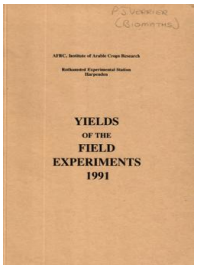
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ROTHAMSTED RESEARCH

Yields of the Field Experiments 1991

Full Table of Content



Yields of the Field 1991

Rothamsted Research

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P. J. VERRIER
(BIOMATHS)

AFRC, Institute of Arable Crops Research

Rothamsted Experimental Station
Harpenden

YIELDS
OF THE
FIELD
EXPERIMENTS
1991

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AFRC, Institute of Arable Crops Research

Rothamsted Experimental Station

Harpenden

YIELDS

of the

FIELD

EXPERIMENTS

1991

This report is produced by members of the Statistics Department and of the Agronomy 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: Fifteen pounds.

Published 1992

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CONVENTIONS 1991

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' contains 27% N and 'Nitram' 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.

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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 3 m wide plots in rows 12 cm apart appropriate coulters are prevented from sowing and 17 central rows are left for yield between pairs of blank rows. If the row-spacing is other than 12 cm 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 1m 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.

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 about 50 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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91/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 148th 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 74-90/R/BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00311
	1	0.00572
	2,4,6 and 7	0.00473
	8 and 9	0.00497
Potatoes:	5	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
17N0+3FH	17	N2(A)	N2 1/2(P K (Na) Mg)	N0+3 1/2(PK Mg)+
18N1+3FH	18	P K Na Mg(A)	N2 1/2(P K (Na) Mg)	N1+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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91/R/BK/1

\+ 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 in 1974 and since 1988
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 until 1988, none since
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:-

				70, 71, 72, 73, 74, 75, and and and														
SECTION	Section	68	69	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
0/W40	0*	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
1/W25	1	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
2/W3	2	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P	W	W	W
-	3	W	W	F	W	W	F	W	W	W	W	W	W	F	P	W	W	W	F
4/W1	4	W	P	BE	W	P	P	W	F	P	W	F	P	W	W	W	F	P	W
POTATOES	5	W	F	W	W	F	W	W	W	W	W	W	F	P	W	W	W	F	P
6/W14	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W	W	W	W	W
7/W2	7	P	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P	W	W
8/W3	8+	W	W	W	W	W	W	W	F	W	W	W	W	W	W	F	W	W	W
9/W33	9	W	W	W	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.

NOTES: (1) For a fuller record of treatments see 'Details' etc.
(2) From autumn 1975 to autumn 1986, chalk was applied at 2.9 t each autumn to all plots in sets of Sections on a three-year cycle. Year 1: Sections 1,2,3. Year 2: Sections 6,7,8,9. Year 3: Sections 0,4,5. Since autumn 1988 a five year cycle has been used. Year 1: Sections 1,3. Year 2: Sections 2,8. Year 3: Sections 7,9. Year 4: Sections 4,6. Year 5: Sections 0,5.

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91/R/BK/1

Standard applications:

W. wheat: Manure: Chalk at 2.9 t (to sections 7 and 9 only). Weedkillers: Glyphosate at 1.4 kg in 200 l (except to sections 4 and 8). Diflufenican at 0.12 kg and isoproturon at 2.2 kg in 200 l (except to section 8). Glyphosate at 2.2 kg with a wetting agent, 'MAFF Adjuvant no. 0004' at 2.9 l, at 150 l (except to section 8). Fungicides (except to section 6): Prochloraz at 0.40 kg with the growth regulator in 200 l. Propiconazole at 0.12 kg with chlorothalonil at 0.50 kg in 200 l. Fenpropimorph at 0.75 kg in 200 l. Growth regulator (except to section 6): Chlormequat chloride at 1.6 kg.

Potatoes: Weedkillers: Glyphosate at 1.4 kg in 200 l. Linuron at 1.6 kg in 200 l. Fungicides: Maneb at 0.96 kg and zinc oxide at 22 g in 200 l on three occasions, the first and third with a wetting agent, 'Bond' at 0.20 l, and the second occasion with pirimicarb. Mancozeb at 1.4 kg with a wetting agent, 'Bond' at 0.20 l, in 200 l. Fentin hydroxide at 0.27 kg with a wetting agent, 'Nu-film P' at 0.18 l, in 200 l. Insecticide: Pirimicarb at 0.14 kg.

Fallow: Weedkiller: Glyphosate at 2.2 kg with a wetting agent, 'MAFF Adjuvant no. 0004' at 2.9 l, in 150 l.

Seed: W. wheat: Apollo, dressed fonofos, sown at 180 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-

All Sections:
K, Na and Mg applied: 1 Oct, 1990. P applied: 2 Oct. FYM applied, ploughed and furrow pressed: 9 Oct. Rotary harrowed: 15 Oct.

Cropped Sections:

W. wheat: Straw chopped (section 0): 14 Aug, 1990. Glyphosate alone applied (except to sections 4 and 8): 23 Aug. Chalk applied (sections 7 and 9): 27 Sept. Autumn N treatments applied: 2 Oct. Rotary harrowed, seed sown: 16 Oct. Diflufenican with isoproturon applied (except to section 8): 21 Nov. Spring N treatments applied: 9 Apr, 1991. Prochloraz with the growth regulator applied (except to section 6): 24 Apr. Propiconazole with chlorothalonil applied (except to section 6): 20 June. Fenpropimorph applied (except to section 6): 2 July. Glyphosate with the wetting agent applied (except to section 8): 12 Aug. Combine harvested: 25 Aug.

Potatoes: Glyphosate applied: 11 Sept, 1990. Deep-tine cultivated: 14 Dec. N treatments applied: 9 Apr, 1991. Heavy spring-tine cultivated: 16 Apr. Rotary harrowed, potatoes planted: 17 Apr. Rotary ridged: 9 May. Linuron applied: 21 May. Maneb and zinc oxide with the wetting agent applied: 1 July and 22 July. Maneb and zinc oxide with the insecticide applied: 10 July. Mancozeb with the wetting agent applied: 1 Aug. Fentin hydroxide with the wetting agent applied: 12 Aug. Haulm mechanically destroyed: 28 Aug. Lifted: 24 Sept.

Fallow: Deep-tine cultivated: 14 Dec, 1990. Heavy spring-tine cultivated: 25 Apr, 1991. Cultivated by rotary grubber: 21 June. Heavy spring-tine cultivated: 8 July. Glyphosate with wetting agent applied: 12 July.

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91/R/BK/1 W.WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	4/W1	7/W2	2/W3	8/W3	6/W14	1/W25	9/W33	0/W40
01DN4PK	8.84	8.60	9.14	*	5.80	*	*	*
21DN2	9.38	8.65	8.84	3.31	7.18	8.98	9.10	8.74
22D	7.80	5.69	6.17	3.60	5.38	5.98	6.87	5.50
030	1.62	0.67	0.79	1.75	1.12	1.25	0.96	1.00
05F	1.50	0.52	0.85	2.10	1.17	1.29	1.09	1.51
06N1F	4.84	3.14	2.92	2.54	3.32	3.39	3.78	3.37
07N2F	6.92	5.42	5.07	3.27	5.75	6.29	6.19	5.82
08N3F	7.96	7.96	6.88	5.00	7.09	7.80	7.76	7.21
09N4F	8.35	8.43	7.39	5.63	6.95	7.65	8.21	7.34
10N2	5.63	4.85	3.29	1.76	3.54	3.14	4.00	3.11
11N2P	4.60	5.40	4.31	2.11	3.25	4.36	1.85	3.67
12N2PNA	5.32	5.67	3.92	2.32	4.31	2.85	2.22	4.51
13N2PK	6.74	4.95	4.56	3.28	5.15	5.42	6.09	5.34
14N2PKMG	6.72	5.27	4.69	2.86	5.14	5.77	6.20	5.67
15N5F	8.51	8.96	7.85	3.89	6.97	8.66	8.84	7.89
16N6F	8.26	8.50	8.21	3.77	6.28	8.16	8.22	7.32
17N0+3FH	8.27	7.40	6.39	3.28	6.36	7.22	7.30	6.91
18N1+3FH	8.38	7.81	7.25	4.33	6.62	7.28	7.38	7.42
19C	3.19	0.84	1.04	2.51	1.64	2.02	1.76	1.90
20NKMG	*	*	*	*	*	3.23	*	3.03

GRAIN MEAN DM% 82.7

STRAW TONNES/HECTARE

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

SECTION PLOT	4/W1	1/W25
01DN4PK	9.02	*
21DN2	9.11	8.67
22D	7.24	4.58
030	1.11	1.06
05F	0.90	0.92
06N1F	3.27	3.01
07N2F	5.54	4.75
08N3F	6.56	5.56
09N4F	6.60	5.90
10N2	3.04	3.78
11N2P	2.96	2.93
12N2PNA	3.37	1.68
13N2PK	5.57	4.38
14N2PKMG	5.86	3.98
15N5F	7.54	6.78
16N6F	7.05	6.34
17N0+3FH	6.68	5.95
18N1+3FH	6.83	6.46
19C	1.48	1.52
20NKMG	*	3.44

STRAW MEAN DM% 89.8

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91/R/BK/1

POTATOES

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

PLOT	TOTAL TUBERS TONNES/ HECTARE	% WARE 3.81 CM (1.5 INCH) RIDDLE
01DN4PK	41.9	93.4
21DN2	45.7	95.6
22D	34.2	93.0
030	5.5	62.6
05F	10.6	78.0
06N1F	23.3	88.8
07N2F	29.2	88.8
08N3F	32.8	91.3
09N4F	29.7	91.4
10N2	8.7	78.2
11N2P	10.0	77.8
12N2PNA	9.8	73.2
13N2PK	18.3	75.9
14N2PKMG	31.1	90.6
15N5F	37.9	90.7
16N6F	35.3	93.2
17N3FH	22.1	89.5
18N3FH	27.1	92.5
19C	16.0	88.9

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91/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 140th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-90/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	-	-

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91/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 triple superphosphate (triple superphosphate in 1974, 1988 and 1989, single superphosphate in other years)
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: Glyphosate at 1.4 kg in 200 l. Mecoprop at 1.1 kg, ioxynil at 0.20 kg, bromoxynil at 0.20 kg and linuron at 0.04 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg in 200 l.

Seed: Triumph, dressed triadimenol and fuberidazole, sown at 130 kg.

Cultivations, etc.:- Glyphosate applied: 7 Nov, 1990. P applied: 21 Nov. K and silicate of soda applied: 28 Nov. FYM applied, ploughed: 3 Dec. Spring-tine cultivated, rotary harrowed, seed sown: 14 Mar, 1991. N applied: 12 Apr. Remaining weedkillers applied: 24 May. Fungicide applied: 4 June. Insecticide applied: 11 July. Combine harvested: 19 Aug.

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91/R/HB/2

MAIN PLOTS

GRAIN TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.98	2.26	2.98	1.67	1.98
-P-	2.85	4.10	3.48	4.78	3.80
--K	2.52	4.02	4.62	4.14	3.82
-PK	2.66	4.58	5.74	6.21	4.80
A--	1.79	2.20	2.62	2.54	2.29
AP-	2.68	3.56	3.06	2.98	3.07
A-K	2.26	3.42	3.47	3.57	3.18
APK	2.67	4.43	5.39	5.82	4.57
N----	2.69	2.88	3.52	3.39	3.12
NP---	3.20	4.37	4.83	4.15	4.14
N-K--	2.69	3.82	3.83	3.56	3.48
NPK--	2.67	4.54	5.53	6.55	4.82
N--S-	2.67	4.63	3.50	3.49	3.57
NP-S-	3.33	4.45	4.59	5.48	4.46
N-KS-	2.85	4.17	4.94	5.13	4.27
NPKS-	2.99	4.80	5.64	6.50	4.98
N---S	2.83	3.23	3.76	4.32	3.54
NP--S	3.15	4.71	5.49	4.24	4.40
N-K-S	2.80	3.77	4.70	4.09	3.84
NPK-S	2.93	4.77	5.93	6.07	4.92
N--SS	2.62	3.22	4.09	4.22	3.54
NP-SS	3.21	4.45	4.42	5.02	4.27
N-KSS	2.99	4.23	4.93	4.56	4.18
NPKSS	1.93	5.62	6.07	6.20	4.96
C(--)	2.94	4.54	4.42	5.10	4.25
C(P-)	3.19	4.69	5.15	5.69	4.68
C(-K)	2.83	4.84	5.87	5.95	4.87
C(PK)	2.81	4.53	5.32	5.73	4.60
D	6.35	6.22	6.16	5.93	6.16
(D)	3.61	5.71	5.46	5.18	4.99
(A)	3.48	4.11	4.03	4.17	3.95
-	2.49	4.03	3.73	4.08	3.58
Mean	2.86	4.22	4.60	4.70	4.10

GRAIN MEAN DM% 87.8

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91/R/HB/2

STRAW TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.42	0.91	1.34	0.70	0.84
-P-	1.14	1.91	1.73	2.53	1.83
--K	1.06	1.51	2.66	2.12	1.84
-PK	0.89	2.03	2.79	3.14	2.21
A--	0.55	0.75	1.30	1.20	0.95
AP-	0.93	1.70	1.91	1.74	1.57
A-K	0.87	1.58	1.75	1.59	1.45
APK	0.90	2.11	2.58	2.85	2.11
D	3.90	4.26	4.71	4.43	4.32
(D)	1.50	2.51	2.75	2.53	2.32
(A)	1.38	1.70	2.01	2.03	1.78
-	1.22	1.70	1.72	2.00	1.66
Mean	1.23	1.89	2.27	2.24	1.91

STRAW MEAN DM% 85.9

PLOT AREA HARVESTED 0.00154

EXTRA PLOTS

GRAIN TONNES/HECTARE

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

MANURE	551AN2PK	561--PK	571NN2--	581NN2--	Mean
MGNESIUM					
0	5.11	1.64	5.24	3.24	3.81
35	5.50	1.53	5.11	3.26	3.85
Mean	5.31	1.59	5.18	3.25	3.83

GRAIN MEAN DM% 86.9

PLOT AREA HARVESTED 0.00329

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91/R/WF/3

WHEAT AND FALLOW

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

The 136th year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-90/R/WF/3.

Whole plot dimensions: 9.0 x 211.

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

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

Cultivations, etc.:-
Wheat plot: Rotary harrowed twice, seed sown: 17 Oct, 1990. Combine harvested: 25 Aug, 1991.
Fallow plot: Deep tine cultivated with vibrating tines 60 cm apart, 45 cm deep: 24 Sept, 1990. Ploughed, furrow pressed: 4 Oct. Heavy spring-tine cultivated: 25 Apr, 1991. Spring-tine cultivated: 14 June. Heavy spring-tine cultivated: 8 July.

GRAIN AND STRAW TONNES/HECTARE

	GRAIN	STRAW
YIELD	1.50	1.49
MEAN DM%	82.5	91.8
PLOT AREA HARVESTED	0.04309	

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91/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 136th year, s. barley.

For previous years see 'Details' 1967, 1973 and 74-90/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 P
P2	87 kg P
P3	131 kg P

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. **N91** — 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.

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91/R/EX/4

Basal applications: Weedkiller: Fluroxypyr at 0.15 kg with the fungicide in 200 l. Fungicide: Fenpropimorph at 0.38 kg.

Seed: Triumph, seed dressed triadimenol and fuberidazole, sown at 130 kg.

Cultivations, etc.:- P and K applied: 20 Nov, 1990. Ploughed: 23 Nov. Spring-tine cultivated: 25 Mar, 1991. Rotary harrowed, seed sown: 26 Mar. N applied: 18 Apr. Weedkiller with fungicide applied: 16 June. Combine harvested: 29 Aug.

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	2.54	4.96	5.42	5.72	4.66
D	4.31	5.22	5.50	5.49	5.13
N	2.35	5.10	5.50	5.86	4.70
P	3.76	5.18	5.24	5.50	4.92
NPKNAMG	3.69	5.14	5.42	5.53	4.94
Mean	3.33	5.12	5.42	5.62	4.87

GRAIN MEAN DM% 85.1

STRAW TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	1.82	3.69	4.14	3.81	3.36
D	3.05	3.72	3.71	3.53	3.50
N	1.73	3.59	3.70	3.79	3.20
P	2.40	3.60	3.61	3.62	3.31
NPKNAMG	2.50	3.45	3.74	3.70	3.35
Mean	2.30	3.61	3.78	3.69	3.34

STRAW MEAN DM% 92.4

PLOT AREA HARVESTED 0.00588

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91/R/EX/4

NITROGEN PLOTS

GRAIN TONNES/HECTARE

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

N91	0	48	96	144	Mean
OLD RES					
O	0.73	1.75	0.74	0.91	1.03
D	2.09	3.41	3.46	3.37	3.08
N*	0.96	2.13	1.15	1.14	1.34
PK	1.74	3.47	3.18	3.64	3.01
N*PK	1.71	3.41	2.99	2.88	2.75
Mean	1.44	2.83	2.30	2.39	2.24

GRAIN MEAN DM% 82.5

STRAW TONNES/HECTARE

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

N91	0	48	96	144	Mean
OLD RES					
O	1.44	1.54	1.80	1.98	1.69
D	1.34	1.93	2.00	2.13	1.85
N*	0.89	1.28	1.44	1.39	1.25
PK	1.14	1.92	1.82	2.20	1.77
N*PK	0.81	1.66	1.76	1.64	1.47
Mean	1.12	1.67	1.76	1.87	1.60

STRAW MEAN DM% 90.2

PLOT AREA HARVESTED 0.00588

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91/R/PG/5

PARK GRASS

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

The 136th year, hay.

For previous years see 'Details' 1967 and 1973 and 74-90/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
N1MN	Plot 6	N1 P K Na Mg
MN	Plot 7	P K Na Mg
PNAMG	Plot 8	P Na Mg
MN(N2)	Plot 9/1	P K Na Mg (N2 until 1989)
N2MN	Plot 9/2	N2 P K Na Mg
N2PNAMG	Plot 10	N2 P Na Mg
N3MN	Plot 11/1	N3 P K Na Mg
N3MNSI	Plot 11/2	N3 P K Na Mg Si
O/PLOT12	Plot 12	None
D/F	Plot 13	D/F
MN(N2*14)	Plot 14/1	P K Na Mg (N2* until 1989)
N2*MN	Plot 14/2	N2* P K Na Mg
MN(N2*15)	Plot 15	P K Na Mg (N2* until 1875)
N1*MN	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 until 1986, triple superphosphate in 1974, and since 1987
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
MN:	P K Na Mg

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91/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. Liming ceased on plots 9/1 and 14/1 after 1989. Lime last applied in 1990.

Additional sub plots (Plots 18, 19 and 20 only) (tonnes CaCO3 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'. Plots 19 and 20 received no further chalk after 1968; plot 18/2 no further chalk after 1972.

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

Cultivations, etc.:- P applied: 21 Nov, 1990. Fish meal applied: 28 Nov. K, Na, Mg and Si applied: 30 Nov. N applied: 10 Apr, 1991. Cut: 9 July, 6 Nov.

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91/R/PG/5

1ST CUT (9/7/91) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	2.08	4.49	2.64	1.12	2.58
O(D)	3.31	4.27	2.51	2.82	3.23
O/PLOT3	3.48	3.78	2.53	2.74	3.13
P	4.30	4.20	4.00	4.05	4.14
N2P	4.65	4.09	7.37	4.00	5.03
N1MN	6.01	6.07			6.04
MN	5.56	5.40	4.93	5.09	5.25
PNAMG	3.25	3.83	4.79	4.79	4.17
MN(N2)	3.41	2.82	1.83	1.97	2.51
N2MN	5.93	6.05	6.09	6.26	6.08
N2PNAMG	4.42	4.37	4.58	3.56	4.23
N3MN	6.54	6.85	5.69	6.84	6.48
N3MNSI	6.80	6.35	6.28	6.43	6.47
O/PLOT12	2.48	3.12	2.46	2.90	2.74
D/F	5.60	5.58	5.59	4.96	5.43
MN(N2*14)	4.37	4.70	3.61	4.40	4.27
N2*MN	5.78	7.16	5.65	5.04	5.91
MN(N2*15)	6.19	5.32	4.42	4.19	5.03
N1*MN	5.99	5.26	4.82	4.70	5.19
N1*	4.06	4.07	4.41	4.07	4.15
N2KNAMG0			3.20	1.19	2.19
N2KNAMG2	4.52				4.52
N2KNAMG1	4.37	4.45			4.41
D0	5.22				5.22
D2	4.97				4.97
D1	5.46				5.46
D/N*PK0	5.40				5.40
D/N*PK2	5.45				5.45
D/N*PK1	5.40				5.40

1ST CUT MEAN DM% 25.5

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91/R/PG/5

2ND CUT (6/11/91) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	2.15	2.41	1.26	0.65	1.62
O(D)	1.82	2.18	1.37	1.77	1.78
O/PLOT3	1.56	2.04	1.90	2.22	1.93
P	1.81	1.99	2.30	2.31	2.10
N2P	2.00	1.41	1.13	0.75	1.32
N1MN	2.61	2.81			2.71
MN	2.99	3.14	2.04	1.92	2.52
PNAMG	1.53	1.81	2.35	2.25	1.99
MN(N2)	1.53	1.11	0.57	0.82	1.01
N2MN	2.00	2.25	0.77	0.80	1.46
N2PNAMG	1.28	1.13	0.87	0.88	1.04
N3MN	2.77	1.66	0.87	2.91	2.05
N3MNSI	2.65	2.33	1.65	2.69	2.33
O/PLOT12	0.92	1.39	1.26	1.60	1.29
D/F	2.76	2.89	2.64	2.81	2.77
MN(N2*14)	2.25	1.93	1.53	1.75	1.87
N2*MN	2.44	2.40	2.21	1.96	2.25
MN(N2*15)	2.51	2.54	2.65	2.13	2.46
N1*MN	2.58	2.50	2.40	1.99	2.37
N1*	2.37	2.33	2.32	2.12	2.29
N2KNAMG0			1.58	0.43	1.00
N2KNAMG2	2.69				2.69
N2KNAMG1	3.18	2.57			2.87
D0	3.34				3.34
D2	3.34				3.34
D1	3.04				3.04
D/N*PK0	3.06				3.06
D/N*PK2	2.83				2.83
D/N*PK1	3.73				3.73

2ND CUT MEAN DM% 25.2

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91/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	4.24	6.90	3.90	1.76	4.20
O(D)	5.13	6.45	3.88	4.59	5.01
O/PLOT3	5.04	5.83	4.44	4.95	5.06
P	6.11	6.19	6.30	6.36	6.24
N2P	6.65	5.51	8.49	4.75	6.35
N1MN	8.62	8.88			8.75
MN	8.56	8.54	6.97	7.01	7.77
PNAMG	4.78	5.64	7.14	7.05	6.15
MN(N2)	4.94	3.93	2.40	2.79	3.52
N2MN	7.93	8.30	6.86	7.06	7.54
N2PNAMG	5.70	5.50	5.45	4.44	5.27
N3MN	9.31	8.52	6.57	9.74	8.54
N3MNSI	9.44	8.68	7.93	9.12	8.80
O/PLOT12	3.39	4.51	3.72	4.50	4.03
D/F	8.36	8.47	8.23	7.77	8.21
MN(N2*14)	6.62	6.63	5.14	6.15	6.14
N2*MN	8.22	9.56	7.86	7.00	8.16
MN(N2*15)	8.70	7.86	7.07	6.32	7.49
N1*MN	8.56	7.75	7.22	6.69	7.56
N1*	6.43	6.40	6.73	6.19	6.44
N2KNAMG0			4.78	1.62	3.20
N2KNAMG2	7.21				7.21
N2KNAMG1	7.55	7.02			7.28
D0	8.56				8.56
D2	8.31				8.31
D1	8.50				8.50
D/N*PK0	8.46				8.46
D/N*PK2	8.28				8.28
D/N*PK1	9.14				9.14

TOTAL OF 2 CUTS MEAN DM% 25.4

PLOT AREA HARVESTED 0.00002

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91/R/BN/7

BARNFIELD

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

Sections 1 and 2 the eighth year of grass/clover. The 17th year of grass on the rest of the experiment.

For previous years see 'Details' 1967 and 1973 and 74-90/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
0	0

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 1991 (kg N per cut) as 'Nitram', cumulative to previous dressings, 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

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91/R/BN/7

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

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

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: 21 Nov, 1990. K applied: 28 Nov. Cut: 30 May, 1991 and 11 Nov.
Grass (Sections 3, 4, 5 and 6) only: N applied: 8 Mar, 1991 and 10 June.

GRASS

1ST CUT (30/5/91) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	4.90	4.58	4.63	4.72	4.71
DPK	4.63	4.65	5.07	4.98	4.83
PKMG	4.47	4.64	4.50	4.72	4.58
P	2.25	1.81	1.65	1.69	1.85
PK	4.72	4.15	4.57	4.62	4.51
PMG	2.50	1.96	1.75	1.80	2.00
0	2.55	2.36	1.94	2.06	2.22
Mean	3.72	3.45	3.45	3.51	3.53

MANURE KMG 100 3.73

Grand mean 3.54

1ST CUT MEAN DM% 21.6

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91/R/BN/7

GRASS

2ND CUT (11/11/91) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	5.15	5.88	4.78	5.60	5.35
DPK	6.12	5.80	5.66	5.39	5.74
PKMG	5.24	4.04	4.73	4.85	4.72
P	2.94	1.52	1.76	1.81	2.01
PK	4.91	5.12	5.03	5.07	5.03
PMG	2.65	1.53	1.17	1.49	1.71
0	2.56	2.51	2.41	2.48	2.49
Mean	4.22	3.77	3.65	3.81	3.86

MANURE KMG 100 4.63

Grand mean 3.89

2ND CUT MEAN DM% 27.2

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	10.05	10.46	9.42	10.33	10.06
DPK	10.75	10.45	10.73	10.37	10.57
PKMG	9.71	8.68	9.23	9.56	9.30
P	5.19	3.32	3.41	3.50	3.86
PK	9.63	9.28	9.60	9.68	9.55
PMG	5.15	3.50	2.93	3.29	3.72
0	5.11	4.86	4.34	4.53	4.71
Mean	7.94	7.22	7.09	7.33	7.39

MANURE KMG 100 8.36

Grand mean 7.43

TOTAL OF 2 CUTS MEAN DM% 24.4

PLOT AREA HARVESTED 0.00568

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91/R/BN/7

GRASS/CLOVER

1ST CUT (30/5/91) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	1.18	1.21	0.57	0.25	0.34	0.28	0.29	0.59

1ST CUT MEAN DM% 30.3

2ND CUT (11/11/91) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	1.59	1.62	1.91	1.03	2.21	1.70	1.47	1.65

2ND CUT MEAN DM% 22.7

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	2.77	2.83	2.48	1.28	2.55	1.99	1.76	2.24

TOTAL OF 2 CUTS MEAN DM% 26.5

PLOT AREA HARVESTED 0.00568

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91/R/GC/8

GARDEN CLOVER

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

The 138th year, red clover.

For previous years see 'Details' 1967 and 1973, and 74-90/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.00 x 1.40.

Treatments:

FUNG RES	Residual effects of fungicide to control Sclerotinia trifoliorum:
NONE	None
BENOMYL	Benomyl sprays during previous winters, last applied November 1989.

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

NOTE: Additional K was applied to replace that removed by the crop in 1990. **FUNG RES** NONE required 157 and 129 kg K2O to the first and second blocks respectively, **FUNG RES** BENOMYL 136 and 124 kg K2O. This was applied as muriate of potash, one third in spring 1991 and one third after the first and second cuts.

Seed: Hungaropoly, sown at 30 kg in 1990.

Cultivations, etc.:- Chalk, P, K and Mg applied: 23 Oct, 1990. Hand weeded: 13 Mar, 1991. K applied: 11 Apr. Cut, weeded and K applied: 5 June, 25 July. Cut and weeded: 20 Sept.

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91/R/GC/8

1ST CUT (5/6/91) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	8.31	7.86	8.09

1ST CUT MEAN DM% 14.5

2ND CUT (25/7/91) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	6.98	6.12	6.55

2ND CUT MEAN DM% 13.5

3RD CUT (20/9/91) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	5.06	4.11	4.58

3RD CUT MEAN DM% 18.7

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	20.35	18.09	19.22

TOTAL OF 3 CUTS MEAN DM% 15.6

PLOT AREA HARVESTED 0.00010

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91/W/RN/3

LEY/ARABLE

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

Sponsor: P.R. Poulton.

The 54th year, leys, w. beans, w. wheat, s. barley.

For previous years see 'Details' 1967 & 1973 and 74-90/W/RN/3.

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

Whole plot dimensions: 8.53 x 40.7.

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

ROTATION

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

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

Rotations themselves followed different cycles:

On four plots in each block the rotations were repeated

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

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

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

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

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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. **FYMRES65** Farmyard manure residues, last applied 1965:

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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91/W/RN/3

1/2 plots

2. **FYMRES64** Farmyard manure residues, last applied 1964:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

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

0
60
120
180

Treatments to leys:

FYM RES Farmyard manure residues:

NONE	None
FYM	38 tonnes on each occasion, last applied 1963 to 1st and 6th year leys, 1962 to 2nd and 7th year leys, 1966 to 3rd and 8th year leys, 1965 to 4th year leys, 1964 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, applied: 13 Mar, 1991:

Continuous rotations	No FYM half plots	FYM half plots
LN	0	0
LC	0	0
AF	295	180
AB	180	180
Ex-alternating rotations		
LN 8 ploughed for w. wheat	0	0
LN 8 not ploughed	100	35
LC 8 ploughed for w. wheat	0	0
LC 8 not ploughed	0	0

Standard applications:-

Grass ley and clover/grass ley, 1st year: Manures: (0:16:36) at 470 kg. N at 75 kg to grass ley as 'Nitram', N at 54 kg to clover/grass ley as 'Nitro-Chalk'. (25:0:16) at 300 kg to grass ley in spring and after the first cut. K2O at 54 kg to clover/grass ley in spring and after the first cut.

Grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 t to 5th year only. (0:16:36) at 470 kg, (25:0:16) at 300 kg in spring and after the first cut.

Clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 t to 5th year only. (0:16:36) at 470 kg, K2O at 54 kg in spring and after the first cut.

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91/W/RN/3

Standard applications:-

S. barley, 1st and 2nd treatment crops: Manures: (20:10:10) at 400 kg. Weedkiller: Metsulfuron-methyl at 6.0 g applied with the fungicide in 200 l. Fungicide: Tridemorph at 0.26 kg.

W. beans, 3rd treatment crop: Manures: (0:24:24) at 170 kg. Weedkillers: Simazine at 0.14 kg and trietazine at 0.97 kg in 220 l. Fungicide: Chlorothalonil at 1.5 kg applied with the insecticide in 300 l. Insecticide: Pirimicarb at 0.14 kg.

Fallow, 1st and 2nd treatment years: No applications.

W. wheat, 1st test crop: Manures: (0:24:24) at 260 kg. Weedkillers: Glyphosate at 0.36 kg in 220 l. Diflufenican at 0.10 kg and isoproturon at 1.0 kg applied with the deltamethrin in 220 l. Fungicides: Fenpropimorph at 0.38 kg in 210 l and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 0.078 kg in 300 l. Insecticide: Deltamethrin at 5.0 g. Carbofuran at 7.5 kg. Desiccant: Glyphosate at 1.4 kg in 200 l.

S. barley, 2nd test crop: Manures: Magnesian limestone at 5.0 t. (0:24:24) at 260 kg. Weedkiller: Metsulfuron-methyl at 6.0 g applied with the fungicide in 200 l. Fungicide: Tridemorph at 0.26 kg. Insecticide: Carbofuran at 7.5 kg.

Seed: Grass ley: Stella meadow fescue at 15 kg, RVP Erecta timothy at 15 kg, mixture sown at 30 kg.

Clover/grass ley: Stella meadow fescue at 14 kg, RVP Erecta timothy at 14 kg, Huia white clover at 3.0 kg, mixture sown at 30 kg.

S. barley: Klaxon, dressed triadimenol and fuberidazole, sown at 135 kg.

W. beans: Banner sown at 120 kg, (21 seeds per square metre).

W. wheat: Mercia sown at 150 kg.

Cultivations, etc.:-

Treatment crops:

Grass ley and clover/grass ley, 1st year: Ploughed: 21 Aug, 1990. N, P and K applied: 28 Aug. Rotary harrowed with crumbler attached, seed sown, rolled: 29 Aug. Spring manures applied: 25 Mar, 1991. Cut: 4 June. Produce removed: 11 June. Second manures applied: 19 June. Cut: 9 Sept. Produce removed: 17 Sept.

Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Magnesian limestone applied to 5th year only: 19 Aug, 1990. Spring manures applied: 22 Mar, 1991. Cut: 4 June. Produce removed: 11 June. Second manures applied: 19 June. Cut: 9 Sept. Produce removed: 17 Sept.

S. barley, 1st and 2nd treatment crops: Ploughed: 21 Aug, 1990 and 20 Mar, 1991. N, P and K applied, rotary harrowed, seed sown: 22 Mar. Weedkiller and fungicide applied: 24 May. Combine harvested: 14 Aug.

W. beans, 3rd treatment crop: P and K applied: 28 Sept, 1990. Disced, seed broadcast, ploughed: 23 Oct. Weedkiller applied: 21 Nov. Fungicide and insecticide applied: 10 July, 1991. Combine harvested: 3 Sept.

Fallow, 1st and 2nd treatment years: Ploughed 1st year only: 21 Aug, 1990. Disced 2nd year only: 23 Oct. Ploughed: 20 Mar, 1991. Rotary cultivated: 5 July.

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91/W/RN/3

Cultivations, etc.:-

Test crops:

W. Wheat, 1st test crop: Glyphosate applied: 22 Aug, 1990. Subsoiled with tines 1.5 m apart and 0.40 m deep: 20 Sept. Rolled, disced and ploughed: 21 Sept. P, K and carbofuran applied, rotary harrowed with crumbler attached, seed sown: 28 Sept. Diflufenican, isoproturon and deltamethrin applied: 8 Nov. Corrective K applied: 13 Mar, 1991. N treatments applied: 2 Apr. Fenpropimorph applied: 24 Apr and with chlorothalonil and flutriafol: 20 June. Desiccant applied: 12 Aug. Combine harvested: 21 Aug.

S. barley, 2nd test crop: Magnesian limestone applied: 19 Aug, 1990. Ploughed: 23 Jan, 1991. P, K and carbofuran applied, rotary harrowed, seed sown: 15 Mar. N treatments applied: 18 Mar. Weedkiller and fungicide applied: 26 May. Combine harvested: 14 Aug.

LEYS

1ST CUTTING OCCASION (4/6/91) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	2.02	2.85	2.43
LC2	3.07	3.41	3.24
LC3	5.35	5.79	5.57
LN1	5.05	5.03	5.04
LN2	4.82	6.40	5.61
LN3	4.63	4.79	4.71
LLC1	2.34	2.35	2.34
LLC2	3.46	3.64	3.55
LLC3	5.04	4.71	4.87
LLC4	4.72	4.10	4.41
LLC5	2.94	1.78	2.36
LLC6	3.14	3.88	3.51
LLC7	3.89	4.57	4.23
LLC8	5.13	4.62	4.88
LLN1	4.29	4.02	4.15
LLN2	5.63	6.21	5.92
LLN3	4.78	4.84	4.81
LLN4	4.36	4.76	4.56
LLN5	4.64	4.51	4.58
LLN6	5.78	5.78	5.78
LLN7	5.93	5.39	5.66
LLN8	5.54	6.17	5.85
Mean	4.39	4.53	4.46

1ST CUT MEAN DM% 23.5

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91/W/RN/3

LEYS

2ND CUTTING OCCASION (9/9/91) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	3.05	2.91	2.98
LC2	3.63	3.89	3.76
LC3	3.24	4.36	3.80
LN1	3.33	3.88	3.61
LN2	4.50	4.14	4.32
LN3	5.18	5.30	5.24
LLC1	3.50	2.56	3.03
LLC2	3.75	3.92	3.83
LLC3	3.21	3.23	3.22
LLC4	4.49	4.26	4.38
LLC5	2.92	1.27	2.09
LLC6	0.52	0.62	0.57
LLC7	3.77	2.71	3.24
LLC8	5.02	4.53	4.77
LLN1	4.27	3.49	3.88
LLN2	3.27	3.73	3.50
LLN3	4.43	4.13	4.28
LLN4	5.80	5.73	5.76
LLN5	3.27	3.89	3.58
LLN6	3.31	3.59	3.45
LLN7	3.47	3.65	3.56
LLN8	4.90	5.44	5.17
Mean	3.76	3.69	3.73

2ND CUT MEAN DM% 32.8

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91/W/RN/3

LEYS

TOTAL OF 2 CUTTING OCCASIONS DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	5.07	5.76	5.41
LC2	6.70	7.29	7.00
LC3	8.59	10.14	9.37
LN1	8.38	8.91	8.64
LN2	9.32	10.54	9.93
LN3	9.80	10.09	9.95
LLC1	5.84	4.91	5.37
LLC2	7.20	7.56	7.38
LLC3	8.25	7.94	8.09
LLC4	9.21	8.36	8.78
LLC5	5.86	3.05	4.46
LLC6	3.66	4.50	4.08
LLC7	7.66	7.28	7.47
LLC8	10.15	9.15	9.65
LLN1	8.56	7.51	8.03
LLN2	8.89	9.94	9.42
LLN3	9.21	8.97	9.09
LLN4	10.15	10.49	10.32
LLN5	7.91	8.40	8.16
LLN6	9.09	9.37	9.23
LLN7	9.39	9.05	9.22
LLN8	10.44	11.61	11.03
Mean	8.15	8.22	8.19

TOTAL OF 2 CUTS MEAN DM% 28.1

PLOT AREA HARVESTED 0.00200

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91/W/RN/3

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES65	NONE	FYM	Mean
ROTATION			
LN 8	8.62	8.46	8.54
LN 3	9.27	8.71	8.99
LC 8	8.63	8.68	8.66
LC 3	9.01	9.38	9.20
AF	7.47	8.42	7.95
AB	8.00	8.61	8.30
Mean	8.50	8.71	8.61

N	0	70	140	210	Mean
ROTATION					
LN 8	5.94	8.83	9.64	9.75	8.54
LN 3	6.75	8.85	9.96	10.41	8.99
LC 8	6.08	8.81	9.63	10.10	8.66
LC 3	6.47	9.37	10.46	10.48	9.20
AF	3.46	8.00	9.75	10.57	7.95
AB	4.48	8.56	9.94	10.23	8.30
Mean	5.53	8.74	9.90	10.26	8.61

N	0	70	140	210	Mean
FYMRES65					
NONE	5.42	8.60	9.92	10.06	8.50
FYM	5.64	8.87	9.87	10.45	8.71
Mean	5.53	8.74	9.90	10.26	8.61

N		0	70	140	210
ROTATION	**FYMRES65**				
LN 8	NONE	5.81	9.03	9.95	9.69
	FYM	6.07	8.63	9.32	9.81
LN 3	NONE	7.61	8.87	10.39	10.21
	FYM	5.88	8.83	9.53	10.61
LC 8	NONE	6.33	8.75	9.42	10.01
	FYM	5.83	8.88	9.83	10.20
LC 3	NONE	6.12	9.36	10.30	10.26
	FYM	6.82	9.38	10.62	10.70
AF	NONE	2.63	7.51	9.44	10.31
	FYM	4.30	8.48	10.06	10.82
AB	NONE	4.02	8.07	10.01	9.89
	FYM	4.93	9.05	9.88	10.58

GRAIN MEAN DM% 87.3

PLOT AREA HARVESTED 0.00183

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91/W/RN/3

S.BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES64	NONE	FYM	Mean
ROTATION			
LN 8	6.51	6.60	6.56
LN 3	6.40	6.68	6.54
LC 8	6.86	6.99	6.92
LC 3	6.74	6.94	6.84
AF	5.53	5.43	5.48
AB	5.87	5.75	5.81
Mean	6.32	6.40	6.36

N	0	60	120	180	Mean
ROTATION					
LN 8	5.46	6.87	7.05	6.84	6.56
LN 3	4.68	6.69	7.41	7.38	6.54
LC 8	5.78	7.12	7.61	7.18	6.92
LC 3	5.26	6.99	7.63	7.47	6.84
AF	1.75	5.92	6.94	7.31	5.48
AB	2.73	5.94	7.22	7.33	5.81
Mean	4.28	6.59	7.31	7.25	6.36

N	0	60	120	180	Mean
FYMRES64					
NONE	4.16	6.55	7.22	7.34	6.32
FYM	4.40	6.63	7.40	7.16	6.40
Mean	4.28	6.59	7.31	7.25	6.36

N		0	60	120	180
ROTATION	**FYMRES64**				
LN 8	NONE	5.08	6.84	7.00	7.12
	FYM	5.85	6.90	7.10	6.56
LN 3	NONE	4.54	6.51	7.15	7.42
	FYM	4.83	6.87	7.68	7.34
LC 8	NONE	5.63	7.22	7.60	6.98
	FYM	5.93	7.02	7.62	7.39
LC 3	NONE	5.02	6.72	7.70	7.51
	FYM	5.50	7.26	7.57	7.43
AF	NONE	1.89	5.90	6.73	7.60
	FYM	1.62	5.93	7.15	7.03
AB	NONE	2.80	6.09	7.14	7.44
	FYM	2.66	5.79	7.31	7.22

GRAIN MEAN DM% 86.5

PLOT AREA HARVESTED 0.00183

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91/W/RN/12

ORGANIC MANURING

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

Sponsor: P.R. Poulton.

The 27th year, w. beans, w. wheat.

For previous years see 'Details' 1973 and 74-90/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.

4th test crop w. beans, after w. wheat 1988, potatoes 1989, w. wheat 1990 tested all combinations of:

Whole plots

1. **TREATMNT** Previous treatments:

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

Sub plots

2. **N RES** Residues of nitrogen fertilizer to w. wheat in 1990 (kg N):

(0)
(50)
(100)
(150)
(200)
(250)

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91/W/RN/12

5th test crop w. wheat, after w. wheat 1987, potatoes 1988, w. wheat 1989, w. beans 1990 tested all combinations of:

Whole plots

1. **TREATMNT** Previous treatments:

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

Sub plots

2. **N** Nitrogen fertilizer to w. wheat in 1991 (kg N as 'Nitro-Chalk'):

0
50
100
150
200
250

Standard applications:

4th test crop:

W. beans: Manures: (0:16:36) at 560 kg. Manganese at 0.16 kg in 300 l. Weedkillers: Glyphosate at 0.54 kg in 220 l. Simazine at 0.14 kg and trietazine at 0.97 kg in 220 l. Fungicides: Chlorothalonil at 1.5 kg applied with the pirimicarb in 300 l. Insecticides: Azinphos-methyl at 0.28 kg and demeton-S-methyl sulphone at 0.085 kg in 400 l. Pirimicarb at 0.14 kg.

5th test crop:

W. wheat: Manures: (0:16:36) at 560 kg. Manganese at 0.16 kg in 300 l. Weedkillers: Glyphosate at 0.54 kg in 220 l. Diflufenican at 0.10 kg and isoproturon at 1.0 kg applied with insecticide in 220 l. Mecoprop at 0.80 kg also applied with insecticide in 220 l. Fungicides: Fenpropimorph at 0.38 kg in 210 l, and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 0.078 kg in 300 l. Insecticide: Deltamethrin at 5.0 g on two occasions.

Seed: W. beans: Banner, sown at 120 kg.
W. wheat: Mercia, sown at 150 kg.

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91/W/RN/12

Cultivations, etc.:-

W. beans: Glyphosate applied: 10 Sept, 1990. P and K applied: 27 Sept. Disced: 12 Oct. Seed broadcast, ploughed: 23 Oct. Remaining weedkillers applied: 21 Nov. Manganese applied: 9 May, 1991. Azinphos-methyl and demeton-S-methyl sulphone applied: 10 May. Chlorothalonil and pirimicarb applied: 10 July. Combine harvested: 3 Sept.

W. wheat: Glyphosate applied: 10 Sept, 1990. Ploughed: 19 Sept. P and K applied, rotary harrowed with crumbler attached, seed sown: 27 Sept. Diflufenican, isoproturon and deltamethrin applied: 8 Nov. Mecoprop and deltamethrin applied: 30 Nov. Nitrogen treatments applied: 4 Apr, 1991. Fenpropimorph applied: 24 May. Manganese applied: 19 May. Fenpropimorph, chlorothalonil and flutriafol applied: 20 June. Combine harvested: 22 Aug.

W.BEANS

GRAIN TONNES/HECTARE

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

N RES / TREATMNT	(0)	(50)	(100)	(150)	(200)	(250)	Mean
LC 8 GM	4.53	4.24	4.83	3.75	4.73	4.37	4.41
LC 8 PT	4.98	4.88	4.87	4.91	5.05	4.90	4.93
LC 6 LC	5.06	5.27	4.93	4.42	4.85	5.28	4.97
LC 6 LN	5.23	5.10	4.91	4.74	4.41	4.75	4.86
FYM	4.35	4.29	4.31	4.46	4.51	4.52	4.41
STRAW	4.81	4.88	4.85	4.81	4.68	5.18	4.87
FERT-FYM	4.06	4.08	4.14	4.15	4.16	4.70	4.21
FERT-STR	5.08	4.90	5.02	4.49	4.89	5.01	4.90
Mean	4.76	4.70	4.73	4.47	4.66	4.84	4.69

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

TREATMNT	N RES	TREATMNT N RES
0.461	0.151	0.604

Except when comparing means with the same level(s) of TREATMNT 0.428

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.461	9.8
BLOCK.WP.SP	40	0.428	9.1

GRAIN MEAN DM% 86.3

SUB PLOT AREA HARVESTED 0.00192

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91/W/RN/12

W.WHEAT

GRAIN TONNES/HECTARE

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

N / TREATMNT	0	50	100	150	200	250	Mean
LC 8 GM	4.45	7.09	8.73	9.49	9.52	9.59	8.15
LC 8 PT	4.52	7.35	8.77	9.55	9.51	9.68	8.23
LC 6 LC	4.39	7.78	9.05	9.60	9.58	9.76	8.36
LC 6 LN	4.73	8.46	9.12	9.57	9.49	9.85	8.54
FYM	4.41	7.22	8.71	9.90	9.79	10.26	8.38
STRAW	3.57	6.34	8.49	9.70	9.90	10.39	8.06
FERT-FYM	2.82	6.34	8.74	8.67	9.01	9.35	7.49
FERT-STR	3.20	6.66	7.40	8.67	8.98	9.74	7.44
Mean	4.01	7.15	8.63	9.39	9.47	9.83	8.08

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

	TREATMNT	N	TREATMNT N
	0.644	0.136	0.734
Except when comparing means with the same level(s) of TREATMNT			0.386

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.644	8.0
BLOCK.WP.SP	40	0.386	4.8

GRAIN MEAN DM% 87.6

STRAW TONNES/HECTARE

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

N / TREATMNT	0	50	100	150	200	250	Mean
LC 8 GM	2.54	3.62	5.33	5.23	5.48	5.86	4.67
LC 8 PT	1.96	3.87	4.65	4.87	5.45	5.94	4.46
LC 6 LC	2.50	4.34	5.94	6.05	5.58	6.62	5.17
LC 6 LN	2.58	5.97	6.07	5.77	6.30	6.31	5.50
FYM	1.79	3.21	5.03	4.35	4.33	5.88	4.10
STRAW	1.98	2.06	4.63	3.53	4.37	5.24	3.63
FERT-FYM	1.73	3.00	3.60	3.80	4.75	3.19	3.35
FERT-STR	1.75	2.82	4.48	4.11	4.22	4.56	3.66
Mean	2.10	3.61	4.97	4.71	5.06	5.45	4.32

STRAW MEAN DM% 91.8

SUB PLOT AREA HARVESTED 0.00183

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91/R/CS/10 and 91/W/CS/10

LONG TERM LIMING

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

Sponsors: S.P. McGrath, P.B. Barraclough, G.F.J. Milford.

The 30th year, w. oilseed rape.

For previous years see 'Details' 1967, 1973 and 74-90/R&W/CS/10.

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

Whole plot dimensions: 6.0 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** Residual 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. **SULPHUR** Sulphur (kg S, as calcium sulphate):

0
30

NOTES: (1) Until 1978 test P was applied cumulatively, rates varied with crop, none in 1979 and 1980. K was also applied cumulatively, to P1 and P3 plots. Since 1981 K has been applied basally (none in 1986, 1987, 1989 and 1990).
(2) Sulphur was applied as gypsum (17.5% S) on 13 Mar, 1991 (R), 21 Mar (W).
(3) Test manganese was applied cumulatively, 1987-90.

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91/R/CS/10 and 91/W/CS/10

Basal applications:

Sawyers I (R): Manures: (25:0:16) at 200 kg. 'Nitram' at 640 kg. Magnesium at 0.13 kg as 'Vytel Liquid Magnesium' in 200 l. Manganese at 0.093 kg as 'Vytel Liquid Manganese' in 200 l. Weedkillers: Metazachlor at 0.75 kg in 200 l. Clopyralid at 0.10 kg in 200 l. Fungicide: Prochloraz at 0.50 kg in 200 l and on a second occasion at 0.40 kg in 200 l. Insecticide: Deltamethrin at 6.2 g in 200 l and at 12 g in 200 l on a second occasion. Desiccant: Diquat at 0.60 kg ion applied with wetting agent, 'Vassgro' at 0.52 l, in 520 l. Irrigation: 25 mm applied on two occasions.

Stackyard C (W): Manures: (25:0:16) at 200 kg. Magnesium at 0.13 kg as 'Vytel Liquid Magnesium' in 200 l. 'Nitram' at 580 kg. Manganese at 0.078 kg as 'Vytel Liquid Manganese' in 300 l. Weedkillers: Quizalofop-ethyl at 38 g with metazachlor at 0.75 kg applied with adjuvant 'Cropspray 11 E' at 2.0 l in 220 l. Fungicide: Prochloraz at 0.28 kg applied with the second insecticide in 200 l. Insecticide: Deltamethrin at 6.2 g in 220 l and on a second occasion at 12 g. Desiccant: Diquat at 0.60 kg ion applied with a wetting agent, 'Agral' at 0.40 l, in 400 l.

Seed: Libravo, dressed fenpropimorph, gamma-HCH, and thiram, at 6.0 kg (R & W).

Cultivations, etc.:-

Sawyers I (R): N and K applied: 23 Aug, 1990. Ploughed: 28 Aug. Rolled: 29 Aug. Rotary harrowed: 30 Aug. Rotary harrowed, seed sown, harrowed, rolled, metazachlor applied: 31 Aug. Irrigated: 21 and 27 Sept. Deltamethrin applied: 7 Nov. Prochloraz and Mg applied: 3 Dec. Clopyralid applied: 17 Dec. N applied: 4 Mar, 1991. Second deltamethrin applied: 12 Apr. Second prochloraz and Mn applied: 23 Apr. Desiccant with wetting agent applied: 30 July. Combine harvested: 7 Aug.

Stackyard C (W): Disced: 15 Aug, 1990. Subsoiled with tines 1.5 m apart, 0.4 m deep: 21 Aug. Ploughed and rolled: 22 Aug. N and K applied: 28 Aug. Rotary harrowed with crumbler attached, seed sown: 30 Aug. Weedkillers and adjuvant applied: 1 Nov. Deltamethrin applied: 15 Nov. Mg applied: 3 Dec. N applied: 15 Mar, 1991. Second deltamethrin applied with fungicide: 12 Apr. Mn applied: 9 May. Desiccant with wetting agent applied: 1 Aug. Combine harvested: 13 Aug.

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

P	O	P1	P2	P3	Mean
CHALK					
0	0.39	1.20	1.67	2.29	1.39
15	1.96	2.94	3.08	1.54	2.38
24.5	2.46	1.83	2.07	2.11	2.12
52.5	2.91	2.22	2.68	2.44	2.56
Mean	1.93	2.05	2.38	2.10	2.11

SULPHUR	0	30	Mean
CHALK			
0	1.38	1.39	1.39
15	2.52	2.25	2.38
24.5	2.06	2.17	2.12
52.5	2.33	2.80	2.56
Mean	2.07	2.15	2.11

SULPHUR	0	30	Mean
P			
O	1.99	1.87	1.93
P1	1.98	2.11	2.05
P2	2.15	2.61	2.38
P3	2.16	2.03	2.10
Mean	2.07	2.15	2.11

	SULPHUR	0	30
CHALK	**P**		
0	O	0.52	0.27
	P1	1.05	1.34
	P2	1.35	1.99
	P3	2.61	1.97
15	O	2.47	1.44
	P1	3.12	2.77
	P2	2.94	3.22
	P3	1.53	1.55
24.5	O	2.40	2.52
	P1	1.91	1.74
	P2	1.96	2.19
	P3	1.98	2.25
52.5	O	2.59	3.23
	P1	1.85	2.59
	P2	2.33	3.02
	P3	2.53	2.35

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	CHALK	P	SULPHUR	CHALK P
	0.419	0.419	0.210	0.838

	CHALK SULPHUR	P SULPHUR	CHALK P SULPHUR
	0.514	0.514	1.027

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

CHALK	0.420		
P		0.420	
CHALK.P			0.839

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.838	39.7
BLOCK.WP.SP	16	0.839	39.8

GRAIN MEAN DM% 76.3

SUB PLOT AREA HARVESTED 0.00079

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

P / CHALK	0	P1	P2	P3	Mean
0	0.35	0.56	1.95	1.76	1.16
9	2.15	2.65	2.56	2.31	2.41
25.5	2.25	2.72	2.71	2.77	2.62
45.5	2.84	2.39	2.66	2.85	2.69
Mean	1.90	2.08	2.47	2.42	2.22

SULPHUR / CHALK	0	30	Mean
0	1.16	1.15	1.16
9	2.20	2.63	2.41
25.5	2.58	2.65	2.62
45.5	2.52	2.86	2.69
Mean	2.12	2.32	2.22

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SULPHUR	0	30	Mean
P			
0	1.80	2.00	1.90
P1	1.95	2.21	2.08
P2	2.35	2.60	2.47
P3	2.36	2.48	2.42
Mean	2.12	2.32	2.22

CHALK	SULPHUR P	0	30
0	0	0.41	0.29
	P1	0.14	0.98
	P2	1.99	1.91
	P3	2.09	1.43
9	0	1.94	2.35
	P1	2.65	2.65
	P2	2.23	2.89
	P3	1.99	2.62
25.5	0	2.10	2.40
	P1	2.86	2.59
	P2	2.62	2.81
	P3	2.76	2.79
45.5	0	2.75	2.94
	P1	2.17	2.62
	P2	2.56	2.77
	P3	2.60	3.10

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

CHALK	P	SULPHUR	CHALK P
0.168	0.168	0.115	0.337

CHALK SULPHUR	P SULPHUR	CHALK P SULPHUR
0.234	0.234	0.469

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

CHALK	0.230		
P		0.230	
CHALK.P			0.461

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.337	15.2
BLOCK.WP.SP	16	0.461	20.8

GRAIN MEAN DM% 90.5

SUB PLOT AREA HARVESTED 0.00182

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91/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, A.A. Evans, P.H. Nicholls.

The 18th year, s. barley.

For previous years see 74-90/R/CS/140.

Design: Single replicate of 32 plots.

Whole plot dimensions: 4.06 x 4.57.

Treatments, applied cumulatively every year 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, at 1.3 kg in 1987 and at 1.5 kg in 1988 to 1990.
2.	**FUNGCIDE[1]**	Fungicide in autumn:
	NONE	None
	TRIADIM	Triadimefon at 0.25 kg in autumn 1981, 1982, 1984 to 1990, 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 28 Sept, 1990. Other treatments were applied on 8 Apr, 1991.

Basal applications: Manures: Muriate of potash at 520 kg. Magnesian limestone at 2.9 t. 'Nitram' at 440 kg. Weedkiller: Fluroxypyr at 0.15 kg in 200 l.

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

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91/R/CS/140

Cultivations, etc.:- K applied: 14 Sept, 1990. Magnesian limestone applied: 4 Oct. Ploughed: 5 Dec. N applied, heavy spring-tine cultivated, rotary harrowed: 8 Apr, 1991. Seed sown, rolled: 9 Apr. Weedkiller applied: 16 June. Combine harvested: 21 Aug.

GRAIN TONNES/HECTARE

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

FUNGCIDE[1]	NONE	TRIADIM	Mean
WEEDKLLR			
NONE	6.07	6.07	6.07
GLYPHOS	6.11	6.09	6.10
Mean	6.09	6.08	6.08

FUNGCIDE[2]	NONE	BENOMYL	Mean
WEEDKLLR			
NONE	6.01	6.13	6.07
GLYPHOS	6.07	6.13	6.10
Mean	6.04	6.13	6.08

FUNGCIDE[2]	NONE	BENOMYL	Mean
FUNGCIDE[1]			
NONE	6.04	6.14	6.09
TRIADIM	6.04	6.12	6.08
Mean	6.04	6.13	6.08

INSCTCDE	NONE	CHLORFEN	Mean
WEEDKLLR			
NONE	5.97	6.17	6.07
GLYPHOS	5.95	6.25	6.10
Mean	5.96	6.21	6.08

INSCTCDE	NONE	CHLORFEN	Mean
FUNGCIDE[1]			
NONE	6.02	6.16	6.09
TRIADIM	5.90	6.26	6.08
Mean	5.96	6.21	6.08

INSCTCDE	NONE	CHLORFEN	Mean
FUNGCIDE[2]			
NONE	5.90	6.18	6.04
BENOMYL	6.02	6.24	6.13
Mean	5.96	6.21	6.08

NEMACIDE	NONE	ALDICARB	Mean
WEEDKLLR			
NONE	6.00	6.14	6.07
GLYPHOS	6.14	6.06	6.10
Mean	6.07	6.10	6.08

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91/R/CS/140

GRAIN TONNES/HECTARE

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

NEMACIDE	NONE	ALDICARB	Mean
FUNGCIDE[1]			
NONE	6.01	6.17	6.09
TRIADIM	6.13	6.03	6.08
Mean	6.07	6.10	6.08

NEMACIDE	NONE	ALDICARB	Mean
FUNGCIDE[2]			
NONE	6.09	5.99	6.04
BENOMYL	6.05	6.21	6.13
Mean	6.07	6.10	6.08

NEMACIDE	NONE	ALDICARB	Mean
INSCTCDE			
NONE	5.95	5.96	5.96
CHLORFEN	6.19	6.23	6.21
Mean	6.07	6.10	6.08

	FUNGCIDE[1]	NONE		TRIADIM	
WEEDKLLR	**FUNGCIDE[2]**	NONE	BENOMYL	NONE	BENOMYL
NONE		5.98	6.16	6.05	6.09
GLYPHOS		6.10	6.13	6.03	6.14

	FUNGCIDE[1]	NONE		TRIADIM	
WEEDKLLR	**INSCTCDE**	NONE	CHLORFEN	NONE	CHLORFEN
NONE		6.05	6.09	5.89	6.26
GLYPHOS		5.99	6.24	5.91	6.26

	FUNGCIDE[2]	NONE		BENOMYL	
WEEDKLLR	**INSCTCDE**	NONE	CHLORFEN	NONE	CHLORFEN
NONE		5.85	6.18	6.08	6.17
GLYPHOS		5.95	6.19	5.95	6.32

	FUNGCIDE[2]	NONE		BENOMYL	
FUNGCIDE[1]	**INSCTCDE**	NONE	CHLORFEN	NONE	CHLORFEN
NONE		6.02	6.06	6.02	6.27
TRIADIM		5.78	6.30	6.02	6.22

	FUNGCIDE[1]	NONE		TRIADIM	
WEEDKLLR	**NEMACIDE**	NONE	ALDICARB	NONE	ALDICARB
NONE		5.92	6.21	6.08	6.06
GLYPHOS		6.10	6.13	6.18	5.99

	FUNGCIDE[2]	NONE		BENOMYL	
WEEDKLLR	**NEMACIDE**	NONE	ALDICARB	NONE	ALDICARB
NONE		6.00	6.02	6.00	6.25
GLYPHOS		6.18	5.95	6.10	6.17

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91/R/CS/140

GRAIN TONNES/HECTARE

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

	FUNGCIDE[2]	NONE		BENOMYL	
FUNGCIDE[1]	**NEMACIDE**	NONE	ALDICARB	NONE	ALDICARB
NONE		6.06	6.02	5.97	6.31
TRIADIM		6.13	5.95	6.13	6.10

	INSCTCDE	NONE		CHLORFEN	
WEEDKLLR	**NEMACIDE**	NONE	ALDICARB	NONE	ALDICARB
NONE		5.88	6.05	6.12	6.22
GLYPHOS		6.02	5.88	6.26	6.24

	INSCTCDE	NONE		CHLORFEN	
FUNGCIDE[1]	**NEMACIDE**	NONE	ALDICARB	NONE	ALDICARB
NONE		5.98	6.06	6.05	6.28
TRIADIM		5.93	5.87	6.33	6.19

	INSCTCDE	NONE		CHLORFEN	
FUNGCIDE[2]	**NEMACIDE**	NONE	ALDICARB	NONE	ALDICARB
NONE		5.93	5.87	6.25	6.11
BENOMYL		5.97	6.06	6.13	6.36

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

Margins of two factor tables	0.129
Two factor tables	0.182
Three factor tables	0.257

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

Stratum	d.f.	s.e.	cv%
WP	6	0.364	6.0

GRAIN MEAN DM% 88.8

PLOT AREA HARVESTED 0.00069

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91/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 14th year, w. wheat.

For previous years see 78-90/R/CS/212.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 5.33 x 10.0.

Treatments:

PREVCROP Previous crops before w. wheat 1991:

	78	79	80	81	82	83	84	85	86	87	88	89	90
W13	W	W	W	W	W	W	W	W	W	W	W	W	W
BE2 W4	W	BE	W	W	BE	W	W	BE	BE	W	W	W	W
BE1 W4	W	W	W	W	W	W	W	W	BE	W	W	W	W
BE1 W6	BE	W	W	BE	W	W	BE	W	W	W	W	W	W
BE1 W7	W	W	BE	W	W	BE	W	W	W	W	W	W	W
BE1 W2	W	BE	W	W	BE	W	W	BE	W	W	BE	W	W
BE1 W1	W	W	BE	W	W	BE	W	W	BE	W	W	BE	W
BE1	BE	W	W	BE	W	W	BE	W	W	BE	W	W	BE

BE = s. beans, W = w. wheat

Basal applications: Manures: (0:16:36) at 980 kg. 'Nitram' at 410 kg. Weedkillers: Isoproturon at 1.3 kg and pendimethalin at 1.3 kg with the insecticide in 200 l. Glyphosate at 0.72 kg with a wetting agent, 'Frigate' at 1.0 l, in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 200 l. Chlorothalonil at 0.49 kg and flutriafol at 0.078 kg with fenpropimorph at 0.38 kg in 200 l. Insecticide: Deltamethrin at 6.2 g.

Seed: Mercia, sown at 170 kg.

Cultivations, etc.:- PK applied: 3 Sept, 1990. Ploughed: 10 Sept. Cultivated by rotary grubber: 26 Sept. Rotary harrowed, seed sown: 27 Sept. Isoproturon, pendimethalin and the insecticide applied: 15 Nov. N applied: 3 Apr, 1991. Fenpropimorph alone applied: 10 May. Chlorothalonil, flutriafol and fenpropimorph applied: 20 June. Glyphosate with wetting agent applied: 13 Aug. Combine harvested: 20 Aug.

NOTE: Plant and soil samples were taken frequently during the season to assess take-all. Additional soil samples were taken to measure the suppressiveness of the soil to the take-all fungus.

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91/R/CS/212

GRAIN TONNES/HECTARE

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

PREVCROP	
W13	6.91
BE2 W4	6.97
BE1 W4	7.21
BE1 W6	7.08
BE1 W7	7.41
BE1 W2	6.83
BE1 W1	6.51
BE1	7.72
Mean	7.08

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

PREVCROP
0.191

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.234	3.3

GRAIN MEAN DM% 87.6

PLOT AREA HARVESTED 0.00216

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91/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.

Sponsor: G.L. Bateman.

The seventh year, w. wheat.

For previous years see 85-90/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 1985-91:

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 15 Nov, 1990 and 12 Apr, 1991.
(2) The eyespot inoculum was colonised on oat seed and this was broadcast in October, 1984.

Basal applications: Manure: 'Nitram' at 120 kg and later at 460 kg. Weedkillers: Tri-allate at 2.2 kg. Diflufenican at 0.10 kg and isoproturon at 1.0 kg in 200 l. Glyphosate at 0.54 kg with a wetting agent, 'Team' at 1.0 l, in 200 l.

Seed: Mercia, sown at 170 kg.

Cultivations, etc.:- Straw burnt, heavy spring-tine cultivated: 22 Aug, 1990. Ploughed, furrow pressed: 24 Aug. Rotary harrowed, seed sown: 24 Sept. Tri-allate applied: 2 Nov. Diflufenican and isoproturon applied: 9 Nov. First N applied: 14 Mar, 1991. Second N applied: 8 Apr. Glyphosate with wetting agent applied: 12 Aug. Combine harvested: 22 Aug.

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91/R/CS/302

NOTE: Eyespot and sharp eyespot were assessed at fortnightly intervals from May - July on the **EYE INOC** NATURAL plots only.

GRAIN TONNES/HECTARE

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

EYE INOC / **FUNGCIDE**	NATURAL	W 19R 1S	W 1R 19S	R 19R 1S	R 1R 19S	Mean
NONE	5.32	5.14	5.12	5.01	4.90	5.14
CARB	5.37	5.20	4.99	5.19	4.90	5.17
PRO	5.54	5.51	5.12	5.40	5.84	5.49
CARB+PRO	5.61	5.72	5.44	5.44	5.51	5.55
Mean	5.46	5.39	5.17	5.26	5.29	5.34

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

EYE INOC	**FUNGCIDE*** **EYE INOC**	
0.082	0.164	min.rep
0.071	0.142	max-min

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

* Within the same level of **FUNGCIDE** only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	24	0.164	3.1

GRAIN MEAN DM% 84.5

SUB PLOT AREA HARVESTED 0.00138

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91/R/CS/309 and 91/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, R.J. Gutteridge, J.F. Jenkyn, B.R. Kerry, W. Powell, A.D. Todd.

Associate sponsor: D.S. Powlson.

The seventh year, w. wheat.

For previous years see 85-90/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	Cultivated to 10 cm depth
TN10PL20	Cultivated to 10 cm depth, ploughed to 20 cm
TN10TN20	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 22 Aug, 1990 (R), 6 Aug (W) and burnt, 22 Aug (R), 14 Aug (W).
(2) Discs were used to cultivate TN10PL20 plots to 10 cm depth on 24 Aug (R), and all plots except PLOUGH20 on 13 Aug and 24 Sept (W). TINE 10 plots were cultivated to 10 cm with a rotary grubber on 11 Oct (R only). A chisel plough was used to cultivate to 20 cm depth, on 10 Oct (R) and a deep-tine cultivator to 20 cm on 14 Aug (W).
(3) Ploughed plots were ploughed to 20 cm depth, on 28 Aug (R), 18 Sept (W), and rolled: 29 Aug (R), 21 Sept (W).

Basal applications:
Great Knott III (R): Manures: 'Nitram' at 120 kg, followed by 580 kg. (0:16:36) at 1040 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Tri-allate at 2.2 kg. Isoproturon at 1.3 kg and pendimethalin at 1.3 kg in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 200 l. Propiconazole at 0.25 kg in 200 l.

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91/R/CS/309 and 91/W/CS/309

Basal applications:

Far Field I (W): Manures: Magnesian limestone at 7.5 t. 'Nitram' at 120 kg followed by 580 kg. Weedkillers: Glyphosate at 0.27 kg in 220 l. Tri-allate at 1.7 kg in 220 l. Pendimethalin at 1.3 kg with isoproturon at 1.2 kg applied with the insecticide in 220 l. Fungicides: Fenpropimorph at 0.38 kg in 210 l, and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 78 g in 300 l. Insecticide: Deltamethrin at 5.0 g.

Seed: Haven, sown at 190 kg (R), 170 kg (W).

Cultivations, etc.:-

Great Knott III (R): Glyphosate applied: 8 Oct, 1990. Disced and rotary harrowed: 11 Oct. Seed sown, harrowed: 12 Oct. Rolled: 15 Oct. Tri-allate applied: 2 Nov. Isoproturon and pendimethalin applied: 15 Nov. N applied: 4 Mar, 1991 and 3 Apr. P and K applied: 12 Apr. Fenpropimorph applied: 24 Apr. Propiconazole applied: 11 June. Combine harvested: 21 Aug.

Far Field I (W): Magnesian limestone applied: 23 Aug, 1990. Glyphosate applied: 11 Sept. Tri-allate applied, rotary harrowed, seed sown: 2 Oct. Remaining weedkillers and insecticide applied: 27 Nov. N applied: 15 Mar, 1991 and 17 Apr. Fenpropimorph applied: 24 Apr. Fenpropimorph, chlorothalonil and flutriafol applied: 20 June. Combine harvested: 25 Aug.

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

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

GRAIN TONNES/HECTARE

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

CULTIVTN / STRAW	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
BURNT	8.80	8.32	8.56	8.38	8.52
CHOPPED	7.15	8.52	8.73	8.65	8.26
Mean	7.70	8.46	8.67	8.56	8.35

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

STRAW	CULTIVTN	STRAW CULTIVTN	
		0.578	min.rep
0.250	0.334	0.501	max-min
		0.409	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	0.818	9.8

GRAIN MEAN DM% 88.7

PLOT AREA HARVESTED 0.00621

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

GRAIN TONNES/HECTARE

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

CULTIVTN / STRAW	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
BURNT	8.67	8.59	9.16	9.30	8.93
CHOPPED	7.76	8.29	7.82	8.72	8.15
Mean	8.07	8.39	8.27	8.91	8.41

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

STRAW	CULTIVTN	STRAW CULTIVTN	
		0.529	min.rep
0.229	0.305	0.458	max-min
		0.374	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	0.529	6.3

GRAIN MEAN DM% 85.1

PLOT AREA HARVESTED 0.00609

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91/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, E.T.G. Bacon, J.F. Jenkyn, B.R. Kerry, W. Powell, A.D. Todd.

The seventh year, w. wheat.

For previous years see 85-90/R/CS/311.

Design: Single replicate of 3 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 on 22 Aug, 1990
	BALED	Baled and removed on 21 Aug
	CHOPPED	Chopped on 22 Aug
2. **CULTTIME**		Time of cultivation, to 10 cm depth:
	EARLY	Cultivated by rotary grubber on 23 Aug, 1990
	LATER	Cultivated by rotary grubber on 14 Sept

Sub plots

3. **FUNGCIDE**		Fungicides:
	0	None
	FULL	Full programme:- Triadimefon at 0.12 kg and carbendazim at 0.25 kg in 200 l on 3 Dec, 1990 Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l on 12 Apr, 1991 Propiconazole at 0.12 kg with chlorothalonil at 0.50 kg in 200 l on 20 June
4. **INSCTCDE**		Insecticides:
	0	None
	CYP+PIR	Cypermethrin at 25 g in 200 l on 6 Nov, 1990 Pirimicarb at 0.14 kg in 200 l on 2 July, 1991
5. **MOLLCIDE**		Molluscicide:
	0	None
	METHCARB	Methiocarb at 0.22 kg on 11 Oct, 1990

NOTE: **STRAW** BURNT plots were disced the day after burning.

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91/R/CS/311

Basal applications: Manures: 'Nitram' at 120 kg and later at 580 kg. Weedkillers: Glyphosate at 0.18 kg and later at 1.4 kg, both in 200 l. Tri-allate at 2.2 kg. Bifenox at 0.95 kg and chlorotoluron at 3.5 kg in 200 l.

Seed: Haven, sown at 190 kg.

Cultivations, etc.:- First glyphosate applied: 8 Oct, 1990. Rotary harrowed, seed sown: 10 Oct. Tri-allate applied: 2 Nov. Bifenox and chlorotoluron applied: 13 Nov. First N applied: 4 Mar, 1991. Second N applied: 5 Apr. Second glyphosate applied: 13 Aug. Combine harvested: 20 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	8.84	8.42	8.63
BALED	9.00	9.23	9.11
CHOPPED	8.78	8.23	8.51
Mean	8.87	8.63	8.75

FUNGCIDE	O	FULL	Mean
STRAW			
BURNT	7.71	9.55	8.63
BALED	8.39	9.84	9.11
CHOPPED	7.66	9.35	8.51
Mean	7.92	9.58	8.75

FUNGCIDE	O	FULL	Mean
CULTTIME			
EARLY	8.17	9.57	8.87
LATER	7.66	9.59	8.63
Mean	7.92	9.58	8.75

INSCTCDE	O	CYP+PIR	Mean
STRAW			
BURNT	8.44	8.82	8.63
BALED	9.05	9.18	9.11
CHOPPED	8.51	8.50	8.51
Mean	8.66	8.83	8.75

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91/R/CS/311

GRAIN TONNES/HECTARE

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

INSCTCDE	O	CYP+PIR	Mean
CULTTIME			
EARLY	8.72	9.02	8.87
LATER	8.61	8.65	8.63
Mean	8.66	8.83	8.75

INSCTCDE	O	CYP+PIR	Mean
FUNGCIDE			
O	7.76	8.08	7.92
FULL	9.57	9.59	9.58
Mean	8.66	8.83	8.75

MOLLCIDE	O	METHCARB	Mean
STRAW			
BURNT	8.57	8.69	8.63
BALED	9.02	9.21	9.11
CHOPPED	8.53	8.48	8.51
Mean	8.71	8.79	8.75

MOLLCIDE	O	METHCARB	Mean
CULTTIME			
EARLY	8.84	8.91	8.87
LATER	8.58	8.68	8.63
Mean	8.71	8.79	8.75

MOLLCIDE	O	METHCARB	Mean
FUNGCIDE			
O	7.84	7.99	7.92
FULL	9.57	9.59	9.58
Mean	8.71	8.79	8.75

MOLLCIDE	O	METHCARB	Mean
INSCTCDE			
O	8.64	8.69	8.66
CYP+PIR	8.77	8.90	8.83
Mean	8.71	8.79	8.75

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91/R/CS/311

GRAIN TONNES/HECTARE

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

			STRAW*
FUNGCIDE	INSCTCDE	MOLLCIDE	FUNGCIDE
0.111	0.111	0.111	0.192
CULTTIME*	STRAW*	CULTTIME*	FUNGCIDE
FUNGCIDE	INSCTCDE	INSCTCDE	INSCTCDE
0.156	0.192	0.156	0.156
STRAW*	CULTTIME*	FUNGCIDE	INSCTCDE
MOLLCIDE	MOLLCIDE	MOLLCIDE	MOLLCIDE
0.192	0.156	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	27	0.383	4.4

GRAIN MEAN DM% 89.6

SUB PLOT AREA HARVESTED 0.00276

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91/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 fourth year, w. barley, w. oats, w. triticale, w. wheat, s. barley.

For previous years see 88-90/R/CS/323

Design: 3 randomised blocks of 26 plots.

Whole plot dimensions: 3.0 x 10.0.

CROPSEQ	Crop sequences (1988, 1989, 1990 and 1991 respectively):
W W S S	W. wheat, w. wheat, s. barley, s. barley
B B B B	W. barley, w. barley, w. barley, w. barley
O B B B	W. oats, w. barley, w. barley, w. barley
B O B B	W. barley, w. oats, w. barley, w. barley
B B O B	W. barley, w. barley, w. oats, w. barley
S B S B	S. barley, w. barley, s. barley, w. barley
T T B B	W. triticale, w. triticale, w. barley, w. barley
T B T B	W. triticale, w. barley, w. triticale, w. barley
W B W B	W. wheat, w. barley, w. wheat, w. barley
W W B B	W. wheat, w. wheat, w. barley, w. barley
B B B O	W. barley, w. barley, w. barley, w. oats
T T T O	W. triticale, w. triticale, w. triticale, w. oats
W W W O	W. wheat, w. wheat, w. wheat, w. oats
T T T T	W. triticale, w. triticale, w. triticale, w. triticale
B B T T	W. barley, w. barley, w. triticale, w. triticale
O T T T	W. oats, w. triticale, w. triticale, w. triticale
T O T T	W. triticale, w. oats, w. triticale, w. triticale
T T O T	W. triticale, w. triticale, w. oats, w. triticale
W W T T	W. wheat, w. wheat, w. triticale, w. triticale
W T W T	W. wheat, w. triticale, w. wheat, w. triticale
W W W W	W. wheat, w. wheat, w. wheat w. wheat
B B W W	W. barley, w. barley, w. wheat, w. wheat
O W W W	W. oats, w. wheat, w. wheat, w. wheat
W O W W	W. wheat, w. oats, w. wheat, w. wheat
W W O W	W. wheat, w. wheat, w. oats, w. wheat
T T W W	W. triticale, w. triticale, w. wheat, w. wheat

Standard applications:

W. cereals: Manures: (0:16:36) at 300 kg. N at 30 kg to all w. cereals followed by N at 150 kg (w. barley), 170 kg (w. wheat), and 120 kg (w. oats and w. triticale), all as 'Nitram'. Weedkillers: Isoxaben at 76 g and methabenzthiazuron at 1.6 kg in 200 l. Fluroxypyr at 0.15 kg in 200 l. Fungicides: Carbendazim at 0.15 kg and prochloraz at 0.40 kg with tridemorph at 0.26 kg in 200 l.

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91/R/CS/323

Standard applications:
S. barley: Manures: (0:16:36) at 300 kg. N at 120 kg as 'Nitram'. Weedkiller: Metsulfuron-methyl at 6.0 g with fenpropimorph in 200 l. Fungicides: Carbendazim at 0.15 kg and prochloraz at 0.40 kg with tridemorph at 0.26 kg in 200 l. Fenpropimorph at 0.75 kg.

Seed: W. barley: Magie, sown at 130 kg.
W. oats: Image, sown at 130 kg.
W. triticale: Lasko, sown at 140 kg.
W. wheat: Mercia, sown at 170 kg.
S. barley: Klaxon, sown at 120 kg.

Cultivations, etc.:-
W. cereals: Ploughed, furrow pressed: 4 Sept, 1990. PK applied: 14 Sept. Rotary harrowed twice: 17 Sept. Rotary harrowed, seed sown: 19 Sept. Isoxaben and methabenzthiazuron applied: 20 Sept. First N applied: 4 Mar, 1991. Fluroxypyr applied: 12 Apr. Second N applied: 15 Apr. Fungicides applied: 23 Apr. Combine harvested: 12 Aug (w. barley), 20 Aug (w. wheat), 27 Aug (w. oats and w. triticale).
S. barley: Ploughed, furrow pressed: 4 Sept, 1990. PK applied: 14 Sept. Rotary harrowed twice: 17 Sept. N applied: 14 Mar, 1991. Rotary harrowed twice, seed sown: 15 Mar. Carbendazim, prochloraz and tridemorph applied: 23 Apr. Weedkiller with fenpropimorph applied: 11 June. Combine harvested: 15 Aug.

NOTE: Plants were sampled in April, June and July to assess take-all, eyespot and sharp eyespot. Soil cores were taken after harvest to assess take-all infectivity.

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91/R/CS/323

GRAIN TONNES/HECTARE

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

CROPSEQ	
W W S S	5.40
B B B B	5.89
O B B B	7.22
B O B B	7.14
B B O B	7.36
S B S B	7.16
T T B B	6.63
T B T B	5.79
W B W B	6.54
W W B B	5.71
B B B O	5.98
T T T O	6.35
W W W O	5.08
T T T T	4.19
B B T T	4.51
O T T T	4.38
T O T T	3.93
T T O T	5.54
W W T T	4.21
W T W T	4.42
W W W W	5.65
B B W W	6.34
O W W W	7.38
W O W W	7.05
W W O W	7.05
T T W W	5.04
Mean	5.84

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

CROPSEQ
0.389

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	50	0.476	8.2

GRAIN MEAN DM% 84.9

PLOT AREA HARVESTED 0.00226

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91/R/CS/326 and 91/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 fifth year, w. wheat.

For previous years see 87-90/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 per ha 85% DM), cumulative to previous annual dressings:

		R	W
NONE	None	-	-
NORMAL	Normal	3.9	3.0
2 NORMAL	Twice normal	7.8	6.0
4 NORMAL	Four times normal	15.6	12.0

NOTES: (1) Straw treatments were applied on 14 Aug, 1990 (R), 15 Aug (W) and chopped by trailed straw chopper and spread on 22 Aug (R), 19 Aug (W).
(2) At Rothamsted straw was incorporated by plough on 24 Aug. At Woburn it was disc cultivated to 10 cm on 24 Sept.

Basal applications:
Great Knott III (R): Manures: 'Nitram' at 120 kg followed by 580 kg. (0:16:36) at 1040 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Tri-allate at 2.2 kg. Isoproturon at 1.3 kg and pendimethalin at 1.3 kg in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 200 l. Propiconazole at 0.25 kg in 200 l.
Far Field I (W): Manures: Magnesian limestone at 7.5 t. 'Nitram' at 120 kg followed by 580 kg. Weedkillers: Glyphosate at 0.27 kg in 220 l. Tri-allate at 1.7 kg in 220 l. Pendimethalin at 1.3 kg with isorpoturon at 1.2 kg applied with the insecticide in 220 l. Fungicides: Fenpropimorph at 0.38 kg in 210 l and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 78 g in 300 l. Insecticide: Deltamethrin at 5.0 g.

Seed: Haven, sown at 190 kg (R), 170 kg (W).

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91/R/CS/326 and 91/W/CS/326

Cultivations, etc.:-

Great Knott III (R): Ploughed and rolled: 24 Aug, 1990. Glyphosate applied: 8 Oct. Rotary harrowed, seed sown and harrowed: 12 Oct. Rolled: 15 Oct. Tri-allate applied: 2 Nov. Isoproturon and pendimethalin applied: 15 Nov. N applied: 4 Mar, 1991 and 3 Apr. P and K applied: 12 Apr. Fenpropimorph applied: 24 Apr. Propiconazole applied: 11 June. Combine harvested: 21 Aug.

Far Field I (W): Magnesian limestone applied: 23 Aug. Glyphosate applied: 11 Sept. Disced twice: 24 Sept. Tri-allate applied, rotary harrowed, seed sown: 2 Oct. Pendimethalin, isoproturon and deltamethrin applied: 27 Nov. N applied: 15 Mar, 1991 and 17 Apr. Fenpropimorph applied: 24 Apr. Fenpropimorph, chlorothalonil and flutriafol applied: 20 June. Combine harvested: 22 Aug.

NOTES: (1) Establishment counts were made in autumn. Shoot numbers and dry weights in spring, fertile ear numbers at anthesis and harvest index were measured.
(2) Foot and root rots were assessed in summer.

91/R/CS/326 GREAT KNOTT III (R)

GRAIN TONNES/HECTARE

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

	STRAW
NONE	8.24
NORMAL	8.43
2 NORMAL	7.87
4 NORMAL	8.61
Mean	8.29

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

STRAW
0.416

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.588	7.1

GRAIN MEAN DM% 87.3

PLOT AREA HARVESTED 0.00307

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91/W/CS/326 FAR FIELD I (W)

GRAIN TONNES/HECTARE

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

	STRAW
NONE	7.59
NORMAL	7.84
2 NORMAL	6.89
4 NORMAL	7.99
Mean	7.58

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

STRAW
0.936

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	1.147	15.1

GRAIN MEAN DM% 86.1

PLOT AREA HARVESTED 0.00302

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91/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 fourth year, lucerne.

For previous years see 88-90/R/CS/327.

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** Residues of carbofuran (kg) applied in first year only:

   (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, in first year only:

   EUROPE
   EUVA
   VELA
   VERTUS

NOTE: Carbofuran was applied to lucerne on 7 Apr, 1988 at sowing.

Basal applications: Manures: (0:16:36) at 510 kg. Weedkillers: 2,4-DB at 1.3 kg in 220 l. Paraquat at 0.40 kg ion in 220 l. Fluazifop-P-butyl at 0.19 kg in 220 l.

Cultivations, etc.:- P and K applied: 16 Nov, 1990. 2,4-DB applied: 14 Dec. Paraquat applied: 7 Mar, 1991. Fluazifop-P-butyl applied: 10 Apr. Cut: 20 May, 9 July, 12 Aug and 3 Oct.

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91/R/CS/327

1ST CUT (20/5/91) DRY MATTER TONNES/HECTARE

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

CARBRATE	(0.0)	(1.5)	Mean
VARIETY			
EUROPE	2.67	1.88	2.28
EUVA	4.48	3.59	4.04
VELA	1.02	1.07	1.04
VERTUS	5.80	5.11	5.45
Mean	3.49	2.91	3.20

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	2.62	1.94	2.28
EUVA	4.34	3.73	4.04
VELA	1.23	0.86	1.04
VERTUS	5.92	4.99	5.45
Mean	3.53	2.88	3.20

ROWSPACE	15	30	Mean
CARBRATE			
(0.0)	3.76	3.23	3.49
(1.5)	3.30	2.53	2.91
Mean	3.53	2.88	3.20

	ROWSPACE	15	30
VARIETY	CARBRATE		
EUROPE	(0.0)	3.07	2.28
	(1.5)	2.17	1.59
EUVA	(0.0)	4.62	4.35
	(1.5)	4.07	3.11
VELA	(0.0)	1.19	0.86
	(1.5)	1.27	0.86
VERTUS	(0.0)	6.16	5.44
	(1.5)	5.68	4.54

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	2.10	3.88	1.32	4.56	2.96

GRAND MEAN 3.16

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.322	0.161	0.114	0.114

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.228	0.228	0.161	0.322

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91/R/CS/327

1ST CUT (20/5/91) DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.322	10.2

IST CUT MEAN DM% 15.7

2ND CUT (9/7/91) DRY MATTER TONNES/HECTARE

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

CARBRATE / **VARIETY**	(0.0)	(1.5)	Mean
EUROPE	3.68	3.79	3.74
EUVA	4.89	4.40	4.65
VELA	3.34	3.67	3.51
VERTUS	5.42	5.16	5.29
Mean	4.34	4.26	4.30

ROWSPACE / **VARIETY**	15	30	Mean
EUROPE	4.00	3.48	3.74
EUVA	4.93	4.37	4.65
VELA	3.88	3.13	3.51
VERTUS	5.48	5.10	5.29
Mean	4.57	4.02	4.30

ROWSPACE / **CARBRATE**	15	30	Mean
(0.0)	4.58	4.09	4.34
(1.5)	4.56	3.95	4.26
Mean	4.57	4.02	4.30

VARIETY	**ROWSPACE** / **CARBRATE**	15	30
EUROPE	(0.0)	3.89	3.48
	(1.5)	4.11	3.47
EUVA	(0.0)	5.11	4.68
	(1.5)	4.76	4.05
VELA	(0.0)	3.66	3.01
	(1.5)	4.09	3.25
VERTUS	(0.0)	5.67	5.18
	(1.5)	5.30	5.03

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	3.61	4.53	3.49	4.93	4.14

GRAND MEAN 4.27

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91/R/CS/327

2ND CUT (9/7/91) DRY MATTER TONNES/HECTARE

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.311	0.155	0.110	0.110

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.220	0.220	0.155	0.311

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.311	7.3

2ND CUT MEAN DM% 17.4

3RD CUT (12/8/91) DRY MATTER TONNES/HECTARE

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

CARBRATE VARIETY	(0.0)	(1.5)	Mean
EUROPE	3.16	2.93	3.04
EUVA	3.79	3.56	3.67
VELA	2.34	2.59	2.46
VERTUS	4.14	4.03	4.08
Mean	3.36	3.28	3.32

ROWSPACE VARIETY	15	30	Mean
EUROPE	3.26	2.83	3.04
EUVA	3.66	3.69	3.67
VELA	2.72	2.20	2.46
VERTUS	4.25	3.92	4.08
Mean	3.47	3.16	3.32

ROWSPACE CARBRATE	15	30	Mean
(0.0)	3.48	3.24	3.36
(1.5)	3.47	3.08	3.28
Mean	3.47	3.16	3.32

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91/R/CS/327

3RD CUT (12/8/91) DRY MATTER TONNES/HECTARE

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

VARIETY	ROWSPACE / CARBRATE	15	30
EUROPE	(0.0)	3.42	2.90
	(1.5)	3.09	2.76
EUVA	(0.0)	3.63	3.95
	(1.5)	3.69	3.44
VELA	(0.0)	2.54	2.14
	(1.5)	2.91	2.27
VERTUS	(0.0)	4.31	3.97
	(1.5)	4.19	3.87

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	2.87	3.66	2.50	3.56	3.15

GRAND MEAN 3.28

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.387	0.194	0.137	0.137

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.274	0.274	0.194	0.387

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.387	11.8

3RD CUT MEAN DM% 16.3

4TH CUT (3/10/91) DRY MATTER TONNES/HECTARE

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

CARBRATE / VARIETY	(0.0)	(1.5)	Mean
EUROPE	1.79	1.62	1.70
EUVA	2.19	2.15	2.17
VELA	1.12	1.21	1.16
VERTUS	2.53	2.44	2.48
Mean	1.91	1.85	1.88

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91/R/CS/327

4TH CUT (3/10/91) DRY MATTER TONNES/HECTARE

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

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	1.91	1.49	1.70
EUVA	2.23	2.11	2.17
VELA	1.29	1.04	1.16
VERTUS	2.59	2.37	2.48
Mean	2.01	1.75	1.88

ROWSPACE	15	30	Mean
CARBRATE			
(0.0)	1.99	1.82	1.91
(1.5)	2.02	1.69	1.85
Mean	2.01	1.75	1.88

	ROWSPACE	15	30
VARIETY	CARBRATE		
EUROPE	(0.0)	2.06	1.51
	(1.5)	1.77	1.46
EUVA	(0.0)	2.13	2.26
	(1.5)	2.34	1.96
VELA	(0.0)	1.20	1.03
	(1.5)	1.37	1.05
VERTUS	(0.0)	2.59	2.47
	(1.5)	2.60	2.28

CA3 R015	EUROPE	EUVA	VELA	VERTUS	Mean
	1.58	2.23	1.29	2.38	1.87

GRAND MEAN 1.88

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

CA3 R015	VARIETY	CARBRATE	ROWSPACE
0.174	0.087	0.062	0.062

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.123	0.123	0.087	0.174

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.174	9.3

4TH CUT MEAN DM% 20.8

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91/R/CS/327

TOTAL OF 4 CUTS DRY MATTER TONNES/HECTARE

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

CARBRATE	(0.0)	(1.5)	Mean
VARIETY			
EUROPE	11.31	10.22	10.76
EUVA	15.35	13.71	14.53
VELA	7.81	8.54	8.18
VERTUS	17.89	16.74	17.32
Mean	13.09	12.30	12.70

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	11.79	9.73	10.76
EUVA	15.17	13.90	14.53
VELA	9.12	7.24	8.18
VERTUS	18.24	16.39	17.32
Mean	13.58	11.81	12.70

ROWSPACE	15	30	Mean
CARBRATE			
(0.0)	13.81	12.38	13.09
(1.5)	13.35	11.25	12.30
Mean	13.58	11.81	12.70

ROWSPACE	15	30
VARIETY CARBRATE		
EUROPE (0.0)	12.44	10.18
EUROPE (1.5)	11.14	9.29
EUVA (0.0)	15.47	15.24
EUVA (1.5)	14.86	12.56
VELA (0.0)	8.59	7.04
VELA (1.5)	9.65	7.44
VERTUS (0.0)	18.73	17.05
VERTUS (1.5)	17.76	15.72

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	10.16	14.30	8.60	15.42	12.12

GRAND MEAN 12.58

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.929	0.465	0.329	0.329

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.657	0.657	0.465	0.929

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91/R/CS/327

TOTAL OF 4 CUTS DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.929	7.4

TOTAL OF 4 CUTS MEAN DM% 17.5

PLOT AREA HARVESTED 0.00045

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91/R/CS/331

TAKE-ALL INOCULATION

Object: To compare a range of methods of artificially inoculating take-all (Gaeumannomyces graminis) and to relate amounts of disease established to the yield and grain quality of w. wheat - Great Harpenden I.

Sponsors: D. Hornby, G.L. Bateman, R.J. Gutteridge.

The third year, w. wheat, w. oats.

For previous years see 89-90/R/CS/331

Design: 4 randomised blocks of 9 plots.

Whole plot dimensions: 3.0 x 22.0.

Treatments:

INOCMETH	Methods of inoculating take-all to w. wheat in the first year, none to w. wheat in 1990:
NONE O W	None (w. oats 1991, alternating with w. wheat)
NONE W O	None (w. wheat 1991, alternating with w. oats)
NONE W W	None (continuous w. wheat)
I PRE PL	Infective inoculum applied to soil surface pre-ploughing
N PRE PL	Non-infective inoculum applied to soil surface pre-ploughing
I PRE SO	Infective inoculum applied by fertilizer drill to 10 cm depth before rotary harrowing and sowing wheat
N PRE SO	Non-infective inoculum applied as above
I CD	Infective inoculum combine drilled with the seed
N CD	Non-infective inoculum combine drilled with the seed

NOTES: (1) Inoculum was prepared on autoclaved oat seed.
(2) The sequence of cultivations in the first year was identical for all treatments: Plough to 23 cm, cultivate to level, traverse with fertilizer drill to 10 cm, rotary harrow to 10 cm and sow wheat with combine drill. In the second year the cultivations, all basal, were: Ploughed, rotary harrowed three times and seed sown. In the third year basal cultivations were: Ploughed on 10 Sept, 1990, rotary harrowed and seed sown, 26 Sept.
(3) The weedkillers applied to wheat were in error also applied to oats. No yields recorded.

Basal applications: Manures: (0:16:36) at 980 kg. 'Nitram' at 120 kg and later at 580 kg. Weedkillers: Isoproturon at 1.3 kg and pendimethalin at 1.3 kg with the insecticide in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 200 l. Chlorothalonil at 0.49 kg and flutriafol at 0.08 kg with fenpropimorph at 0.38 kg in 200 l. Insecticide: Deltamethrin at 6.2 g.

Seed: W. wheat: Mercia, sown at 170 kg.
W. oats: Image, sown at 120 kg.

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91/R/CS/331

Cultivations, etc.:- PK applied: 3 Sept, 1990. Weedkillers with the insecticide applied: 15 Nov. N applied: 13 Mar, 1991 and later on 3 Apr. Fenpropimorph alone applied: 10 May. Fenpropimorph with chlorothalonil and flutriafol applied: 20 June. Combine harvested: 20 Aug (wheat), 27 Aug (oats).

NOTE: Plants were sampled on six occasions between mid-March and mid-July to assess take-all. Quality assessments were made on the grain. Soil cores were taken after harvest to assess take-all infectivity.

GRAIN TONNES/HECTARE

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

INOCMETH	
NONE W O	8.21
NONE W W	7.85
I PRE PL	8.01
N PRE PL	8.05
I PRE SO	8.03
N PRE SO	7.91
I CD	7.93
N CD	8.20
Mean	8.02

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

INOCMETH
0.180

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	21	0.254	3.2

GRAIN MEAN DM% 87.7

PLOT AREA HARVESTED 0.00506

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91/W/CS/336

SET-ASIDE STUDY

Object: To compare different treatments of land temporarily withdrawn from arable cropping and to study their effects on nitrate leaching and on subsequent wheat crops - Woburn, Horsepool.

Sponsors: R.D. Prew, E.T.G. Bacon, M.V. Hewitt, D.P. Yeoman, J.F. Jenkyn, R.J. Gutteridge, W. Powell, J. Ashby.

Associate sponsors: D.L.O. Smith, I. Shield.

The third year, w. wheat.

For previous years see 89-90/W/CS/336.

Design: 3 randomised blocks of 7 plots split into 7 sub plots.

Whole plot dimensions: 10.0 x 24.0.

Treatments: All combinations of:-

Whole plots

1. **LAND TRT[89]** Land treatment in 1989, after s. wheat 1988 (all treatments ploughed in autumn 1989 and 1990 before w. wheat in 1990 and 1991):

CA WW	Cultivated in autumn, sown to w. wheat
CA RA	Cultivated in autumn, sown to ryegrass in autumn, topped in spring
SA CA FA	Straw chopped and spread in autumn, cultivated in autumn, sown to forage rape in autumn, topped in spring
CA CS	Cultivated in autumn, cultivated in spring
SA CS	Straw chopped and spread in autumn, cultivated in spring
WT	Weeds topped
WT CS TS	Weeds topped, cultivated in spring, trefoil sown in spring, topped

Sub plots

2. **N RES** Residues of nitrogen fertilizer to w. wheat in 1990 (kg N):

(0)
(37)
(56)
(73)
(92)
(110)
(128)

NOTE: An additional fallow sub plot was present, systematically arranged on one side of each whole plot.

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91/W/CS/336

Standard applications:

W. wheat: Manures: 'Nitram' at 580 kg. Weedkillers: Diclofop at 1.1 kg applied with the insecticide in 220 l. Diflufenican at 0.10 kg and isoproturon at 1.0 kg in 220 l. Fluroxypyr at 0.20 kg with bromoxynil at 0.34 kg and clopyralid at 0.07 kg in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 210 l, and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 0.078 kg in 300 l. Insecticide: Deltamethrin at 5.0 g.

Fallow: Weedkiller: Linuron at 1.5 kg with paraquat at 0.6 kg ion in 210 l.

Seed: W. wheat: Mercia, sown at 150 kg.

Cultivations, etc.:-

W. wheat: Straw chopped on plots: 8 Aug, 1990. Ploughed: 14 Sept. Rotary harrowed with crumbler attached, seed sown: 26 Sept. Diclofop and insecticide applied: 27 Nov. Diflufenican and isoproturon applied: 5 Dec. Fluroxypyr, bromoxynil and clopyralid applied: 12 Apr, 1991. N applied: 17 Apr. Fenpropimorph applied: 24 Apr. Fenpropimorph, chlorothalonil and flutriafol applied: 20 June. Combine harvested: 20 Aug.

Fallow: Weedkiller applied: 20 May. Rotary cultivated: 15 July.

NOTE: Amounts of soil nitrogen were measured in autumn and spring on CA RA and WT plots. Assessments of plant cover were made in autumn. Plant samples were taken to assess diseases.

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91/W/CS/336

GRAIN TONNES/HECTARE

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

N RES	(0)	(37)	(56)	(73)	(92)	(110)	(128)	Mean
LAND TRT[89]								
CA WW	6.30	5.54	6.21	5.61	5.72	5.58	5.72	5.81
CA RA	7.77	7.90	8.01	7.41	8.15	7.40	7.46	7.73
SA CA FA	6.44	6.53	7.00	6.58	6.85	7.43	7.43	6.89
CA CS	4.28	5.51	5.78	5.67	6.01	6.78	6.38	5.77
SA CS	4.27	5.48	5.03	5.44	6.26	6.29	6.13	5.56
WT	4.32	5.66	4.06	4.44	5.21	6.08	6.02	5.11
WT CS TS	4.60	5.13	5.68	6.16	5.57	6.09	6.11	5.62
Mean	5.43	5.96	5.97	5.90	6.25	6.52	6.46	6.07

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

LAND TRT[89]	**N RES LAND TRT[89]**	**N RES**
0.629	0.198	0.794
Except when comparing means with the same level(s) of		
LAND TRT[89]		0.524

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.770	12.7
BLOCK.WP.SP	84	0.641	10.6

GRAIN MEAN DM% 87.8

SUB PLOT AREA HARVESTED 0.00199

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91/W/CS/339

SULPHUR AND NITROGEN

Object: To study the effects of differing amounts of sulphur on rates of sulphur uptake and on the yield of w. oilseed rape and the extent to which responses are affected by amounts of nitrogen fertilizer - Woburn, Butt Close II.

Sponsors: S.P. McGrath, G.F.J. Milford.

The third year, w. oilseed rape.

For previous years see 89-90/W/CS/339.

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 4.0 x 8.0.

Treatments: All combinations of:-

1. **S** Rates of sulphur (kg S) as calcium sulphate:

   0
   10
   20
   40

2. **N** Rates of nitrogen (kg N) as 'Nitro-Chalk':

   0
   180
   230

NOTES: (1) Sulphur and nitrogen treatments were not cumulative to previous years but were re-randomized.
(2) Nitrogen treatments were applied in two stages; 40 kg N: 26 Feb, 1991 and the remainder: 5 Apr. Sulphur was applied on 26 Feb.

Basal applications: Manure: 'Nitram' at 145 kg. Weedkillers: Quizalofop-ethyl at 38 g with metazachlor at 0.75 kg and adjuvant 'Cropspray 11E' at 2.0 l in 220 l. Benazolin at 0.30 kg and clopyralid at 0.05 kg with insecticide in 220 l. Fungicides: Benomyl at 0.25 kg in 220 l. Prochloraz at 0.32 kg with insecticide in 200 l. Insecticide: Deltamethrin at 6.2 g on the first occasion and at 12 g on the second. Irrigation: 12 mm on each of two occasions.

Seed: Libravo, sown at 6.0 kg.

Cultivations, etc.:- Subsoiled: 28 Aug, 1990. Disced, ploughed and rolled: 29 Aug. Basal N applied, rotary harrowed, seed sown: 30 Aug. Irrigation applied: 19 and 20 Sept. Quizalofop-ethyl, metazachlor and adjuvant applied: 1 Nov. Benazolin, clopyralid and deltamethrin applied: 15 Nov. Benomyl applied: 17 Dec. Prochloraz and deltamethrin applied: 12 Apr, 1991. Combine harvested: 13 Aug.

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91/W/CS/339

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

S / N	0	10	20	40	Mean
0	0.44	0.44	0.30	0.40	0.39
180	1.90	2.69	2.14	2.31	2.26
230	1.12	1.74	2.73	2.72	2.08
Mean	1.15	1.62	1.72	1.81	1.58

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

N	S	N S
0.207	0.239	0.413

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	22	0.506	32.1

GRAIN MEAN DM% 85.8

STRAW (AT 90% DRY MATTER) TONNES/HECTARE

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

S / N	0	10	20	40	Mean
0	1.50	1.44	0.99	1.36	1.32
180	2.99	3.34	3.19	3.01	3.13
230	3.13	2.34	3.18	3.37	3.01
Mean	2.54	2.37	2.46	2.58	2.49

STRAW MEAN DM% 41.5

PLOT AREA HARVESTED 0.00084

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91/W/CS/342

CATCH CROPS

Object: To compare a range of catch crops for their ability to take up N during the autumn, to measure rates of mineralization of N after incorporating them in spring and to measure their effects on the yield of a subsequent spring barley crop in the first year and on winter barley in the second - Woburn, Road Piece.

Sponsors: D.G. Christian, D.S. Powlson.

The second year, w. barley.

For first year see 90/W/CS/342.

Design: 3 randomised blocks of 11 plots split into 2 sub plots criss-cross.

Whole plot dimensions: 8.0 x 10.0.

Treatments: All combinations of:-

Whole plots

1. **CROP RES**		Catch crops and subsequent crops in 1990, all w. barley in 1991:
		Sown 1989, ploughed in March 1990 and s. barley sown:
	AL CL SB	Alsike clover
	FA CU SB	Fallow, cultivated to keep soil bare
	FA UC SB	Fallow, uncultivated, weeds and volunteers allowed to grow
	FO RA SB	Forage rape
	PH TA SB	Phacelia tanacetifolia
	RY GR SB	Ryegrass
	RYE SB	Rye
	WH MU SB	White mustard
	WM+RY SB	White mustard + rye
	WW SB	Winter wheat
		Sown 1989, taken to normal maturity:
	W WHEAT	Winter wheat

Sub plots

2.	**N RES**	Nitrogen fertilizer (kg N) in 1990:
	(0)	
	(50)	

Basal applications: Manure: 'Nitram' at 116 kg followed by 232 kg. Weedkillers: Diflufenican at 0.10 kg and isoproturon at 1.0 kg applied with the insecticide in 220 l. Fungicides: Triadimefon at 0.12 kg with tridemorph at 0.26 kg in 210 l. Propiconazole at 0.12 kg in 300 l. Insecticide: Deltamethrin at 5.0 g.

Seed: Magie sown at 140 kg.

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91/W/CS/342

Cultivations, etc.:- Straw chopped on plots: 18 Aug, 1990. Disced: 19 Aug. Ploughed and rolled: 7 Sept. Rotary harrowed with crumbler attached, seed sown: 21 Sept. Weedkiller and insecticide applied: 8 Nov. N applied: 19 Mar, 1991 and 16 Apr. Triadimefon and tridemorph applied: 23 Apr. Propiconazole applied: 21 May. Combine harvested: 6 Aug.

GRAIN TONNES/HECTARE

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

N RES	(0)	(50)	Mean
CROP RES			
AL CL SB	8.79	8.76	8.77
FA CU SB	8.05	7.76	7.91
FA UC SB	8.60	7.73	8.16
FO RA SB	7.95	8.59	8.27
PH TA SB	8.09	8.15	8.12
RY GR SB	8.30	8.36	8.33
RYE SB	8.64	8.16	8.40
WH MU SB	8.20	8.23	8.22
WM+RY SB	8.12	7.81	7.97
WW SB	8.88	7.96	8.42
W WHEAT	7.89	8.38	8.13
Mean	8.32	8.17	8.25

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

CROP RES	N RES	CROP RES N RES
0.433	0.120	0.516

Except when comparing means with the same level(s) of
CROP RES 0.397

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.531	6.4
BLOCK.WP.SP	22	0.487	5.9

GRAIN MEAN DM% 84.0

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91/W/CS/342

STRAW TONNES/HECTARE

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

N RES	(0)	(50)	Mean
CROP RES			
AL CL SB	4.17	4.25	4.21
FA CU SB	3.42	3.18	3.30
FA UC SB	4.30	3.17	3.74
FO RA SB	3.73	4.24	3.98
PH TA SB	4.62	4.06	4.34
RY GR SB	3.89	4.42	4.16
RYE SB	3.36	3.82	3.59
WH MU SB	4.09	3.72	3.91
WM+RY SB	3.77	4.11	3.94
WW SB	3.96	3.95	3.96
W WHEAT	3.94	4.06	4.00
Mean	3.93	3.91	3.92

STRAW MEAN DM% 89.3

SUB PLOT AREA HARVESTED 0.00100

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91/W/CS/346

SET-ASIDE STUDY

Object: To compare different treatments of land temporarily withdrawn from arable cropping and to study their effects on nitrate leaching and on subsequent wheat crops - Woburn, White Horse.

Sponsors: R.D. Prew, E.T.G. Bacon, M.V. Hewitt, D.P. Yeoman, J.F. Jenkyn, R.J. Gutteridge, W. Powell, J. Ashby.

Associate sponsors: D.L.O. Smith, I. Shield, M.D. Helps.

The second year, w. wheat.

For first year see 90/W/CS/346.

Design: 3 randomised blocks of 7 plots split into 7 sub plots.

Whole plot dimensions: 10.0 x 24.0.

Treatments: All combinations of:-

Whole plots

1. **LAND TRT**		Land treatment in 1990, after w. wheat 1989 (all treatments ploughed autumn 1990 before w. wheat):
	CA WW	Cultivated in autumn, sown to w. wheat
	CA RA	Cultivated in autumn, sown to ryegrass in autumn, topped in spring
	SA CA FA	Straw chopped and spread in autumn, cultivated in autumn, sown to forage rape in autumn, topped in spring
	CA CS	Cultivated in autumn, cultivated in spring
	SA CS	Straw chopped and spread in autumn, cultivated in spring
	WT	Weeds topped
	WT CS TS	Weeds topped, cultivated in spring, trefoil sown in spring, topped

Sub plots

2.	**N**	Nitrogen fertilizer (kg N) as 'Nitro-chalk':
	0	
	80	
	120	
	160	
	200	
	240	
	280	

NOTES: (1) An additional fallow sub plot was present, systematically arranged on one side of each whole plot.
(2) Some variation occured in the method of N application. Statistical correction did not improve the response curve and the yield data are given as recorded.

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91/W/CS/346

Standard applications: W. wheat: Weedkillers: Mecoprop at 1.6 kg with the insecticide in 220 l. Fluroxypyr at 0.20 kg with bromoxynil at 0.34 kg and clopyralid at 0.07 kg in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 210 l, and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 0.078 kg in 300 l. Insecticide: Deltamethrin at 5.0 g.

Seed: W. wheat: Mercia, sown at 150 kg.

Cultivations, etc.:-
W. wheat: Ploughed: 13 Sept, 1990. Rotary harrow with crumbler attached, seed sown: 25 Sept. Mecoprop and insecticide applied: 30 Nov. N treatments applied: 3 Apr, 1991. Fluroxypyr, bromoxynil and clopyralid applied: 12 Apr. Fenpropimorph applied: 24 Apr. Fenpropimorph, chlorothalonil and flutriafol applied: 20 June. Combine harvested: 21 Aug.
Fallow: Ploughed: 13 Sept, 1990. Rotary cultivated: 20 May, 1991 and 15 July.

NOTE: Amounts of soil nitrogen and plant dry matter were measured in autumn and spring. Assessments of plant cover were made in autumn, spring and summer. Plant samples were taken to assess diseases.

GRAIN TONNES/HECTARE

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

N / LAND TRT	0	80	120	160	200	240	280	Mean
CA WW	1.82	3.43	6.68	6.25	6.26	6.99	7.42	5.55
CA RA	2.04	4.80	6.64	7.63	8.96	8.98	8.89	6.85
SA CA FA	4.27	6.35	7.46	8.08	8.70	9.08	9.19	7.59
CA CS	6.11	7.45	8.02	8.24	8.51	8.61	8.67	7.94
SA CS	5.74	7.01	8.13	9.28	8.86	9.37	9.10	8.21
WT	4.69	7.37	8.51	8.70	8.81	9.12	9.39	8.08
WT CS TS	3.43	6.78	7.48	7.53	8.68	8.40	8.96	7.32
Mean	4.01	6.17	7.56	7.96	8.40	8.65	8.80	7.36

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

	LAND TRT	N	LAND TRT N
	0.472	0.290	0.852
Except when comparing means with the same level(s) of LAND TRT			0.766

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.579	7.9
BLOCK.WP.SP	84	0.939	12.7

GRAIN MEAN DM% 87.1

SUB PLOT AREA HARVESTED 0.00199

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91/W/CS/347

GREEN CROPS FOR SET-ASIDE

Object: To obtain information on the establishment and maintenance of sown crops and unsown vegetation in a long term, up to five-year, set-aside area given no chemical inputs. Effects on soil nitrate and leaching after ploughing are also studied - Woburn, Horsepool Lane Close II.

Sponsors: R.D. Prew, E.T.G. Bacon, M.V. Hewitt, D.P. Yeoman.

Design: 6 randomised blocks of 6 plots.

Whole plot dimensions: 6.5 x 26.0.

The second year, w. wheat, ryegrass, clover.

For previous year see 90/W/CS/347.

Treatments in 1990 and 1991:

CROPS	Crops:
RY LF	Ryegrass, cuttings left in situ
RY+CL LF	Ryegrass + clover, cuttings left in situ
RY+CL RE	Ryegrass + clover, cuttings removed
RY+N RE	Ryegrass given 100 kg N in spring, cuttings removed
TU LF	Tumbledown, natural regrowth, cuttings left in situ
W WHEAT	Winter wheat

NOTE: Yields were taken from the w. wheat and from the ley plots from which cuttings were removed.

Standard applications:

All crops except w. wheat and tumbledown: Manures: P_2O_5 at 25 kg to RY+CL RE and at 39 kg to RY+N RE as 'Triple superphosphate'. K_2O at 122 kg to RY+CL RE and at 223 kg to RY+N RE as 'Muriate of potash'. N at 100 kg as 'Nitram' to RY+N RE plots only.

W. wheat: Manures: N at 40 kg and on a second occasion at 160 kg as 'Nitram'. Fungicides: Fenpropimorph at 0.38 kg in 210 l and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 0.078 kg in 300 l.

Seed: W. wheat: Mercia sown at 150 kg.
Ryegrass and clover sown in 1989.

Cultivations, etc.:-

All crops except w. wheat and tumbledown: P and K applied to RY+CL RE and RY+N RE plots: 20 Feb, 1991. N applied to RY+N RE plots: 18 Mar. RY LF and RY+CL LF plots topped: 30 May, 15 July and 18 Sept. RY+CL RE and RY+N RE plots cut and produce removed: 3 June, 17 July and 16 Sept.

Tumbledown plots: Topped: 7 Nov, 1990, 30 May, 1991, 15 July and 18 Sept.

W. wheat plots: Ploughed: 21 Sept, 1990. Rotary harrowed, seed sown, rolled: 25 Sept. N applied: 18 Mar, 1991 and 17 Apr. Fenpropimorph applied: 24 Apr. Remaining fungicides applied: 20 June. Combine harvested: 20 Aug.

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91/W/CS/347

NOTE: Assessments were made of soil nitrogen in autumn 1990 and spring 1991, and plant numbers and plant cover in spring and autumn 1991.

GRASS

1ST CUT (3/6/91) DRY MATTER TONNES/HECTARE

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

CROPS	RY+CL RE	RY+N RE	Mean
	1.38	5.66	3.52

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

CROPS
0.236

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	5	0.408	11.6

1ST CUT MEAN DM% 24.6

2ND CUT (17/7/91) DRY MATTER TONNES/HECTARE

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

CROPS	RY+CL RE	RY+N RE	Mean
	1.84	2.39	2.12

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

CROPS
0.229

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	5	0.396	18.7

2ND CUT MEAN DM% 34.8

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91/W/CS/347

3RD CUT (16/9/91) DRY MATTER TONNES/HECTARE

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

CROPS	RY+CL RE	RY+N RE	Mean
	0.48	0.47	0.47

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

CROPS
0.146

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	5	0.252	53.3

3RD CUT MEAN DM% 35.8

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

CROPS	RY+CL RE	RY+N RE	Mean
	3.70	8.52	6.11

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

CROPS
0.430

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	5	0.746	12.2

TOTAL OF 3 CUTS MEAN DM% 31.7

PLOT AREA HARVESTED 0.00264

WHEAT

GRAIN TONNES/HECTARE 9.254

GRAIN MEAN DM% 86.3

PLOT AREA HARVESTED 0.00546

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91/R/CS/354

SOWING DATES AND TAKE-ALL

Object: To study the effects of sequences of sowing dates and volunteers on take-all (Gaeumannomyces graminis) and yield of winter wheat - Little Knott I.

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

The first year, w. wheat.

Design: 4 randomised blocks of 5 plots.

Whole plots dimensions: 3.0 x 10.0.

Treatments:

SOW DATE	Sowing dates:
17 SEP	17 September, 1990 (triplicated)
11 OCT	11 October (duplicated)

Basal applications: Manure: (0:16:36) at 980 kg. 'Nitram' at 580 kg. Weedkillers: Isoproturon at 1.3 kg and pendimethalin at 1.3 kg with the insecticide in 200 l. Difenzoquat at 1.0 kg with a wetting agent, 'Vassgro' at 1.0 l, in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 200 l. Chlorothalonil at 0.49 kg and flutriafol at 78 g in 200 l. Insecticide: Deltamethrin at 5.0 g.

Seed: Mercia, sown at 170 kg.

Cultivations, etc.:- PK applied: 22 Aug, 1990. Ploughed: 30 Aug. Rotary harrowed all plots, **SOW DATE** 17 SEP rotary harrowed again and seed sown: 17 Sept. **SOW DATE** 11 OCT rotary harrowed, seed sown: 11 Oct. Isoproturon, pendimethalin and the insecticide applied: 21 Nov. Difenzoquat with wetting agent applied: 13 Mar, 1991. N applied: 28 Mar. Fenpropimorph applied: 9 May. Chlorothalonil and flutriafol applied: 20 June. Combine harvested: 20 Aug. Previous crops: W. wheat 1989, w. oats 1990.

NOTE: Plants were sampled in April and July to assess take-all. Soil cores were taken after harvest to assess take-all infectivity.

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91/R/CS/354

GRAIN TONNES/HECTARE

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

SOW DATE	
17 SEP	9.39
11 OCT	9.45
Mean	9.41

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

SOW DATE
0.086

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.187	2.0

GRAIN MEAN DM% 86.7

PLOT AREA HARVESTED 0.00230

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91/R/CS/355

RATES OF N AND MINERALIZATION

Object: To study the cumulative effects of rates of nitrogen fertilizer on soil mineralization capacity and yields of continuous winter wheat - Claycroft.

Sponsor: P.R. Poulton.

The first year, w. wheat.

Design: 3 randomised blocks of 7 plots.

Whole plot dimensions: 21.0 x 23.0.

Treatments:

N	Nitrogen fertilizer (kg N) as 'Nitram':
0	
50	
100	
150	
200	
250	
300	

Basal applications: Manure: Magnesian limestone at 5.0 t. Weedkillers: Bifenox at 0.95 kg and chlortoluron at 3.5 kg with the insecticide in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 200 l. Fenpropimorph at 0.38 kg with chlorothalonil at 0.49 kg and flutriafol at 0.078 kg in 200 l. Insecticide: Deltamethrin at 6.2 g.

Seed: Mercia, sown at 170 kg.

Cultivations, etc.:- Magnesian limestone applied: 22 Aug, 1990. Deep tine cultivated with vibrating tines 60 cm apart and 45 cm deep: 19 Sept. Ploughed: 27 Sept. Disced: 28 Sept. Disced, rotary harrowed, seed sown: 9 Oct. Weedkillers with the insecticide applied: 23 Nov. N treatments applied: 9 Apr, 1991. Fenpropimorph alone applied: 10 May. Fenpropimorph with chlorothalonil and flutriafol applied: 20 June. Combine harvested: 21 Aug. Previous crops: W. wheat 1989 and 1990.

NOTE: Quadrat samples were taken before harvest to estimate straw and stubble yield.

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91/R/CS/355

GRAIN TONNES/HECTARE

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

N	
0	4.38
50	6.30
100	7.43
150	7.64
200	8.00
250	8.21
300	7.98
Mean	7.13

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

N
0.395

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.484	6.8

GRAIN MEAN DM% 87.5

PLOT AREA HARVESTED 0.00483

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91/W/CS/356

SET-ASIDE STUDY

Object: To compare different treatments of land temporarily withdrawn from arable cropping and to study their effects on nitrate leaching and on subsequent wheat crops - Woburn, Horsepool Lane Close I.

Sponsors: R.D. Prew, E.T.G. Bacon, M.V. Hewitt, D.P. Yeoman, J.F. Jenkyn, R.J. Gutteridge, W. Powell, J. Ashby.

Associate sponsors: D.L.O. Smith, I. Shield, M.D. Helps.

The first year, w. wheat, forage rape, ryegrass, trefoil.

Design: 3 randomised blocks of 7 plots.

Whole plot dimensions: 10.0 x 24.0.

Treatments:

LAND TRT	Land treatment after w. wheat 1990:
CA WW	Cultivated in autumn, sown to w. wheat
CA RA	Cultivated in autumn, sown to ryegrass in autumn, topped in spring
SA CA FA	Straw chopped and spread in autumn, cultivated in autumn, sown to forage rape in autumn, topped in spring
CA CS	Cultivated in autumn, cultivated in spring
SA CS	Straw chopped and spread in autumn, cultivated in spring
WT	Weeds topped
WT CS TS	Weeds topped, cultivated in spring, trefoil sown in spring, topped

NOTE: Yields were taken from CA WW only.

Standard applications, seed and cultivations, etc.:-

CA WW: W. wheat straw baled and carted: 16 Aug, 1990. Ploughed: 23 Aug. Rolled: 24 Aug. Rotary harrowed, Mercia wheat sown at 150 kg: 25 Sept. Manures: N applied as 'Nitram' at 40 kg: 18 Mar, 1991 and at 160 kg: 17 Apr. Fungicides: Fenpropimorph at 0.38 kg in 210 l: 24 Apr and again with chlorothalonil at 0.49 kg and flutriafol at 0.078 kg in 300 l: 20 June. Combine harvested: 20 Aug.

CA RA: W. wheat straw baled and carted: 16 Aug, 1990. Ploughed: 23 Aug. Rolled: 24 Aug. Rotary harrowed, Italian ryegrass seed sown at 25 kg, rolled: 6 Sept. Topped: 25 Apr, 1991, 19 June, 15 July and 11 Sept.

SA CA FA: W. wheat straw chopped: 19 Aug, 1990. Ploughed: 23 Aug. Rolled: 24 Aug. Rotary harrowed, Giant forage rape seed sown at 10 kg, rolled: 6 Sept. Topped: 25 Apr, 1991, 19 June, 15 July and 11 Sept.

CA CS: W. wheat straw baled and carted: 16 Aug, 1990. Ploughed: 23 Aug. Rolled: 24 Aug. Weedkiller: Glyphosate applied at 0.72 kg: 23 Jan, 1991. Rotary cultivated: 17 June and 15 July.

SA CS: W. wheat straw chopped: 19 Aug. Shallow-tine cultivated: 17 May, 1991 and 15 July.

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91/W/CS/356

Standard applications, seed and cultivations, etc.:-
WT: W. wheat straw baled and carted: 16 Aug, 1990. Topped: 25 Apr, 1991, 19 June, 15 July and 11 Sept.
WT CS TS: W. wheat straw baled and carted: 16 Aug, 1990. Topped: 25 Apr, 1991. Ploughed, rotary cultivated, Virgo Pajayere trefoil seed, inoculated with Rhizobium, sown at 10 kg, rolled: 9 May. Weeds topped: 15 July. Topped: 11 Sept.
Previous crops: W. oats 1989, w. wheat 1990.

NOTE: Soil nitrogen, plant dry matter and plant cover were assessed in autumn, spring and summer.

GRAIN TONNES/HECTARE (CA WW PLOT ONLY) 9.26

MEAN DM% 86.5

PLOT AREA HARVESTED 0.00501

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91/W/CS/357

COVER CROPS

Object: To compare a range of cover crops for their ability to take up N during the autumn, to measure rates of mineralization of N after incorporating them in spring and to measure their effects on the yield of a subsequent spring barley crop - Woburn, Lansome III.

Sponsors: D.G. Christian, D.S. Powlson.

The first year, forage rape, phacelia, ryegrass, rye, mustard, w. and s. barley.

Design: 3 randomised blocks of 15 plots split into 2 sub plots.

Whole plot dimensions: 6.0 x 25.0.

Treatments: All combinations of:-

Whole plots

1. **CROPS** — Cover crops, sown 1990, ploughed on 13 Mar, 1991, sown to s. barley: 14 Mar:

FO RA SB	Forage rape
PH TA SB	Phacelia tanacetifolia
RY GR SB	Perennial ryegrass
RYE SB	Rye
WH MU SB	White mustard
WM+RY SB	White mustard + rye

2. **CC SOWDT** — Sowing dates of cover crops:

24 AUG	24 August, 1990
24 SEPT	24 September

Sub plots

3. **N** — Nitrogen fertilizer on 14 Mar, 1991 (kg N) as 'Nitro-Chalk':

0
50

plus three extra treatments:

1. **EXTRA**

CULT FAL	Cultivated fallow until sown to s. barley on 14 Mar, 1991
TUMBDOWN	Tumbledown fallow, no weed control until sown to s. barley, on 14 Mar, 1991
W BARLEY	W. barley sown 25 September, 1990, taken to maturity

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91/W/CS/357

Sub plots

2. **N EXTRA** Nitrogen fertilizer on 14 Mar, 1991 (kg N) as 'Nitro-Chalk':

O	
APPLIED	50 (CULT FAL and TUMBDOWN) or 100 (W BARLEY)

NOTE: The tumbledown fallow was given 50 kg of seed from the previous wheat crop to ensure volunteers.

Basal applications: Manure: Magnesian limestone at 7.5 t.

Standard applications:
CULT FAL plots only: Weedkiller: Paraquat at 0.60 kg ion in 250 l.
W BARLEY plots only: Manures: N treatments applied on two occasions, each at 50 kg. Weedkillers: Diflufenican at 0.10 kg and isoproturon at 1.0 kg applied with insecticide in 220 l. Fungicide: Propiconazole at 0.12 kg in 300 l. Insecticide: Deltamethrin at 5.0 g.
S. barley only: Weedkiller: Metsulfuron-methyl at 6.0 g with fungicide in 200 l. Fungicide: Tridemorph at 0.26 kg.

Seed: Forage rape: Giant, sown at 30 kg.
Phacelia tanacetifolia: sown at 30 kg.
Perrenial ryegrass: Contessa, sown at 25 kg.
Rye: Halo, sown at 180 kg.
White mustard: sown at 30 kg.
White mustard + rye: sown at 15 kg and 90 kg respectively.
W. barley: Puffin, sown at 140 kg.
S. barley: Alexis, sown at 160 kg

Cultivations, etc.:-
All plots: Deep-tine cultivated with tines 1.5 m apart and 0.4 m deep: 18 Aug, 1990. Disced: 19 Aug. Magnesian limestone applied, rotary cultivated: 23 Aug.
24 AUG plots only: Rotary harrowed with crumbler attached, seed sown, rotary harrowed, rolled: 24 Aug.
24 SEPT plots only: Rotary harrowed with crumbler attached, and rolled: 24 Aug. Seed sown, rotary harrowed: 24 Sept.
CULT FAL plots only: Disced: 23 Oct. Weedkiller applied: 26 Feb, 1991.
All plots except W BARLEY: Ploughed: 13 Mar. N treatments applied, rotary cultivated, s. barley seed sown: 14 Mar. Weedkiller and fungicide applied: 24 May. Combine harvested: 15 Aug.
W BARLEY plots only: Rotary harrowed with crumbler attached, w. barley seed sown: 25 Sept, 1990. Weedkillers and insecticide applied: 29 Nov. N treatments applied: 14 Mar and 22 Apr, 1991. Fungicide applied: 21 May. Combine harvested: 6 Aug.

NOTE: Because of rabbit damage the yields of three plots were lost, with treatment combinations:-

CROPS	FO RA SB	RYE SB	RY GR SB
CC SOWDT	24 SEPT	24 SEPT	24 AUG
N	0	0	0

Estimated values were used in the analysis.

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91/W/CS/357

GRAIN TONNES/HECTARE

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

SPRING BARLEY

CC SOWDT	24 AUG	24 SEPT	Mean
CROPS			
FO RA SB	4.38	5.78	5.08
PH TA SB	4.05	4.14	4.09
RY GR SB	4.00	4.12	4.06
RYE SB	3.73	4.89	4.31
WH MU SB	4.65	3.89	4.27
WM+RY SB	4.73	5.66	5.20
Mean	4.26	4.75	4.50

N	0	50	Mean
CROPS			
FO RA SB	4.63	5.53	5.08
PH TA SB	2.85	5.34	4.09
RY GR SB	4.49	3.62	4.06
RYE SB	3.92	4.70	4.31
WH MU SB	3.50	5.04	4.27
WM+RY SB	4.80	5.59	5.20
Mean	4.03	4.97	4.50

N	0	50	Mean
CC SOWDT			
24 AUG	3.76	4.75	4.26
24 SEPT	4.30	5.19	4.75
Mean	4.03	4.97	4.50

	N	0	50
CROPS	**CC SOWDT**		
FO RA SB	24 AUG	3.76	5.01
	24 SEPT	5.51	6.05
PH TA SB	24 AUG	2.66	5.44
	24 SEPT	3.04	5.23
RY GR SB	24 AUG	5.27	2.72
	24 SEPT	3.72	4.52
RYE SB	24 AUG	2.77	4.69
	24 SEPT	5.07	4.71
WH MU SB	24 AUG	3.95	5.35
	24 SEPT	3.06	4.72
WM+RY SB	24 AUG	4.18	5.28
	24 SEPT	5.42	5.90

N EXTRA	0	APPLIED	Mean
EXTRA			
CULT FAL	2.85	4.88	3.87
TUMBDOWN	5.06	5.06	5.06
Mean	3.96	4.97	4.46

GRAND MEAN 4.50

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91/W/CS/357

GRAIN TONNES/HECTARE

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

WINTER BARLEY

N EXTRA	0	APPLIED	Mean
	4.58	5.97	5.27

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

CROPS	**CC SOWDT**	**N**	**CROPS CC SOWDT**
0.664	0.384	0.350	0.940

CROPS N	**CC SOWDT N**	**CROPS CC SOWDT N**	**N EXTRA**
0.899	0.519	1.272	0.857

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

CROPS	0.857		
CC SOWDT		0.495	
CROPS.CC SOWDT			**1.212**

EXTRA	**N EXTRA EXTRA**
0.940	1.272

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

EXTRA	1.212

NOTE: do not use SED for comparisons involving Winter Barley means

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	26	1.15	25.6
BLOCK.WP.SP	25	1.48	33.0

GRAIN MEAN DM% 83.8

STRAW TONNES/HECTARE

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

SPRING BARLEY

CC SOWDT CROPS	24 AUG	24 SEPT	Mean
FO RA SB	1.94	2.60	2.27
PH TA SB	2.27	1.70	1.99
RY GR SB	1.65	1.70	1.67
RYE SB	1.49	2.04	1.76
WH MU SB	1.97	2.18	2.07
WM+RY SB	1.83	2.37	2.10
Mean	1.86	2.10	1.98

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91/W/CS/357

STRAW TONNES/HECTARE

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

N	0	50	Mean
CROPS			
FO RA SB	2.09	2.45	2.27
PH TA SB	1.15	2.83	1.99
RY GR SB	1.90	1.45	1.67
RYE SB	1.54	1.99	1.76
WH MU SB	1.68	2.46	2.07
WM+RY SB	1.88	2.32	2.10
Mean	1.71	2.25	1.98

N	0	50	Mean
CC SOWDT			
24 AUG	1.57	2.15	1.86
24 SEPT	1.84	2.35	2.10
Mean	1.71	2.25	1.98

N		0	50
CROPS	**CC SOWDT**		
FO RA SB	24 AUG	1.68	2.20
	24 SEPT	2.51	2.69
PH TA SB	24 AUG	1.28	3.26
	24 SEPT	1.01	2.40
RY GR SB	24 AUG	2.34	0.95
	24 SEPT	1.46	1.94
RYE SB	24 AUG	0.91	2.06
	24 SEPT	2.17	1.91
WH MU SB	24 AUG	1.67	2.27
	24 SEPT	1.69	2.66
WM+RY SB	24 AUG	1.52	2.14
	24 SEPT	2.23	2.51

N EXTRA	0	APPLIED	Mean
EXTRA			
CULT FAL	0.90	2.04	1.47
TUMBDOWN	2.94	2.05	2.50
Mean	1.92	2.05	1.98

GRAND MEAN 1.98

WINTER BARLEY

N EXTRA	O	APPLIED	Mean
	2.77	3.17	2.97

STRAW MEAN DM% 89.3

PLOT AREA HARVESTED 0.00252

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91/R/CS/361

CONTROL OF STEM NEMATODE

Object: To study the effects of rates of carbofuran on the control of stem nematode (Ditylenchus dipsaci) and on the yield of two varieties of lucerne of different susceptibility - Long Hoos IV 3.

Sponsors: A.G. Whitehead, A.J.F. Nichols.

The first year, lucerne.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 1.2 x 8.8.

Treatments: All combinations of:-

1. **CARBRATE** Rates of carbofuran (kg), applied to seed furrow at sowing: 21 Aug, 1990.

   0.00
   0.60
   1.20
   2.30

2. **VARIETY** Varieties and stem nematode susceptibility:

EUROPE	Europe - susceptible
EUVER	Euver - partially resistant

Basal applications: Weedkillers: 2,4-DB at 1.3 kg in 220 l. Paraquat at 0.40 kg ion in 220 l. Fluazifop-P-butyl at 0.19 kg in 220 l. Irrigation: 5 mm on seven occasions, total 35 mm.

Cultivations, etc.:- Ploughed and rolled: 20 Aug, 1990. Seed sown, cultivated by rotary grubber: 22 Aug. Irrigated: 28, 30 Aug, 3, 10, 13, 20 and 26 Sept. 2,4-DB applied: 14 Dec. Paraquat applied: 7 Mar, 1991. Fluazifop-P-butyl applied: 10 Apr. Cut: 10 July, 13 Aug and 3 Oct. Previous crops: S. peas 1989, w. wheat 1990.

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91/R/CS/361

1ST CUT (10/7/91) DRY MATTER TONNES/HECTARE

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

CARBRATE VARIETY	0.00	0.60	1.20	2.30	Mean
EUROPE	1.19	2.88	2.85	3.54	2.61
EUVER	3.47	3.22	4.36	4.28	3.83
Mean	2.33	3.05	3.61	3.91	3.22

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

VARIETY	CARBRATE	VARIETY CARBRATE
0.267	0.377	0.533

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.653	20.3

1ST CUT MEAN DM% 21.0

2ND CUT (13/8/91) DRY MATTER TONNES/HECTARE

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

CARBRATE VARIETY	0.00	0.60	1.20	2.30	Mean
EUROPE	1.44	1.88	2.29	3.04	2.16
EUVER	2.87	3.15	3.28	3.50	3.20
Mean	2.16	2.51	2.79	3.27	2.68

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

VARIETY	CARBRATE	VARIETY CARBRATE
0.178	0.252	0.356

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.437	16.3

2ND CUT MEAN DM% 17.7

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91/R/CS/361

3RD CUT (3/10/91) DRY MATTER TONNES/HECTARE

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

CARBRATE VARIETY	0.00	0.60	1.20	2.30	Mean
EUROPE	1.23	1.40	1.53	1.69	1.46
EUVER	1.99	1.96	2.06	1.86	1.97
Mean	1.61	1.68	1.80	1.77	1.71

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

VARIETY	CARBRATE	VARIETY CARBRATE
0.064	0.091	0.129

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.158	9.2

3RD CUT MEAN DM% 20.0

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

CARBRATE VARIETY	0.00	0.60	1.20	2.30	Mean
EUROPE	3.86	6.15	6.68	8.27	6.24
EUVER	8.33	8.33	9.70	9.64	9.00
Mean	6.09	7.24	8.19	8.95	7.62

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

VARIETY	CARBRATE	VARIETY CARBRATE
0.472	0.667	0.943

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	1.155	15.2

TOTAL OF 3 CUTS MEAN DM% 19.6

PLOT AREA HARVESTED 0.00045

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91/W/CS/371

CHEMICAL CONTROL OF GLOBODERA PALLIDA

Object: To determine the residual effects of nematicides applied to control G. pallida in 1990 - Woburn, Lansome/Mill Dam Close III.

Sponsors: A.G. Whitehead, A.J.F. Nichols.

Design: 3 randomised blocks of 2 plots split into 6 sub plots.

The second year, potatoes.

For previous year see 90/W/P/2.

Whole plot dimensions: 6.0 x 13.3.

Treatments: All combinations of:-

1. **IRRIG RS** Residues of irrigation applied in 1990:

   NONE
   252 MM

Sub plots

2. **CHEM RES** Residues of chemicals applied in 1990:

NONE	None
OXAMYL	Oxamyl at 5.6 kg
OX CARBO	Oxamyl at 5.6 kg + carbofuran at 5.6 kg
OX ETHOP	Oxamyl at 5.6 kg + ethoprophos at 5.6 kg
OX FORMA	Oxamyl at 5.6 kg + formalin at 1170 kg
OX SODME	Oxamyl at 5.6 kg + sodium metavanadate at 36 kg

Basal applications: Manures: (13:13:20) at 1.6 t. Weedkillers: Linuron at 1.5 kg with paraquat at 0.4 kg ion in 210 l. Fungicides: Maneb at 1.2 kg and zinc oxide at 28 g with a wetting agent, 'Bond' at 200 ml, in 200 l, and on a second occasion at 0.96 kg, 22 g and 200 ml respectively in 300 l. Mancozeb at 0.82 kg with insecticide: pirimicarb at 0.14 kg and wetting agent, 'Bond' at 200 ml, in 300 l on two occasions. Desiccant: Glufosinate-ammonium at 0.45 kg in 200 l.

Variety: Sante.

Cultivations, etc.:- Ploughed: 12 Mar, 1991. N, P and K applied, spiked rotary cultivated, seed sown: 9 Apr. Rotary ridged, weedkillers applied: 26 Apr. Hand weeded 12, 13 June and 12 to 18 July. Rotary ridged: 13 June. Maneb, zinc oxide and wetting agent applied: 4 and 31 July. Mancozeb, pirimicarb and wetting agent applied: 20 July and 12 Aug. Desiccant applied: 27 Aug. Potatoes lifted: 5 Sept.

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91/W/CS/371

TOTAL TUBERS TONNES/HECTARE

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

IRRIG RS	NONE	252 MM	Mean
CHEM RES			
NONE	25.8	9.4	17.6
OXAMYL	26.8	20.7	23.7
OX CARBO	28.2	24.1	26.1
OX ETHOP	29.0	25.5	27.3
OX FORMA	32.3	22.9	27.6
OX SODME	31.0	23.2	27.1
Mean	28.9	21.0	24.9

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

CHEM RES	**IRRIG RS*** **CHEM RES**
2.36	3.34

* within the same level of **IRRIG RS** only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	20	4.09	16.4

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

IRRIG RS	NONE	252 MM	Mean
CHEM RES			
NONE	66.6	39.2	52.9
OXAMYL	77.4	71.4	74.4
OX CARBO	77.3	73.4	75.3
OX ETHOP	79.1	73.4	76.3
OX FORMA	80.7	63.1	71.9
OX SODME	75.0	72.5	73.8
Mean	76.0	65.5	70.8

SUB PLOT AREA HARVESTED 0.00057

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91/R/WW/1

WINTER WHEAT

EYESPOT TYPES AND YIELD

Object: To compare the effects of eyespot (Pseudocercosporella herpotrichoides) caused by the R-type and the W-type on the yield of w. wheat - Summerdells II.

Sponsors: G.L. Bateman, J.F. Jenkyn.

Design: 4 randomised blocks of 12 plots.

Whole plot dimensions: 3.0 x 6.0.

Treatments: All combinations of:

1. **EYE TYPE** Eyespot types:

R	Rye
W	Wheat

2. **INOCDATE** Dates of inoculation of eyespot types:

NOV	November 23, 1990
MAR	March 13, 1991
NOV+MAR	Both above dates

plus two extra treatments:

EXTRA

NONE	None (quintuplicated)
NO I PRO	No inoculation, sprayed prochloraz at 0.40 kg in 200 l on 12 Apr, 1991.

NOTE: The eyespot inoculum was sprayed on as a spore suspension.

Basal applications: Manure: 'Nitram' at 460 kg. Weedkillers: Bifenox at 0.95 kg and chlorotoluron at 3.5 kg in 200 l. Glyphosate at 1.4 kg in 200 l.

Seed: Mercia, sown at 170 kg.

Cultivations, etc.:- Deep-tine cultivated: 6 Oct, 1990. Ploughed, furrow pressed: 10 Oct. Rotary harrowed, seed sown: 12 Oct. Bifenox and chlorotoluron applied: 13 Nov. N applied: 3 Apr, 1991. Glyphosate applied: 12 Aug. Combine harvested: 22 Aug. Previous crops: W. oilseed rape 1989, potatoes 1990.

NOTE: Plant samples were taken in early May and early July for assessment of eyespot and sharp eyespot.

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91/R/WW/1

GRAIN TONNES/HECTARE

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

INOCDATE	NOV	MAR	NOV+MAR	Mean
EYE TYPE				
R	7.47	7.48	7.24	7.40
W	7.66	7.70	7.47	7.61
Mean	7.56	7.59	7.35	7.50

EXTRA	NONE	NO I PRO	Mean
	7.53	7.53	7.53

GRAND MEAN 7.51

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

EYE TYPE	**INOCDATE**	**EYE TYPE INOCDATE**
0.088	0.108	0.153

SED for comparing **EXTRA** NONE and N I PRO is 0.119

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	37	0.217	2.9

GRAIN MEAN DM% 86.5

PLOT AREA HARVESTED 0.00138

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91/R/WW/2

WINTER WHEAT

CONTROL OF VOLUNTEERS

Object: To compare methods of volunteer control in winter wheat after w. and s. barley - Great Knott I, Long Hoos I/II.

Sponsor: D.G. Christian.

Design: 3 replicates of 8 x 3 criss-cross.

Column plot dimensions: 6.0 x 20.0.

Treatments: All combinations of:-

Column plots

1. **PRIMCULT** Primary cultivations:

NONE	None until just before sowing
DYNDRIVE	'Bomford Dynadrive'
PLOUGH	Plough
TINE	Tine

2. **CULTDATE** Date of cultivations:

EARLY	25 July, 1990 (Great Knott I) 15 Aug (Long Hoos I/II)
LATER	15 Aug (Great Knott I) 5 Sept (Long Hoos I/II)

Row plots

3. **PRSOWCON** Pre-sowing volunteer control using weedkillers:

GLYPHOS	Glyphosate at 0.27 kg in 200 l on 8 Oct, 1990
PARAQUAT	Paraquat at 0.60 kg ion in 200 l on 8 Oct
NONE	None

NOTES: (1) The 'Bomford Dynadrive' has a frame similar to a rotary cultivator but it has two rotating shafts containing flat, slightly twisted, spade-shaped 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.
(2) **PRIMCULT** TINE was heavy spring-tine cultivated twice.
(3) All plots were heavy spring-tine cultivated on 9 Oct, 1990 then rotary harrowed and the seed sown on 10 Oct.

Basal applications: Manures: (0:16:36) at 980 kg (Great Knott I only). 'Nitram' at 120 kg and later at 580 kg. Weedkillers: Isoproturon at 1.3 kg and pendimethalin at 1.3 kg in 200 l. Glyphosate (Long Hoos I/II only) at 1.4 kg in 200 l. Fungicides: Fenpropimorph at 0.38 kg in 200 l and on a second occasion with chlorothalonil at 0.49 kg and flutriafol at 78 g in 200 l.

Seed: Mercia, sown at 170 kg.

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91/R/WW/2

Cultivations, etc.:- PK applied (Great Knott I only): 20 Aug, 1990. Isoproturon and pendimethalin applied: 14 Nov (Great Knott I), 23 Nov (Long Hoos I/II). First N applied: 13 Mar, 1991. Second N applied: 3 Apr (Great Knott I), 8 Apr (Long Hoos I/II). Fenpropimorph alone applied: 27 Apr. Fenpropimorph with chlorothalonil and flutriafol applied: 20 June. Glyphosate applied (Long Hoos I/II only): 12 Aug. Combine harvested: 20 Aug (Great Knott I), 25 Aug (Long Hoos I/II). Previous crops: W. barley 1989 and 1990 (Great Knott I), sunflowers 1989, s. barley 1990 (Long Hoos I/II)

NOTES: (1) Ears of volunteer plants were counted at anthesis of the sown crop.
(2) Percentage contamination of harvested grain by volunteer grain was measured.

91/R/WW/2 GREAT KNOTT I W. WHEAT AFTER W. BARLEY

GRAIN TONNES/HECTARE

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

CULTDATE	EARLY	LATER	Mean
PRIMCULT			
NONE	6.43	7.39	6.91
DYNDRIVE	6.89	6.72	6.81
PLOUGH	7.46	7.45	7.46
TINE	7.10	7.09	7.10
Mean	6.97	7.16	7.07

PRSOWCON	GLYPHOS	PARAQUAT	NONE	Mean
PRIMCULT				
NONE	7.14	6.88	6.70	6.91
DYNDRIVE	7.09	6.75	6.59	6.81
PLOUGH	7.49	7.42	7.46	7.46
TINE	7.17	7.25	6.87	7.10
Mean	7.22	7.08	6.91	7.07

PRSOWCON	GLYPHOS	PARAQUAT	NONE	Mean
CULTDATE				
EARLY	7.11	6.98	6.82	6.97
LATER	7.33	7.18	6.99	7.16
Mean	7.22	7.08	6.91	7.07

CULTDATE	EARLY			LATER		
PRIMCULT **PRSOWCON**	GLYPHOS	PARAQUAT	NONE	GLYPHOS	PARAQUAT	NONE
NONE	6.61	6.54	6.12	7.67	7.22	7.27
DYNDRIVE	7.13	6.75	6.80	7.04	6.75	6.38
PLOUGH	7.51	7.28	7.60	7.46	7.56	7.33
TINE	7.19	7.34	6.78	7.15	7.17	6.96

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91/R/WW/2 GREAT KNOTT I W. WHEAT AFTER W. BARLEY

GRAIN TONNES/HECTARE

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

	PRIMCULT	CULTDATE	PRSOWCON	PRIMCULT CULTDATE
	0.269	0.190	0.238	0.381

	PRIMCULT PRSOWCON	CULTDATE PRSOWCON	PRIMCULT CULTDATE PRSOWCON
	0.375	0.309	0.482

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

PRIMCULT	0.279		
CULTDATE		0.252	
PRSOWCON	0.302	0.214	0.427
PRIMCULT.CULTDATE			0.325

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP1	14	0.466	6.6
BLOCK.WP2	4	0.292	4.1
BLOCK.WP1.WP2	28	0.290	4.1

GRAIN MEAN DM% 87.5

SUB PLOT AREA HARVESTED 0.00094

91/R/WW/2 LONG HOOS I/II W. WHEAT AFTER S. BARLEY

GRAIN TONNES/HECTARE

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

CULTDATE	EARLY	LATER	Mean
PRIMCULT			
NONE	9.10	9.22	9.16
DYNDRIVE	9.12	9.43	9.28
PLOUGH	9.25	9.03	9.14
TINE	9.26	9.26	9.26
Mean	9.18	9.24	9.21

PRSOWCON	GLYPHOS	PARAQUAT	NONE	Mean
PRIMCULT				
NONE	9.09	9.02	9.38	9.16
DYNDRIVE	9.27	9.00	9.56	9.28
PLOUGH	9.32	8.88	9.22	9.14
TINE	9.21	9.15	9.43	9.26
Mean	9.22	9.01	9.40	9.21

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91/R/WW/2 LONG HOOS I/II W. WHEAT AFTER S. BARLEY

GRAIN TONNES/HECTARE

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

PRSOWCON	GLYPHOS	PARAQUAT	NONE	Mean
CULTDATE				
EARLY	9.28	8.93	9.34	9.18
LATER	9.16	9.09	9.46	9.24
Mean	9.22	9.01	9.40	9.21

CULTDATE	EARLY			LATER		
PRIMCULT **PRSOWCON**	GLYPHOS	PARAQUAT	NONE	GLYPHOS	PARAQUAT	NONE
NONE	9.13	9.03	9.15	9.05	9.01	9.61
DYNDRIVE	9.16	8.80	9.41	9.38	9.20	9.70
PLOUGH	9.69	8.86	9.20	8.95	8.91	9.25
TINE	9.14	9.05	9.59	9.28	9.25	9.27

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

PRIMCULT	**CULTDATE**	**PRSOWCON**	**PRIMCULT** **CULTDATE**
0.171	0.121	0.119	0.241

PRIMCULT **PRSOWCON**	**CULTDATE** **PRSOWCON**	**PRIMCULT** **CULTDATE** **PRSOWCON**
0.232	0.176	0.316

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

PRIMCULT	0.181		
CULTDATE		0.143	
PRSOWCON	0.214	0.151	0.303
PRIMCULT.CULTDATE			0.241

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP1	14	0.296	3.2
BLOCK.WP2	4	0.146	1.6
BLOCK.WP1.WP2	28	0.274	3.0

GRAIN MEAN DM% 84.0

SUB PLOT AREA HARVESTED 0.00090

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91/R/WW/3

WINTER WHEAT

N AND CROP PHYSIOLOGY

Object: To study the relationship between N supply to crops of different size and their nitrate contents, N uptakes, growth rates and yield - Stackyard.

Sponsors: R.J. Darby, G.F.J. Milford.

Design: 3 randomised blocks of 15 plots.

Whole plot dimensions: 3.0 x 20.0.

Treatments: All combinations of:-

1. **SOW DATE** Dates of sowing:

12 SEP	12 September, 1990
11 OCT	11 October

2. **N R T S** Nitrogen fertilizer (kg N) as 'Nitro-Chalk', rates, times and plot shading:

-	None
N1	30 kg N on 21 Mar, 1991 + 92 kg N on 11 Apr
N2	60 " " " " " " + 184 " " " " " (duplicated)
N2T	" " " " 11 Apr " " " " " " 29 Apr

plus 5 extra treaments all sown on 31 Oct

N R T SL Nitrogen fertilizer (kg N) as 'Nitro-Chalk', rates and times:

-	None
N1	30 kg N on 21 Mar, 1991 + 92 kg N on 11 Apr
N2	60 " " " " " " + 184 " " " " "
N3	" " " " " " " " " " " " " " + 56 kg N on 23 May
N2T	" " " " 11 Apr " " " " " " 29 Apr

NOTES: (1) Shading, to reduce light to 44% of normal, was erected on 9 Apr, 1991 on **SOW DATE** 12 SEP and 11 OCT only, on one of the duplicates of **N R T S** N2. On **N R T SL** shading was not erected, because of loss of plants due to bird damage.
(2) **N R T S** N2T treatment was applied three weeks after a threshhold stem nitrate value of 200 ppm.
(3) Each sowing date was rotary harrowed before drilling.

Basal applications: Manure: Magnesian limestone at 5.0 t. Weedkillers: Isoproturon at 1.3 kg and pendimethalin at 1.3 kg in 300 l. Fungicides: Fenpropimorph at 0.75 kg in 250 l and on a second occasion at 0.75 kg with chlorothalonil at 0.50 kg in 300 l. Insecticides: Deltamethrin at 6.2 g in 300 l. Pirimicarb at 0.14 kg in 300 l.

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91/R/WW/3

Seed: Mercia, sown at 170 kg.

Cultivations, etc.:- Magnesian limestone applied: 31 July, 1990. Ploughed: 3 Sept. Rolled: 4 Sept. Rotary harrowed: 12 Sept. Deltamethrin applied: 7 Nov. Weedkillers applied: 21 Nov. Fenpropimorph alone applied: 10 May, 1991. Fenpropimorph with chlorothalonil applied: 2 July. Pirimicarb applied: 17 July. Combine harvested: 27 Aug. Previous crops: Fallow 1989, w. oats 1990.

NOTE: Soils were sampled, to 90 cm depth, for ammonium and nitrate contents on four occasions from mid-October to the end of February and then at fortnightly intervals corresponding with crop sampling. Crop samples were taken from November to June at fortnightly intervals to measure stem nitrate concentrations and at similar intervals from April to the end of June to measure crop growth and total N content.

GRAIN TONNES/HECTARE

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

N R T S / SOW DATE	-	N1	N2	N2T	Mean
12 SEPT	2.00	6.31	8.75	8.25	6.81
11 OCT	1.98	6.81	8.91	8.21	6.96
Mean	1.99	6.56	8.83	8.23	6.89

N R T SL	-	N1	N2	N3	N2T	Mean
	2.07	6.47	8.52	9.04	8.08	6.84

GRAND MEAN 6.87

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

SOW DATE	N R T S	N R T SL	N R T S / SOW DATE	
	0.121		0.170	min.rep
0.076	0.101	0.170	0.148	max-min
			0.121	max.rep

N R T S	
max.rep	N2 only
min.rep	any of the remainder
max-min	N2 v any of the remainder

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.209	3.0

GRAIN MEAN DM% 84.8

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91/R/WW/3

STRAW TONNES/HECTARE

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

N R T S	-	N1	N2	N2T	Mean
SOW DATE					
12 SEPT	1.73	5.05	7.51	5.78	5.52
11 OCT	1.48	5.87	7.29	5.99	5.58
Mean	1.60	5.46	7.40	5.88	5.55

N R T SL	-	N1	N2	N3	N2T	Mean
	1.18	5.11	6.13	6.31	5.38	4.82

GRAND MEAN 5.31

STRAW MEAN DM% 77.6

PLOT AREA HARVESTED 0.00276

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91/R/WW/8

WINTER WHEAT

FOLIAR POTASSIUM NITRATE

Object: To study the effects of foliar applications of potassium nitrate and urea on the yield and nutrient composition of w. wheat - Summerdells II.

Sponsor: P.B. Barraclough.

Design: 5 randomised blocks of 9 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments:

FOLIAR N	Foliar nitrogen; all applications were divided equally and applied on two closely spaced days:
NONE	None (duplicated)
K20E	20 kg K as potassium nitrate at GS 39 on 29 and 30 May, 1991
K20EU40E	" " " " " " plus 40 kg N as urea on 29 and 30 May
U40E	40 kg N as urea on 29 and 30 May
K5M	5 kg K as potassium nitrate at GS 59 on 17 and 20 June
K20M	20 kg K " " " " " " " 17 and 20 June
K20EK20M	" " " " " on 29 and 30 May repeated on 17 and 20 June
K20MK20L	" " " " " on 17 and 20 June repeated at GS 71 on 9 and 10 July

NOTE: All plots received N at 120 kg as 'Nitram' applied on 3 Apr, 1991.

Basal applications: Manures: (0:20:32) at 980 kg. Weedkillers: Bifenox at 0.95 kg and chlorotoluron at 3.5 kg in 200 l. Glyphosate at 1.4 kg in 200 l. Fungicide: Fenpropimorph at 0.38 kg in 200 l.

Seed: Mercia, sown at 170 kg.

Cultivations, etc.:- Deep-tine cultivated: 6 Oct, 1990. Ploughed, furrow pressed: 10 Oct. Rotary harrowed, seed sown: 13 Oct. Bifenox and chlorotoluron applied: 13 Nov. PK applied: 6 Dec. Fungicide applied: 9 May, 1991. Glyphosate applied: 12 Aug. Combine harvested: 22 Aug. Previous crops: W. oilseed rape 1989, potatoes 1990.

NOTES: (1) Leaf samples were taken approximately five days after foliar treatment applications to measure N and K contents.
(2) Components of yield were measured.

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91/R/WW/8

GRAIN TONNES/HECTARE

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

FOLIAR N	
NONE	8.71
K20E	8.58
K20EU40E	8.41
U40E	8.12
K5M	8.64
K20M	8.63
K20EK20M	8.89
K20MK20L	8.48
Mean	8.58

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

FOLIAR N	
0.113	min.rep
0.098	max-min

	FOLIAR N
max-min	NONE 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	33	0.179	2.1

GRAIN MEAN DM% 87.4

PLOT AREA HARVESTED 0.00230

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91/R/BW/1

WINTER BARLEY

CONTROL OF VOLUNTEERS

Object: To compare methods of volunteer control in winter barley after w. wheat - Great Harpenden II.

Sponsor: D.G. Christian.

Design: 3 replicates of 8 x 3 criss-cross.

Column plot dimensions: 6.0 x 20.0.

Treatments: All combinations of:-

Column plots

1. **PRIMCULT**	Primary cultivations:	
	NONE	None until just before sowing
	DYNDRIVE	'Bomford Dynadrive'
	PLOUGH	Plough
	TINE	Tine
2. **CULTDATE**	Dates of cultivation:	
	EARLY	13 Aug, 1990
	LATER	3 Sept

Row plots

3. **PRSOWCON**	Pre-sowing volunteer control using weedkillers:	
	GLYPHOS	Glyphosate at 0.27 kg in 200 l on 8 Oct, 1990
	PARAQUAT	Paraquat at 0.60 kg ion in 200 l on 8 Oct
	NONE	None

NOTES: (1) The 'Bomford Dynadrive' has a frame similar to a rotary cultivator but it has two rotating shafts containing flat, slightly twisted, spade-shaped 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.
(2) All plots were heavy spring-tine cultivated on 9 Oct, 1990 then rotary harrowed and the seed sown on 10 Oct.

Basal applications: Manure: 'Nitram' at 460 kg. Weedkillers: Isoproturon at 1.3 kg and pendimethalin at 1.3 kg in 200 l with the insecticide. Fungicides: Prochloraz at 0.40 kg with tridemorph at 0.26 kg in 200 l. Propiconazole at 0.12 kg in 200 l. Insecticide: Deltamethrin at 6.2 g.

Seed: Magie, sown at 150 kg.

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91/R/BW/1

Cultivations, etc.:- Weedkillers with the insecticide applied: 15 Nov, 1990. N applied: 26 Mar, 1991. Prochloraz with tridemorph applied: 23 Apr. Propiconazole applied: 23 May. Combine harvested: 12 Aug. Previous crops: Potatoes 1989, w. wheat 1990.

NOTES: (1) Ears of volunteer plants were counted at anthesis of the sown crop.
(2) Percentage contamination of harvested grain by volunteer grain was measured.

GRAIN TONNES/HECTARE

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

CULTDATE	EARLY	LATER	Mean
PRIMCULT			
NONE	6.52	6.71	6.61
DYNDRIVE	6.83	7.15	6.99
PLOUGH	6.81	6.90	6.86
TINE	6.99	7.41	7.20
Mean	6.79	7.04	6.92

PRSOWCON	GLYPHOS	PARAQUAT	NONE	Mean
PRIMCULT				
NONE	7.04	6.28	6.53	6.61
DYNDRIVE	7.07	7.09	6.83	6.99
PLOUGH	7.28	6.33	6.96	6.86
TINE	7.25	7.19	7.17	7.20
Mean	7.16	6.72	6.87	6.92

PRSOWCON	GLYPHOS	PARAQUAT	NONE	Mean
CULTDATE				
EARLY	7.05	6.67	6.65	6.79
LATER	7.27	6.78	7.09	7.04
Mean	7.16	6.72	6.87	6.92

CULTDATE	EARLY			LATER		
PRIMCULT **PRSOWCON**	GLYPHOS	PARAQUAT	NONE	GLYPHOS	PARAQUAT	NONE
NONE	7.03	6.28	6.25	7.04	6.28	6.81
DYNDRIVE	6.87	7.06	6.58	7.27	7.12	7.07
PLOUGH	7.30	6.12	7.01	7.26	6.55	6.90
TINE	6.99	7.22	6.77	7.50	7.17	7.56

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GRAIN TONNES/HECTARE

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

	PRIMCULT	CULTDATE	PRSOWCON	PRIMCULT CULTDATE
	0.262	0.186	0.187	0.371

	PRIMCULT PRSOWCON	CULTDATE PRSOWCON	PRIMCULT CULTDATE PRSOWCON
	0.387	0.280	0.541

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

PRIMCULT	0.343		
CULTDATE		0.250	
PRSOWCON	0.378	0.267	0.534
PRIMCULT.CULTDATE			0.478

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP1	14	0.455	6.6
BLOCK.WP2	4	0.229	3.3
BLOCK.WP1.WP2	28	0.576	8.3

GRAIN MEAN DM% 84.4

SUB PLOT AREA HARVESTED 0.00094

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91/R/BW/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 barley yellow dwarf virus (BYDV) on winter barley sown on a range of dates - Highfield IV.

Sponsors: G.M. Tatchell, R.T. Plumb.

Design: 4 randomised blocks of 10 plots.

Whole plot dimensions: 3.0 x 21.0.

Treatments: All combinations of:-

1. **SOWDATE** Dates of sowing:

5 SEPT	5 September, 1990
14 SEPT	14 September
24 SEPT	24 September
4 OCT	4 October
17 OCT	17 October

2. **APHICIDE** Aphicide:

NONE	None
CYPERMET	Cypermethrin at 25 g in 300 l on 6 Nov, 1990

NOTES: (1) All **SOWDATE** treatments were rotary cultivated on 31 July, 1990, ploughed on 8 Aug and rotary harrowed on the day of sowing. **SOWDATE** 5 SEPT was rotary harrowed again on 5 Sept.
(2) The experiment was netted against birds during June and July.

Basal applications: Manure: 'Nitram' at 460 kg. Weedkillers: Paraquat at 0.40 kg ion with a wetting agent, 'Vassgro' at 0.06 l, in 200 l. Diflufenican at 0.10 kg and isoproturon at 1.0 kg in 300 l. Fungicides: Fenpropimorph at 0.75 kg in 300 l. Prochloraz at 0.40 kg with tridemorph at 0.26 kg in 200 l. Propiconazole at 0.12 kg in 200 l.

Seed: Magie, sown at 140 kg.

Cultivations, etc.:- Paraquat with wetting agent applied: 3 Sept, 1990. Fenpropimorph applied: 14 Nov. Diflufenican and isoproturon applied: 21 Nov. N applied: 26 Mar, 1991. Prochloraz with tridemorph applied: 23 Apr. Propiconazole applied: 23 May. Combine harvested: 5 Aug. Previous crops: W. wheat 1989, w. barley 1990.

NOTES: (1) Aphid numbers were sampled from September to May.
(2) BYDV was assessed by enzyme-linked immunosorbent assay from November to May and by visual symptoms during May.
(3) Components of yield were measured.

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91/R/BW/2

GRAIN TONNES/HECTARE

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

APHICIDE SOWDATE	NONE	CYPERMET	Mean
5 SEPT	6.31	7.09	6.70
14 SEPT	7.73	8.09	7.91
24 SEPT	8.17	8.94	8.55
4 OCT	7.74	7.82	7.78
17 OCT	7.44	7.65	7.54
Mean	7.48	7.92	7.70

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

SOWDATE	APHICIDE	SOWDATE APHICIDE
0.202	0.128	0.286

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	27	0.404	5.2

GRAIN MEAN DM% 85.6

PLOT AREA HARVESTED 0.00204

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91/R/BS/1

SPRING BARLEY

INSECTICIDES AND APHIDS

Object: To compare the effects of a range of insecticides on the control of aphids and barley yellow dwarf virus (BYDV) and on the yield of spring barley - Stackyard.

Sponsors: N. Carter, R.T. Plumb.

Design: 4 blocks of 5 plots, with external dummy plots and arranged to allow estimation of the effects of neighbouring plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

INSCTCDE	Insecticides:
NONE	None
IMIDA SD	Imidacloprid seed dressing
DELTA SP	Deltamethrin spray applied at 5.0 g
DEMET SP	Demeton-S-methyl spray applied at 0.24 kg
PIRIM SP	Pirimicarb spray applied at 0.14 kg

NOTES: (1) Imidacloprid seed dressing applied as a 35% W/V formulation at 300 ml per 100 kg seed.
(2) Spray treatments were applied in 250 l on 21 May, 1991, and in 300 l on 17 June and 2 July.
(3) A NONE and a DELTA SP plot were inadvertently sprayed with pirimicarb on 2 July. Deltamethrin not subsequently applied to DELTA SP plot. Yields from these plots were treated as missing and estimated values were used in the analysis

Basal applications: Manures: Magnesian limestone at 2.0 t. 'Nitram' at 350 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Mecoprop at 1.2 kg with bromoxynil at 0.19 kg and ioxynil at 0.19 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

Seed: Alexis, sown at 160 kg.

Cultivations, etc.:- Magnesian limestone applied: 31 July, 1990. Ploughed, furrow pressed: 3 Sept. Paraquat applied: 12 Mar, 1991. Heavy spring-tine cultivated: 15 Mar. Spring-tine cultivated: 22 Mar. N applied, spring-tine cultivated, rotary harrowed and seed sown: 16 Apr. Remaining weedkillers applied: 2 June. Fungicide applied: 4 June. Combine harvested: 29 Aug. Previous crops: W. wheat 1989, w. oats 1990.

NOTES: (1) Aphids were sampled from early May to the end of July.
(2) Shoot samples for borers were taken in early July from NONE plots.
(3) BYDV was assessed visually at weekly intervals from mid-June to the end of July.
(4) Plant emergence and components of yield were measured.

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91/R/BS/1

GRAIN TONNES/HECTARE

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

INSCTCDE	
NONE	6.40
IMIDA SD	6.33
DELTA SP	6.78
DEMET SP	6.44
PIRIM SP	6.47
Mean	6.48

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

INSCTCDE
0.087

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.123	1.9

GRAIN MEAN DM% 86.3

PLOT AREA HARVESTED 0.00230

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91/R/BS/2

SPRING BARLEY

SPRAY TIMINGS AND BYDV

Object: To investigate the optimum strategy for controlling barley yellow dwarf virus (BYDV) in spring barley in relation to sowing date, aphid immigration and subsequent population development - Stackyard.

Sponsors: N. Carter, R.T. Plumb.

Design: 3 randomised blocks of 16 plots with external dummy plots and arranged to allow estimation of the effects of neighbouring plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

S P DATE	Dates of sowing and of applying pirimicarb, at 0.14 kg in 300 l on the first, fifth and sixth occasions and in 250 l on the remainder:
E 0	Sown 25 March, 1991 no pirimicarb
E D1	" " " pirimicarb applied 23 Apr
E D2	" " " " " 7 May
E D3	" " " " " 21 May
E D1 D2	" " " " " 23 Apr and 7 May
E D1 D3	" " " " " 23 Apr and 21 May
E D2 D3	" " " " " 7 May and 21 May
E D1D2D3	" " " " " 23 Apr, 7 May and 21 May
L 0	Sown 23 April, no pirimicarb
L D3	" " " pirimicarb applied 21 May
L D4	" " " " " 5 June
L D5	" " " " " 17 July
L D3 D4	" " " " " 21 May and 5 June
L D3 D5	" " " " " 21 May and 17 July
L D4 D5	" " " " " 5 June and 17 July
L D3D4D5	" " " " " 21 May, 5 June and 17 July

Basal applications: Manures: Magnesian limestone at 2.0 t. 'Nitram' at 350 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Mecoprop at 1.2 kg with bromoxynil at 0.19 kg and ioxynil at 0.19 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

Seed: Alexis, sown at 160 kg.

Cultivations, etc.:- Magnesian limestone applied: 31 July, 1990. Ploughed, furrow pressed: 3 Sept. Paraquat applied: 12 Mar, 1991. Heavy spring-tine cultivated: 15 Mar. Spring-tine cultivated: 22 Mar. Early-sown plots rotary harrowed, seed sown: 25 Mar. N applied: 16 Apr. Late-sown plots spring-tine cultivated, rotary harrowed, seed sown: 23 Apr. Remaining weedkillers applied: 2 June. Fungicide applied: 4 June. Combine harvested 29 Aug. Previous crops: W. wheat 1989, w. oats 1990.

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91/R/BS/2

NOTES: (1) Aphids were sampled from mid-April until late July.
(2) Shoot samples for borers were taken in late June.
(3) BYDV was assessed visually at weekly intervals from mid-June until the end of July. Leaves from infected plants were tested using enzyme-linked immunosorbent assays to determine virus strains present.
(4) Plant emergence and components of yield were measured.
(5) The special features of this experiments design are not used in this report.

GRAIN TONNES/HECTARE

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

S P DATE	
E 0	6.13
E D1	6.37
E D2	6.45
E D3	6.48
E D1 D2	6.37
E D1 D3	6.26
E D2 D3	6.35
E D1D2D3	6.27
L 0	5.99
L D3	5.72
L D4	5.94
L D5	5.98
L D3 D4	6.05
L D3 D5	5.72
L D4 D5	5.79
L D3D4D5	5.99
Mean	6.12

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

S P DATE
0.209

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.255	4.2

GRAIN MEAN DM% 86.4

PLOT AREA HARVESTED 0.00230

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91/R/BS/3

SPRING BARLEY

VARIETIES AND HARVEST DATES

Object: To study the effects of harvest dates on the yield and malting quality of three varieties differing in their quality and dormancy characteristics - Stackyard.

Sponsor: J.F. Jenkyn.

Design: 3 randomised blocks of 15 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

   BLENHEIM
   REGATTA
   TRIUMPH

2. **HARVDATE** Dates of harvest:

1	15 Aug, 1991
2	21 Aug
3	27 Aug
4	2 Sept
5	10 Sept

NOTE: An additional replicate was sown to provide material to flush the combine harvester of extraneous grain before each treatment combination.

Basal applications: Manures: Magnesian limestone at 5.0 t. 'Nitram' at 290 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Metsulfuron-methyl at 6.0 g in 200 l. Fungicides: Tridemorph at 0.52 kg in 200 l. Fenpropimorph at 0.75 kg with the insecticide in 200 l. Insecticide: Pirimicarb at 0.14 kg.

Seed: Varieties, dressed ethirimol, flutriafol and thiabendazole, sown at 350 seeds per square metre.

Cultivations, etc.:- Magnesian limestone applied: 31 July, 1990. Ploughed, furrow pressed: 3 Sept. Paraquat applied: 12 Mar, 1991. Heavy spring-tine cultivated: 15 Mar. Spring-tine cultivated: 22 Mar. N applied, rotary harrowed, seed sown: 25 Mar. Tridemorph applied: 4 June. Metsulfuron-methyl applied: 11 June. Fenpropimorph with pirimicarb applied: 10 July. Previous crops: W. wheat 1989, w. oats 1990.

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91/R/BS/3

GRAIN TONNES/HECTARE

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

HARVDATE / VARIETY	1	2	3	4	5	Mean
BLENHEIM	6.69	6.76	6.61	6.69	6.51	6.65
REGATTA	6.88	6.73	6.77	6.73	6.65	6.75
TRIUMPH	6.56	6.52	6.10	6.19	6.32	6.34
Mean	6.71	6.67	6.49	6.54	6.49	6.58

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

VARIETY	HARVDATE	VARIETY HARVDATE
0.073	0.095	0.164

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.201	3.1

GRAIN MEAN DM% 84.4

PLOT AREA HARVESTED 0.00150

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91/R/BS/5

SPRING BARLEY

SUMMER INSECTICIDES AND POLYPHAGOÙS PREDATORS

Object: To study the effects of summer applied insecticides on non-target polyphagous predators - Appletree.

Sponsors: N. Carter, K.F.A. Walters (M.A.F.F)

Design: 3 randomised blocks of 4 plots.

Whole plot dimensions: 8.0 x 15.0.

Treatments:

INSCTCDE	Insecticides:
NONE	None
ALPHAC 1	Alpha-cypermethrin at 7.5 g in 200 l on 11 July, 1991
ALPHAC 2	" " 15.0 g in 200 l on 11 July
DIMETHOA	Dimethoate at 0.34 kg in 520 l on 11 July

NOTE: Polythene barriers were erected around the plots from May until harvest to prevent movement of ground insects.

Basal applications: Manures: Magnesian limestone at 5.0 t. (0:16:36) at 980 kg. 'Nitram' at 360 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Mecoprop at 1.2 kg with bromoxynil at 0.19 kg and ioxynil at 0.19 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

Seed: Alexis, sown at 120 kg.

Cultivations, etc.:- Magnesian limestone applied: 13 Aug, 1990. PK applied: 22 Aug. Glyphosate applied: 12 Sept. Ploughed: 18 Oct. N applied: 12 Apr, 1991. Spring-tine cultivated: 15 Apr. Rotary harrowed, seed sown: 16 Apr. Mecoprop, bromoxynil and ioxynil applied: 2 June. Fungicide applied: 4 June. Combine harvested: 29 Aug. Previous crops: W. oilseed rape 1989, w. wheat 1990.

NOTES: (1) Aphids were sampled during July.
(2) Polyphagous predators were monitored, using pitfall traps, from early July to August.
(3) Components of yield were measured.

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91/R/BS/5

GRAIN TONNES/HECTARE

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

INSCTCDE	
NONE	5.89
ALPHAC 1	6.25
ALPHAC 2	5.72
DIMETHOA	5.96
Mean	5.96

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

INSCTCDE
0.385

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.471	7.9

GRAIN MEAN DM% 86.6

PLOT AREA HARVESTED 0.00345

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91/W/R/1

WINTER RYE

INPUTS

Object: To study the effects of fungicides and rates of growth regulator on the growth and yield of w. rye - Woburn, Lansome II.

Sponsors: P.D.R. Styles, I.H. Barker.

Design: 3 randomised blocks of 6 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments: All combinations of:-

1. **G R RATE** Rates of growth regulator:

1	Chlormequat chloride at 1.6 kg in 200 l; 24 Apr, 1991 and 2-chloroethylphosphonic acid at 0.15 kg with mepiquat chloride at 0.30 kg in 200 l; 10 May
2	Chlormequat chloride at 1.6 kg in 200 l; 24 Apr and 2-chloroethylphosphonic acid at 0.31 kg with mepiquat chloride at 0.61 kg in 200 l; 10 May
3	2-chloroethylphosphonic acid at 0.31 kg with mepiquat chloride at 0.61 kg in 200 l; 10 May

2. **FUNGCIDE** Fungicides:

F+B	Fenpropimorph at 0.38 kg with benodanil at 1.0 kg in 200 l; 23 Apr
F+B+P	As above plus propiconazole at 0.12 kg; 21 May

Basal applications: Manures: Magnesian limestone at 7.5 t. 'Nitram' at 290 kg. Weedkiller: Pendimethalin at 1.0 kg applied with insecticide in 220 l. Insecticide: Deltamethrin at 5.0 g.

Seed: Halo, sown at 100 kg.

Cultivations, etc.:- Deep tine cultivated with tines 1.5 m apart and 0.45 m deep: 18 Aug, 1990. Magnesian limestone applied: 23 Aug. Ploughed: 24 Aug. Rotary harrowed, seed sown: 5 Oct. Weedkiller and insecticide applied: 23 Nov. N applied: 16 Apr, 1991. Combine harvested: 16 Aug. Previous crops: W. wheat 1989 and 1990.

NOTE: Assessments of lodging were made before harvest.

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91/W/R/1

GRAIN TONNES/HECTARE

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

FUNGCIDE G R RATE	F+B	F+B+P	Mean
1	7.48	8.22	7.85
2	7.45	8.60	8.02
3	6.99	8.14	7.57
Mean	7.31	8.32	7.81

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

G R RATE	FUNGCIDE	G R RATE FUNGCIDE
0.170	0.139	0.240

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.294	3.8

GRAIN MEAN DM% 87.3

PLOT AREA HARVESTED 0.00210

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91/R/RAW/1

WINTER OILSEED RAPE

TIMES OF APPLYING FUNGICIDES

Object: To study the single and combined effects of prochloraz applied in autumn, spring and summer on the seed quality and yield of two varieties - Black Horse I N.

Sponsors: L. Figueroa, V.J. Church, B.D.L. Fitt.

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

Whole plots dimensions: 9.0 x 22.5.

Treatments: All combinations of:-

Whole plots

1. **AUTSPRAY** Autumn spray:

NONE	None
PROCHLOR	Prochloraz at 0.50 kg on 3 Dec, 1990

2. **SPRSPRAY** Spring spray:

NONE	None
PROCHLOR	Prochloraz at 0.50 kg on 8 Apr, 1991

3. **SUMSPRAY** Summer spray:

NONE	None
PROCHLOR	Prochloraz at 0.50 kg on 17 June

Sub plots

4. **VARIETY** Varieties:

CAPRCORN	Capricorn
FALCON	Falcon

Basal applications: Manure: 'Nitram' at 320 kg on two occasions. Weedkillers: Paraquat at 0.40 kg ion with a wetting agent, 'Vassgro' at 0.06 l, in 200 l. Metazachlor at 0.75 kg in 200 l. Insecticides: Deltamethrin at 6.2 g in 200 l. Alpha-cypermethrin at 0.02 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent, 'Vassgro' at 0.52 l, in 520 l.

Seed: Varieties, seed dressed gamma-HCH, thiram and fenpropimorph sown at 120 seeds per square metre.

Cultivations, etc.:- Burnt straw, heavy spring-tine cultivated: 31 July, 1990. Paraquat with wetting agent applied: 3 Sept. Cultivated by rotary grubber, rotary harrowed, seed sown: 4 Sept. Metazachlor applied: 2 Oct. Deltamethrin applied: 22 Oct. First N applied: 26 Feb, 1991. Second N applied: 22 Mar. Alphacypermethrin applied: 24 Apr. Desiccant with wetting agent applied: 1 Aug. Combine harvested: 6 Aug. Previous crops: W. wheat 1989, w. barley 1990.

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91/R/RAW/1

NOTE: Incidence of light leaf spot and other diseases were assessed monthly during the season. Airborne inoculum was monitored from January to March 1991 and plant numbers, before and after spray treatments, were recorded. Oil and glucosinolate content of harvested seed and components of yield were measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SPRSPRAY	NONE	PROCHLOR	Mean
AUTSPRAY			
NONE	3.42	3.64	3.53
PROCHLOR	3.66	3.93	3.79
Mean	3.54	3.78	3.66

SUMSPRAY	NONE	PROCHLOR	Mean
AUTSPRAY			
NONE	3.48	3.58	3.53
PROCHLOR	3.78	3.80	3.79
Mean	3.63	3.69	3.66

SUMSPRAY	NONE	PROCHLOR	Mean
SPRSPRAY			
NONE	3.53	3.55	3.54
PROCHLOR	3.73	3.83	3.78
Mean	3.63	3.69	3.66

VARIETY	CAPRCORN	FALCON	Mean
AUTSPRAY			
NONE	3.26	3.80	3.53
PROCHLOR	3.74	3.84	3.79
Mean	3.50	3.82	3.66

VARIETY	CAPRCORN	FALCON	Mean
SPRSPRAY			
NONE	3.36	3.71	3.54
PROCHLOR	3.64	3.93	3.78
Mean	3.50	3.82	3.66

VARIETY	CAPRCORN	FALCON	Mean
SUMSPRAY			
NONE	3.49	3.77	3.63
PROCHLOR	3.51	3.87	3.69
Mean	3.50	3.82	3.66

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91/R/RAW/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	SPRSPRAY	NONE		PROCHLOR	
AUTSPRAY	**SUMSPRAY**	NONE	PROCHLOR	NONE	PROCHLOR
NONE		3.39	3.45	3.57	3.71
PROCHLOR		3.66	3.65	3.90	3.96

	SPRSPRAY	NONE		PROCHLOR	
AUTSPRAY	**VARIETY**	CAPRCORN	FALCON	CAPRCORN	FALCON
NONE		3.11	3.73	3.40	3.88
PROCHLOR		3.62	3.70	3.87	3.99

	SUMSPRAY	NONE		PROCHLOR	
AUTSPRAY	**VARIETY**	CAPRCORN	FALCON	CAPRCORN	FALCON
NONE		3.22	3.74	3.30	3.86
PROCHLOR		3.76	3.80	3.72	3.88

	SUMSPRAY	NONE		PROCHLOR	
SPRSPRAY	**VARIETY**	CAPRCORN	FALCON	CAPRCORN	FALCON
NONE		3.39	3.66	3.34	3.76
PROCHLOR		3.59	3.88	3.68	3.98

		SUMSPRAY	NONE		PROCHLOR	
AUTSPRAY	**SPRSPRAY**	**VARIETY**	CAPRCORN	FALCON	CAPRCORN	FALCON
NONE	NONE		3.11	3.67	3.11	3.78
	PROCHLOR		3.33	3.81	3.48	3.95
PROCHLOR	NONE		3.68	3.65	3.56	3.75
	PROCHLOR		3.85	3.95	3.89	4.02

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91/R/RAW/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

AUTSPRAY	SPRSPRAY	SUMSPRAY	VARIETY
0.071	0.071	0.071	0.042

AUTSPRAY SPRSPRAY	AUTSPRAY SUMSPRAY	SPRSPRAY SUMSPRAY	AUTSPRAY VARIETY
0.100	0.100	0.100	0.082

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

AUTSPRAY	0.059

SPRSPRAY VARIETY	SUMSPRAY VARIETY	AUTSPRAY SPRSPRAY SUMSPRAY	AUTSPRAY SPRSPRAY VARIETY
0.082	0.082	0.141	0.116

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

SPRSPRAY	0.059
SUMSPRAY	0.059
AUTSPRAY.SPRSPRAY	0.083

AUTSPRAY SUMSPRAY VARIETY	SPRSPRAY SUMSPRAY VARIETY	AUTSPRAY SPRSPRAY SUMSPRAY VARIETY
0.116	0.116	0.164

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

AUTSPRAY.SUMSPRAY	0.083
SPRSPRAY.SUMSPRAY	0.083
AUTSPRAY.SPRSPRAY.SUMSPRAY	0.118

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.141	3.9
BLOCK.WP.SP	8	0.118	3.2

GRAIN MEAN DM% 79.4

SUB PLOT AREA HARVESTED (VARIES BETWEEN BLOCKS) 0.00518 or 0.00483

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91/R/RAW/2

WINTER OILSEED RAPE

VARIETIES AND FUNGICIDES

Object: To investigate the effects of fungicides on a range of low glucosinolate varieties - Black Horse I N.

Sponsors: V.J. Church, B.D.L. Fitt.

Design: 4 randomised blocks of 12 plots.

Whole plot dimensions: 3.0 x 21.0.

Treatments: All combinations of:-

1. **VARIETY**	Varieties:	
	CAPRCORN	Capricorn
	COBRA	Cobra
	ENVOL	Envol
	FALCON	Falcon
	LIBRAVO	Libravo
	SAMOURAI	Samourai
2. **FUNGCIDE**	Fungicides:	
	NONE	None
	PR+CA+IP	Prochloraz at 0.45 kg and carbendazim at 0.17 kg in 200 l on 3 Dec, 1990 and 8 Apr, 1991. Iprodione at 0.50 kg in 200 l on 17 June.

Basal applications: Manure: 'Nitram' at 320 kg on two occasions. Weedkillers: Paraquat at 0.40 kg ion with a wetting agent, 'Vassgro' at 0.06 l, in 200 l. Metazachlor at 0.75 kg in 200 l. Insecticide: Deltamethrin at 6.2 g and on a second occasion at 12.5 g both in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent, 'Vassgro' at 0.52 l, in 520 l.

Seed: Varieties sown at 120 seeds per square metre. Seed dressed with gamma-HCH, thiram and fenpropimorph except for **VARIETY** ENVOL, which was untreated.

Cultivations, etc.:- Heavy spring-tine cultivated: 31 July, 1990. Paraquat with wetting agent applied, cultivated with rotary grubber: 3 Sept. Rotary harrowed, seed sown: 4 Sept. Metazachlor applied: 2 Oct. First deltamethrin applied: 23 Oct. First N applied: 26 Feb, 1991. Second N applied: 22 Mar. Second deltamethrin applied: 12 Apr. Desiccant with wetting agent applied: 7 Aug. Combine harvested: 13 Aug. Previous crops: W. wheat 1989, w. barley 1990. to post-harvest.

NOTE: Disease assessments were made from November to post-harvest. Plots were assessed for cabbage stem flea beetle damage in October and pollen beetle damage in April. Glucosinolate levels and oil content were measured.

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91/R/RAW/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE VARIETY	NONE	PR+CA+IP	Mean
CAPRCORN	2.13	2.78	2.46
COBRA	1.70	2.52	2.11
ENVOL	1.93	2.68	2.30
FALCON	2.28	2.73	2.50
LIBRAVO	2.64	2.99	2.81
SAMOURAI	1.78	2.67	2.22
Mean	2.08	2.73	2.40

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

VARIETY	FUNGCIDE	VARIETY FUNGCIDE
0.159	0.092	0.225

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	33	0.319	13.3

GRAIN MEAN DM% 88.5

PLOT AREA HARVESTED 0.00483

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91/R/RAW/4

WINTER OILSEED RAPE

N, S AND GLUCOSINOLATES

Object: To study the separate and combined effects of rates of nitrogen and sulphur on the quality and yield of three varieties of w. oilseed rape - Pastures.

Sponsors: J.E. Fieldsend, J. Spink, J.E. Leach, H. Stevenson.

Design: 4 replicates of 3 x 3 x 3 in blocks of 9 plots.

Whole plot dimensions: 3.0 x 21.0.

Treatments: All combinations of:

1.	**VARIETY**	Varieties:
	ARIANA	Ariana
	FALCON	Falcon
	LIBRAVO	Libravo
2.	**N**	Nitrogen fertilizer (kg N) as 'Nitram' on 12 Mar, 1991:
	0	
	150	
	250	
3.	**S**	Sulphur (kg S) as calcium sulphate on 13 Mar:
	0	
	50	
	100	

NOTE: Sulphur was applied as gypsum (17.5% S).

Basal applications: Manure: Magnesian limestone at 5.0 t. Weedkiller: Metazachlor at 0.75 kg in 200 l. Fungicide: Prochloraz at 0.40 kg in 300 l. Insecticide: Deltamethrin at 6.2 g in 200 l. Irrigation: 25 mm applied on two occasions.

Seed: Varieties, dressed fenpropimorph, gamma-HCH and thiram, sown at 120 seeds per square metre.

Cultivations, etc.:- Magnesian limestone applied: 31 July, 1990. Ploughed: 3 Aug. Rotary harrowed: 28 Aug. Rotary harrowed, seed sown: 29 Aug. Weedkiller applied: 30 Aug. Irrigation applied: 13 and 27 Sept. Deltamethrin applied: 15 Oct. Fungicide applied: 23 Apr, 1991. Combine harvested: 8 Aug. Previous crops: W. wheat 1989, w. barley 1990.

NOTE: Crop samples were taken on five occasions throughout the season and a further five during seed development, to measure nitrogen, sulphur and glucosinolate content.

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91/R/RAW/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N	0	150	250	Mean
VARIETY				
ARIANA	2.94	3.80	3.67	3.47
FALCON	2.87	3.53	3.85	3.42
LIBRAVO	2.88	3.52	3.06	3.15
Mean	2.90	3.61	3.53	3.35

S	0	50	100	Mean
VARIETY				
ARIANA	3.53	3.39	3.49	3.47
FALCON	3.34	3.48	3.43	3.42
LIBRAVO	3.04	3.27	3.15	3.15
Mean	3.30	3.38	3.35	3.35

S	0	50	100	Mean
N				
0	2.99	2.82	2.88	2.90
150	3.47	3.69	3.68	3.61
250	3.44	3.64	3.50	3.53
Mean	3.30	3.38	3.35	3.35

	S	0	50	100
VARIETY	**N**			
ARIANA	0	3.11	2.81	2.90
	150	3.73	3.71	3.94
	250	3.73	3.66	3.61
FALCON	0	3.00	2.74	2.88
	150	3.06	3.76	3.76
	250	3.97	3.94	3.63
LIBRAVO	0	2.86	2.91	2.85
	150	3.63	3.58	3.35
	250	2.63	3.31	3.25

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

VARIETY	**N**	**S**	**VARIETY N**
0.067	0.067	0.067	0.116

VARIETY S	**N S**	**VARIETY N S**
0.116	0.116	0.211

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

VARIETY	0.207
N	0.207
S	0.207
VARIETY.N	0.214
VARIETY.S	0.214
N.S	0.214

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91/R/RAW/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
REP.BLOCK.WP	70	0.283	8.5

GRAIN MEAN DM% 82.8

SUB PLOT AREA HARVESTED 0.00345

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91/R/RAW/6

WINTER OILSEED RAPE

FUNGICIDES AND LIGHT LEAF SPOT

Object: To study the effects of three dates of applying prochloraz on light leaf spot (Pyrenopeziza brassicae) and yield of winter oilseed rape - Great Field I.

Sponsors: L. Figueroa, B.D.L. Fitt.

Design: 4 randomised blocks of 4 plots.

Whole plot dimensions: 3.0 x 25.0.

Treatments:

PROCHLOR	Date of applying prochloraz at 0.5 kg in 200 l:
NEVER	Never
WINTER	3 Dec, 1990
SPRING	8 Apr, 1991
SUMMER	17 June

Basal applications: Manure: 'Nitram' at 320 kg on two separate occasions. Weedkillers: Glyphosate at 0.54 kg in 200 l. Metazachlor at 0.75 kg in 200 l. Insecticide: Alphacypermethrin at 0.02 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent, 'Vassgro' at 0.52 l, in 520 l. Irrigation: 25 mm.

Seed: Cobra, seed not dressed, sown at 6.0 kg.

Cultivations, etc.:- Rotary cultivated: 21 July, 1990. Glyphosate applied: 24 Aug. Cultivated by rotary grubber: 28 Aug. Seed sown: 30 Aug. Metazachlor applied: 31 Aug. Irrigated: 14 Sept. N applied: 26 Feb, 1991, and 21 Mar. Insecticide applied: 24 Apr. Desiccant with wetting agent applied: 29 July. Combine harvested: 5 Aug. Previous crops: S. barley 1989, w. oilseed rape 1990.

NOTE: Incidence and severity of light leaf spot and other diseases were assessed monthly. Airborne inoculum was monitored from sowing to March. Oil, glucosinolate content and components of yield were measured and meteorological data recorded.

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91/R/RAW/6

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PROCHLOR	
NEVER	2.66
WINTER	2.66
SPRING	2.77
SUMMER	2.64
Mean	2.68

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

PROCHLOR
0.105

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.148	5.5

GRAIN MEAN DM% 87.7

PLOT AREA HARVESTED 0.00253

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91/R/RAW/9

WINTER OILSEED RAPE

WEED COMPETITION

Object: To study the effects of a range of densities of two weed species on the growth and yield of w. oilseed rape - Pastures.

Sponsor: P.J.W. Lutman.

Design: 4 randomised blocks of 12 plots.

Whole plot dimensions: 3.0 x 6.0.

Treatments: All combinations of:-

1. **WEED SPC** Weed species:

S MEDIA	Stellaria media
V PERSIC	Veronica persica

2. **SOW DENS** Sowing density of weed seeds (seeds per square metre):

1	300
2	600
3	1200
4	2400
5	4800

plus one extra treatment without sown weed seeds:

EXTRA	
NONE	None (duplicated)

Basal applications: Manures: Magnesian limestone at 5.0 t. 'Nitram' at 320 kg on two occasions. Weedkiller: Quizalofop-ethyl at 0.12 kg with a wetting agent, 'Actipron at 2.0 l, in 200 l. Fungicide: Prochloraz at 0.40 kg in 200 l. Insecticide: Deltamethrin at 6.2 g in 200 l and later at 12.5 g in 200 l. Irrigation: 25 mm applied on two occasions

Seed: Libravo, dressed fenpropimorph, gamma-HCH and thiram, sown at 6.0 kg.

Cultivations, etc.:- Magnesian limestone applied: 31 July, 1990. Ploughed and rolled: 3 Aug. Rotary harrowed twice, cultivated by rotary grubber, seed sown: 5 Sept. Irrigated: 13 and 27 Sept. First deltamethrin applied: 15 Oct. Weedkiller with wetting agent applied: 23 Oct. First N applied: 27 Feb, 1991. Second N applied: 21 Mar. Second deltamethrin applied: 12 Apr. Fungicide applied: 23 Apr. Harvested by hand: 30 July. Previous crops: W. wheat 1989, w. barley 1990.

NOTE: Samples of crop and weed were taken in December, March, May and July for assessment of the effects of weeds on the growth of the rape. Components of yield were measured.

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91/R/RAW/9

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOW DENS	1	2	3	4	5	Mean
WEED SPC						
S MEDIA	3.94	3.75	3.24	3.73	3.35	3.60
V PERSIC	3.72	3.82	4.21	3.30	3.16	3.64
Mean	3.83	3.78	3.73	3.52	3.26	3.62
NONE	3.77					
GRAND MEAN	3.65					

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

WEED SPC	**SOW DENS**	**WEED SPC SOW DENS**
0.207	0.327	0.462

SED of **NONE** v any item in the **WEED SPC.SOW DENS** table is 0.400

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	34	0.654	17.9

MEAN DM% *

PLOT AREA HARVESTED 0.00020

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91/R/RAW/10

WINTER OILSEED RAPE

DWARF STRAINS

Object: To compare the growth and yield of w. oilseed rape strains containing a dwarfing gene with standard strains - Long Hoos IV 5.

Sponsors: T. Scott, J.E. Leach.

Design: 2 randomised blocks of 13 plots.

Whole plot dimensions: 2.0 x 10.0.

Treatments: All combinations of:-

1. **ISO LINE** Isogenic lines:

   1
   2
   3
   4

2. **ISO TYPE** Types within lines:

DWARF	Dwarf
INTER	Intermediate
TALL	Tall

plus one extra treatment:

LIBRAVO	Standard tall variety Libravo

Basal applications: Manures: (0:16:36) at 1.1 t. Magnesian limestone at 2.9 t. 'Nitram' at 640 kg. Weedkiller: Metazachlor at 0.75 kg in 200 l. Insecticide: Alpha-cypermethrin at 20 g in 220 l. Irrigation: 25 mm on two occasions.

Seed: Various, sown at 8.0 kg.

Cultivations, etc.:- P and K applied: 3 Sept, 1990. Magnesian limestone applied, ploughed: 4 Sept. Rolled: 5 Sept. Rotary harrowed: 7 Sept. Cultivated with rotary grubber and rotary harrowed, seed sown, rolled, weedkiller applied: 10 Sept. Irrigated: 18 and 26 Sept. N applied: 14 Mar, 1991. Insecticide applied: 7 May. Hand harvested: 1 Aug.

NOTES: (1) The plots were netted against birds from late autumn to summer.
(2) Measurements were made of light penetration, total dry matter and nitrogen content at 50% flowering, maximum crop size and at harvest. After harvest components of yield were assessed.

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91/R/RAW/10

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

ISO LINE / ISO TYPE	1	2	3	4	Mean
DWARF	1.31	0.84	1.01	0.89	1.01
INTER	1.26	2.86	2.01	2.57	2.18
TALL	3.14	2.25	3.45	3.52	3.09
Mean	1.90	1.99	2.16	2.33	2.09

LIBRAVO 4.82

GRAND MEAN 2.30

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

ISO TYPE	ISO LINE	ISO TYPE ISO LINE & LIBRAVO
0.602	0.696	1.205

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	1.204	52.4

MEAN DM% 94.4

PLOT AREA HARVESTED 0.00010

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91/R/LP/1

WINTER LUPINS

SEED RATES AND GROWTH REGULATOR

Object: To compare the effects of different times of applying triapenthanol to three different seed rates on the growth and yield of w. lupins - Long Hoos V 2.

Sponsor: D.P. Yeoman.

Design: 3 randomised blocks of 14 plots.

Whole plot dimensions: 1.8 x 8.0.

Treatments: All combinations of:-

1. **G R TIME** — Times of applying triapenthanol at 0.64 kg in 220 l:

NEVER	Never
PRE FLR	Pre-flowering, on 21 May, 1991
TERM POD	First pods on terminal inflorescence, on 20 June
SEC POD	First pods on secondary inflorescence, on 17 July

2. **SEEDRATE** — Seed rates (kg):

100
200
300

plus two extra treatments: sown at 200 kg, triapenthanol applied at 0.32 kg in 220 l on each of two occasions:

EXTRA

MAY+JUNE	21 May and 20 June
MAY+JULY	21 May and 17 July

Basal applications: Weedkillers: Terbuthylazine at 0.42 kg and terbutryn at 0.98 kg in 200 l. Fungicide: Prochloraz at 0.45 kg applied with the insecticide in 200 l. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.60 kg ion applied with a wetting agent, 'Vassgro', in 400 l. Previous crops: Fallow 1989, s. barley 1990.

Seed: Lugel (C8) inoculated with Rhizobium, sown at 60 seeds per square metre.

Cultivations, etc.:- Ploughed and rolled: 11 Sept, 1990. Cultivated with rotary grubber, rotary harrowed, seed sown, harrowed: 26 Sept. Weedkillers applied, rolled: 27 Sept. Fungicide and insecticide applied: 22 July, 1991. Desiccant applied: 12 Sept. Combine harvested: 22 Oct.

NOTE: The crop was netted against birds and mammals from after sowing until spring.

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91/R/LP/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE / G R TIME	100	200	300	Mean
NEVER	0.55	0.74	0.87	0.72
PRE FLR	0.55	0.56	0.79	0.63
TERM POD	0.58	0.80	0.95	0.78
SEC POD	0.52	0.55	0.96	0.68
Mean	0.55	0.66	0.89	0.70

EXTRA	MAY+JUNE	MAY+JULY	Mean
	0.66	0.71	0.69

GRAND MEAN 0.70

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

G R TIME	SEEDRATE	G R TIME SEEDRATE & EXTRA
0.095	0.082	0.164

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

Stratum	d.f.	s.e.	cv%
BLOCK	26	0.201	28.7

GRAIN MEAN DM% 69.4

PLOT AREA HARVESTED 0.00144

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91/R/LP/2

WINTER LUPINS

PRUNING STUDY

Object: To study the effects of different amounts of manual pruning on the maturity date and yield of indeterminate varieties for comparison with a genetically determinate variety - Long Hoos V 4.

Sponsors: J.M. Day, G.F.J. Milford, J.E. Leach, H.J. Stevenson.

Design: 4 randomised blocks of 8 plots.

Whole plot dimensions: 1.8 x 9.0.

Treatments:

VAR PRUN	Varieties and pruning:
SDL 1 U	SDL 1, unpruned
LUGEL U	Lugel, unpruned
LG SI E	Lugel, secondary branches and inflorescences removed early on 20 May, 1991
LG SI L	Lugel, secondary branches and inflorescences removed late on 3 June
LG T	Lugel, tertiary branches removed on 5 June
LUNOBL U	Lunoble, unpruned
LN SI E	Lunoble, secondary branches and inflorescences removed early on 20 May
LN T	Lunoble, tertiary branches removed on 5 June

Basal applications: Manures: (0:16:36) at 1.1 t. Weedkillers: Terbuthylazine at 0.42 kg and terbutryn at 0.98 kg in 200 l. Fluazifop-P-butyl at 0.19 kg applied with a wetting agent, 'Vassgro' at 0.22 l, in 220 l. Fungicides: Chlorothalonil at 1.5 kg with benomyl at 0.55 kg in 200 l. Prochloraz at 0.45 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg in 200 l.

Seed: Varieties, inoculated with Rhizobium, sown at 60 seeds per square metre.

Cultivations, etc.:- P and K applied: 3 Sept, 1990. Ploughed and rolled: 11 Sept. Cultivated with rotary grubber, rotary harrowed, seed sown: 25 Sept. Rolled, terbuthylazine and terbutryn applied: 27 Sept. Fluazifop-P-butyl with wetting agent applied: 13 Dec. Insecticide applied: 2 July, 1991. Chlorothalonil and benomyl applied: 10 July. Prochloraz applied: 22 July. Hand harvested: 10 Sept (LG SI E, LG SI L, LN SI E), 19 Sept (SDL 1 U, LG T, LN T) and 14 Oct (LUGEL U, LUNOBL U).

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91/R/LP/2

NOTES: (1) The crop was netted against birds and mammals from sowing to mid-June.
(2) Leaf numbers, flower and pod development were monitored. Dry matter was measured in May and July.
(3) Measurements of light interception by the crop were made in spring and summer.
(4) Because of the shortage of seed, the yield of one plot of SDL 1 U was lost. Estimated values were used in the analysis.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VAR PRUN	
SDL 1 U	4.59
LUGEL U	1.41
LG SI E	0.08
LG SI L	0.18
LG T	1.66
LUNOBL U	2.24
LN SI E	0.37
LN T	2.68
Mean	1.65

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

VAR PRUN
0.301

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.426	25.8

GRAIN MEAN DM% *

PLOT AREA HARVESTED 0.00065

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91/R/LP/3

WINTER LUPINS

SEED RATES

Object: To study the effects of plant density on the growth, development, maturity date and yield of w. lupins - Long Hoos III 2.

Sponsors: J.M. Day, G.F.J. Milford, J.E. Leach, H.J. Stevenson.

Design: 4 randomised blocks of 6 plots.

Whole plot dimensions: 3.6 x 9.0.

Treatments:

POPULATN Plant populations per square metre in rows 36 cm apart:

7
14
21
28
35 (duplicated)

NOTE: The final populations were established in spring by hand thinning from larger sown populations - 35 and 70 seeds per square metre.

Basal applications: Manures: Muriate of potash at 520 kg. Weedkillers: Terbuthylazine at 0.42 kg and terbutryn at 0.98 kg in 200 l. Fluazifop-P-butyl at 0.19 kg applied with a wetting agent, 'Vassgro' at 0.2 l, in 220 l. Fungicide: Prochloraz at 0.45 kg applied with the insecticide in 200 l. Insecticide: Pirimicarb at 0.14 kg.

Seed: Lunoble, inoculated with Rhizobium, at two seed rates.

Cultivations, etc.:- Deep-tine cultivated with vibrating tines 60 cm apart and 45 cm deep: 13 Sept, 1990. K applied: 14 Sept. Ploughed and furrow pressed: 17 Sept. Cultivated with rotary grubber, harrowed, seed sown: 24 Sept. Rolled, terbuthylazine and terbutryn applied: 27 Sept. Fluazifop-P-butyl applied: 13 Dec. Fungicide and insecticide applied: 22 July, 1991. Combine harvested: 22 Oct.

NOTES: (1) The crop was netted against birds and mammals from sowing to mid-June.

(2) It was originally intended to have populations of 42 and 56 plants per square netre, but establishment was poor and these became **POPULATN** 35. In two blocks the target population of 35 was not achieved, and consequently 4 plots were treated as missing. Estimated values were used in the analysis.

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91/R/LP/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

POPULATN	
7	1.42
14	1.43
21	1.45
28	1.32
35	1.55
Mean	1.45

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

POPULATN	
0.154	min.rep
0.134	max-min

	POPULATN
max-min	35 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	12	0.218	15.0

GRAIN MEAN DM% 73.1

AVERAGE PLOT AREA HARVESTED 0.00184

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91/R/SU/1

SUNFLOWERS

VARIETIES AND BOTRYTIS

Object: To study the incidence of Botrytis cinerea on two varieties of sunflower and to compare their yields in the absence of fungicide treatment - Great Harpenden I.

Sponsors: V.J. Church, B.D.L. Fitt.

Design: 8 randomised blocks of 2 plots.

Whole plot dimensions: 3.5 x 10.0.

Treatments:

VARIETY Varieties:

S 47
ALLEGRO

Basal applications: Manures: (0:16:36) at 980 kg. (12:20:20) at 380 kg. Weedkillers: Trifluralin at 1.1 kg in 200 l. Linuron at 0.48 kg in 200 l.

Seed: Varieties, sown at 12 seeds per square metre.

Cultivations, etc.:- First PK applied: 3 Sept, 1990. Ploughed: 11 Dec. NPK applied: 11 Apr, 1991. Heavy spring-tine cultivated: 24 Apr. Rotary harrowed, trifluralin applied, rotary harrowed, seed sown, rolled: 29 Apr. Linuron applied: 9 May. Hand harvested: 9 Sept. Previous crops: W. barley 1989 and 1990.

NOTE: Selected plants were monitored daily for growth stage and for disease from flowering to harvest. Numbers of Botrytis spores were recorded daily using a Burkard spore trap. Seed moisture content was measured at intervals after flowering.

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91/R/SU/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VARIETY	
S 47	2.48
ALLEGRO	2.43
Mean	2.45

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

VARIETY
0.071

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.143	5.8

GRAIN MEAN DM% 71.2

PLOT AREA HARVESTED 0.00150

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91/R/SU/2

SUNFLOWERS

BIRD REPELLANT

Object: To study the effects of applying two rates of a saponin, at two times, on damage by birds to and yields of sunflowers - Great Harpenden I.

Sponsor: V.J. Church.

Design: 5 x 5 quasi-complete Latin square.

Whole plot dimensions: 3.5 x 10.0.

Treatments:

SAP R T	Rates and times of applying a saponin (as weight of quinoa husk):
NONE	None
S1 E	51 kg applied 8 Aug, 1991
S1 L	51 kg applied 28 Aug
S2 E	57 kg applied 8 Aug
S2 L	57 kg applied 28 Aug

NOTES: (1) On S1 plots saponin was applied as ground quinoa husk in 860 l/ha.
(2) On S2 plots saponin was applied as ground quinoa husk as a dry dust.

Basal applications: Manures: (0:16:36) at 980 kg. (12:20:20) at 380 kg. Weedkillers: Trifluralin at 1.1 kg in 200 l. Linuron at 0.50 kg, in 400 l.

Seed: Allegro, sown at 9 seeds per square metre.

Cultivations, etc.:- First PK applied: 3 Sept, 1990. Ploughed: 11 Dec. NPK applied: 11 Apr, 1991. Heavy spring-tine cultivated: 24 Apr. Rotary harrowed, trifluralin applied, rotary harrowed, seed sown, rolled: 26 Apr. Linuron applied: 3 May. Hand harvested: 10 Sept. Previous crops: W. barley 1989 and 1990.

NOTE: Growth stage and bird damage was monitored twice weekly. Rainfall was recorded after repellant application. Disease was assessed before harvest and seed moisture measured on three occasions before harvest.

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91/R/SU/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SAP R T	
NONE	1.91
S1 E	2.08
S1 L	1.84
S2 E	1.80
S2 L	2.03
Mean	1.93

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

SAP R T
0.115

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

Stratum	d.f.	s.e.	cv%
ROW.COL	12	0.182	9.4

GRAIN MEAN DM% 62.4

PLOT AREA HARVESTED 0.00150

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91/R/LN/1

LINSEED

VARIETIES AND FUNGICIDES

Object: To study the effects of fungicides on the incidence of diseases and on the yield of four varieties - Long Hoos I/II.

Sponsors: B.D.L. Fitt, H. Davies.

Design: 4 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

ANTARES	Antares
BARBARA	Barbara
NORLIN	Norlin
MCGREGOR	McGregor

2. **FUNGCIDE** Fungicides:

NONE	None
PR+IP+CM	Prochloraz (as seed dressing) at 0.40 g/kg seed Prochloraz at 0.32 kg in 200 l on 2 July, 1991 Iprodione at 0.50 kg in 200 l on 22 July Carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l on 1 Aug

Basal applications: Manure: 'Nitram' at 220 kg. Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with bentazone at 0.96 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent, 'Vassgro' at 0.40 l, in 400 l.

Seed: Varieties, sown at 600 seeds per square metre.

Cultivations, etc.:- Ploughed: 31 Oct, 1990. N applied: 9 Apr, 1991. Spring-tine cultivated, rotary harrowed, seed sown: 10 Apr. Weedkillers applied: 6 June. Desiccant with wetting agent applied: 2 Sept. Combine harvested: 10 Oct. Previous crops: Potatoes 1989, linseed 1990.

NOTE: The incidence of diseases was assessed regularly during the season. Oil content of harvested seed was measured.

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91/R/LN/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE / VARIETY	NONE	PR+IP+CM	Mean
ANTARES	2.22	2.43	2.32
BARBARA	2.43	2.37	2.40
NORLIN	1.50	1.85	1.67
MCGREGOR	1.67	2.13	1.90
Mean	1.95	2.19	2.07

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

VARIETY	FUNGCIDE	VARIETY FUNGCIDE
0.126	0.089	0.179

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	21	0.253	12.2

GRAIN MEAN DM% 85.7

PLOT AREA HARVESTED 0.00276

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91/R/LN/2

LINSEED

FUNGICIDES AND DISEASE RESISTANCE

Object: To study the effects of different fungicides on the pathogens and yield of linseed - Long Hoos IV 4.

Sponsors: I. Vloutoglou, B.D.L. Fitt.

Design: 5 randomised blocks of 4 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

FUNGCIDE	Fungicides:
NONE	None
BENOMYL	Benomyl at 0.14 kg
IPRODION	Iprodione at 0.25 kg
PROCHLOR	Prochloraz at 0.16 kg

NOTE: Fungicides were applied in 220 l on 20 June, 1991, 10 and 23 July, 7 and 27 Aug.

Basal applications: Manure: 'Nitram' at 220 kg. Weedkillers: Bentazone at 0.96 kg with bromoxynil at 0.24 kg and clopyralid at 0.05 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with wetting a agent, 'Vassgro' at 0.4 l, in 400 l.

Seed: Antares undressed, sown at 600 seeds per square metre.

Cultivations, etc.:- Ploughed: 4 Sept, 1990. N applied: 9 Apr, 1991. Rotary harrowed, seed sown, rolled: 10 Apr. Weedkillers applied: 6 June. Desiccant with wetting agent applied: 2 Sept. Combine harvested: 11 Oct. Previous crops: S. barley 1989, w. wheat 1990.

NOTE: Foliar diseases were assessed throughout the growing season.

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91/R/LN/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE	
NONE	2.24
BENOMYL	2.59
IPRODION	2.50
PROCHLOR	2.67
Mean	2.50

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

FUNGCIDE
0.082

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.129	5.2

GRAIN MEAN DM% 87.1

PLOT AREA HARVESTED 0.00230

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91/R/LN/4

LINSEED

RATES AND TIMES OF FUNGICIDE

Object: To study the effects of fungicide rates and timing on the control of pathogens and on the yield of linseed - White Horse II.

Sponsor: B.D.L. Fitt.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments:

FUNG R T	Fungicides, rates and times of application:
NONE	None
PROC 4 E	Prochloraz at 400 g, applied early on 20 June, 1991
PROC 5 E	" " 500 g, " " " 20 June
PROC 4 L	" " 400 g, " later " 17 July
PROC 5 L	" " 500 g, " " " 17 July
P2E+P2L	" " 250 g, " early on 20 June and later on 17 July
P3E+FN6E	" " 394 g + fenpropimorph at 656 g applied early on 20 June
P3L+FN6L	Prochloraz + fenpropimorph at above rates applied later on 17 July

NOTE: Fungicides were applied in 200 l.

Basal applications: Manure: 'Nitram' at 220 kg. Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with bentazone at 0.96 kg in 200 l. Desiccant: Diquat at 0.60 kg ion, with a wetting agent, 'Vassgro' at 0.40 l, in 400 l.

Seed: Antares, dressed prochloraz, sown at 600 seeds per square metre.

Cultivations, etc.:- Ploughed: 18 Oct, 1990. N applied: 9 Apr, 1991. Spring-tine cultivated, rotary harrowed, seed sown: 10 Apr. Weedkillers applied: 5 June. Desiccant with wetting agent applied: 2 Sept. Combine harvested: 9 Oct. Previous crops: W. wheat 1989 and 1990.

NOTE: The incidence of diseases was assessed regularly during the season.

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91/R/LN/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNG R T	
NONE	1.52
PROC 4 E	1.77
PROC 5 E	1.51
PROC 4 L	1.54
PROC 5 L	1.85
P2E+P2L	1.58
P3E+FN6E	1.61
P3L+FN6L	1.76
Mean	1.64

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

FUNG R T
0.199

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.244	14.8

GRAIN MEAN DM% 84.7

PLOT AREA HARVESTED 0.00345

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91/R/P/1

POTATOES

CONTROL OF STORAGE DISEASES

Object: To study the effects of applying fungicides to seed tubers, harvest dates and post-harvest treatments on tuber diseases - Great Harpenden I.

Sponsors: S.M. Hall, G.A. Hide.

Design: 3 randomised blocks of 3 whole plots split into 9 sub plots.

Whole plot dimensions: 16.5 x 11.4.

Treatments: All combinations of:-

Whole plots

1. **HARVDATE** Dates of harvest:

H1	28 Aug, 1991
H2	18 Sept
H3	9 Oct

Sub plots

2. **FUNGRATE** Concentration of a mixture of thiabendazole (30%) and imazalil (10%) as a pre-planting dip:

0	None
F1	0.27% active ingredient of mixture
F2	0.07% active ingredient of mixture

NOTE: **HARVDATE** H1 and H2 haulm was pulverised 16 days before lifting and **HARVDATE** H3 was pulverised 14 days before lifting.

Basal applications: Manures: (0:20:32) at 980 kg. (12:20:20) at 1530 kg. Weedkillers: Linuron at 1.6 kg with paraquat at 0.60 kg ion in 200 l. Fungicides: Maneb at 0.96 kg and zinc oxide at 22 g in 200 l on three occasions, the first and third occasion with a wetting agent, 'Bond' at 0.2 l, and the second with the pirimicarb. Mancozeb at 1.4 kg with a wetting agent, 'Bond' at 0.2 l, in 200 l. Fentin hydroxide at 0.27 kg with a wetting agent, 'Nu Film P' at 0.18 l, in 200 l. Insecticide: Pirimicarb at 0.14 kg. Irrigation: 19 mm.

Variety: King Edward.

Cultivations, etc.:- PK applied: 4 Dec, 1990. Ploughed: 11 Dec. NPK applied: 11 Apr, 1991. Rotary harrowed, ridged: 15 Apr. Hand planted, split back: 16 Apr. Rotary ridged: 9 May. Weedkillers applied: 21 May. First maneb, zinc oxide and wetting agent applied: 1 July. Maneb, zinc oxide and pirimicarb applied: 10 July. Second maneb, zinc oxide and wetting agent applied: 19 July. Mancozeb with wetting agent applied: 1 Aug. Fentin hydroxide with wetting agent applied: 12 Aug. Irrigation applied: 14 Aug.

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NOTES: (1) Tuber diseases were assessed after harvest and in storage.
(2) Yields were not taken on **HARVDATE** H1.

TOTAL TUBERS TONNES/HECTARE

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

FUNGRATE	O	F1	F2	Mean
HARVDATE				
H2	44.0	45.3	46.7	45.4
H3	48.7	47.4	47.3	47.8
Mean	46.4	46.4	47.0	46.6

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

FUNGRATE	**HARVDATE*** **FUNGRATE**
1.77	2.50

* Within the same level of **HARVDATE** only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	44	5.31	11.4

PERCENTAGE WARE 4.44 CM (1.75 INCH) RIDDLE

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

FUNGRATE	O	F1	F2	Mean
HARVDATE				
H2	64.0	67.8	65.4	65.7
H3	68.6	70.8	61.7	67.0
Mean	66.3	69.3	63.6	66.4

SUB PLOT AREA HARVESTED 0.00171

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91/W/P/1

POTATOES

AUTUMN AND SPRING NEMATICIDES

Object: To study the effects of combinations of fumigant and non-fumigant nematicides on the control of Globodera pallida and on the yield of potatoes - Woburn, Far Field II.

Sponsors: A.G. Whitehead, A.J.F. Nichols.

Design: 2 whole plots each containing 2 replicates of 2 sub plots each containing 7 sub sub plots.

Whole plot dimensions: 15.0 x 54.0.

Treatments: All combinations of:-

Whole plots

1. **OXAMYL[90]** Oxamyl (kg) applied in April 1990:

   0.0
   5.6

Sub plots

2. **DICHLO[90]** 1, 3-dichloropropene (kg) applied 2 Nov, 1990:

   0 None (duplicated)
   300 300 (duplicated)

Sub sub plots

3. **OXAMYL[91]** Oxamyl (kg) applied 3 April, 1991:

   0.0 (duplicated for **VARIETY** DESIREE only)
   5.6

4. **VARIETY** Varieties:

   DESIREE
   RECORD
   ROMANO

Basal applications: Manures: (12:20:20) at 1.3 t. Weedkillers : Linuron at 1.5 kg with paraquat at 0.40 kg ion in 210 l. Fungicides: Maneb at 1.2 kg and zinc oxide at 28 g applied with a wetting agent, 'Bond' at 200 ml, in 200 l. Maneb at 0.96 kg and zinc oxide at 22 g with insecticide and wetting agent, 'Bond' at 200 ml, in 300 l. Maneb at 0.96 kg and zinc oxide at 22 g and wetting agent, 'Bond' at 200 ml, in 300 l. Mancozeb at 0.82 kg with insecticide and wetting agent, 'Bond' at 200 ml, in 300 l. Fentin hydroxide at 0.27 kg in 300 l. Insecticide: Pirimicarb at 0.14 kg applied on two occasions. Desiccant: Glufosinate-ammonium at 0.45 kg in 300 l.

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91/W/P/1

Cultivations, etc.:- Deep tine cultivated, fumigant treatment applied, rolled: 2 Nov, 1990. Rolled: 8 Nov. Heavy spring-tine cultivated: 12 Mar, 1991. Manures applied, spring-tine cultivated, nematicide treatments applied, rotary cultivated, tubers planted: 3 Apr. Rotary ridged, weedkiller applied: 26 Apr. Maneb, zinc oxide and wetting agent applied: 4 July. Maneb, zinc oxide, insecticide and wetting agent applied: 20 July. Maneb, zinc oxide and wetting agent applied: 31 July. Mancozeb, insecticide and wetting agent applied: 12 Aug. Fentin hydroxide applied: 27 Aug. Desiccant applied: 12 Sept. Potatoes lifted: 23 Sept. Previous crops: Navy beans 1989, potatoes 1990.

NOTE: Soil samples were taken before planting, after fumigation and after harvest for nematode counts and assessment of egg viability.

TOTAL TUBERS TONNES/HECTARE

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

DICHLO[90]	0	300	Mean
OXAMYL[90]			
0.0	22.1	41.3	31.7
5.6	31.1	43.8	37.5
Mean	26.6	42.6	34.6

OXAMYL[91]	0.0	5.6	Mean
OXAMYL[90]			
0.0	28.4	36.1	31.7
5.6	32.4	44.2	37.5
Mean	30.4	40.1	34.6

OXAMYL[91]	0.0	5.6	Mean
DICHLO[90]			
0	20.5	34.7	26.6
300	40.3	45.6	42.6
Mean	30.4	40.1	34.6

VARIETY	DESIREE	RECORD	ROMANO	Mean
OXAMYL[90]				
0.0	30.9	32.2	32.3	31.7
5.6	35.9	36.8	40.6	37.5
Mean	33.4	34.5	36.4	34.6

VARIETY	DESIREE	RECORD	ROMANO	Mean
DICHLO[90]				
0	25.9	27.5	26.6	26.6
300	40.8	41.5	46.2	42.6
Mean	33.4	34.5	36.4	34.6

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91/W/P/1

TOTAL TUBERS TONNES/HECTARE

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

VARIETY	DESIREE	RECORD	ROMANO	Mean
OXAMYL[91]				
0.0	30.7	31.1	29.2	30.4
5.6	38.8	38.0	43.6	40.1
Mean	33.4	34.5	36.4	34.6

	OXAMYL[91]	0.0	5.6
OXAMYL[90]	**DICHLO[90]**		
0.0	0	16.7	29.2
	300	40.1	42.9
5.6	0	24.4	40.1
	300	40.5	48.3

	VARIETY	DESIREE	RECORD	ROMANO
OXAMYL[90]	**DICHLO[90]**			
0.0	0	22.0	23.9	20.3
	300	39.8	40.6	44.3
5.6	0	29.9	31.2	33.0
	300	41.9	42.5	48.1

	VARIETY	DESIREE	RECORD	ROMANO
OXAMYL[90]	**OXAMYL[91]**			
0.0	0.0	27.9	30.1	27.6
	5.6	36.8	34.4	37.0
5.6	0.0	33.4	32.1	30.9
	5.6	40.7	41.6	50.2

	VARIETY	DESIREE	RECORD	ROMANO
DICHLO[90]	**OXAMYL[91]**			
0	0.0	21.3	21.5	18.0
	5.6	35.1	33.6	35.3
300	0.0	40.0	40.6	40.5
	5.6	42.5	42.4	51.9

		VARIETY	DESIREE	RECORD	ROMANO
OXAMYL[90]	**DICHLO[90]**	**OXAMYL[91]**			
0.0	0	0.0	17.1	18.4	14.3
		5.6	31.9	29.4	26.3
	300	0.0	38.7	41.8	40.9
		5.6	41.8	39.3	47.7
5.6	0	0.0	25.6	24.7	21.6
		5.6	38.3	37.7	44.3
	300	0.0	41.2	39.4	40.1
		5.6	43.2	45.5	56.2

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91/W/P/1

TOTAL TUBERS TONNES/HECTARE

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

	DICHLO[90]	OXAMYL[91]	VARIETY	OXAMYL[90]* DICHLO[90]	
			1.41		min.rep
	2.35	1.08	1.29	3.33	max-min

	OXAMYL[90]* OXAMYL[91]	OXAMYL[90]* VARIETY	DICHLO[90] OXAMYL[91]	DICHLO[90] VARIETY	
		2.00	2.65	2.89	min.rep
	1.53	1.82	2.59	2.78	max-min
			2.53	2.65	max.rep
Except when comparing means with the same level(s) of					
DICHLO[90]				2.00	min.rep
			1.53	1.82	max-min

	OXAMYL[91] VARIETY	OXAMYL[90]* DICHLO[90] OXAMYL[91]	OXAMYL[90]* DICHLO[90] VARIETY	DICHLO[90] OXAMYL[91] VARIETY	
	2.00	3.75	4.09	3.52	min.rep
	1.73	3.66	3.93	3.22	max-min
		3.57	3.75	2.89	max.rep
Except when comparing means with the same level(s) of					
DICHLO[90]				2.82	min.rep
				2.45	max-min
OXAMYL[90].DICHLO[90]		2.31	2.82		min.rep
		2.16	2.58		max-min
		2.00	2.31		max.rep

	OXAMYL[90]* OXAMYL[91] VARIETY	OXAMYL[90]* DICHLO[90] OXAMYL[91] VARIETY	
	2.82	4.97	min.rep
	2.45	4.55	max-min
		4.09	max.rep
Except when comparing means with the same level(s) of			
OXAMYL[90].DICHLO[90]		3.99	min.rep
		3.46	max-min
		2.82	max.rep

* Within the same level of **OXAMYL[90]** or **DICHLO[90]**

max.rep **OXAMYL[91]** 0.0 and **VARIETY** DESIREE
min.rep all treatments except **OXAMYL[91]** 0.0 and **VARIETY** DESIREE
max-min **OXAMYL[91]** 0.0 and **VARIETY** DESIREE v all other combinations

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

Stratum	d.f.	s.e.	cv%
WP.SP	4	3.33	9.6
WP.SP.SSP	28	3.99	11.6

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91/W/P/1

PERCENTAGE WARE 3.8CM (1.5 INCH) RIDDLE

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

DICHLO[90]	0	300	Mean
OXAMYL[90]			
0.0	63.3	83.2	73.3
5.6	75.9	84.1	80.0
Mean	69.6	83.7	76.6

OXAMYL[91]	0.0	5.6	Mean
OXAMYL[90]			
0.0	69.8	77.9	73.3
5.6	77.6	83.2	80.0
Mean	73.7	80.5	76.6

OXAMYL[91]	0.0	5.6	Mean
DICHLO[90]			
0	63.9	77.2	69.6
300	83.5	83.9	83.7
Mean	73.7	80.5	76.6

VARIETY	DESIREE	RECORD	ROMANO	Mean
OXAMYL[90]				
0.0	71.0	71.5	78.5	73.3
5.6	77.9	81.0	82.2	80.0
Mean	74.4	76.2	80.3	76.6

VARIETY	DESIREE	RECORD	ROMANO	Mean
DICHLO[90]				
0	65.9	71.6	73.1	69.6
300	82.9	80.8	87.6	83.7
Mean	74.4	76.2	80.3	76.6

VARIETY	DESIREE	RECORD	ROMANO	Mean
OXAMYL[91]				
0.0	72.8	74.1	75.1	73.7
5.6	77.7	78.4	85.6	80.5
Mean	74.4	76.2	80.3	76.6

	OXAMYL[91]	0.0	5.6
OXAMYL[90]	DICHLO[90]		
0.0	0	56.3	72.7
	300	83.3	83.2
5.6	0	71.5	81.7
	300	83.7	84.6

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91/W/P/1

PERCENTAGE WARE 3.8CM (1.5 INCH) RIDDLE

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

	VARIETY	DESIREE	RECORD	ROMANO
OXAMYL[90]	DICHLO[90]			
0.0	0	58.6	64.9	68.8
	300	83.4	78.1	88.1
5.6	0	73.3	78.3	77.4
	300	82.5	83.6	87.0

	VARIETY	DESIREE	RECORD	ROMANO
OXAMYL[90]	OXAMYL[91]			
0.0	0.0	68.8	69.2	72.4
	5.6	75.4	73.9	84.5
5.6	0.0	76.8	79.0	77.7
	5.6	80.0	82.9	86.6

	VARIETY	DESIREE	RECORD	ROMANO
DICHLO[90]	OXAMYL[91]			
0	0.0	61.4	67.7	65.1
	5.6	74.9	75.6	81.1
300	0.0	84.2	80.5	85.1
	5.6	80.5	81.2	90.0

		VARIETY	DESIREE	RECORD	ROMANO
OXAMYL[90]	DICHLO[90]	OXAMYL[91]			
0.0	0	0.0	53.3	60.8	57.6
		5.6	69.0	69.1	80.0
	300	0.0	84.2	77.5	87.2
		5.6	81.8	78.6	89.1
5.6	0	0.0	69.5	74.6	72.6
		5.6	80.8	82.1	82.2
	300	0.0	84.2	83.5	82.9
		5.6	79.2	83.7	91.0

SUB PLOT AREA HARVESTED 0.00090

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91/W/P/2

POTATOES

DOUBLE CROPPING

Object: To study the effects of growing two crops of potatoes in one season on the increase of Globodera pallida - Woburn, Lansome/Mill Dam Close III.

Sponsor: A.G. Whitehead.

Design: 2 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 6.0.

Treatments: All combinations of:-

1. **JAV OX** Rates of oxamyl (kg) applied to the seedbed for first early Pentland Javelin grown under plastic sheet: 11 Mar, 1991.

   0.0
   2.8
   5.6

2. **COS OX** Rates of oxamyl (kg) applied to the seedbed for Costella grown after the Pentland Javelin: 5 July.

   0.0
   5.6

plus two extra treatments, rates of oxamyl (kg) applied to the seedbed for Costella grown as a single maincrop variety: 5 Apr.

M COS OX

0.0
5.6

Basal applications: Manures: (0:24:24) at 1.3 t.

Standard applications:

JAV OX plots only: Manures: 'Nitro-Chalk' at 670 kg. Weedkiller: Linuron at 1.6 kg in 250 l. Irrigation: 12 mm applied on four occasions and 6.5 mm on the fifth.

COS OX plots only: Manures: (13:13:21) at 1.8 t. Weedkiller: Linuron at 1.5 kg in 200 l. Fungicides: Mancozeb at 0.82 kg and wetting agent, 'Bond' at 200 ml, applied on three occasions, with insecticide on the first and third, all in 300 l. Fentin hydroxide at 0.27 kg in 300 l. Insecticide: Pirimicarb at 0.14 kg on two occasions. Irrigation: 12 mm applied on five occasions.

M COS OX plots only: Manures: 'Nitro-Chalk' at 820 kg. Weedkillers: Monolinuron at 0.77 kg and paraquat at 0.55 kg ion in 200 l. Fungicides: Mancozeb at 0.82 kg and wetting agent, 'Bond' at 200 ml, applied on three occasions, with insecticide on the first and third, all in 300 l. Insecticide: Pirimicarb at 0.14 kg on two occasions. Irrigation: 12 mm applied on four occasions and 6.5 mm on the fifth.

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91/W/P/2

Cultivations, etc.:-
All plots: P and K applied: 5 Mar, 1991. Spring-tine cultivated, rotary cultivated: 11 Mar.
JAV OX plots only: N applied: 5 Mar. Oxamyl treatments applied, potatoes planted, weedkiller applied: 11 Mar. Plastic sheet applied: 12 Mar. Plastic sheet removed: 20 May. Irrigated: 21, 29, 31 May, 3 and 7 June. Potatoes lifted: 19 June.
COS OX plots only: Rolled: 20 June. Rotary cultivated, oxamyl treatments applied, manures applied, rotary cultivated, potatoes planted: 5 July. Rotary ridged: 8 July. Weedkiller applied: 10 July. Mancozeb, pirimicarb and wetting agent applied: 20 July and 12 Aug. Mancozeb and wetting agent applied: 31 July. Irrigation applied: 15, 28 Aug, 7, 14 and 21 Sept. Fentin hydroxide applied: 12 Sept. Potatoes lifted: 29 Oct.
M COS OX plots only: Rotary cultivated, N applied, oxamyl treatments applied, spiked rotary cultivated, potatoes planted: 5 Apr. Weedkillers applied: 1 May. Irrigated: 21, 29, 31 May, 3 and 7 June. Mancozeb, pirimicarb and wetting agent applied: 20 July and 12 Aug. Mancozeb and wetting agent applied: 31 July. Potatoes lifted: 13 Aug. Previous crops: Potatoes since 1988.

NOTE: Soil samples were taken before planting and after each crop for nematode counts.

TOTAL TUBERS TONNES/HECTARE

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

COS OX	0.0	5.6	Mean
JAV OX			
0.0	28.3	40.3	34.3
2.8	33.2	45.5	39.4
5.6	33.0	32.5	32.7
Mean	31.5	39.4	35.5

M COS OX	0.0	5.6	Mean
	4.5	20.8	12.6

GRAND MEAN 29.8

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

JAV OX	**COS OX**	**JAV OX COS OX & M COS OX**
2.99	2.45	4.24

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	4.24	14.2

PLOT AREA HARVESTED 0.00090

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91/R/M/1

S. BARLEY, S. BEANS, LINSEED, PEAS, S. RAPE

CROPS AND WEED COMPETITION

Object: To study the effects of a range of populations of spring oats on the growth and yield of s. barley, s. beans, linseed, peas and s. rape and the effects of these crops on the spring oats - Summerdells I.

Sponsor: P.J.W. Lutman.

Design: 6 plots, each divided into 3 blocks of 6 sub plots.

Whole plot dimensions: 54.0 x 10.0.

Treatments: All combinations of:

Whole plots

1. **CROP**	Crops:
S BARLEY	S. barley
S BEANS	S. beans
FALLOW	Fallow
LINSEED	Linseed
PEAS	Peas
S RAPE	S. oilseed rape

Sub plots

2. **OAT RATE**	Rates of broadcasting Dula s. oats (seeds per square metre):
0	
10	
40	
120	
240	
480	

NOTE: To prevent damage from birds PEAS and S RAPE plots were netted from emergence to harvest.

Standard applications:-

All crops and fallow: Manure: FYM at 25 t.

S. barley: Manure: 'Nitram' at 350 kg. Weedkiller: Metsulfuron-methyl at 6.0 g with the fungicide in 200 l. Fungicide: Fenpropimorph at 0.38 kg.

S. beans: Weedkillers: Terbutryne at 0.98 kg and terbuthylazine at 0.42 kg in 200 l. Fungicide: Chlorothalonil at 1.5 kg in 200 l with the pirimicarb. Insecticides: Deltamethrin at 7.5 g in 200 l on two occasions. Pirimicarb at 0.14 kg.

Fallow: Weedkiller: Metsulfuron-methyl at 6.0 g with the fungicide in 200 l. Fungicide: Fenpropimorph at 0.38 kg.

Linseed: Manure: 'Nitram' at 220 kg. Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with bentazone at 0.96 kg in 200 l. Insecticide: Deltamethrin at 7.5 g in 200 l.

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91/R/M/1

Standard applications:-
Peas: Weedkillers: Terbutryne at 0.98 kg and terbuthylazine at 0.42 kg in 200 l. Insecticide: Deltamethrin at 7.5 g in 220 l.
S. rape: Manure: 'Nitram' at 350 kg. Weedkiller: Metazachlor at 0.75 kg in 200 l. Insecticide: Alpha-cypermethrin at 0.02 kg in 220 l.

Seed: S. barley: Doublet, sown at 160 kg.
S. beans: Troy, sown at 250 kg.
Linseed: Antares, dressed prochloraz, sown at 50 kg.
Peas: Solara, dressed thiram, sown at 260 kg.
S. rape: Topas, sown at 6.0 kg.

Cultivations, etc.:-
All plots: FYM applied: 17 Jan, 1991. Ploughed: 21 Jan. Spring-tine cultivated twice, oat treatments broadcast: 25 Mar. Rotary harrowed all plots, seed sown (except to fallow): 26 Mar.
S. barley: N applied: 15 Apr, 1991. Weedkiller and fungicide applied: 17 June. Combine harvested: 10 Sept.
S. beans: Weedkillers applied: 27 Mar, 1991. Deltamethrin applied: 20 May, 18 June. Pirimicarb with the fungicide applied: 10 July. Combine harvested: 10 Sept.
Fallow: Weedkiller with the fungicide applied: 17 June, 1991.
Linseed: N applied: 15 Apr, 1991. Deltamethrin applied: 7 May. Weedkillers applied: 6 June. Cut: 2 Oct.
Peas: Weedkillers applied: 27 Mar, 1991. Deltamethrin applied: 20 May. Cut: 2 Oct.
S. rape: Weedkiller applied: 3 Apr, 1991. N applied: 15 Apr. Insecticide applied: 18 June. Cut: 2 Oct. Previous crops: W. wheat 1989, w. beans 1990.

NOTES: (1) Samples were taken in June and July to assess the effects of spring oats on the growth of the crops. Components of yield were measured.
(2) Because of an error during the threshing of PEAS, the yields of two plots were lost, with **OAT RATE** 0 and 10. Estimated values were used in the analysis.

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91/R/M/1 SPRING BARLEY

GRAIN TONNES/HECTARE

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

OAT RATE	0	10	40	120	240	480	Mean
	5.64	6.03	4.12	4.52	3.38	2.38	4.34

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

OAT RATE
0.369

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.452	10.4

GRAIN MEAN DM% *

PLOT AREA HARVESTED 0.00001

SPRING BEANS

GRAIN TONNES/HECTARE

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

OAT RATE	0	10	40	120	240	480	Mean
	5.02	5.20	4.60	2.90	2.12	1.32	3.53

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

OAT RATE
0.414

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.508	14.4

GRAIN MEAN DM% *

PLOT AREA HARVESTED 0.00001

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91/R/M/1 LINSEED

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

OAT RATE	0	10	40	120	240	480	Mean
	2.96	2.43	1.81	0.84	0.32	0.16	1.42

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

OAT RATE
0.128

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.1565	11.0

GRAIN MEAN DM% *

PLOT AREA HARVESTED 0.00001

PEAS

GRAIN TONNES/HECTARE

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

OAT RATE	0	10	40	120	240	480	Mean
	6.73	4.25	2.73	1.65	0.84	0.35	2.76

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

OAT RATE
0.310

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	8	0.3796	13.7

GRAIN MEAN DM% *

PLOT AREA HARVESTED 0.00001

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91/R/M/1 SPRING RAPE

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

OAT RATE	0	10	40	120	240	480	Mean
	2.61	2.62	2.34	1.91	0.95	0.50	1.82

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

OAT RATE
0.358

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.438	24.1

GRAIN MEAN DM% *

PLOT AREA HARVESTED 0.00001

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91/R/M/3

WINTER WHEAT AND WINTER BARLEY

APHIDS AND BYDV

Object: To study the effects of barley yellow dwarf virus (BYDV) on winter cereals - Bones Close.

Sponsors: N. Carter, R.T. Plumb.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 9.0 x 10.0.

Treatments: All combinations of:-

1. **CROP** Crops:

   W BARLEY — Winter barley
   W WHEAT — Winter wheat

2. **AUT INS** Autumn insecticide:

   NONE — None
   CYPERMET — Cypermethrin at 25 g in 200 l on 6 Nov, 1990

3. **FLO INS** Insecticide at flowering:

   NONE — None
   PIRIMICA — Pirimicarb at 0.14 kg in 200 l on 11 June, 1991 (to barley) and 1 July (to wheat)

Basal applications: Manures: Magnesian limestone at 5.0 t. 'Nitram' at 290 kg (to barley) and 460 kg (to wheat). Weedkillers: Pendimethalin at 1.1 kg with mecoprop at 1.6 kg in 200 l. Fungicides: Prochloraz at 0.40 kg with tridemorph at 0.26 kg in 200 l. Propiconazole at 0.12 kg in 200 l.

Seed: W. barley: Magie, sown at 140 kg.
W. wheat: Mercia, sown at 170 kg.

Cultivations, etc.:- Ploughed, furrow pressed: 20 Aug, 1990. Magnesian limestone applied: 22 Aug. Rotary harrowed: 12 Sept. Cultivated by rotary grubber twice, rotary harrowed, seed sown: 13 Sept. Weedkillers applied: 3 Dec. N applied: 27 Mar, 1991. Prochloraz with tridemorph applied: 23 Apr. Propiconazole applied: 23 May. Combine harvested: 12 Aug (barley) and 20 Aug (wheat). Previous crops: S. barley 1989, w. beans 1990.

NOTES: (1) Aphids were sampled from early October to early August.
(2) BYDV was assessed visually and virus isolates determined by enzyme-linked immunosorbent assay during April and June.
(3) Components of yield were measured.

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91/R/M/3 W.WHEAT AND W.BARLEY

GRAIN TONNES/HECTARE

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

AUT INS	NONE	CYPERMET	Mean
CROP			
W BARLEY	7.76	7.95	7.85
W WHEAT	7.68	7.85	7.77
Mean	7.72	7.90	7.81

FLO INS	NONE	PIRIMICA	Mean
CROP			
W BARLEY	7.71	8.00	7.85
W WHEAT	7.56	7.97	7.77
Mean	7.64	7.98	7.81

FLO INS	NONE	PIRIMICA	Mean
AUT INS			
NONE	7.37	8.07	7.72
CYPERMET	7.90	7.90	7.90
Mean	7.64	7.98	7.81

	AUT INS	NONE		CYPERMET	
CROP	**FLO INS**	NONE	PIRIMICA	NONE	PIRIMICA
W BARLEY		7.61	7.91	7.82	8.08
W WHEAT		7.14	8.22	7.99	7.72

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

CROP	**AUT INS**	**FLO INS**	**CROP AUT INS**
0.106	0.106	0.106	0.149

CROP FLO INS	**AUT INS FLO INS**	**CROP AUT INS FLO INS**
0.149	0.149	0.211

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.259	3.3

GRAIN MEAN DM% 85.9

PLOT AREA HARVESTED 0.00230

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METEOROLOGICAL RECORDS 1991 - 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	76 (+24)	3.1 (+0.0)	0.9	4.5	6.6
FEB	63 (-2)	0.8 (-2.5)	-0.5	3.1	5.1
MAR	95 (-12)	7.5 (+2.2)	5.5	7.0	6.5
APR	153 (+15)	7.4 (-0.2)	3.8	8.5	7.9
MAY	131 (-57)	9.7 (-1.2)	7.0	10.5	9.0
JUNE	128 (-63)	11.9 (-2.0)	9.3	12.7	10.9
JULY	219 (+31)	16.9 (+1.0)	13.8	16.3	13.5
AUG	240 (+61)	17.4 (+1.6)	12.9	17.2	15.1
SEPT	184 (+44)	14.4 (+0.8)	11.4	15.3	14.9
OCT	92 (-12)	9.7 (-0.7)	7.7	11.8	12.9
NOV	60 (-5)	6.5 (+0.6)	4.6	8.7	10.5
DEC	60 (+14)	4.0 (-0.1)	1.7	5.7	8.1
YEAR*	1501 (+38)	9.1 (+0.0)	6.5	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	26	83 (+18)	15	72	9.2
FEB	24	54 (+7)	16	37	8.1
MAR	15	28 (-29)	15	13	8.6
APR	16	74 (+20)	14	29	10.5
MAY	9	15 (-38)	7	4	7.0
JUNE	5	100 (+43)	22	42	6.4
JULY	0	73 (+26)	11	26	5.8
AUG	0	46 (-8)	8	15	6.0
SEPT	6	61 (+7)	13	23	6.1
OCT	13	29 (-37)	12	4	6.2
NOV	17	59 (-6)	15	45	9.0
DEC	18	16 (-53)	8	10	7.8
YEAR*	149	637 (-51)	156	317	7.6

30-year means are for the period 1961-90

(1) Mean of maximum and minimum

(2) Number of nights grass min. was below 0.0 C

(3) Number of days rainfall was 0.2 mm or more

(4) At 2 metres above ground level

*Mean or total

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METEOROLOGICAL RECORDS 1991 - 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	In ground under grass 100 cm	Ground frosts (2)	Total rainfall: mm 12.7 cm (5in) gauge	Rain days (3)	Wind km per hour (4)
JAN	59 (+10)	3.2 (-0.2)	1.0	4.1	6.9	17	55 (+3)	14	7.9
FEB	56 (-4)	1.1 (-2.3)	0.0	2.9	5.2	22	44 (+5)	11	5.2
MAR	88 (-15)	7.9 (+2.4)	5.6	7.5	6.8	11	30 (-22)	14	6.6
APR	130 (+0)	7.8 (+0.2)	4.4	8.5	8.1	12	69 (+18)	12	10.0
MAY	121 (-58)	10.3 (-0.7)	7.3	10.7	9.0	7	13 (-41)	7	5.8
JUNE	129 (-54)	12.4 (-1.6)	9.2	13.6	11.3	3	83 (+29)	26	8.5
JULY	201 (+21)	17.2 (+1.2)	14.0	17.6	14.1	0	72 (+23)	10	6.9
AUG	229 (+59)	17.1 (+1.4)	13.0	18.7	16.0	0	16 (-42)	5	6.1
SEPT	178 (+42)	14.5 (+0.9)	11.5	16.3	15.8	3	91 (+39)	13	6.7
OCT	77 (-24)	9.7 (-0.8)	8.2	11.7	13.4	5	31 (-25)	11	5.8
NOV	50 (-12)	6.6 (+0.3)	4.9	8.4	10.7	13	66 (+10)	13	9.5
DEC	38 (-5)	3.7 (-0.5)	1.8	5.4	8.2	18	12 (-47)	7	7.8
YEAR*	1354 (-39)	9.3 (+0.1)	6.7	10.5	10.5	111	582 (-50)	143	7.2

30-year means are for the period 1961-90

(1) Mean of maximum and minimum

(2) Number of nights grass min. was below 0.0 C

(3) Number of days rainfall was 0.2 mm or more

(4) At 2 metres above ground level

*Mean or total

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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

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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:

$2\frac{1}{3} \times P = P_2O_5$ $\quad$ $\frac{3}{7} \times P_2O_5 = P$
$1\frac{1}{5} \times K = K_2O$ $\quad$ $\frac{5}{6} \times K_2O = K$
$1\frac{2}{5} \times Ca = CaO$ $\quad$ $\frac{7}{10} \times CaO = Ca$
$1\frac{2}{3} \times Mg = MgO$ $\quad$ $\frac{3}{5} \times MgO = Mg$

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

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