 27 July. Combine harvested: 8 Aug. Previous crops: Potatoes 1986, w. wheat 1987.
NOTE: Plant counts were made in autumn and in mid-February. Percentages of oil in the grain were measured.

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88/R/RA/8

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE / SOWING	8	16	Mean
OVERS BA	3.52	3.18	3.35
OVERS CH	3.37	3.34	3.36
CONVEN S	3.49	3.13	3.31
Mean	3.46	3.22	3.34

N RATE / SOWING	0	50	Mean
OVERS BA	3.51	3.19	3.35
OVERS CH	3.47	3.24	3.36
CONVEN S	3.52	3.10	3.31
Mean	3.50	3.18	3.34

N RATE / SEEDRATE	0	50	Mean
8	3.57	3.35	3.46
16	3.43	3.00	3.22
Mean	3.50	3.18	3.34

SEEDRATE	8		16	
SOWING / N RATE	0	50	0	50
OVERS BA	3.41	3.63	3.60	2.75
OVERS CH	3.61	3.13	3.34	3.34
CONVEN S	3.69	3.28	3.36	2.91

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

SOWING	SEEDRATE	N RATE	SOWING SEEDRATE
0.167	0.137	0.182	0.237

SOWING N RATE	SEEDRATE N RATE	SOWING SEEDRATE N RATE
0.279	0.227	0.394

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

SOWING	0.315
SEEDRATE	0.257
SOWING.SEEDRATE	0.445

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.290	8.7
BLOCK.WP.SP	12	0.545	16.3

GRAIN MEAN DM% 92.6

SUB PLOT AREA HARVESTED 0.00345

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88/R/RA/12

SPRING OILSEED RAPE

ANTI-FEEDANTS

Object: To study the effects of insect anti-feedants on pests of oilseed rape - Long Hoos V 7.

Sponsors: D.C. Griffiths, L.E. Smart.

Design: 4 randomised blocks of 6 plots.

Whole plot dimensions: 2.5 x 5.0.

Treatments:

PESTCONT	Methods of insect pest control:
NONE	None
HCH TRI	Gamma-HCH and triazophos
AJUGA C	Ajuga chamaepytis extract
AJUGA R	Ajuga remota extract
HOP EXTR	Beta-acid extract of hops
NEEM OIL	Neem oil

Notes: (1) Gamma-HCH was applied at 0.53 kg on 14 June, 1988, triazophos at 0.42 kg on 12 July.
(2) Remaining materials were applied on 14, 20, 29 June and 5, 12, 20 and 26 July. On each occasion Ajuga chamaepytis extract was applied at a rate equivalent to the extract from 20 kg of fresh plant material, Ajuga remota from 5 kg of fresh plant material. The beta-acid extract of hops was applied at 1.0 l, neem oil at 0.10 l.
(3) All treatments were applied in 10 l water.

Basal applications: Manures: (0:18:36) at 1040 kg. 'Nitro-Chalk' at 600 kg. Weedkiller: Clopyralid at 0.10 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 220 l, applied twice.

NOTE: The desiccant was repeated because of rain soon after the first application.

Seed: Topas, sown at 8 kg.

Cultivations, etc.:- PK applied: 30 Sept, 1987. Ploughed: 14 Dec. Rotary harrowed, seed sown, N applied, rolled: 18 Apr, 1988. Weedkiller applied: 14 June. Desiccant applied twice: 14 Sept. Combine harvested: 30 Sept. Previous crops: Fallow 1986, lupins 1987.

NOTES: (1) Pollen beetle, seed weevil and pod midge damage were assessed at intervals during the season.
(2) Because of a combine malfunction yields from two plots were lost, with treatments NONE and HCH TRI. Estimated values were used in the analysis.

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88/R/RA/12

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PESTCONT	NONE	HCH TRI	AJUGA C	AJUGA R	HOP EXTR	NEEM OIL	Mean
	1.14	1.22	0.98	1.00	1.11	1.12	1.10

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

PESTCONT
0.076

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	13	0.107	9.8

GRAIN MEAN DM% 83.5

PLOT AREA HARVESTED 0.00084

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88/R/SU/1

SUNFLOWERS

EARLY VARIETIES AND PLANT HEALTH

Object: To compare six varieties of sunflower with and without pest and pathogen control - Fosters Corner.

Sponsors: C.J. Rawlinson, V.J. Church, R.A. Gutteridge..

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 2.5 x 8.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

S10	S - 10
HA 701	HA 701
S34	S - 34
S47	S - 47
S54	S - 54
S69	S - 69

2. **PATHCONT** Pathogen control:

NONE	None
FULL	Full: Pirimicarb at 0.14 kg in 220 l on 23 June, 1988. Carbendazim at 0.25 kg with vinclozolin at 0.50 kg in 220 l on 7, 15, 26 July, 3 and 15 Aug.

Basal applications: Manures: (10:10:15+4.5 Mg) at 600 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l. Desiccant: Diquat at 0.80 kg ion in 440 l to S10, at 0.60 kg ion in 220 l to other varieties .

Seed: Varieties, sown at 100,000 seeds per hectare.

Cultivations, etc.:- Glyphosate applied: 17 Nov, 1987. Ploughed: 8 Dec. Manures applied: 11 Mar, 1988. Trifluralin applied, spring-tine cultivated, rotary harrowed twice: 6 Apr. Seed sown, rolled: 7 Apr. Linuron applied: 11 Apr. Desiccant applied to all plots except S10: 5 Sept, to S10 plots: 29 Sept. Harvested by hand, threshed by stationary combine harvester, all plots except S10: 6 Sept, S10 plots: 30 Sept. Previous crops: S. oats 1986, w. wheat 1987.

NOTES: (1) Plots were covered by a bird-proof net from mid-April to maturity.
(2) Crop height was measured at anthesis. Head diameters and neck thickness were measured at maturity. Botrytis was assessed on four occasions.

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88/R/SU/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PATHCONT VARIETY	NONE	FULL	Mean
S10	1.87	2.01	1.94
HA 701	2.88	2.76	2.82
S34	0.70	0.86	0.78
S47	1.74	1.78	1.76
S54	1.40	1.42	1.41
S69	1.35	1.41	1.38
Mean	1.66	1.71	1.68

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

VARIETY	PATHCONT	VARIETY PATHCONT
0.078	0.045	0.110

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	22	0.135	8.0

GRAIN MEAN DM% 66.6

PLOT AREA HARVESTED 0.00120

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88/R/SU/2

SUNFLOWERS

SEED RATES

Object: To test the effects of five seed rates on plant growth, disease and yield - Fosters Corner.

Sponsors: C.J. Rawlinson, V.J. Church, R.A. Gutteridge.

Design: 4 randomised blocks of 5 plots.

Whole plot dimensions: 2.5 x 8.0.

Treatments:

SEEDRATE Seed rate (no. seeds sown per square metre):

6
8
10
12
14

Basal applications: Manures: (10:10:15+4.5 Mg) at 600 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l. Desiccant: Diquat at 0.40 kg ion in 220 l on two occasions.

Seed: HA 701.

Cultivations, etc.:- Glyphosate applied: 17 Nov, 1987. Ploughed: 8 Dec. Manures applied: 11 Mar, 1988. Trifluralin applied, spring-tine cultivated, rotary harrowed, seed sown: 6 Apr. Rolled: 7 Apr. Linuron applied: 11 Apr. Desiccant applied twice: 14 Sept. Combine harvested: 22 Sept. Previous crops: S. oats 1986, w. wheat 1987.

NOTE: The plots were covered by a bird-proof net from mid-April to maturity. Crop heights were measured at anthesis and maturity. Flower head angles and diameters were measured at maturity. Botrytis was assessed on three occasions.

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88/R/SU/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE	6	8	10	12	14	Mean
	1.99	1.99	2.30	2.16	2.39	2.16

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

SEEDRATE
0.121

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.171	7.9

GRAIN MEAN DM% 64.6

PLOT AREA HARVESTED 0.00120

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88/R/SU/3

SUNFLOWERS

FUNGICIDES AND BOTRYTIS

Object: To study the effects of four rates of fungicides on the control of Botrytis head infection and on the yield of sunflowers - Fosters Corner.

Sponsors: C.J. Rawlinson, V.J. Church, R.A. Gutteridge.

Design: 4 randomised blocks of 5 plots.

Whole plot dimensions: 2.5 x 8.0.

Treatments:

FUNGRATE	Rates of fungicides, per application:
0	None (duplicated)
1	Carbendazim at 0.25 kg plus vinclozolin at 0.5 kg
2	Carbendazim at 0.50 kg plus vinclozolin at 1.0 kg
3	Carbendazim at 0.75 kg plus vinclozolin at 1.5 kg

NOTE: Fungicides were applied on 7, 15, 26 July, 1988, 3 and 15 Aug.

Basal applications: Manures: (10:10:15+4.5 Mg) at 600 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 220 l.

Seed: S47, sown at 120,000 seeds per hectare.

Cultivations, etc.:- Glyphosate applied: 17 Nov, 1987. Ploughed: 8 Dec. Manures applied: 11 Mar, 1988. Spring-tine cultivated: 5 Apr. Trifluralin applied, spring-tine cultivated, rotary harrowed, seed sown: 6 Apr. Rolled: 7 Apr. Linuron applied: 11 Apr. Desiccant applied: 5 Sept. Combine harvested: 6 Sept. Previous crops: S. Oats 1986, w. wheat 1987.

NOTES: (1) The plots were covered by a bird-proof net from mid-April to maturity.
(2) Botrytis was assessed on three occasions.

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88/R/SU/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGRATE	0	1	2	3	Mean
	0.99	1.23	1.19	1.21	1.12

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

FUNGRATE	
0.086	min.rep
0.075	max-min

	FUNGRATE
max-min	0 v any of remainder
min.rep	any of remainder

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	13	0.122	10.9

GRAIN MEAN DM% 83.7

PLOT AREA HARVESTED 0.00120

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88/R/SU/4

SUNFLOWERS

VARIETIES AND SOWING DATES

Object: To study the effects of five sowing dates on the rates of vegetative and floral development, seed growth, dates of maturity, disease and yield of two varieties of sunflowers - Fosters Corner.

Sponsors: V.J. Church, R.A. Gutteridge, C.J. Rawlinson.

Design: 3 randomised blocks of 10 plots.

Whole plot dimensions: 2.5 x 8.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

SUNB 246	Sunbred 246
S 47	S47

2. **SOWDATE** Sowing date:

17 MAR	17 March, 1988
5 APR	5 April
15 APR	15 April
25 APR	25 April
11 MAY	11 May

Basal applications: Manures: (10:10:15+4.5 Mg) at 600 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 220 l to S47 on the first three sowing dates and at 0.80 kg in 440 l to the remainder.

Seed: Sown at 100,000 seeds per hectare.

Cultivations, etc.:- Glyphosate applied: 17 Nov, 1987. Ploughed: 8 Dec. NPK Mg applied: 11 Mar, 1988. Spring-tine cultivated, trifluralin applied, rotary harrowed all plots and, to sowdate 17 Mar; seed sown, rolled, linuron applied: 17 Mar. To sowdate 5 Apr; seed sown: 5 Apr, rolled: 7 Apr, linuron applied: 11 Apr. To sowdate 15 Apr; rotary harrowed, seed sown, rolled: 15 Apr, linuron applied: 25 Apr. To sowdate 25 Apr; rotary harrowed, seed sown, rolled, linuron applied: 25 Apr. To sowdate 11 May; rotary harrowed, seed sown, rolled: 11 May. Linuron applied: 20 May. Desiccant applied to S 47, sowdates 17 Mar, 5 Apr and 15 Apr: 5 Sept. Desiccant applied to S 47, sowdates 25 Apr and 11 May: 29 Sept. Desiccant applied to SUNB 246, sowdates 17 Mar, 5 Apr and 5 Apr: 5 Oct. Desiccant applied to SUNB 246, sowdates 25 Apr and 1 May: 12 Oct. Hand harvested S 47, sowdates 17 Mar, 5 Apr and 15 Apr: 6 Sept. Hand harvested S 47, sowdates 25 Apr and 11 May: 30 Sept. Hand harvested SUNB 246 sowdates 17 Mar, 5 Apr and 15 Apr: 10 Oct. Hand harvested SUNB 246 sowdates 25 Apr and 11 May: 17 Oct. Previous crops: s. oats 1986, w. wheat 1987.

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88/R/SU/4

NOTES: (1) Heads were cut by hand and then threshed by stationary combine harvester.
(2) The plots were covered by a bird-proof net soon after sowing until maturity.
(3) Assessments of Botrytis was made on six occasions.
(4) Head diameters were measured at anthesis and before harvest.
(5) Crop height, head angle and neck thickness were measured after anthesis.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOWDATE / VARIETY	17 MAR	5 APR	15 APR	25 APR	11 MAY	Mean
SUNB 246	0.74	1.60	1.69	0.41	1.85	1.26
S 47	1.47	1.68	2.05	1.30	2.02	1.70
Mean	1.11	1.64	1.87	0.86	1.94	1.48

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

VARIETY	SOWDATE	VARIETY SOWDATE
0.128	0.202	0.285

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.349	23.6

GRAIN MEAN DM% 61.7

PLOT AREA HARVESTED 0.00120

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88/R/LN/2

LINSEED

INSECT STUDY

Object: To study the effects of insecticidal and fungicidal sprays on the pests, pathogens and yields of linseed - Ex-allotments.

Sponsors: A.W. Ferguson, I.H. Williams, B.D.L. Fitt.

Design: 3 randomised blocks of 4 plots.

Whole plot dimensions: 4.0 x 10.0.

Treatments: All combinations of:-

1. **INSCTCDE** Insecticide:

NONE	None
DELTA	Deltamethrin at 0.0075 kg in 260 l on 6 May, 1988 and in 200 l on 20 May, 6 June, 20 June, 19 July, 5 Aug and 18 Aug

2. **FUNGCIDE** Fungicide

NONE	None
BE+IPR	Benomyl at 0.55 kg in 200 l and, separately, iprodione at 0.50 kg in 200 l on 6 June, 1988 19 July and 18 Aug

Basal applications: Manures: 'Nitram' at 250 kg. Weedkiller: Trifluralin at 1.1 kg in 450 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.50 l) in 200 l.

Seed: Antares, dressed iprodione and benomyl, sown at 87 kg.

Cultivations, etc.:- Ploughed: 27 Nov, 1987. Heavy spring-tine cultivated: 6 Apr, 1988. N applied: 7 Apr. Weedkiller applied, spring-tine cultivated: 12 Apr. Rotary harrowed, seed sown: 13 Apr. Desiccant with wetting agent applied: 19 Sept. Combine harvested: 28 Oct. Previous crops: S. barley 1986, linseed 1987.

NOTE: Insects were sampled and insect damage assessed, fortnightly, from emergence to maturity.

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88/R/LN/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE	NONE	BE+IPR	Mean
INSCTCDE			
NONE	2.00	2.55	2.28
DELTA	1.88	3.11	2.49
Mean	1.94	2.83	2.39

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

INSCTCDE	FUNGCIDE	INSCTCDE FUNGCIDE
0.238	0.238	0.337

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.412	17.3

GRAIN MEAN DM% 85.5

PLOT AREA HARVESTED 0.00310

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88/R/P/1 and 88/W/P/1

POTATOES

VARIETIES

Object: To compare the quality and yield of some of the newer varieties of potato with current standards on two soil types - Rothamsted Pastures (R), Woburn White Horse (W).

Sponsor: R. Moffitt.

Design: 4 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 7.0.

Treatments:

VARIETY	Varieties:
CARA	Cara
CROWN	Pentland Crown
DESIREE	Desiree
DE+CAO	Desiree given calcium peroxide in the ridge at planting
ESTIMA	Estima
KINGSTON	Kingston
ROMANO	Romano
WILJA	Wilja

NOTE: Calcium peroxide was applied as granules at a rate of 370 kg (10 g per tuber) applied to planted tuber before covering.

Basal applications:

Pastures (R): Manures: (0:18:36) at 690 kg. FYM at 35 t. (10:10:15+4.5 Mg) at 1960 kg. Weedkiller: Linuron at 1.65 kg in 260 l. Fungicides: Dithiocarbamate complex at 1.4 kg in 200 l applied twice. Mancozeb at 1.4 kg in 200 l on five occasions applied with the insecticide on the first two. Fentin hydroxide at 0.27 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.

White Horse (W): Manures: (0:18:36) at 690 kg. (10:10:15+4.5 Mg) at 2400 kg. Weedkillers: Paraquat at 0.40 kg ion in 200 l. Linuron at 1.5 kg with paraquat at 0.40 kg ion in 220 l. Fungicides: Mancozeb at 1.4 kg in 220 l on five occasions applied with the insecticide on the first, second and fifth occasions. Fentin hydroxide at 0.28 kg in 220 l. Nematicide: Oxamyl at 5.5 kg. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 400 l.

Cultivations, etc.:-

Pastures (R): PK applied: 13 Oct, 1987. FYM applied: 10 Dec. Ploughed: 17 Dec. NPK Mg applied: 6 Apr, 1988. Rotary harrowed, ridged, hand planted and split back: 11 Apr. Ridged: 26 Apr. Linuron applied: 5 May. Mancozeb and pirimicarb applied: 15 and 30 June. Dithiocarbamate complex applied: 6 and 8 July. Mancozeb applied: 18 July, 1 and 15 Aug. Fentin hydroxide applied: 30 Aug. Haulm mechanically destroyed: 14 Sept. Desiccant applied: 20 Sept. Lifted: 31 Oct. Previous crops: W. wheat 1986, s. beans 1987.

https://doi.org/10.23637/ERADOC-1-43 *pp 252*

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88/R/P/1 and 88/W/P/1
Cultivations, etc.:-
White Horse (W): Paraquat applied: 21 Sept, 1987. PK applied: 25 Sept. NPK Mg applied: 7 Apr, 1988. Oxamyl applied, rotary cultivated and ridged, hand planted, split back ridges: 15 Apr. Rotary ridged, linuron and paraquat applied: 12 May. Mancozeb applied: 15 July, 1 Aug. Mancozeb and pirimicarb applied: 14 June, 7 July and 15 Aug. Fentin hydroxide applied: 30 Aug. Desiccant applied: 15 Sept. Haulm mechanically destroyed: 29 Sept. Lifted: 14 Oct. Previous crops: Mixed w. cereals 1986, w. oats 1987.

NOTE: On Pastures (R) one of the plots of CROWN was severely infested with thistles. An estimated value was used in the analysis.

88/R/P/1 PASTURES(R)

TOTAL TUBERS TONNES/HECTARE

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

VARIETY	
CARA	80.7
CROWN	77.7
DESIREE	63.4
DE+CAO	63.5
ESTIMA	74.7
KINGSTON	68.1
ROMANO	66.3
WILJA	67.9
Mean	70.3

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

VARIETY
3.54

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	5.00	7.1

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

VARIETY	
CARA	98.0
CROWN	98.5
DESIREE	97.0
DE+CAO	96.8
ESTIMA	98.3
KINGSTON	97.4
ROMANO	98.0
WILJA	96.8
Mean	97.6

PLOT AREA HARVESTED 0.00105

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88/W/P/1 WHITE HORSE (W)

TOTAL TUBERS TONNES/HECTARE

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

VARIETY	
CARA	83.3
CROWN	76.3
DESIREE	60.4
DE+CAO	53.6
ESTIMA	72.5
KINGSTON	72.9
ROMANO	62.7
WILJA	74.4
Mean	69.5

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

VARIETY
3.24

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	21	4.59	6.6

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

VARIETY	
CARA	96.3
CROWN	96.2
DESIREE	94.5
DE+CAO	93.8
ESTIMA	95.2
KINGSTON	95.5
ROMANO	95.3
WILJA	93.7
Mean	95.0

PLOT AREA HARVESTED 0.00105

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88/R/M/1 and 88/W/M/1

MIXED 1

INPUTS FOR WINTER CEREALS

Object: To compare amounts of disease and the yield of triticale with those of w. wheat, w. barley and w. rye on two contrasted sites each given contrasted amounts of agrochemicals - Rothamsted Highfield VI (R) Woburn Far Field II (W).

Sponsors: R.J. Gutteridge, D. Hornby, R.D. Prew (R), P.R. Scott, W. Hollins, R.L. Gregory (I.P.S.R., Cambridge).

Design: 3 randomised blocks of 10 plots.

Whole plot dimensions: 3.0 x 10.0 (R), 4.0 x 10.0 (W).

Treatments: All combinations of :-

1. **CROP VAR**	Crop and variety:	(R)	(W)
B PANDA	W. barley, Panda sown at	200 kg,	200 kg
R DOMINT	W. rye, Dominant sown at	120 kg,	140 kg
T LASKO	W. triticale, Lasko sown at	180 kg,	180 kg
T STATUS	W. triticale, Status sown at	130 kg,	140 kg
W AVALON	W. wheat, Avalon sown at	180 kg,	190 kg

2. **INPUT** Inputs of agrochemicals, in addition to basals:

LARGE
- High input, 40 kg N early plus 160 kg N later (R) and (W).
- Prochloraz + carbendazim + tridemorph (April) (R) and (W).
- Fenpropimorph + chlorothalonil (May) (R)
- Propiconazole + tridemorph (May) (W)
- Propiconazole + carbendazim (June) (W)

SMALL
- Low input, 120 kg N in early April. No fungicides or summer insecticides.

NOTES: (1) Treatments were applied as follows:

Highfield (R): N treatments: 23 Feb, 1988 and 5 Apr. Prochloraz at 0.40 kg, carbendazim at 0.15 kg with tridemorph at 0.52 kg in 220 l: 26 Apr. Fenpropimorph at 0.75 kg with clorothalonil at 1.0 kg in 220 l: 25 May.

Far Field II (W): N treatments: 3 Mar, 1988 and 13 Apr. Prochloraz at 0.40 kg, carbendazim at 0.15 kg with tridemorph at 0.52 kg in 220 l: 26 Apr. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 220 l: 23 May. Propiconazole at 0.12 kg with carbendazim at 0.15 kg: 18 June.

(2) The R DOMINT and the T STATUS plots at Rothamsted failed and were cultivated and fallowed in early May 1988.

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88/R/M/1 and 88/W/M/1

Basal applications:

Highfield VI (R): Manures: Chalk at 5.0 t. Weedkillers: Glyphosate at 0.27 kg in 200 l. Diclofop-methyl at 0.95 kg in 200 l. Fluroxypyr at 0.20 kg with metsulfuron-methyl at 0.006 kg in 200 l. Insecticide: Fonofos at 1.4 kg in 200 l.

Far Field II (W): Weedkillers: Isoxaben at 0.12 kg in 200 l. Diclofop-methyl at 0.57 kg in 200 l. Insecticide: Fonofos at 1.4 kg in 200 l.

Cultivations, etc.:-

Highfield VI (R): Chalk applied: 16 Sept, 1987. Glyphosate applied: 29 Sept. Ploughed: 2 Oct. Rotary harrowed: 5 Oct. Rotary harrowed, seed sown, harrowed: 6 Oct. Diclofop-methyl applied: 18 Nov. Insecticide applied: 14 Jan, 1988. Fluroxypyr and metsulfuron-methyl applied: 25 Apr. Combine harvested: 4 Aug (barley), 23 Aug (wheat), 26 Aug (triticale). Previous crops: W. wheat 1986 and 1987.

Far Field II (W): Ploughed: 21 Sept, 1987. Rotary cultivated with crumbler attached, seed sown: 1 Oct. Harrowed and rolled: 2 Oct. Isoxaben applied: 23 Oct. Diclofop-methyl applied: 24 Oct. Insecticide applied: 12 Jan, 1988. Combine harvested: 3 Aug (barley) 25 Aug (other cereals). Previous crops: W. wheat 1986 and 1987.

88/R/M/1 W.BARLEY, W.TRITICALE, W.WHEAT

GRAIN TONNES/HECTARE

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

INPUT CROP VAR	LARGE	SMALL	Mean
B PANDA	8.40	6.44	7.42
T LASKO	8.27	6.18	7.22
W AVALON	6.88	5.87	6.37
Mean	7.85	6.16	7.01

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

CROP VAR	INPUT	CROP VAR INPUT
0.458	0.374	0.647

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.793	11.3

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00272

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88/W/M/1 W.BARLEY, W.TRITICALE, W.WHEAT

GRAIN TONNES/HECTARE

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

INPUT / CROP VAR	LARGE	SMALL	Mean
B PANDA	6.99	4.52	5.76
R DOMINT	8.15	7.09	7.62
T LASKO	3.90	3.80	3.85
T STATUS	5.22	2.95	4.09
W AVALON	4.26	2.77	3.52
Mean	5.71	4.23	4.97

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

CROP VAR	INPUT	CROP VAR INPUT
0.354	0.224	0.500

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.613	12.3

GRAIN MEAN DM% 81.3

PLOT AREA HARVESTED 0.00271

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88/R/M/5

MIXED 5

COMPARISON OF COMBINES

Object: To evaluate the suitability of two combines for plot work in respect of purity of sample and accuracy when working on slopes - Great Knott II.

Sponsors: R. Moffitt, M.N. Rogers.

Design: A systematic split-plot design of 56 whole plots arranged as shown below.

W	B	W	B	W	B	W	B	Top of slope
W	W	W	W	W	W	W	W	
W	W	W	W	W	W	W	W	
B	B	B	B	B	B	B	B	
W	W	W	W	W	W	W	W	
W	W	W	W	W	W	W	W	
W*	B	W	B	W	B	W	B	Bottom of slope

* Combines started here (after harvesting a dummy wheat plot downhill), worked up the column of plots then down the next column etc.

B = Barley W = wheat

NOTES: (1) Each whole plot was systematically divided to compare the two combine harvesters.
(2) There were 10 m headlands between contiguous barley and wheat plots. These were removed before combining the plots. There were 1 m paths between contiguous wheat plots.

Whole plot dimensions: 9.0 x 11.0.

Treatments:

Whole plots

1. **CROP** Crop:

WHEAT	W. wheat
BARLEY	S. barley

2. **DIRECTN** Combine direction in relation to slope:

UP	Up slope
DOWN	Down slope

3. **ORDER** Order of combining:

BEGIN	First plot in column
STRAIGHT	Central plots in column
END	Last plot in column

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88/R/M/5

Sub plots

4. **COMBINE** Combine type:

CLAYSON	Clayson 1530
DEUTZ-F	Deutz-Fahr 660

NOTE: Spring barley replaced autumn-sown rye which failed.

Basal applications: Manures: Chalk at 5.0 t. 'Nitram' at 120 kg and later at 250 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Glyphosate at 0.36 kg in 200 l (to failed rye plots only). Fluroxypyr at 0.15 kg with clopyralid at 0.05 kg and bromoxynil at 0.24 kg in 200 l. Fungicide: Propiconazole at 0.12 kg in 200 l.

Seed: W. wheat: Mission, sown at 200 kg.
W. rye: Dominant, sown at 200 kg.
S. barley: Klaxon, sown at 180 kg.

Cultivations, etc.:- Ploughed: 12 Aug, 1987. Disced: 17 Aug. Chalk applied: 16 Sept. Paraquat applied: 28 Oct. Rotary harrowed, w. wheat and w. rye seed sown: 18 Nov. First N applied: 2 Mar, 1988. Glyphosate applied (to rye plots): 19 Apr. Second N applied: 22 Apr. Ex-rye plots heavy spring-tine cultivated, rotary harrowed, s. barley seed sown: 29 Apr. Remaining weedkillers applied: 13 May. Fungicide applied: 27 May. Combine harvested: 5 Sept (CLAYSON plots) and 6 Sept (DEUTZ-F plots). Previous crops: W. barley 1986, w. oilseed rape 1987.

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88/R/M/5

GRAIN TONNES/HECTARE

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

COMBINE	CLAYSON	DEUTZ-F
	5.77	5.33

	DIRECTN	UP			DOWN		
CROP	**ORDER**	BEGIN	STRAIGHT	END	BEGIN	STRAIGHT	END
WHEAT		5.45	6.38	6.48		6.67	
BARLEY			3.07		3.70	3.41	3.41

CROP	**DIRECTN**	**ORDER**	**COMBINE**	CLAYSON	DEUTZ-F
WHEAT	UP	BEGIN		6.10	4.79
		STRAIGHT		6.87	5.88
		END		6.87	6.09
	DOWN	STRAIGHT		7.00	6.34
BARLEY	UP	STRAIGHT		2.52	3.62
	DOWN	BEGIN		3.53	3.87
		STRAIGHT		3.10	3.73
		END		3.19	3.63

Grand mean 5.55

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

COMBINE	**CROP DIRECTN ORDER**	**CROP DIRECTN ORDER COMBINE**	
0.082	0.375	0.434	min.rep
	0.297	0.343	max-min
	0.188	0.217	max.rep
Except when comparing means with the same level(s) of			
CROP.DIRECTN.ORDER		0.307	min.rep
		0.242	max-min
		0.153	max.rep

max.rep **CROP** WHEAT and **ORDER** STRAIGHT
min.rep any of the remainder
max-min **CROP** WHEAT and **ORDER** STRAIGHT v any of the remainder

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

Stratum	d.f.	s.e.	cv%
WP	48	0.531	9.6
WP.SP	48	0.434	7.8

GRAIN MEAN DM% 84.0

PLOT AREA HARVESTED CLAYSON 0.00310
DEUTZ F 0.00230

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88/R/M/6

MIXED 6

FACTORS AFFECTING EYESPOT

Object: To study eyespot (Pseudocercosporella herpotrichoides) development after inoculation with different pathotypes in relation to host crop and seed rate - Great Knott II.

Sponsors: A. Goulds, B.D.L. Fitt.

Design: 2 randomised blocks of 12 plots split into 4.

Whole plot dimensions: 3.0 x 37.0.

Treatments: All combinations of:-

Whole plots

1. **W CEREAL** — Winter cereals sown on 30 October, 1987:

BARLEY	Winter barley cv. Opera
WHEAT	Winter wheat cv. Avalon

2. **SEEDRATE** — Seed rates (seeds per square metre):

NORMAL	Normal - 300 barley, 400 wheat
HALF N	Half normal - 150 barley, 200 wheat

3. **INOCULUM** — Inoculation with different eyespot pathogen types:

NONE	None
RYE INOC	Rye type
WHE INOC	Wheat type

Sub plots

4. **FUNGTIME** — Times of applying prochloraz at 0.40 kg and carbendazim at 0.15 kg in 220 l:

NONE	None
EARLY	Sprayed at growth stage 30/31 on 26 Apr, 1988
LATE	Sprayed at growth stage, 33/37 wheat, 41/49 barley on 20 May

NOTES: (1) One additional sub-plot in each whole plot was systematically arranged for sampling, yields not taken.
(2) Strains of wheat and rye type inoculum were colonised on oat seed and broadcast within two weeks of emergence.

Basal applications: Manures: Chalk at 5.0 t. 'Nitram' at 120 kg and later at 250 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg with the tridemorph in 200 l. Fungicides: Tridemorph at 0.52 kg. Chlorothalonil at 1.0 kg in 200 l.

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88/R/M/6

Cultivations, etc.:- Ploughed: 12 Aug, 1987. Disced: 17 Aug. Chalk applied: 16 Sept. Paraquat applied: 28 Oct. Rotary harrowed, seed sown: 30 Oct. First N applied: 2 Mar, 1988. Second N applied 22 Apr. Remaining weedkillers with tridemorph applied: 10 May. Chlorothalonil applied: 6 June. Combine harvested: 4 Aug (barley), 22 Aug (wheat). Previous crops: W. barley 1986, w. oilseed rape 1987.

NOTE: Eyespot was assessed on plants at weekly intervals from early March until early August.

GRAIN TONNES/HECTARE

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

SEEDRATE	NORMAL	HALF N	Mean
W CEREAL			
BARLEY	6.93	6.58	6.76
WHEAT	8.96	8.26	8.61
Mean	7.94	7.42	7.68

INOCULUM	NONE	RYE INOC	WHE INOC	Mean
W CEREAL				
BARLEY	6.74	6.81	6.71	6.76
WHEAT	8.62	8.55	8.66	8.61
Mean	7.68	7.68	7.69	7.68

INOCULUM	NONE	RYE INOC	WHE INOC	Mean
SEEDRATE				
NORMAL	7.97	8.04	7.82	7.94
HALF N	7.39	7.32	7.55	7.42
Mean	7.68	7.68	7.69	7.68

FUNGTIME	NONE	EARLY	LATE	Mean
W CEREAL				
BARLEY	6.62	6.82	6.82	6.76
WHEAT	8.42	8.64	8.76	8.61
Mean	7.52	7.73	7.79	7.68

FUNGTIME	NONE	EARLY	LATE	Mean
SEEDRATE				
NORMAL	7.78	8.02	8.04	7.94
HALF N	7.27	7.45	7.55	7.42
Mean	7.52	7.73	7.79	7.68

FUNGTIME	NONE	EARLY	LATE	Mean
INOCULUM				
NONE	7.61	7.73	7.70	7.68
RYE INOC	7.43	7.80	7.82	7.68
WHE INOC	7.53	7.66	7.87	7.69
Mean	7.52	7.73	7.79	7.68

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88/R/M/6

GRAIN TONNES/HECTARE

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

W CEREAL	INOCULUM / SEEDRATE	NONE	RYE INOC	WHE INOC
BARLEY	NORMAL	6.97	7.03	6.78
	HALF N	6.52	6.59	6.65
WHEAT	NORMAL	8.97	9.05	8.86
	HALF N	8.26	8.05	8.46

W CEREAL	FUNGTIME / SEEDRATE	NONE	EARLY	LATE
BARLEY	NORMAL	6.78	7.06	6.93
	HALF N	6.46	6.57	6.72
WHEAT	NORMAL	8.77	8.97	9.15
	HALF N	8.08	8.32	8.38

W CEREAL	FUNGTIME / INOCULUM	NONE	EARLY	LATE
BARLEY	NONE	6.64	6.72	6.88
	RYE INOC	6.57	6.98	6.89
	WHE INOC	6.67	6.76	6.71
WHEAT	NONE	8.58	8.75	8.52
	RYE INOC	8.29	8.62	8.75
	WHE INOC	8.39	8.56	9.02

SEEDRATE	FUNGTIME / INOCULUM	NONE	EARLY	LATE
NORMAL	NONE	7.75	8.09	8.07
	RYE INOC	7.91	8.06	8.16
	WHE INOC	7.67	7.89	7.89
HALF N	NONE	7.47	7.37	7.32
	RYE INOC	6.95	7.54	7.48
	WHE INOC	7.39	7.43	7.84

W CEREAL	SEEDRATE	FUNGTIME / INOCULUM	NONE	EARLY	LATE
BARLEY	NORMAL	NONE	6.76	7.11	7.04
		RYE INOC	6.93	7.21	6.97
		WHE INOC	6.67	6.88	6.79
	HALF N	NONE	6.51	6.32	6.71
		RYE INOC	6.21	6.75	6.81
		WHE INOC	6.67	6.65	6.63
WHEAT	NORMAL	NONE	8.74	9.08	9.11
		RYE INOC	8.90	8.91	9.34
		WHE INOC	8.68	8.91	9.00
	HALF N	NONE	8.43	8.42	7.94
		RYE INOC	7.68	8.33	8.15
		WHE INOC	8.11	8.21	9.05

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88/R/M/6

GRAIN TONNES/HECTARE

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

	W CEREAL	SEEDRATE	INOCULUM	FUNGTIME
	0.090	0.090	0.110	0.086

	W CEREAL SEEDRATE	W CEREAL INOCULUM	SEEDRATE INOCULUM	W CEREAL FUNGTIME
	0.127	0.156	0.156	0.134
Except when comparing means with the same level(s) of				
W CEREAL				0.122

	SEEDRATE FUNGTIME	INOCULUM FUNGTIME	W CEREAL SEEDRATE INOCULUM	W CEREAL SEEDRATE FUNGTIME
	0.134	0.164	0.220	0.190
Except when comparing means with the same level(s) of				
SEEDRATE	0.122			
INOCULUM		0.150		
W CEREAL.SEEDRATE				0.173

	W CEREAL INOCULUM FUNGTIME	SEEDRATE INOCULUM FUNGTIME	W CEREAL SEEDRATE INOCULUM FUNGTIME
	0.233	0.233	0.329
Except when comparing means with the same level(s) of			
W CEREAL.INOCULUM	0.212		
SEEDRATE.INOCULUM		0.212	
W CEREAL.SEEDRATE.INOCULUM			0.299

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.220	2.9
BLOCK.WP.SP	24	0.299	3.9

GRAIN MEAN DM% 80.5

SUB PLOT AREA HARVESTED 0.00235

https://doi.org/10.23637/ERADOC-1-43 *pp 264*

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METEOROLOGICAL RECORDS 1988 – ROTHAMSTED

(Departure from 30-year means in brackets)

MONTH	Total sunshine: hours	Mean temperature: C Air(1)	Dew point	In ground under grass 30cm	100cm
JAN	51 (+1)	4.8 (+2.0)	3.2	6.2	7.6
FEB	109 (+47)	4.2 (+1.1)	1.2	4.8	6.3
MAR	91 (-18)	6.0 (+0.9)	3.5	6.0	6.3
APR	130 (-10)	7.8 (+0.1)	4.8	8.4	7.7
MAY	182 (-7)	11.6 (+0.5)	8.5	11.7	9.8
JUNE	154 (-43)	13.5 (-0.5)	10.3	13.5	11.6
JULY	159 (-21)	14.4 (-1.2)	11.7	15.1	13.3
AUG	202 (+35)	15.5 (-0.2)	11.4	15.4	14.0
SEPT	140 (0)	13.3 (-0.3)	10.5	13.9	13.6
OCT	106 (+6)	10.6 (+0.3)	9.0	11.9	12.3
NOV	82 (+20)	4.8 (-1.1)	3.4	7.9	10.1
DEC	39 (-7)	6.6 (+2.5)	5.5	7.0	8.2
YEAR*	1443 (+2)	9.4 (+0.3)	6.9	10.1	10.1

MONTH	Ground frosts (2)	Total rainfall:mm 12.7cm (5 in) gauge	Rain days (3)	Drainage through 50.8cm (20 in) soil:mm	Wind km per hour (4)
JAN	19	137 (+74)	27	123	9.6
FEB	25	42 (-10)	12	32	12.1
MAR	12	65 (+13)	18	33	11.0
APR	13	29 (-18)	10	TRACE	8.2
MAY	10	50 (-1)	14	15	7.0
JUNE	1	57 (-1)	11	16	6.8
JULY	1	95 (+43)	24	46	6.5
AUG	1	60 (-1)	12	15	6.0
SEPT	3	52 (-7)	11	29	7.3
OCT	9	70 (+10)	15	47	6.7
NOV	23	30 (-40)	12	17	4.3
DEC	18	20 (-49)	11	15	9.0
YEAR*	135	705 (+12)	177	385	7.9

(1) 30-year means are for the period 1951-80
(2) Mean of maximum and minimum
(3) Number of nights grass min. was below 0.0 C
(4) Number of days rainfall was 0.2 mm or more
(5) At 2 metres above ground level
*Mean or total

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METEOROLOGICAL RECORDS 1988 – WOBURN

(Departure from 30-year means in brackets)

Mean temperature: C

MONTH	Total sunshine: hours		Air (1)		Dew point	In ground under grass 30 cm	100 cm	Ground frosts (2)	Total rainfall: mm 12.7 cm (5in) gauge		Rain days (3)	Wind km per hour (4)
JAN	41	(-9)	5.2	(+2.0)	3.6	6.1	7.7	14	109	(+55)	23	10.5
FEB	101	(+40)	4.6	(+1.2)	1.9	4.9	6.5	23	31	(-11)	11	11.3
MAR	80	(-27)	6.4	(+1.1)	3.5	6.3	6.5	11	64	(+15)	18	10.3
APR	119	(-13)	7.9	(+0.2)	4.8	8.4	7.7	14	28	(-16)	11	7.2
MAY	173	(-11)	11.7	(+0.7)	8.7	12.5	10.0	7	56	(+6)	13	6.3
JUNE	142	(-50)	14.0	(0.0)	11.0	15.0	12.2	0	54	(-1)	12	6.4
JULY	152	(-24)	15.1	(-0.8)	11.9	16.0	14.0	0	106	(+55)	22	10.0
AUG	187	(+25)	15.4	(-0.2)	11.7	16.1	14.7	0	43	(-24)	11	7.9
SEPT	138	(+3)	13.5	(-0.1)	11.0	14.5	14.3	1	71	(+17)	9	7.9
OCT	107	(+7)	10.6	(+0.4)	8.8	11.7	12.7	9	52	(0)	14	5.7
NOV	73	(+11)	4.6	(-1.6)	2.9	6.7	10.1	25	30	(-29)	9	3.4
DEC	33	(-12)	7.1	(+2.8)	5.5	6.8	8.1	13	24	(-35)	10	9.2
YEAR*	1346	(-62)	9.7	(+0.5)	7.1	10.4	10.4	117	669	(+32)	163	8.0

(1) 30-year means are for the period 1951-80
(2) Mean of maximum and minimum
(3) Number of nights grass min. was below 0.0 C
(4) Number of days rainfall was 0.2 mm or more
(5) At 2 metres above ground level
*Mean or total

https://doi.org/10.23637/ERADOC-1-43 *pp 266*

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CONVERSION FACTORS

Factors for the Conversion of Imperial to Metric Units

1 inch (in.)	= 2·540 centimetres (cm)
1 foot (ft) (=12 in.)	= 30·48 cm
1 yard (yd) (=3 ft)	= 0·9144 metre (m)
1 square yard (yd²)	= 0·8361 m²
1 acre (ac) (=4840 yd²)	= 0·4047 hectare (ha)
1 ounce (oz)	= 28·35 grams (g)
1 pound (lb)	= 0·4536 kilogram (kg)
1 hundredweight (cwt) (=112 lb)	= 50·80 kg
1 ton (=2240 lb)	= 1016 kg = 1·016 metric tons (tonnes) (t)
1 pint	= 0·5682 litre (l)
1 gallon (gal) (=8 pints)	= 4·546 litres
1 fluid ounce = 1/20 pint	= 0·02841 litre = 28·41 ml
1 cubic foot	= 28·32 litres

To convert	*Multiply by*
oz ac^{-1} to g ha^{-1}	70·06
lb ac^{-1} to kg ha^{-1}	1·121
cwt ac^{-1} to kg ha^{-1}	125·5
cwt ac^{-1} to t ha^{-1}	0·1255
ton ac^{-1} to kg ha^{-1}	2511
ton ac^{-1} to t ha^{-1}	2·511
gal ac^{-1} to l ha^{-1}	11·233

The following factors are accurate to about 2 parts in 100:

1 lb ac^{-1} = 1·1 kg ha^{-1}
1 gal ac^{-1} = 11 litres ha^{-1}
1 ton ac^{-1} = 2·5 t ha^{-1}

In general reading of the text there will be no great inaccuracy in regarding:

1 lb = 0·5 kg
1 lb ac^{-1} = 1 kg ha^{-1}

Temperatures

To convert °F into °C subtract 32 and multiply by $\frac{5}{9}$ (0.556)
To convert °C into °F multiply by $\frac{9}{5}$ (1·8) and add 32

https://doi.org/10.23637/ERADOC-1-43 *pp 267*

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CONVERSION FACTORS

Factors for the Conversion of Metric to Imperial Units

1 centimetre (cm)	=	0·3937 inch (in.) = 0·03281 ft
1 metre (m)	=	1·094 yards (yd)
1 square metre (m^2)	=	1·196 square yards (yd^2)
1 hectare (ha)	=	2·471 acres (ac)
1 gram (g)	=	0·03527 ounce (oz)
1 kilogram (kg)	=	2·205 pounds (lb)
1 kg	=	0·01968 hundredweight (cwt) = 0·0009842 ton
1 metric ton (tonne) (t)	=	0·9842 ton
1 litre	=	1·760 pints = 0·2200 gallon (gal)

1 litre = 1000 millilitres (ml) = 35·20 fluid ounces = 0·03531 cubic foot (ft^3)

To convert	*Multiply by*
g ha^{-1} to oz ac^{-1}	0·01427
kg ha^{-1} to lb ac^{-1}	0·8921
kg ha^{-1} to cwt ac^{-1}	0·007966
t ha^{-1} to cwt ac^{-1}	7·966
kg ha^{-1} to tons ac^{-1}	0·0003983
t ha^{-1} to tons ac^{-1}	0·3983
l ha^{-1} to gal ac^{-1}	0·08902

Plant nutrients

Plant nutrients are best stated in terms of amounts of the elements (P, K, Na, Ca, Mg, S); the old 'oxide' terminology (P_2O_5, K_2O, Na_2O, CaO, MgO, SO_3) is still used in work involving fertilisers and liming since Regulations require statements of P_2O_5, K_2O, etc.

For quick conversions

(accurate to within 2%) the following factors may be used:

$2\frac{1}{3} \times P = P_2O_5$	$\frac{3}{7} \times P_2O_5 = P$
$1\frac{1}{5} \times K = K_2O$	$\frac{5}{6} \times K_2O = K$
$1\frac{2}{5} \times Ca = CaO$	$\frac{7}{10} \times CaO = Ca$
$1\frac{2}{3} \times Mg = MgO$	$\frac{3}{5} \times MgO = Mg$

For accurate conversions:

To convert	*Multiply by*	*To convert*	*Multiply by*
P_2O_5 to P	0·4364	P to P_2O_5	2·2915
K_2O to K	0·8301	K to K_2O	1·2047
CaO to Ca	0·7146	Ca to CaO	1·3994
MgO to Mg	0·6031	Mg to MgO	1·6581

https://doi.org/10.23637/ERADOC-1-43 *pp 268*