ROTHAMSTED RESEARCH

Yields of the Field Experiments 1989

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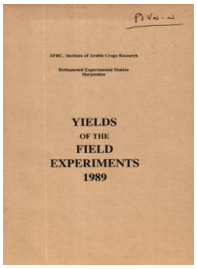

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Rothamsted Research

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AFRC, Institute of Arable Crops Research

Rothamsted Experimental Station
Harpenden

YIELDS OF THE FIELD EXPERIMENTS 1989

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YIELDS

of the

FIELD

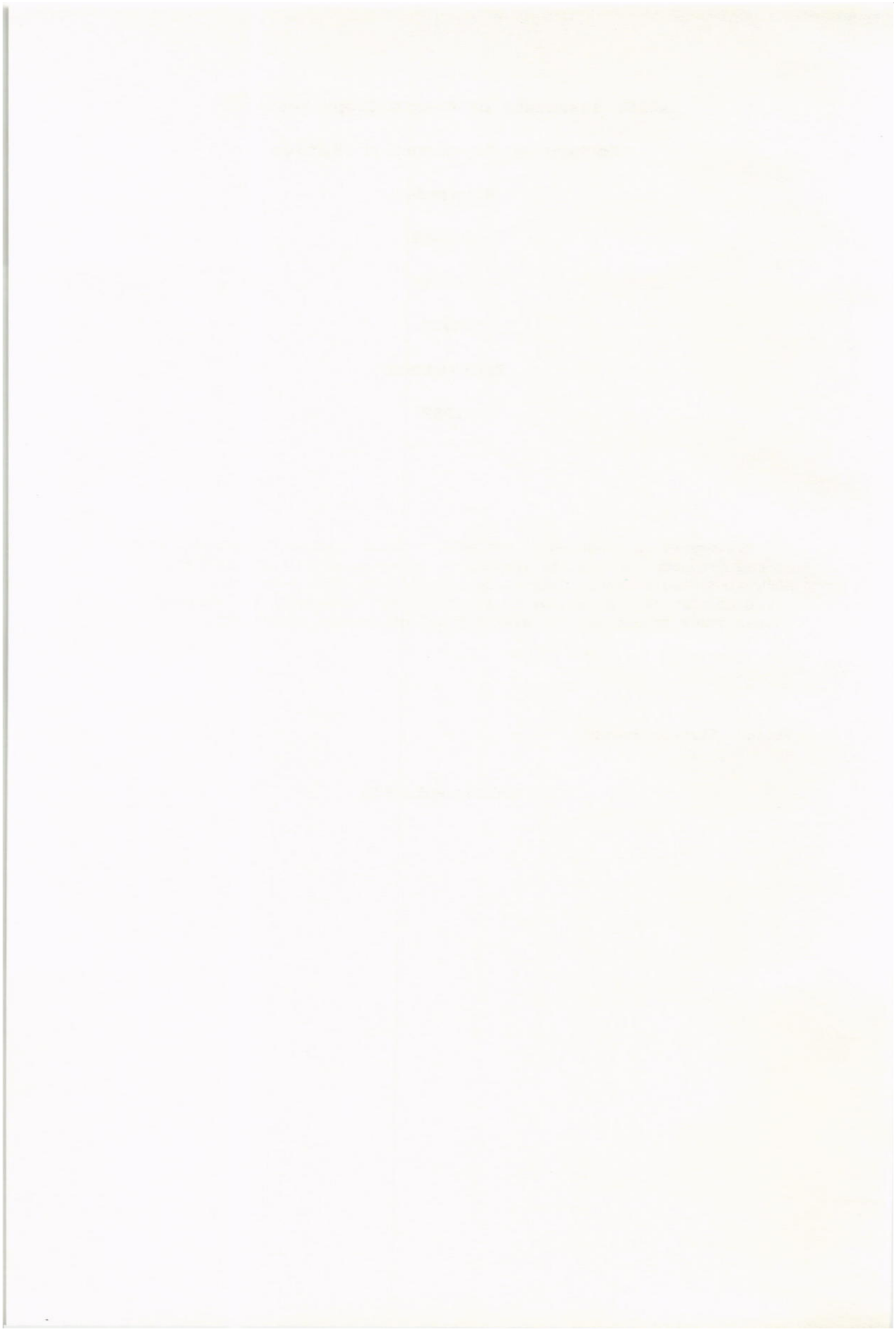
EXPERIMENTS

1989

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 1990



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https://doi.org/10.23637/ERADOC-1-40

MISCELLANEOUS DATA

https://doi.org/10.23637/ERADOC-1-40

CONVENTIONS 1989

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

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

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

The following conventions are observed unless otherwise stated.

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

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

All yields and plant numbers are per hectare.

The following abbreviations are used in variate headings:

Wheat, barley, oats, beans etc.

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

Sugar beet

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

All crops

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

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

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

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

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

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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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89/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 146th 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 74-88/R/BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00311
	1	0.00572
	2,3,5 and 6	0.00473
	8 and 9	0.00497
Potatoes:	7	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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89/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
0/38B	0*	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
1/23B	1	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
2/1B	2	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P	W
2/1S	2	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P	W
3/2B	3	W	W	F	W	W	F	W	W	W	W	W	W	F	P	W	W
-	4	W	P	BE	W	P	P	W	F	P	W	F	P	W	W	W	F
5/3B	5	W	F	W	W	F	W	W	W	W	W	W	F	P	W	W	W
6/12B	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W	W	W
6/12S	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W	W	W
POTATOES	7	P	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P
8/1B	8+	W	W	W	W	W	W	W	F	W	W	W	W	W	W	F	W
9/31B	9	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
9/31S	9	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.

B = Brimstone, S = Squareheads Master

https://doi.org/10.23637/ERADOC-1-40

89/R/BK/1

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.

Standard applications:

W. wheat: Manures: Chalk at 2.9 t (to sections 1 and 3 only). Weedkillers: Glyphosate at 1.4 kg in 200 l (except to sections 2 and 8). Isoproturon at 2.5 kg in 200 l (except to section 8). Mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg with isoproturon at 2.1 kg in 200 l (except to section 8). Fungicides (except to section 6): Prochloraz at 0.40 kg and carbendazim at 0.15 kg applied with the growth regulator in 200 l. Fenpropimorph at 0.56 kg with chlorothalonil at 0.75 kg in 200 l. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l. Growth regulator (except to section 6): Chlormequat chloride at 1.6 kg.

Potatoes: Weedkiller: Metribuzin at 1.0 kg in 300 l. Fungicides: Mancozeb at 1.4 kg in 200 l on three occasions and at 1.0 kg in 200 l on a fourth occasion. Fentin hydroxide at 0.27 kg in 260 l.

Fallow: Weedkiller: Glyphosate at 1.4 kg in 200 l.

Seed: W. wheat: Brimstone, dressed fonofos, and Squareheads Master both sown at 180 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-

All Sections:
P applied to plots 17 and 18: 26 Sept, 1988. P applied to remaining plots: 7 Oct. K, Na and Mg applied: 5 Oct. FYM applied, ploughed: 14 Oct. Rotary harrowed: 24 Oct.

Cropped Sections:

W. wheat: Straw chopped (section 0): 9 Sept, 1988. Glyphosate applied (except to sections 2 and 8): 20 Sept. Autumn N treatments applied: 7 Oct. Chalk applied (sections 1 and 3): 11 Oct. Rotary harrowed, Brimstone seed sown: 26 Oct. Rotary harrowed, Squareheads Master seed sown: 27 Oct. Isoproturon applied (except to section 8): 15 Nov. Spring N treatments applied: 18 Apr, 1989. Prochloraz and carbendazim with the growth regulator applied (except to section 6): 19 Apr. Mecoprop, bromoxynil, ioxynil with isoproturon applied (except to section 8): 5 May. Fenpropimorph with chlorothalonil applied (except to section 6): 31 May. Propiconazole with carbendazim and maneb applied (except to section 6): 20 June. Combine harvested Brimstone: 7 Aug and Squareheads Master: 8 Aug.

Potatoes: Deep-tine cultivated: 29 Mar, 1989. N treatments applied: 18 Apr. Rotary harrowed, potatoes planted: 24 Apr. Rotary ridged: 25 May. Weedkiller applied: 31 May. Mancozeb applied: 3 July, 17 July, 28 July and 14 Aug. Fentin hydroxide applied: 30 Aug. Haulm mechanically destroyed: 5 Sept. Lifted: 12 Sept.

Fallow: Glyphosate applied: 20 Sept, 1988. Rotary cultivated: 9 May, 1989 and 19 June. Cultivated with thistle bar: 12 July.

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89/R/BK/1 W. WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	2/1B	2/1S	8/1B	3/2B	5/3B	6/12B	6/12S	1/23B	9/31B	9/31S	0/38B
01DN4PK	8.66	*	*	7.54	6.57	7.36	*	*	*	*	*
21DN2	7.94	*	5.06	7.24	7.23	7.37	*	7.54	7.56	*	5.63
22D	6.81	*	7.16	4.96	5.02	5.21	*	5.90	6.62	*	4.70
030	3.04	1.74	1.54	0.66	0.83	0.97	0.93	0.90	0.74	0.95	0.90
05F	2.86	1.66	3.00	0.95	0.99	1.31	0.82	1.12	1.62	1.25	0.90
06N1F	5.46	3.17	4.21	3.16	2.56	3.27	1.79	2.34	3.48	2.38	3.11
07N2F	6.21	3.71	4.58	4.27	3.73	4.52	2.58	4.40	4.31	3.01	3.53
08N3F	7.45	3.92	4.73	5.24	5.15	5.28	2.82	4.06	5.07	3.25	4.16
09N4F	7.10	4.06	5.43	5.41	4.47	5.03	3.33	4.55	4.70	3.50	4.02
10N2	3.95	3.28	1.43	1.63	3.16	2.49	2.15	2.48	2.16	2.03	1.62
11N2P	4.77	3.29	1.36	2.68	2.54	2.00	2.24	2.58	1.98	2.87	2.57
12N2PNA	5.04	3.58	2.37	3.49	3.46	3.29	2.08	3.10	3.68	3.16	2.75
13N2PK	5.59	3.61	2.78	3.63	3.87	3.15	2.48	4.67	5.06	3.17	3.17
14N2PKMG	6.13	3.54	4.13	4.19	3.93	3.63	2.24	4.65	4.82	3.29	3.49
15N5F	6.36	3.75	4.73	5.97	4.90	5.37	3.21	5.85	5.53	3.12	3.89
16N6F	7.13	3.65	5.95	6.42	5.07	5.97	3.12	4.63	5.82	3.29	1.98
17N0+3FN	6.83	3.78	4.66	4.49	4.34	5.11	3.18	3.32	5.45	3.51	2.26
18N1+3FN	7.19	3.93	5.16	5.56	5.59	5.76	3.32	3.69	5.24	3.44	2.94
19C	3.66	2.83	3.68	1.24	2.26	1.56	1.48	1.92	1.33	1.44	1.97
20NKMG	*	*	*	*	*	*	*	2.42	*	*	2.53

GRAIN MEAN DM% 88.9

STRAW TONNES/HECTARE

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

SECTION PLOT	2/1B	2/1S	1/23B
01DN4PK	3.70	*	*
21DN2	2.84	*	2.90
22D	1.75	*	2.31
030	0.57	1.28	0.30
05F	0.47	0.93	0.30
06N1F	1.29	3.14	0.80
07N2F	1.41	3.84	1.00
08N3F	1.63	5.13	0.94
09N4F	0.93	5.61	1.46
10N2	0.56	3.26	1.10
11N2P	0.90	2.58	0.92
12N2PNA	0.45	3.48	0.84
13N2PK	1.46	4.35	0.93
14N2PKMG	1.23	3.45	1.02
15N5F	1.75	4.48	1.30
16N6F	1.64	5.49	1.11
17N0+3FN	1.91	4.60	0.55
18N1+3FN	1.57	5.15	1.08
19C	0.56	1.58	0.71
20NKMG	*	*	0.74

STRAW MEAN DM% 89.7

https://doi.org/10.23637/ERADOC-1-40

89/R/BK/1 POTATOES

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

PLOT	TOTAL TUBERS TONNES/ HECTARE	% WARE 3.81 CM (1.5 INCH) RIDDLE
01DN4PK	21.5	91.0
21DN2	25.6	95.6
22D	23.9	95.4
030	7.2	88.4
05F	6.4	78.9
06N1F	12.3	90.4
07N2F	16.8	94.6
08N3F	20.2	93.0
09N4F	18.4	92.5
10N2	5.6	80.3
11N2P	6.4	74.1
12N2PNA	7.9	80.8
13N2PK	14.0	92.0
14N2PKMG	18.4	92.2
15N5F	17.7	92.7
16N6F	20.8	91.6
17N3FH	14.2	91.9
18N3FH	16.4	92.7
19C	12.0	89.9

https://doi.org/10.23637/ERADOC-1-40

89/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 138th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-88/R/HB/2.

Treatments: All combinations of:-

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

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

https://doi.org/10.23637/ERADOC-1-40

89/R/HB/2

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

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

0
48
96
144

Plus extra plots testing all combinations of:-

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

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

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

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

0
35

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

Basal applications: Manures: Chalk at 2.5 t. Weedkillers: Glyphosate at 1.4 kg in 200 l. Mecoprop at 1.6 kg with ioxynil at 0.20 kg and bromoxynil at 0.20 kg in 200 l. Fungicides: Propiconazole at 0.12 kg with fenpropimorph at 0.75 kg in 200 l.

Seed: Triumph, seed dressed flutriafol, ethirimol and thiabendazole, sown at 160 kg.

Cultivations, etc.:- Glyphosate applied: 2 Oct, 1988. Chalk applied: 28 Nov. Silicate of soda applied: 7 Dec. Mg and K applied: 8 Dec. P applied: 9 Dec. FYM applied, ploughed: 13 Dec. Spring-tine cultivated twice, seed sown: 7 Feb, 1989. N applied: 31 Mar. Remaining weedkillers applied: 9 May. Fungicides applied: 9 June. Combine harvested: 1 Aug.

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89/R/HB/2

MAIN PLOTS

GRAIN TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.21	0.60	0.24	1.18	0.56
-P-	1.27	2.73	2.23	2.75	2.25
--K	0.25	0.35	0.78	1.20	0.64
-PK	1.77	3.01	3.90	3.03	2.93
A--	0.18	1.06	0.89	0.63	0.69
AP-	1.40	1.38	1.46	1.73	1.49
A-K	0.45	0.92	1.09	0.91	0.84
APK	1.82	2.94	4.90	3.48	3.28
N----	0.45	1.09	1.15	1.02	0.93
NP---	1.73	2.11	2.69	2.70	2.31
N-K--	0.19	0.81	1.08	1.93	1.00
NPK--	2.02	3.12	3.59	3.48	3.05
N--S-	1.01	0.57	0.63	1.02	0.81
NP-S-	1.53	2.70	2.75	2.69	2.42
N-KS-	0.95	1.79	2.18	1.64	1.64
NPKS-	2.00	3.41	4.62	3.95	3.50
N---S	0.89	1.53	1.15	1.15	1.18
NP--S	1.54	2.35	2.63	3.07	2.40
N-K-S	1.14	1.81	1.33	1.83	1.53
NPK-S	1.92	2.58	4.36	3.23	3.02
N--SS	0.45	1.34	1.15	1.40	1.08
NP-SS	1.27	2.75	2.04	3.65	2.43
N-KSS	1.46	1.51	2.02	2.09	1.77
NPKSS	1.48	3.32	3.94	3.55	3.07
C(--)	1.10	1.77	1.94	2.01	1.71
C(P-)	1.48	2.27	2.77	2.87	2.35
C(-K)	1.28	2.19	2.29	2.66	2.11
C(PK)	1.70	2.99	3.42	3.55	2.91
D	4.60	4.56	4.91	4.56	4.66
(D)	1.23	1.98	1.76	3.23	2.05
(A)	0.91	1.10	1.52	1.28	1.20
-	0.66	1.08	0.90	0.94	0.90
Mean	1.26	1.99	2.26	2.33	1.96

GRAIN MEAN DM% 84.0

https://doi.org/10.23637/ERADOC-1-40

89/R/HB/2

MAIN PLOTS

STRAW TONNES/HECTARE

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

N / MANURE	0	48	96	144	Mean
---	0.07	0.22	0.11	0.39	0.20
-P-	0.41	0.66	0.62	0.65	0.59
--K	0.11	0.07	0.21	0.42	0.20
-PK	0.39	0.76	1.23	1.06	0.86
A--	0.07	0.26	0.26	0.26	0.21
AP-	0.37	0.55	0.45	0.48	0.46
A-K	0.21	0.31	0.33	0.37	0.31
APK	0.54	0.98	1.50	1.51	1.13
D	1.78	2.00	2.32	2.14	2.06
(D)	0.29	0.61	0.53	1.16	0.65
(A)	0.28	0.34	0.45	0.44	0.38
-	0.19	0.33	0.29	0.33	0.28
Mean	0.39	0.59	0.69	0.77	0.53

STRAW MEAN DM% 85.5

PLOT AREA HARVESTED 0.00154

EXTRA PLOTS

GRAIN TONNES/HECTARE

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

MANURE / MGNESIUM	551AN2PK	561--PK	571NN2--	581NN2--	Mean
0	3.54	0.27	2.01	0.75	1.64
35	4.42	0.30	1.60	0.95	1.82
Mean	3.98	0.28	1.81	0.85	1.73

GRAIN MEAN DM% 83.7

PLOT AREA HARVESTED 0.00329

https://doi.org/10.23637/ERADOC-1-40

89/R/WF/3

WHEAT AND FALLOW

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

The 134th year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-88/R/WF/3.

Whole plot dimensions: 9.60 x 211.

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

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

Cultivations, etc.:-
Wheat plot: Heavy spring-tine cultivated: 27 Oct, 1988. Seed sown: 28 Oct. Combine harvested: 9 Aug, 1989.
Fallow plot: Ploughed: 12 Dec, 1988. Rotary cultivated: 8 May, 1989. Cultivated with 'thistle bar': 31 July.

GRAIN AND STRAW TONNES/HECTARE

	GRAIN	STRAW
YIELD	1.91	0.69
MEAN DM%	87.8	86.9
PLOT AREA HARVESTED	0.016642	

https://doi.org/10.23637/ERADOC-1-40 *pp 20*

89/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 134th year, s. barley.

For previous years see 'Details' 1967, 1973 and 74-88/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. **N89** — Nitrogen fertilizer (kg N) as 'Nitro-Chalk' until 1985, as 'Nitram' since 1986 (basal until 1975, on a cyclic system since 1976):

0
48
96
144

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

https://doi.org/10.23637/ERADOC-1-40 *pp 21*

89/R/EX/4

Basal applications: Weedkillers: Glyphosate at 1.4 kg in 200 l. Mecoprop at 1.6 kg with ioxynil at 0.20 kg and bromoxynil at 0.20 kg in 200 l. Fungicide: Propiconazole at 0.12 kg in 200 l.

Seed: Triumph, seed dressed flutriafol, ethirimol and thiabendazole, sown at 160 kg.

Cultivations, etc.:- Glyphosate applied: 19 Oct, 1988. P and K applied: 10 Nov. Ploughed: 14 Dec. Rotary harrowed, seed sown: 8 Feb, 1989. N applied: 8 May. Remaining weedkillers applied: 18 May. Fungicide applied: 9 June. Combine harvested: 16 Aug.

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	0.99	2.18	2.33	2.08	1.89
D	2.25	2.52	2.44	2.00	2.30
N	0.77	1.85	2.31	1.96	1.72
P	1.50	2.38	2.89	2.63	2.35
NPKNAMG	1.49	1.96	2.51	2.17	2.03
Mean	1.40	2.18	2.49	2.17	2.06

GRAIN MEAN DM% 83.8

STRAW TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	0.58	0.87	0.95	0.79	0.80
D	0.96	1.09	1.06	0.72	0.96
N	0.45	0.86	1.04	0.73	0.77
P	0.66	1.00	1.21	1.17	1.01
NPKNAMG	0.65	0.79	1.07	0.92	0.86
Mean	0.66	0.92	1.07	0.87	0.88

STRAW MEAN DM% 89.7

PLOT AREA HARVESTED 0.00728

https://doi.org/10.23637/ERADOC-1-40 *pp 22*

89/R/EX/4

NITROGEN PLOTS

GRAIN TONNES/HECTARE

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

N89	0	48	96	144	Mean
OLD RES					
O	0.68	0.83	1.20	1.08	0.95
D	1.12	1.74	1.03	1.64	1.38
N*	0.58	0.66	1.13	0.58	0.74
PK	0.60	1.47	1.43	1.25	1.19
N*PK	0.63	1.19	1.02	1.20	1.01
Mean	0.72	1.18	1.16	1.15	1.05

GRAIN MEAN DM% 83.5

STRAW TONNES/HECTARE

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

N89	0	48	96	144	Mean
OLD RES					
O	0.37	0.44	0.44	0.37	0.41
D	0.43	0.65	0.44	0.65	0.54
N*	0.22	0.29	0.44	0.22	0.29
PK	0.43	0.48	0.45	0.51	0.47
N*PK	0.29	0.43	0.44	0.51	0.42
Mean	0.35	0.46	0.44	0.45	0.43

STRAW MEAN DM% 88.9

PLOT AREA HARVESTED 0.00728

https://doi.org/10.23637/ERADOC-1-40

89/R/PG/5

PARK GRASS

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

The 134th year, hay.

For previous years see 'Details' 1967 and 1973 and 74-88/R/PG/5.

Treatments: Combinations of:-

Whole plots

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

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

N1, N2, N3:	48, 96, 144 kg N as sulphate of ammonia
N1*, N2*:	48, 96 kg N as nitrate of soda (30 kg N to Plot 20, only in years with no farmyard manure)
P:	35 kg P (15 kg P to Plot 20, only in years with no farmyard manure) as single superphosphate 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
MIN:	P K Na Mg

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89/R/PG/5

Sub plots

2. **LIME** Liming:

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

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

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

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

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

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

Cultivations, etc.:- K, Na, Mg and Si applied: 7 Dec, 1988. P applied: 8 Dec. FYM applied: 14 Dec. N applied: 4 May, 1989. Cut: 12 June, 26 Sept.

https://doi.org/10.23637/ERADOC-1-40 *pp 25*

89/R/PG/5

1ST CUT (12/6/89) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	1.65	1.13	0.56	0.36	0.92
O(D)	1.79	2.06	0.83	0.65	1.33
O/PLOT3	1.52	1.86	0.43	0.60	1.10
P	2.54	2.76	1.44	1.64	2.10
N2P	1.22	1.24	1.24	0.85	1.14
N1MIN	3.76	3.83			3.80
MIN	4.38	4.51	3.45	3.15	3.87
PNAMG	1.94	2.25	1.79	2.01	2.00
N2MIN	3.49	3.81	2.25	1.51	2.77
N2PNAMG	1.74	1.64	1.26	0.87	1.38
N3MIN	3.76	3.28	2.53	2.45	3.01
N3MINSI	4.13	3.80	3.33	1.97	3.31
O/PLOT12	1.16	1.08	0.55	0.75	0.89
D/F	4.60	4.36	3.89	3.45	4.08
N2*MIN	4.72	5.08	4.41	4.34	4.64
MIN(N2*)	3.52	3.38	2.61	2.50	3.00
N1*MIN	4.56	4.59	2.83	3.16	3.79
N1*	2.51	2.64	1.85	1.69	2.17
N2KNAMG0	0.24	0.24	0.24		
N2KNAMG2	1.59				1.59
N2KNAMG1	1.62	1.24			1.43
D0	4.14				4.14
D2	4.87				4.87
D1	4.54				4.54
D/N*PK0	4.64				4.64
D/N*PK2	5.10				5.10
D/N*PK1	4.41				4.41

1ST CUT MEAN DM% 28.4

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89/R/PG/5

2ND CUT (26/9/89) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	1.28	0.60	0.17	0.08	0.53
O(D)	0.50	0.75	0.21	0.25	0.43
O/PLOT3	0.30	0.58	0.14	0.13	0.29
P	0.51	0.73	0.42	0.23	0.47
N2P	0.88	1.02	0.67	0.66	0.81
N1MIN	0.68	0.98			0.83
MIN	1.29	1.32	1.18	0.76	1.14
PNAMG	0.54	0.61	0.69	0.56	0.60
N2MIN	0.91	1.10	1.16	1.06	1.06
N2PNAMG	0.78	0.87	0.72	0.63	0.75
N3MIN	1.54	1.14	1.51	1.35	1.38
N3MINSI	1.61	1.55	1.43	1.73	1.58
O/PLOT12	0.52	0.49	0.55	0.48	0.51
D/F	1.67	1.50	1.04	0.94	1.29
N2*MIN	1.19	1.34	0.88	0.94	1.09
MIN(N2*)	1.10	0.75	0.69	0.55	0.77
N1*MIN	1.17	1.27	0.40	0.40	0.81
N1*	0.48	0.43	0.49	0.86	0.56
N2KNAMG0	0.10	0.09	0.09		
N2KNAMG2	1.00				1.00
N2KNAMG1	0.63	0.76			0.69
D0	0.80				0.80
D2	1.34				1.34
D1	1.02				1.02
D/N*PK0	1.05				1.05
D/N*PK2	1.24				1.24
D/N*PK1	1.23				1.23

2ND CUT MEAN DM% 43.9

https://doi.org/10.23637/ERADOC-1-40

89/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	2.92	1.73	0.73	0.44	1.45
O(D)	2.29	2.81	1.04	0.90	1.76
O/PLOT3	1.82	2.44	0.57	0.72	1.39
P	3.05	3.49	1.87	1.87	2.57
N2P	2.11	2.26	1.90	1.51	1.94
N1MIN	4.45	4.81			4.63
MIN	5.67	5.83	4.64	3.91	5.01
PNAMG	2.49	2.86	2.48	2.57	2.60
N2MIN	4.40	4.91	3.41	2.57	3.82
N2PNAMG	2.52	2.51	1.98	1.50	2.13
N3MIN	5.31	4.41	4.04	3.80	4.39
N3MINSI	5.74	5.35	4.75	3.70	4.89
O/PLOT12	1.68	1.57	1.11	1.23	1.40
D/F	6.28	5.86	4.93	4.39	5.37
N2*MIN	5.91	6.42	5.29	5.28	5.73
MIN(N2*)	4.62	4.12	3.30	3.05	3.78
N1*MIN	5.73	5.86	3.23	3.56	4.59
N1*	2.98	3.07	2.34	2.55	2.74
N2KNAMG0	0.34	0.33	0.33		
N2KNAMG2	2.58				2.58
N2KNAMG1	2.25	2.00			2.12
D0	4.94				4.94
D2	6.21				6.21
D1	5.56				5.56
D/N*PK0	5.69				5.69
D/N*PK2	6.34				6.34
D/N*PK1	5.64				5.64

TOTAL OF 2 CUTS MEAN DM% 36.1

PLOT AREA HARVESTED 0.00002

https://doi.org/10.23637/ERADOC-1-40 *pp 28*

89/R/AG/6

AGDELL

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

The 20th year of revised scheme, ley.

For previous years see 'Details' 1967 and 1973, and 74-88/R/AG/6.

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

Basal applications: Manures: 'Nitram' at 400 kg and later at 180 kg.

Cultivations, etc.:- First N applied: 28 Mar, 1989. Cut: 27 May.
Second N applied: 5 June. Cut: Started 30 Sept, completed 31 Oct.

https://doi.org/10.23637/ERADOC-1-40

89/R/BN/7

BARNFIELD

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

Sections 1 and 2 the sixth year of grass/clover. The 15th year of grass on the rest of the experiment.

For previous years see 'Details' 1967 and 1973 and 74-88/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 1989 (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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89/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: K applied: 8 Dec, 1988. P applied: 9 Dec. Cut: 25 May, 1989, 27 Sept.
Grass (Sections 3, 4, 5 and 6) only: N applied: 10 Apr, 1989, 6 June.

GRASS

1ST CUT (25/5/89) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	4.28	4.77	4.83	4.72	4.65
DPK	4.62	5.07	5.30	5.09	5.02
PKMG	4.03	4.57	4.97	4.90	4.62
P	2.52	2.34	2.22	2.02	2.27
PK	3.73	4.33	4.68	4.27	4.25
PMG	2.81	2.63	2.21	1.96	2.40
0	2.41	2.56	2.66	2.25	2.47
Mean	3.49	3.75	3.84	3.60	3.67

MANURE KMG 100 4.33

Grand mean 3.69

1ST CUT MEAN DM% 22.5

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89/R/BN/7

GRASS

2ND CUT (27/9/89) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	1.31	1.73	1.62	1.40	1.52
DPK	1.24	1.73	1.62	1.51	1.53
PKMG	0.86	1.16	1.56	1.43	1.25
P	0.65	0.56	0.53	0.32	0.52
PK	0.57	1.42	1.34	0.96	1.07
PMG	0.52	0.61	0.33	0.30	0.44
0	0.41	0.37	0.38	0.41	0.39
Mean	0.80	1.08	1.06	0.90	0.96

MANURE KMG 100 0.91

Grand mean 0.96

2ND CUT MEAN DM% 37.4

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	5.60	6.49	6.45	6.12	6.16
DPK	5.86	6.80	6.92	6.60	6.55
PKMG	4.89	5.73	6.53	6.33	5.87
P	3.17	2.90	2.76	2.34	2.79
PK	4.30	5.75	6.02	5.23	5.32
PMG	3.34	3.24	2.54	2.26	2.85
0	2.82	2.93	3.04	2.66	2.86
Mean	4.28	4.83	4.89	4.51	4.63

MANURE KMG 100 5.24

Grand mean 4.65

TOTAL OF 2 CUTS MEAN DM% 29.9

PLOT AREA HARVESTED 0.00568

https://doi.org/10.23637/ERADOC-1-40 *pp 32*

89/R/BN/7

GRASS/CLOVER

1ST CUT (25/5/89) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	2.60	3.07	1.99	1.12	1.94	1.69	1.16	1.94

1ST CUT MEAN DM% 25.1

2ND CUT (27/9/89) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	0.49	0.58	0.12	0.40	0.17	0.39	0.51	0.38

2ND CUT MEAN DM% 37.1

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	3.09	3.65	2.11	1.52	2.12	2.08	1.67	2.32

TOTAL OF 2 CUTS MEAN DM% 31.1

PLOT AREA HARVESTED 0.00568

https://doi.org/10.23637/ERADOC-1-40

89/R/GC/8

GARDEN CLOVER

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

The 136th year, red clover.

For previous years see 'Details' 1967 and 1973, and 74-88/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.02 x 1.42.

Treatments:

FUNGCIDE	Fungicide, to control Sclerotinia trifoliorum:
NONE	None
BENOMYL	Benomyl at 0.60 kg in 800 l on 14 Oct, 1988, 6 Dec, 3 Jan, 1989, 26 Jan and 8 March

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 1988. **FUNGCIDE** NONE required 882 and 671 kg K2O to the first and second blocks respectively, **FUNGCIDE** BENOMYL 601 and 571 kg K2O. This was applied as muriate of potash, one third in spring 1989 and one third after the first and second cuts.

Seed: Hungaropoly, sown at 34 kg in 1987.

Cultivations, etc.:- Chalk, PK and Mg applied: 21 Oct, 1988. K applied: 12 Apr, 1989. Cut and K applied: 1 June, 5 July. Cut: 15 Aug, 25 Sept.

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89/R/GC/8

1ST CUT (1/6/89) DRY MATTER TONNES/HECTARE

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

FUNGCIDE	NONE	BENOMYL	Mean
	6.65	6.53	6.59

1ST CUT MEAN DM% 18.1

2ND CUT (5/7/89) DRY MATTER TONNES/HECTARE

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

FUNGCIDE	NONE	BENOMYL	Mean
	1.97	1.92	1.94

2ND CUT MEAN DM% 21.3

3RD CUT (15/8/89) DRY MATTER TONNES/HECTARE

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

FUNGCIDE	NONE	BENOMYL	Mean
	1.51	1.50	1.51

3RD CUT MEAN DM% 23.1

4TH CUT (25/9/89) DRY MATTER TONNES/HECTARE

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

FUNGCIDE	NONE	BENOMYL	Mean
	0.08	0.10	0.09

4TH CUT MEAN DM% 26.1

TOTAL OF 4 CUTS DRY MATTER TONNES/HECTARE

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

FUNGCIDE	NONE	BENOMYL	Mean
	10.21	10.06	10.13

TOTAL OF 4 CUTS MEAN DM% 22.1

PLOT AREA HARVESTED 0.00010

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89/R/RN/1 and 89/R/RN/2

LEY ARABLE

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

Sponsor: P.R. Poulton.

The 41st year, old grass, leys, sugar beet, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-88/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (89/R/RN/1)

FOSTERS — A site with little organic matter initially (89/R/RN/2)

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

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

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

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

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

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

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

C	Clover-grass ley
N	All-grass ley

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

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89/R/RN/1 and 89/R/RN/2

Additional treatments to 2nd test crop w. wheat:-

Sub plots

FYMRES70 Farmyard manure residues, last applied 1970:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertilizer in 1989 (kg N) as 'Nitram':

0
50
100
150

Standard applications:
2nd Treatment crops:
Lucerne: Manures: (0:18:36) at 630 kg.
All-grass ley: Manures: (0:18:36) at 420 kg. (25:0:16) at 300 kg on two occasions.
Clover-grass ley: Manures: (0:18:36) at 420 kg.
Sugar beet: Manures: (13:13:20) at 1150 kg. Weedkiller: Metamitron at 3.5 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg in 200 l.
2nd Test crop:
W. wheat: Manures: (0:18:36) at 560 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Chlortoluron at 3.5 kg in 200 l.
Reseeded grass and old grass: Manures: (0:18:36) at 420 kg. All-grass half plots: (25:0:16) at 300 kg in spring and after each cut except the last.

Seed: Sugar beet: Monoire, seed spaced 3.8 cm apart in rows 51 cm apart.
W. wheat: Avalon, sown at 180 kg.

Cultivations, etc.:-
2nd Treatment crops:
Lucerne: PK applied: 9 Dec, 1988. First cut: 24 May, 1989. Second cut: 25 Sept (Fosters), 27 Sept (Highfield).
All-grass ley and clover-grass ley: PK applied: 9 Dec, 1988. NK applied to all-grass ley: 10 Apr, 1989 and 26 May. Cut: 24 May, 25 Sept.
Sugar beet: Ploughed: 19 Dec, 1988. NPK applied: 10 Apr, 1989. Spring-tine cultivated twice: 18 Apr. Weedkiller applied, rotary harrowed and harrowed: 2 May. Rolled, seed sown, rolled: 3 May. Insecticide applied: 9 June. Singled: 20 June. Lifted: 21 Nov.
2nd Test crop w. wheat: Glyphosate applied: 1 Oct, 1988. PK applied: 7 Oct. Ploughed: 11 Oct. Rotary harrowed, seed sown: 27 Oct. Chlortoluron applied: 15 Nov. N treatments applied: 18 Apr, 1989. Combine harvested: 7 Aug.
Reseeded grass and old grass: PK applied: 9 Dec, 1988. NK applied to all-grass half plots: 10 Apr, 1989 and 26 May. Cut: 24 May, 25 Sept.

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89/R/RN/1 and 89/R/RN/2

NOTE: Lucerne on Highfield grew poorly and no yields were recorded.

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 2 CUTS	3.29	3.62
MEAN DM%	35.1	36.2
ALL-GRASS LEY		
TOTAL OF 2 CUTS	6.58	6.40
MEAN DM%	36.6	37.1

	FOSTERS
LUCERNE	
TOTAL OF 2 CUTS	6.70
MEAN DM%	31.6

	HIGHFIELD	
OLD GRASS		
TOTAL OF 2 CUTS	C	N
41ST EXPTL YEAR		
BLOCKS 1 & 4	1.96	6.46
BLOCK 2	3.06	6.43
MEAN DM%	35.1	35.2

	HIGHFIELD		FOSTERS	
RESEEDED GRASS				
TOTAL OF 2 CUTS	C	N	C	N
41ST EXPTL YEAR BLOCKS	1 & 4	1 & 4	1 & 3	1 & 3
	2.24	6.71	3.85	6.28
41ST EXPTL YEAR BLOCKS	2 & 3	2 & 3	2 & 4	2 & 4
	3.18	6.77	3.83	5.68
(SEEDED 1949 RESEEDED 1973)				
MEAN DM%	34.7	35.5	35.0	36.5

SUGAR BEET: TONNES/HECTARE

	HIGHFIELD	FOSTERS
ROOTS WASHED	40.0	36.4
SUGAR PERCENTAGE	17.1	16.7
TOTAL SUGAR	6.85	6.07
TOPS	28.6	29.7

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89/R/RN/1 HIGHFIELD W.WHEAT (2ND TEST CROP)

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	Mean
ROTATION			
LUCERNE	5.96	5.46	5.71
CLOGRA	5.82	5.97	5.90
GRASS	5.99	5.37	5.68
ARABLE	3.94	3.24	3.59
Mean	5.43	5.01	5.22

N	0	50	100	150	Mean
ROTATION					
LUCERNE	4.23	6.10	6.23	6.30	5.71
CLOGRA	4.92	6.16	5.73	6.77	5.90
GRASS	4.54	5.29	6.47	6.42	5.68
ARABLE	1.94	3.28	4.59	4.56	3.59
Mean	3.91	5.21	5.75	6.01	5.22

N	0	50	100	150	Mean
FYMRES70					
NONE	4.10	5.47	5.96	6.18	5.43
FYM	3.71	4.95	5.55	5.85	5.01
Mean	3.91	5.21	5.75	6.01	5.22

	N	0	50	100	150
ROTATION	**FYMRES70**				
LUCERNE	NONE	4.95	6.35	6.49	6.05
	FYM	3.51	5.85	5.96	6.54
CLOGRA	NONE	4.84	6.20	5.56	6.68
	FYM	4.99	6.13	5.90	6.86
GRASS	NONE	4.68	5.69	6.84	6.73
	FYM	4.39	4.89	6.10	6.10
ARABLE	NONE	1.94	3.63	4.94	5.25
	FYM	1.94	2.92	4.24	3.88

GRAIN MEAN DM% 89.0

PLOT AREA HARVESTED 0.00663

https://doi.org/10.23637/ERADOC-1-40

89/R/RN/2 FOSTERS W.WHEAT (2ND TEST CROP)

GRAIN TONNES/HECTARE

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

FYMRES70	NONE	FYM	Mean
ROTATION			
LUCERNE	6.06	6.33	6.19
CLOGRA	6.13	6.17	6.15
GRASS	5.27	5.47	5.37
ARABLE	4.37	3.99	4.18
Mean	5.46	5.49	5.48

N	0	50	100	150	Mean
ROTATION					
LUCERNE	5.08	5.95	6.80	6.95	6.19
CLOGRA	4.69	5.54	6.68	7.69	6.15
GRASS	4.63	5.35	5.40	6.12	5.37
ARABLE	2.27	3.78	4.74	5.94	4.18
Mean	4.17	5.15	5.90	6.68	5.48

N	0	50	100	150	Mean
FYMRES70					
NONE	3.97	5.19	5.76	6.91	5.46
FYM	4.36	5.11	6.05	6.44	5.49
Mean	4.17	5.15	5.90	6.68	5.48

N		0	50	100	150
ROTATION	**FYMRES70**				
LUCERNE	NONE	4.98	5.61	6.37	7.27
	FYM	5.18	6.28	7.22	6.64
CLOGRA	NONE	3.99	6.37	6.34	7.81
	FYM	5.39	4.71	7.02	7.57
GRASS	NONE	4.35	5.17	4.49	7.08
	FYM	4.90	5.54	6.31	5.15
ARABLE	NONE	2.56	3.63	5.84	5.47
	FYM	1.98	3.92	3.64	6.42

GRAIN MEAN DM% 88.9

PLOT AREA HARVESTED 0.00663

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89/W/RN/3

LEY/ARABLE

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

Sponsors: A.E. Johnston, P.R. Poulton.

The 52nd year, leys, w. beans, w. wheat, s. barley.

For previous years see 'Details' 1967 & 1973 and 74-88/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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89/W/RN/3

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

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

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

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

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

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

Whole plots

1. **ROTATION** Rotations:

   LN 8
   LN 3
   LC 8
   LC 3
   AF
   AB

1/2 plots

2. **FYMRES63** Farmyard manure residues, last applied 1963:

   NONE None
   FYM 38 tonnes on each occasion

1/8 plots

3. **N** Nitrogen fertilizer (kg N) as 'Nitram':

   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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89/W/RN/3

1/2 plots

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

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

3. **N** Nitrogen fertilizer (kg N) as 'Nitram':

0
60
120
180

Treatments to leys:

FYM RES Farmyard manure residues:

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

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

Continuous rotations	No FYM half plots	FYM half plots
LN	115	85
LC	0	0
AF	185	110
AB	335	280
Ex-alternating rotations		
LN 8 ploughed for w. wheat	0	0
LN 8 not ploughed	70	0
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: Magnesian limestone at 5.0 t. (0:18:36) at 420 kg. N at 76 kg to grass ley and 50 kg to clover/grass as 'Nitram'.

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

Clover/grass ley; 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 t to 5th and 6th years only. K2O at 54 kg as muriate of potash in spring and after each cut except the last.

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89/W/RN/3

Standard applications:-

S. barley, 1st and 2nd treatment crops: Manures: Magnesian limestone at 5.0 t to 1st treatment crop only. (20:10:10) at 400 kg. Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with mecoprop at 2.1 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 220 l.

W. beans: 3rd treatment crop: Manures: (0:24:24) at 170 kg. Weedkiller: Simazine at 0.85 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l. Pirimicarb at 0.14 kg in 220 l.

Fallow, 1st and 2nd treatment years: Manure: Magnesian limestone at 5.0 t to 1st year only.

W. wheat, 1st test crop: Manures: (0:24:24) at 260 kg. Manganese at 0.096 kg Mn as a foliar spray in 220 l. Weedkillers: Glyphosate at 1.4 kg in 220 l. Bromoxynil at 0.34 kg and clopyralid at 0.07 kg with mecoprop at 2.5 kg in 220 l. Fungicides: Carbendazim at 0.15 kg and prochloraz at 0.40 kg applied with the growth regulator in 220 l. Propiconazole at 0.12 kg in 220 l. Fenpropimorph at 0.75 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticide: Carbofuran at 7.5 kg. Growth regulator: Chlormequat chloride at 1.6 kg.

S. barley, 2nd test crop: Manures: Magnesian limestone at 5.0 t. (0:24:24) at 260 kg. Weedkillers: Bromoxynil at 0.24 kg and clopyralid at 0.05 kg with mecoprop at 2.1 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 220 l. Insecticide: Carbofuran at 7.5 kg.

Seed: Grass ley: Climax timothy at 15 kg and meadow fescue at 15 kg, mixture sown at 30 kg.

Clover/grass ley: Climax timothy at 15 kg, meadow fescue at 12 kg and Huia white clover at 3.4 kg, mixture sown at 30 kg.

S. barley: Klaxon, sown at 160 kg.

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

W. wheat: Mercia, mixed with methiocarb pellets, sown at 165 kg.

Cultivations, etc.:-

Treatment crops:

Grass ley and clover/grass ley, 1st year: Magnesian limestone applied: 29 Nov, 1988. Ploughed: 14 Dec. PK and N applied: 12 May, 1989. Rotary harrowed with crumbler attached, rolled, spike harrowed with crumbler attached, seed sown, rolled: 15 May. Topped: 11 July. Cut: 20 Nov.

Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Magnesian limestone applied, 5th and 6th year only: 29 Nov, 1988. Topped: 12 Dec. Corrective K applied to 4th year only: 29 Dec. NK applied to grass ley, K applied to grass/clover ley: 13 Mar, 1989 and 16 June. Cut: 5 June and 20 Nov (8th year leys were cut only on the first occasion).

S. barley, 1st and 2nd treatment crops: Magnesian limestone applied to 1st treatment only: 29 Nov, 1988. Ploughed: 15 Dec. NPK applied: 8 Mar, 1989. Rotary harrowed with crumbler attached, seed sown: 14 Mar. Weedkillers applied: 19 May. Fungicides applied: 5 June. Combine harvested: 16 Aug.

W. beans, 3rd treatment crop: PK applied, seed broadcast: 22 Nov, 1988. Ploughed: 23 Nov. Weedkiller applied: 29 Nov. Deltamethrin applied: 17 May, 1989. Pirimicarb applied: 22 June. Combine harvested: 22 Aug.

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89/W/RN/3

Cultivations, etc.:-

Fallow, 1st and 2nd treatment years: Magnesian limestone applied, 1st year only: 29 Nov, 1988. Ploughed: 15 Dec. Spring-tine cultivated: 15 May, 1989 and 28 June. Shallow cultivated with thistle bar: 11 July and 2 Aug.

Test crops:

W. wheat, 1st test crop: Glyphosate applied: 19 Oct, 1988. Ploughed: 28 Oct. PK applied, carbofuran applied, spring-tine cultivated with crumbler attached, seed sown: 31 Oct. Corrective K applied: 29 Dec. N applied: 18 Apr, 1989. Bromoxynil, clopyralid and mecoprop applied: 28 Apr. Carbendazim, prochloraz and growth regulator applied: 17 May. Manganese applied: 22 May. Propiconazole applied: 5 June. Fenpropimorph, carbendazim and maneb applied: 3 July. Combine harvested: 7 Aug.

S. barley,2nd test crop: Magnesian limestone applied: 29 Nov, 1988. Ploughed: 15 Dec. PK applied: 8 Mar, 1989. Carbofuran applied, rotary harrowed with crumbler attached, seed sown: 14 Mar. N applied: 20 Mar. Weedkillers applied: 19 May. Fungicides applied: 5 June. Combine harvested: 16 Aug.

LEYS

1ST CUTTING OCCASION (5/6/89) DRY MATTER TONNES/HECTARE

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

FYM RES / LEY	NONE	FYM	Mean
LC1	*	*	*
LC2	3.34	3.96	3.65
LC3	4.18	4.46	4.32
LN1	*	*	*
LN2	6.88	5.84	6.36
LN3	3.84	4.41	4.13
LLC1	*	*	*
LLC2	4.91	5.11	5.01
LLC3	6.05	4.65	5.35
LLC4	4.21	3.89	4.05
LLC5	6.24	5.80	6.02
LLC6	5.64	6.27	5.96
LLC7	3.93	4.94	4.44
LLC8	4.39	4.30	4.35
LLN1	*	*	*
LLN2	6.94	5.87	6.41
LLN3	4.82	4.83	4.83
LLN4	5.10	5.26	5.18
LLN5	3.61	3.49	3.55
LLN6	6.35	5.69	6.02
LLN7	4.57	5.99	5.28
LLN8	5.67	6.68	6.17
Mean	5.04	5.08	5.06

1ST CUT MEAN DM% 26.6

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

LEYS

2ND CUTTING OCCASION (20/11/89) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	0.88	0.62	0.75
LC2	0.32	0.30	0.31
LC3	0.00	0.00	0.00
LN1	0.45	0.39	0.42
LN2	1.10	0.82	0.96
LN3	0.00	0.00	0.00
LLC1	1.19	0.91	1.05
LLC2	0.38	0.46	0.42
LLC3	0.76	0.28	0.52
LLC4	0.93	1.30	1.11
LLC5	0.90	0.63	0.76
LLC6	0.88	1.06	0.97
LLC7	0.46	0.54	0.50
LLC8	0.00	0.00	0.00
LLN1	0.73	0.76	0.75
LLN2	1.08	0.99	1.03
LLN3	0.86	1.20	1.03
LLN4	0.96	1.95	1.46
LLN5	0.87	1.09	0.98
LLN6	2.02	1.64	1.83
LLN7	1.20	1.24	1.22
LLN8	0.00	0.00	0.00
Mean	0.73	0.74	0.73

2ND CUT MEAN DM% 23.7

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

LEYS

TOTAL OF 2 CUTTING OCCASIONS DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	0.88	0.62	0.75
LC2	3.66	4.27	3.97
LC3	4.18	4.46	4.32
LN1	0.45	0.39	0.42
LN2	7.98	6.66	7.32
LN3	3.84	4.41	4.13
LLC1	1.19	0.91	1.05
LLC2	5.30	5.57	5.43
LLC3	6.81	4.94	5.87
LLC4	5.14	5.19	5.16
LLC5	7.14	6.42	6.78
LLC6	6.52	7.33	6.93
LLC7	4.38	5.48	4.93
LLC8	4.39	4.30	4.35
LLN1	0.73	0.76	0.75
LLN2	8.02	6.86	7.44
LLN3	5.68	6.03	5.86
LLN4	6.06	7.21	6.64
LLN5	4.48	4.58	4.53
LLN6	8.36	7.33	7.85
LLN7	5.77	7.23	6.50
LLN8	5.67	6.68	6.17
Mean	4.85	4.89	4.87

TOTAL OF 2 CUTTING OCCASIONS MEAN DM% 24.4

PLOT AREA HARVESTED 0.00204

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/3

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES66	NONE	FYM	Mean
ROTATION			
LN 8	4.73	5.18	4.95
LN 3	5.71	5.35	5.53
LC 8	5.60	5.92	5.76
LC 3	5.87	5.96	5.92
AF	5.00	4.35	4.68
AB	3.21	4.01	3.61
Mean	5.02	5.13	5.07

N	0	70	140	210	Mean
ROTATION					
LN 8	3.77	5.58	5.56	4.91	4.95
LN 3	4.04	5.94	6.10	6.04	5.53
LC 8	4.91	6.69	6.39	5.06	5.76
LC 3	5.45	6.28	6.12	5.81	5.92
AF	2.80	4.92	5.17	5.82	4.68
AB	1.16	3.94	4.58	4.74	3.61
Mean	3.69	5.56	5.65	5.40	5.07

N	0	70	140	210	Mean
FYMRES66					
NONE	3.65	5.32	5.90	5.21	5.02
FYM	3.73	5.80	5.40	5.58	5.13
Mean	3.69	5.56	5.65	5.40	5.07

N		0	70	140	210
ROTATION	FYMRES66				
LN 8	NONE	3.46	5.45	5.65	4.36
	FYM	4.08	5.70	5.48	5.46
LN 3	NONE	4.23	5.31	7.04	6.23
	FYM	3.86	6.57	5.16	5.84
LC 8	NONE	4.47	6.15	6.72	5.07
	FYM	5.35	7.24	6.06	5.04
LC 3	NONE	5.83	6.22	5.80	5.64
	FYM	5.07	6.34	6.44	5.98
AF	NONE	2.99	5.59	5.63	5.80
	FYM	2.61	4.26	4.71	5.84
AB	NONE	0.91	3.20	4.58	4.14
	FYM	1.42	4.68	4.58	5.34

GRAIN MEAN DM% 89.3

PLOT AREA HARVESTED 0.00251

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89/W/RN/3

S.BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES62	NONE	FYM	Mean
ROTATION			
LN 8	3.17	3.52	3.34
LN 3	3.53	3.19	3.36
LC 8	3.48	3.10	3.29
LC 3	3.13	3.24	3.19
AF	3.18	3.21	3.20
AB	2.61	2.58	2.59
Mean	3.18	3.14	3.16

N	0	60	120	180	Mean
ROTATION					
LN 8	2.69	3.42	3.64	3.62	3.34
LN 3	2.42	3.41	3.84	3.77	3.36
LC 8	2.70	3.50	3.48	3.48	3.29
LC 3	2.49	3.15	3.57	3.54	3.19
AF	1.58	3.71	3.64	3.87	3.20
AB	1.37	3.14	3.20	2.66	2.59
Mean	2.21	3.39	3.56	3.49	3.16

N	0	60	120	180	Mean
FYMRES62					
NONE	2.14	3.49	3.59	3.51	3.18
FYM	2.28	3.29	3.54	3.47	3.14
Mean	2.21	3.39	3.56	3.49	3.16

N		0	60	120	180
ROTATION	**FYMRES62**				
LN 8	NONE	2.35	3.40	3.28	3.63
	FYM	3.04	3.45	4.00	3.60
LN 3	NONE	2.56	3.48	4.04	4.01
	FYM	2.28	3.33	3.63	3.53
LC 8	NONE	2.80	3.80	3.60	3.70
	FYM	2.60	3.20	3.36	3.25
LC 3	NONE	2.53	3.08	3.58	3.34
	FYM	2.45	3.21	3.56	3.73
AF	NONE	1.44	3.69	3.70	3.90
	FYM	1.72	3.73	3.57	3.83
AB	NONE	1.15	3.48	3.32	2.47
	FYM	1.59	2.80	3.08	2.84

GRAIN MEAN DM% 85.6

PLOT AREA HARVESTED 0.00251

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/4

MARKET GARDEN

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

Sponsor: S.P. McGrath.

The 48th year, clover.

For previous years see 'Details' 1967 & 1973, 74-80/W/RN/4 and 83-88/W/RN/4.

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

Whole plot dimensions: 8.15 x 5.18.

Treatments:

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

Whole plots

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

FYM	Farmyard manure until 1967
SEWAGE	Sewage sludge until 1961
SEW COM	Sewage sludge, composted with straw, until 1961
VEG COM	Vegetable compost until 1962, then farmyard manure until 1967

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

25
50

EXTRA plus one extra treatment (duplicated):

NONE No organic manures

Sub plots

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

0
100

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/4

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

Whole plots

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

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

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

25
50

EXTRA plus one extra treatment (duplicated):

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

Sub plots

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

0
100

Basal applications:
Series A and B: Manure: Magnesian limestone at 5.0 t.

Cultivations, etc.:- Magnesian limestone applied: 16 Dec, 1988. Cut: 2 June, 1989.

NOTE: Yields were taken only from the **N RESID** 0 plots.

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/4 WHITE CLOVER SERIES A

1ST AND ONLY CUT (2/6/89) DRY MATTER TONNES/HECTARE

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

OM RESID / **OM RATE**	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	3.59	4.36	3.86	3.82	3.91
50	4.09	4.01	3.75	3.59	3.86
Mean	3.84	4.19	3.80	3.70	3.88

EXTRA NONE 4.17

Grand mean 3.94

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

OM RESID	**OM RATE**	**OM RESID** **OM RATE**
0.188	0.133	0.265

SED for comparing **EXTRA** NONE with any item in
OM RESID.OM RATE table is 0.230

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.375	9.5

1ST CUT MEAN DM% 12.5

PLOT AREA HARVESTED 0.00052

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89/W/RN/4 WHITE CLOVER SERIES B

1ST AND ONLY CUT (2/6/89) DRY MATTER TONNES/HECTARE

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

OM RESID / **OM RATE**	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	5.07	5.08	5.06	4.94	5.04
50	4.48	5.39	4.67	5.17	4.93
Mean	4.77	5.23	4.87	5.06	4.98

EXTRA PEAT 4.92

Grand mean 4.97

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

OM RESID	**OM RATE**	**OM RESID** **OM RATE**
0.279	0.198	0.395

SED for comparing **EXTRA** PEAT with any item in
OM RESID.OM RATE table is 0.342

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.559	11.2

1ST CUT MEAN DM% 12.6

PLOT AREA HARVESTED 0.00052

https://doi.org/10.23637/ERADOC-1-40 *pp 53*

89/R/RN/5

ARABLE REFERENCE PLOTS

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

Sponsors: R.J. Darby, M.V. Hewitt.

The 34th year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980; w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 30th year of a rotation on the additional plots (as the initial above rotation for 20 years; w. barley, ley, potatoes, w. wheat, w. oats since 1980). The 33rd year of permanent grass.

For previous years see 58/Bc/1(t), 59/Bc/1(t), 60/B/3(t), 61-64/B/2, 65/B/2(t), 66/B/2(t), 67/B/2, 68/B/3(t) and 69-88/R/RN/5.

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

Whole plot dimensions: 2.13 x 2.44.

Treatments: Fertilizers and farmyard manure:

MANURE

Original plots

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

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

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

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89/R/RN/5

Additional plots

MANURE	Fertilizers from 1980 to 1989 and in previous years:
1980-89	Until 1979
O	O
N2PK	N2 PK
N2PKMG	N2 PK MG CA
N2PKS	N2 PK CA S
N2PKMGS	N2 PK MG S
N1PKMGS	N2 PK CA MG S
N3PKMGS	N2 PK CA MG S TE

N: In 1989: N1: 20 kg (ley), 120 kg (w. wheat, w. barley and w. oats), 160 kg (potatoes). N2: 30 kg (ley), 160 kg (w. wheat, w. barley and w. oats), 240 kg (potatoes). N3: 40 kg (ley), 200 kg (w. wheat, w. barley and w. oats), 320 kg (potatoes). Until 1979 N2 = larger rate on original plots in these years. As urea in all years. Cereals receive 40 kg N in March, remainder in April.
P: 126 kg P_2O_5 as potassium dihydrogen phosphate.
K: 251 kg K_2O total. As potassium dihydrogen phosphate (83 kg K_2O) on all PK plots. In addition plots without S receive 168 kg K_2O as potassium chloride, plots with S receive 92 kg K_2O as potassium sulphate plus 76 kg K_2O as potassium chloride. Since 1978 all PK plots receive, in addition to the standard total, 126 kg K_2O for potatoes, applied in autumn as potassium chloride.
MG: 126 kg MgO as magnesium chloride.
CA: 126 kg CaO as calcium carbonate until 1979. In 1980 plots not previously given Ca received calcium carbonate at 7.5 t, except O which was given 5.0 t.
S: 30 kg S supplied by the potassium sulphate.
TE: Trace element mixture which included Mn, Cu, Zn, B, Mo, Ca and Fe.

Standard applications:

Original and additional plots:

All cereals: Weedkillers: Isoproturon at 2.5 kg in 220 l (to wheat and barley). Fluroxypyr at 0.15 kg in 220 l. Fungicides: Prochloraz at 0.56 kg and carbendazim at 0.21 kg in 220 l. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.38 kg in 220 l. Propiconazole at 0.12 kg applied with the pirimicarb. Insecticides: Dimethoate at 0.67 kg in 220 l. Pirimicarb at 0.14 kg. Growth regulators: Chlormequat at 1.6 kg in 220 l (to wheat and oats). Mepiquat chloride at 0.86 kg and 2-chloroethylphosphonic acid at 0.44 kg in 220 l (to barley).

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

Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 220 l. Fungicide: Mancozeb at 1.3 kg applied with the insecticide in 220 l. Insecticide: Pirimicarb at 0.14 kg.

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

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89/R/RN/5

Cultivations, etc.:-

Original and additional plots:

All cereals: Isoproturon applied (to wheat and barley): 11 Oct, 1988. Dimethoate applied: 21 Oct. First N treatments applied: 8 Mar, 1989. Prochloraz and carbendazim applied, fluroxypyr applied separately: 28 Mar. Growth regulator applied (to wheat and oats): 29 Mar. Second N treatments applied: 10 Apr. Growth regulators applied (to barley): 12 Apr. Carbendazim, maneb and tridemorph applied: 8 May. Propiconazole and pirimicarb applied: 26 May.

W. wheat: P, K, Mg and (to additional plots only) S applied, rotary cultivated, raked level and seed sown: 22 Sept, 1988. Hand harvested: 1 Aug, 1989.

W. barley: P, K and (to additional plots only) Mg and S applied: 15 Sept, 1988. Rotary cultivated, raked level, seed sown and raked in: 16 Sept. Hand harvested: 18 July, 1989.

W. oats: P, K and (to additional plots only) Mg and S applied: 29 Sept, 1988. Rotary cultivated, raked level, seed sown and raked in: 30 Sept. Hand harvested: 19 July, 1989.

Potatoes: FYM applied (to original plots) and plots dug by hand: 22 Nov, 1988. P, K and (to additional plots only) Mg and S applied: 18 Apr, 1989. N applied, rotary cultivated, potatoes planted: 19 Apr. Weedkillers applied: 15 May. Fungicide with insecticide applied: 21 July. Plots given neither FYM nor K on original plots and plot given no fertilizer on additional plots harvested by hand: 22 Aug. Remaining plots harvested by hand: 14 Sept.

Grass-clover ley: Rotary cultivated, raked level, seed sown and raked in: 6 Sept, 1988. P, K and (to additional plots only), Mg and S applied: 9 Dec, 1988. N applied: 8 Mar, 1989. Cut: 10 May, 25 July and 29 Sept.

Permanent grass: FYM, P, K and first N applied: 8 Mar, 1989. Cut, second N applied: 10 May. Cut, third N applied: 25 July. Cut: 29 Sept.

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89/R/RN/5

ORIGINAL PLOTS

TONNES/HECTARE

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

	W. WHEAT:		W. BARLEY:		LEY : DRY MATTER			
	GRAIN	STRAW	GRAIN	STRAW	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE								
0	3.49	3.93	2.34	2.06	2.40	0.78	0.25	3.43
N1	2.72	4.42	2.42	2.64	3.59	0.79	0.24	4.62
P	2.47	3.36	4.17	3.04	2.47	0.90	0.23	3.60
N1P	1.94	3.79	4.03	4.82	3.96	0.74	0.21	4.92
K	4.77	5.27	3.25	3.06	2.52	1.03	0.23	3.78
N1K	6.54	7.29	5.16	5.24	2.53	1.43	0.32	4.28
PK	5.86	6.25	4.52	3.38	3.74	1.52	0.90	6.16
N1PK	8.79	9.48	7.77	7.92	4.88	1.16	0.40	6.44
N2PK	8.84	12.06	8.63	8.64	5.98	1.19	0.33	7.50
D	7.96	9.40	5.54	5.28	4.47	1.32	0.33	6.13
N1PKD	9.96	12.94	9.38	9.44	6.10	1.49	0.46	8.05
N2PKD	9.09	14.02	9.13	10.96	6.30	1.59	0.44	8.32
MEAN DM%	84.8	82.9	89.6	90.2	25.1	44.5	38.1	35.9

	W. OATS:		POTATOES:	PERMANENT GRASS : DRY MATTER			
	GRAIN	STRAW	TOTAL TUBERS	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE							
0	3.57	5.42	6.9	0.65	0.71	0.26	1.62
N1	5.29	8.81	9.4	1.07	0.69	0.43	2.18
P	3.31	4.71	12.7	0.39	0.69	0.18	1.26
N1P	5.58	9.13	7.7	1.50	0.78	0.67	2.95
K	1.26	5.50	27.1	0.90	0.89	0.39	2.17
N1K	5.57	9.86	19.2	1.76	1.19	0.56	3.52
PK	4.42	7.04	26.9	1.52	1.66	0.30	3.48
N1PK	6.88	12.39	29.2	1.81	1.51	0.63	3.95
N2PK	6.35	14.29	30.0	2.55	1.24	0.79	4.58
D	6.19	10.89	28.1	2.85	1.46	0.69	5.00
N1PKD	6.77	14.47	37.5	3.34	2.37	1.01	6.72
N2PKD	6.12	16.07	36.3	3.61	2.73	0.97	7.31
MEAN DM%	86.4	55.3	23.9	29.9	45.8	41.5	39.1

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89/R/RN/5

ADDITIONAL PLOTS

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

	W. WHEAT:		W. BARLEY:		W. OATS:		POTATOES: TOTAL
	GRAIN	STRAW	GRAIN	STRAW	GRAIN	STRAW	TUBERS
MANURE							
0	4.17	4.80	3.23	2.57	3.74	5.13	6.7
N2PK	9.48	11.08	9.11	9.82	6.98	13.26	23.6
N2PKMG	10.73	11.81	8.38	8.62	6.26	13.36	32.1
N2PKS	8.99	11.30	7.57	8.40	6.89	14.22	26.9
N2PKMGS	8.08	9.59	9.48	9.12	6.69	12.53	26.7
N1PKMGS	9.34	10.73	8.77	8.73	7.16	13.27	29.0
N3PKMGS	9.06	11.78	9.30	9.46	6.17	12.60	24.8
MEAN DM%	85.3	82.3	90.1	91.0	87.3	64.1	23.2

	LEY : DRY MATTER			
	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE				
0	2.83	1.00	0.28	4.12
N2PK	5.47	1.04	0.32	6.82
N2PKMG	5.73	1.29	0.43	7.45
N2PKS	5.71	1.39	0.40	7.50
N2PKMGS	5.89	1.48	0.48	7.85
N1PKMGS	5.42	1.35	0.55	7.32
N3PKMGS	6.40	1.46	0.43	8.29
MEAN DM%	23.8	45.2	36.0	35.0

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89/R/RN/8

CULTIVATION/WEEDKILLER

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

Sponsor: R. Moffitt.

The 29th year, w. barley.

For previous years see 'Details' 1967 and 1973 and 74-88/R/RN/8.

Design: 2 randomised blocks of 12 plots.

Whole plot dimensions: 12.8 x 12.2.

Treatments: All combinations of:-

Whole plots

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

PLOUGH	Ploughed: 19 Aug, 1988
ROTA DIG	Cultivated by rotary digger: 19 Aug
DEEPTINE	Deep-tine cultivated, twice: 19 Aug

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

NONE	None
CNVNTIAL	Conventional vertical tine
PARAPLOW	'Paraplow'

XTR BURN — plus three extra treatments with straw burnt since 1985, direct drilled until 1984, heavy spring-tine cultivated on 5 Sept, 1988, in addition to basal cultivating, differing in subsoiling in September 1982:

NONE	None
CNVNTIAL	Conventional vertical tine
PARAPLOW	'Paraplow'

NOTES: (1) Straw was chopped on 5 Aug, 1988 and was burnt on XTR BURN on 17 Aug.
(2) The conventional vertical tine subsoiler had tines 76 cm apart and worked at a depth of about 50 cm.
(3) The 'Paraplow' had rigid tines set at a 45 degree angle. The tip of each tine was in line with the attachment of an adjacent tine. The tines were 51 cm apart and worked at a depth of about 38 cm.

Basal applications: Manures: (0:18:36) at 920 kg. 'Nitram' at 480 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Chlortoluron at 3.5 kg in 200 l. Isoproturon at 2.1 kg with mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg in 200 l. Molluscicide: Methiocarb at 0.22 kg.

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89/R/RN/8

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- PK applied: 16 Sept, 1988. Glyphosate applied: 2 Oct. Heavy spring-tine cultivated: 17 Oct. Heavy spring-tine cultivated, spring-tine cultivated: 22 Oct. Seed sown: 23 Oct. Chlortoluron applied: 16 Nov. Molluscicide applied: 30 Jan, 1989. N applied: 14 Apr. Remaining weedkillers applied: 2 May. Combine harvested: 13 July.

GRAIN TONNES/HECTARE

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

SUBSOIL[82] / CLT CHOP	NONE	CNVNTIAL	PARAPLOW	Mean
PLOUGH	4.71	4.82	4.52	4.69
ROTA DIG	3.98	3.58	4.05	3.87
DEEPTINE	4.12	4.34	4.50	4.32
Mean	4.27	4.25	4.36	4.29

XTR BURN	NONE	CNVNTIAL	PARAPLOW	Mean
	4.90	5.09	5.49	5.16

Grand mean 4.51

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

XTR BURN	CLT CHOP	SUBSOIL[82]	CLT CHOP SUBSOIL[82]
0.486	0.281	0.281	0.486

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.486	10.8

GRAIN MEAN DM% 80.1

PLOT AREA HARVESTED 0.00280

https://doi.org/10.23637/ERADOC-1-40

89/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 25th year, w. wheat, potatoes.

For previous years see 'Details' 1973 and 74-88/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.

3rd test crop w. wheat, after w.wheat 1987, potatoes 1988, 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 in 1989 (kg N) as 'Nitro-Chalk':

0
50
100
150
200
250

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89/W/RN/12

2nd test crop potatoes, after w. wheat 1988, 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** Nitrogen fertilizer in 1989 (kg N) as 'Nitram':

0
70
140
210
280
350

Standard applications:

2nd test crop:

Potatoes: Manures: Magnesian limestone at 5.0 t. Kieserite at 680 kg. (0:18:36) at 1380 kg. Weedkiller: Linuron at 1.2 kg in 220 l. Fungicides: Mancozeb at 1.4 kg in 220 l on two occasions and at 2.0 kg in 220 l on two occasions. Fentin hydroxide at 0.28 kg in 220 l. Nematicide: Oxamyl at 5 kg. Desiccant: Dilute sulphuric acid at 280 l.

3rd test crop:

W. wheat: Manures: Magnesian limestone at 5.0 t. (0:18:36) at 560 kg/ha. Mn at 0.096 kg as manganese sulphate in 220 l, applied on two occasions. Weedkillers: Mecoprop at 2.5 kg with bromoxynil at 0.34 kg and clopyralid at 0.07 kg in 220 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg applied with the growth regulator in 220 l. Propiconazole at 0.12 kg in 220 l. Fenpropimorph at 0.75 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Molluscicide: Methiocarb at 0.20 kg, also applied with seed. Nematicide: Carbofuran at 7.5 kg. Growth regulator: Chlormequat chloride at 1.6 kg.

Seed: Potatoes: Pentland Crown dressed 'Seedtect'.
W. wheat: Mercia, sown at 160 kg with methiocarb pellets.

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/12

Cultivations, etc.:-

Potatoes: Magnesian limestone applied: 28 Oct, 1988. Ploughed 9 Dec. Kieserite applied: 3 Jan, 1989. PK applied: 4 Jan. Spring-tine cultivated: 4 May. N applied: 5 May. Nematicide applied: 8 May. Rotary cultivated, seed planted: 9 May. Weedkiller applied: 25 May. Mancozeb applied: 6, 17, 28 July and 16 Aug. Fentin hydroxide applied: 31 Aug. Desiccant applied: 25 Sept. Lifted: 6 Oct.

W. wheat: Ploughed: 27 Oct, 1988. Magnesian limestone applied: 28 Oct. Molluscicide applied: 29 Oct. PK applied, nematicide applied, spring-tine cultivated, seed sown: 31 Oct. Weedkillers applied: 28 Apr, 1989. Mn applied: 29 Apr, 22 May. N applied: 2 May. Prochloraz, carbendazim and growth regulator applied: 17 May. Propiconazole applied: 5 June. Fenpropimorph, carbendazim and maneb applied: 3 July. Combine harvested: 8 Aug.

W.WHEAT

GRAIN TONNES/HECTARE

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

N / TREATMNT	0	50	100	150	200	250	Mean
LC 8 GM	3.00	5.06	6.01	6.92	6.86	6.25	5.68
LC 8 PT	3.06	5.67	5.63	6.84	6.16	6.42	5.63
LC 6 LC	3.07	4.28	6.03	6.46	6.62	6.09	5.43
LC 6 LN	3.20	5.41	6.21	6.97	6.43	7.34	5.93
FYM	2.48	3.64	4.98	5.25	5.99	6.30	4.77
STRAW	2.57	3.52	4.30	5.27	5.46	5.80	4.49
FERT-FYM	1.32	3.31	4.92	4.21	5.24	5.40	4.07
FERT-STR	1.06	2.70	3.65	3.96	4.11	4.56	3.34
Mean	2.47	4.20	5.22	5.73	5.86	6.02	4.92

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

TREATMNT	N	TREATMNT N
0.437	0.241	0.760

Except when comparing means with the same level(s) of TREATMNT 0.681

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.437	8.9
BLOCK.WP.SP	40	0.681	13.9

GRAIN MEAN DM% 87.7

SUB PLOT AREA HARVESTED 0.00252

https://doi.org/10.23637/ERADOC-1-40 *pp 63*

89/W/RN/12

POTATOES

TOTAL TUBERS TONNES/HECTARE

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

N TREATMNT	0	70	140	210	280	350	Mean
LC 8 GM	34.2	44.9	48.2	42.8	42.9	45.9	43.2
LC 8 PT	32.9	46.8	50.0	47.5	48.4	50.4	46.0
LC 6 LC	35.3	44.0	49.9	49.5	45.5	46.2	45.1
LC 6 LN	35.1	47.7	51.9	50.4	47.7	46.6	46.5
FYM	32.4	37.5	40.8	42.2	41.3	38.4	38.8
STRAW	27.1	38.8	40.4	42.8	40.9	42.2	38.7
FERT-FYM	22.4	33.7	34.6	37.7	34.6	34.9	33.0
FERT-STR	23.7	37.7	38.6	36.9	40.2	41.7	36.5
Mean	30.4	41.4	44.3	43.7	42.7	43.3	41.0

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

	TREATMNT	N	TREATMNT N
	3.61	1.05	4.52

Except when comparing means with the same level(s) of TREATMNT 2.98

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	3.61	8.8
BLOCK.WP.SP	40	2.98	7.3

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

N TREATMNT	0	70	140	210	280	350	Mean
LC 8 GM	95.6	95.6	95.5	96.1	94.8	96.6	95.7
LC 8 PT	96.4	96.8	96.6	96.4	96.5	96.4	96.5
LC 6 LC	96.0	96.1	97.8	96.5	96.1	97.2	96.6
LC 6 LN	96.7	97.1	97.5	96.7	96.5	95.9	96.7
FYM	93.5	95.6	95.0	96.1	94.9	93.1	94.7
STRAW	95.1	95.3	93.0	92.9	94.9	95.7	94.5
FERT-FYM	90.8	90.9	93.3	93.0	91.6	91.0	91.7
FERT-STR	92.3	96.1	93.2	93.7	95.0	94.8	94.2
Mean	94.5	95.4	95.2	95.2	95.0	95.1	95.1

SUB PLOT AREA HARVESTED 0.00137

https://doi.org/10.23637/ERADOC-1-40 *pp 64*

89/W/RN/13

INTENSIVE CEREALS

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

Sponsor: J. McEwen.

The 24th year, w. wheat and s. wheat.

For previous years see 'Details' 1973 and 74-88/W/RN/13.

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

Treatments: Until 1977 the experiment tested all phases of the five-course rotation: ley, potatoes, cereal, cereal, cereal and continous cereal. From 1977 to 1980 all phases were cropped with cereal. The experiment was in two halves, one in which the cereal was w. wheat, sown on part of the site of the classical continuous wheat experiment 1877-1954 and one in which the cereal was s. barley, sown on part of the site of the classical continuous barley experiment 1877-1954. From 1981 the experiment was used to establish grass/clover leys of different durations for tests on w. wheat in 1987. Plots not in ley were sown to w. wheat on both halves of the experiment. All leys were ploughed for 1987 and the site sown to w. wheat. This was followed by potatoes in 1988 and by wheat in 1989, testing all combinations of the following treatments:

Whole plots

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

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

Sub plots

2. **N** Nitrogen fertilizer in 1989 (kg N) as 'Nitram':

   0
   50
   100
   150
   200
   250

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89/W/RN/13

NOTE: Because of an error twelve sub plots from four whole plots were not sown with the rest of the experiment. These had the combinations **LEY AGE** 1 YEAR with **N** 50, 100 and 250, **LEY AGE** 4 YEARS with **N** 50, 100 and 150 and **LEY AGE** 5 YEARS with **N** 0, 50, 100 (from two separate whole plots), 150 and 250. They were sown to w. wheat later on two occasions but failed and were re-sown to s. wheat. Yields from these plots were not recorded. Estimated values were used in the analysis.

Basal applications: Manures: Dolomite at 5 t. (0:18:36) at 556 kg. Manganese at 0.096 kg Mn as a foliar spray in 220 l applied twice. Weedkillers: Mecoprop at 2.5 kg with bromoxynil at 0.34 kg and clopyralid at 0.07 kg in 220 l. Metsulfuron-methyl at 6.0 g in 220 l to s. wheat only. Fungicides: Prochloraz at 0.40 kg with carbendazim at 0.15 kg applied with the growth regulator in 220 l. Propiconazole at 0.12 kg in 220 l. Fenpropimorph at 0.75 kg with maneb at 1.6 kg and carbendazim at 0.25 kg in 220 l. Molluscicide: Methiocarb at 0.20 kg. Nematicide: Carbofuran at 7.5 kg. Growth regulator: Chlormequat chloride at 1.6 kg.

Seed: W. wheat: Mercia, with methiocarb pellets, sown at 165 kg - omitted plots sown at 180 kg.
S. wheat: Alexandria, sown at 180 kg.

Cultivations, etc.:- Ploughed: 28 Oct, 1988. Dolomite applied, methiocarb applied: 29 Oct. PK applied: 31 Oct. Carbofuran applied and cultivated in: 1 Nov. Spike harrowed with crumbler attached, seed sown: 2 Nov. Omitted plots sown: 13 Dec. Omitted plots spring-tine cultivated: 6 Feb, 1989. Omitted plots re-sown: 7 Feb. Omitted plots harrowed and sown to s. wheat: 31 Mar. Mecoprop, bromoxynil and clopyralid applied: 28 Apr. Mn applied: 29 Apr and 22 May. N applied: 3 May. Prochloraz and growth regulator applied: 17 May. Propiconazole applied: 5 June. Metsulfuron-methyl applied to s. wheat: 13 June. Fenpropimorph, maneb and carbendazim applied: 3 July. Combine harvested: 7 Aug.

https://doi.org/10.23637/ERADOC-1-40

89/W/RN/13

GRAIN TONNES/HECTARE

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

N / LEY AGE	0	50	100	150	200	250	Mean
1 YEAR	1.26	2.90	4.71	5.34	5.51	5.43	4.19
2 YEARS	2.22	3.98	5.14	5.30	6.16	6.22	4.84
3 YEARS	2.57	4.46	5.72	5.95	6.63	6.31	5.27
4 YEARS	2.35	4.88	5.47	6.77	6.75	6.89	5.52
5 YEARS	2.52	4.63	5.73	5.87	6.30	6.36	5.23
6 YEARS	3.10	5.18	6.04	6.35	7.15	6.62	5.74
Mean	2.34	4.34	5.47	5.93	6.41	6.30	5.13

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

LEY AGE	N	LEY AGE N
0.473	0.152	0.583

Except when comparing means with the same level(s) of
LEY AGE 0.373

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.669	13.0
BLOCK.WP.SP	78	0.528	10.3

GRAIN MEAN DM% 87.6

SUB PLOT AREA HARVESTED 0.00165

https://doi.org/10.23637/ERADOC-1-40 *pp 67*

89/R/CS/10 and 89/W/CS/10

LONG TERM LIMING

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

Sponsor: S.P. McGrath, J.M. McEwen, D.P. Yeoman.

The 28th year, s. beans.

For previous years see 'Details' 1967, 1973 and 74-88/R&W/CS/10.

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

Whole plot dimensions: 6.40 x 18.3.

Treatments: All combinations of:-

Whole plots

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

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

2. **P** 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. **MANGNESE** Manganese in 1989, cumulative to earlier applications:

0	None
MN	Manganese sprays

NOTES: (1) Until 1978 test P was applied cumulatively, rates varied with crop, K was also applied cumulatively, to P1 and P3 plots. Since 1981 K has been applied basally (none in 1986, 1987 and 1989).

(2) Manganese was applied at 0.19 kg Mn, as 'Vytel', in 200 l on 17 May, 1989 (R), in 220 l on 22 May (W) repeated at 0.10 kg Mn in 200 l on 13 June (R), in 220 l on 15 June (W).

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89/R/CS/10 and 89/W/CS/10

Basal applications:

Sawyers I (R): Weedkillers: Simazine at 0.17 kg and trietazine at 1.2 kg in 200 l. Fungicides: Benomyl at 0.55 kg in 200 l. Fenpropimorph at 0.75 kg in 200 l. Insecticides: Deltamethrin at 7.5 g in 400 l applied on two occasions. Pirimicarb at 0.14 kg in 200 l.

Stackyard C (W): Weedkillers: Simazine at 0.14 kg and trietazine at 1.0 kg in 220 l. Alloxydim-sodium at 1.5 kg in 220 l. Fungicides: Fenpropimorph at 0.75 kg in 220 l. Benomyl at 0.55 kg applied with a wetting agent in 220 l. Insecticides: Deltamethrin at 6.2 g in 220 l and at 7.5 g in 220 l on a second occasion. Pirimicarb at 0.14 kg in 220 l.

Seed: Alfred, sown at 200 kg (R & W).

Cultivations, etc.:-

Sawyers I (R): Ploughed: 20 Dec, 1988. Heavy spring-tine cultivated, rotary harrowed: 29 Mar, 1989. Rotary harrowed, seed sown, harrowed, rolled: 30 Mar. Weedkiller applied: 31 Mar. Deltamethrin applied: 10 May and 31 May. Pirimicarb applied: 14 June. Benomyl and fenpropimorph applied: 14 July. Combine harvested: 14 Aug.

Stackyard C (W): Ploughed: 14 Dec, 1988. Spring-tine cultivated: 28 Mar, 1989. Rotary harrowed, seed sown: 31 Mar. Simazine and trietazine applied: 21 Apr. Deltamethrin applied: 22 May and 7 June. Alloxydim-sodium applied: 7 June. Pirimicarb applied: 22 June. Benomyl and fenpropimorph applied: 12 July. Combine harvested: 22 Aug.

NOTES: (1) Establishment counts were made and components of yield were measured at maturity.
(2) Soils were sampled for pH, P, K and Mg.
(3) Most CHALK 0 plots failed and yields of the rest of these plots were negligible. They have been omitted from the analysis.

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
15	0.80	0.71	0.94	1.16	0.90
24.5	0.84	1.22	1.06	1.03	1.04
52.5	1.12	1.48	1.52	1.47	1.40
Mean	0.92	1.14	1.17	1.22	1.11

MANGNESE	O	MN	Mean
CHALK			
15	0.96	0.84	0.90
24.5	1.06	1.01	1.04
52.5	1.50	1.30	1.40
Mean	1.17	1.05	1.11

https://doi.org/10.23637/ERADOC-1-40

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

GRAIN TONNES/HECTARE

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

MANGNESE	O	MN	Mean
P			
0	0.95	0.89	0.92
P1	1.17	1.10	1.14
P2	1.29	1.05	1.17
P3	1.29	1.15	1.22
Mean	1.17	1.05	1.11

MANGNESE		O	MN
CHALK	P		
15	0	0.78	0.82
	P1	0.67	0.75
	P2	1.18	0.69
	P3	1.21	1.11
24.5	0	0.93	0.75
	P1	1.05	1.38
	P2	1.03	1.08
	P3	1.24	0.82
52.5	0	1.13	1.11
	P1	1.80	1.16
	P2	1.64	1.39
	P3	1.42	1.52

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

CHALK	P	MANGNESE	CHALK P
0.203	0.234	0.099	0.405

CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
0.236	0.273	0.472

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

CHALK	0.171
P	0.198
CHALK.P	0.342

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.405	36.5
BLOCK.WP.SP	12	0.342	30.8

GRAIN MEAN DM% 87.4

SUB PLOT AREA HARVESTED 0.00200

https://doi.org/10.23637/ERADOC-1-40

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
9	0.68	0.58	0.34	0.85	0.61
25.5	1.17	0.50	1.01	1.33	1.00
45.5	1.17	1.44	1.21	1.38	1.30
Mean	1.01	0.84	0.85	1.19	0.97

MANGNESE	O	MN	Mean
CHALK			
9	0.59	0.64	0.61
25.5	0.97	1.04	1.00
45.5	1.21	1.39	1.30
Mean	0.92	1.02	0.97

MANGNESE	O	MN	Mean
P			
0	0.91	1.10	1.01
P1	0.84	0.84	0.84
P2	0.76	0.95	0.85
P3	1.19	1.19	1.19
Mean	0.92	1.02	0.97

	MANGNESE	O	MN
CHALK	**P**		
9	0	0.75	0.61
	P1	0.59	0.57
	P2	0.29	0.39
	P3	0.73	0.97
25.5	0	0.97	1.37
	P1	0.57	0.43
	P2	0.96	1.05
	P3	1.36	1.30
45.5	0	1.01	1.33
	P1	1.35	1.52
	P2	1.01	1.40
	P3	1.46	1.31

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

GRAIN TONNES/HECTARE

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

	CHALK	P	MANGNESE	CHALK P
	0.162	0.187	0.052	0.324

	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
	0.174	0.201	0.348

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

CHALK	0.090
P	0.104
CHALK.P	0.180

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.324	33.3
BLOCK.WP.SP	12	0.180	18.5

GRAIN MEAN DM% 88.8

SUB PLOT AREA HARVESTED 0.00265

https://doi.org/10.23637/ERADOC-1-40 *pp 72*

89/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 16th year, s. barley.

For previous years see 74-88/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.
2.	**FUNGCIDE[1]**	Fungicide in autumn:
	NONE	None
	TRIADIM	Triadimefon at 0.25 kg in autumn 1981, 1982, 1984, 1985, 1986, 1987 and 1988, 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 10 Oct, 1988 and 24 Oct respectively. Other treatments were applied on 31 Mar, 1989.

Basal applications: Manure: 'Nitram' at 320 kg. Weedkillers: Bentazone at 0.80 kg, dichlorprop at 1.1 kg and MCPA at 0.64 kg in 220 l.

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

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89/R/CS/140

Cultivations, etc.:- Ploughed: 25 Nov, 1988. N applied: 7 Mar, 1989. Spring-tine cultivated, seedbed treatments applied, rotary harrowed, seed sown, rolled: 31 Mar. Weedkillers applied: 9 May. Combine harvested: 15 Aug.

GRAIN TONNES/HECTARE

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

FUNGCIDE[1]	NONE	TRIADIM	Mean
WEEDKLLR			
NONE	3.81	3.93	3.87
GLYPHOS	3.94	3.92	3.93
Mean	3.88	3.93	3.90

FUNGCIDE[2]	NONE	BENOMYL	Mean
WEEDKLLR			
NONE	3.85	3.89	3.87
GLYPHOS	3.90	3.97	3.93
Mean	3.87	3.93	3.90

FUNGCIDE[2]	NONE	BENOMYL	Mean
FUNGCIDE[1]			
NONE	3.83	3.93	3.88
TRIADIM	3.92	3.93	3.93
Mean	3.87	3.93	3.90

INSCTCDE	NONE	CHLORFEN	Mean
WEEDKLLR			
NONE	3.74	3.99	3.87
GLYPHOS	3.89	3.98	3.93
Mean	3.81	3.99	3.90

INSCTCDE	NONE	CHLORFEN	Mean
FUNGCIDE[1]			
NONE	3.72	4.03	3.88
TRIADIM	3.91	3.95	3.93
Mean	3.81	3.99	3.90

INSCTCDE	NONE	CHLORFEN	Mean
FUNGCIDE[2]			
NONE	3.80	3.94	3.87
BENOMYL	3.83	4.03	3.93
Mean	3.81	3.99	3.90

NEMACIDE	NONE	ALDICARB	Mean
WEEDKLLR			
NONE	3.63	4.10	3.87
GLYPHOS	3.73	4.14	3.93
Mean	3.68	4.12	3.90

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89/R/CS/140

GRAIN TONNES/HECTARE

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

NEMACIDE	NONE	ALDICARB	Mean
FUNGCIDE[1]			
NONE	3.61	4.14	3.88
TRIADIM	3.75	4.10	3.93
Mean	3.68	4.12	3.90

NEMACIDE	NONE	ALDICARB	Mean
FUNGCIDE[2]			
NONE	3.67	4.08	3.87
BENOMYL	3.69	4.17	3.93
Mean	3.68	4.12	3.90

NEMACIDE	NONE	ALDICARB	Mean
INSCTCDE			
NONE	3.58	4.05	3.81
CHLORFEN	3.78	4.20	3.99
Mean	3.68	4.12	3.90

	FUNGCIDE[2]	NONE	BENOMYL
WEEDKLLR	**FUNGCIDE[1]**		
NONE	NONE	3.83	3.79
	TRIADIM	3.87	3.98
GLYPHOS	NONE	3.82	4.06
	TRIADIM	3.97	3.88

	INSCTCDE	NONE	CHLORFEN
WEEDKLLR	**FUNGCIDE[1]**		
NONE	NONE	3.63	3.99
	TRIADIM	3.85	4.00
GLYPHOS	NONE	3.81	4.07
	TRIADIM	3.96	3.89

	INSCTCDE	NONE	CHLORFEN
WEEDKLLR	**FUNGCIDE[2]**		
NONE	NONE	3.74	3.96
	BENOMYL	3.75	4.02
GLYPHOS	NONE	3.87	3.92
	BENOMYL	3.90	4.04

	INSCTCDE	NONE	CHLORFEN
FUNGCIDE[1]	**FUNGCIDE[2]**		
NONE	NONE	3.71	3.94
	BENOMYL	3.73	4.12
TRIADIM	NONE	3.89	3.95
	BENOMYL	3.92	3.95

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/140

GRAIN TONNES/HECTARE

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

	NEMACIDE	NONE	ALDICARB
WEEDKLLR	FUNGCIDE[1]		
NONE	NONE	3.67	3.95
	TRIADIM	3.60	4.25
GLYPHOS	NONE	3.56	4.33
	TRIADIM	3.89	3.96

	NEMACIDE	NONE	ALDICARB
WEEDKLLR	FUNGCIDE[2]		
NONE	NONE	3.61	4.09
	BENOMYL	3.66	4.11
GLYPHOS	NONE	3.73	4.06
	BENOMYL	3.72	4.22

	NEMACIDE	NONE	ALDICARB
FUNGCIDE[1]	FUNGCIDE[2]		
NONE	NONE	3.61	4.04
	BENOMYL	3.61	4.24
TRIADIM	NONE	3.73	4.11
	BENOMYL	3.76	4.10

	NEMACIDE	NONE	ALDICARB
WEEDKLLR	INSCTCDE		
NONE	NONE	3.51	3.98
	CHLORFEN	3.76	4.22
GLYPHOS	NONE	3.66	4.11
	CHLORFEN	3.79	4.17

	NEMACIDE	NONE	ALDICARB
FUNGCIDE[1]	INSCTCDE		
NONE	NONE	3.55	3.89
	CHLORFEN	3.67	4.39
TRIADIM	NONE	3.61	4.20
	CHLORFEN	3.88	4.01

	NEMACIDE	NONE	ALDICARB
FUNGCIDE[2]	INSCTCDE		
NONE	NONE	3.47	4.14
	CHLORFEN	3.87	4.01
BENOMYL	NONE	3.69	3.96
	CHLORFEN	3.68	4.38

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

Margins of two factor tables	0.144
Two factor tables	0.204
Three factor tables	0.289

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

Stratum	d.f.	s.e.	cv%
WP	6	0.409	10.5

GRAIN MEAN DM% 84.6 PLOT AREA HARVESTED 0.00093

https://doi.org/10.23637/ERADOC-1-40

89/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 12th year, s. beans, w. wheat.

For previous years see 78-88/R/CS/212.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 5.33 x 10.7.

Treatments:

PREVCROP Previous crops before w. wheat 1989:

	78	79	80	81	82	83	84	85	86	87	88
W9 W W	W	W	W	W	W	W	W	W	W	W	W
W2 BE W	BE	W	W	BE	W	W	BE	W	W	BE	W
BE2 W W	W	BE	W	W	BE	W	W	BE	BE	W	W
BE1 W W	W	W	W	W	W	W	W	W	BE	W	W
W2 W W	BE	W	W	BE	W	W	BE	W	W	W	W
W3 W W	W	W	BE	W	W	BE	W	W	W	W	W
W1 W BE	W	BE	W	W	BE	W	W	BE	W	W	BE

BE = s. beans, W = w. wheat

NOTE: One additional crop sequence was in s. beans 1989, yields not taken.

Standard applications:

Both crops: Manures: (0:18:36) at 920 kg. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg in 200 l.

W. wheat: Manure: 'Nitram' at 400 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg with isoproturon at 2.0 kg in 200 l.

S. beans: Insecticide: Deltamethrin at 7.5 g in 400 l.

Seed: W. wheat: Avalon, sown at 190 kg.
S. beans: Alfred, sown at 200 kg.

Cultivations, etc.:-

Both crops: PK applied: 16 Sept, 1988. Ploughed: 21 Sept. Fungicides applied: 10 May, 1989. Pirimicarb applied: 20 June.

W. wheat: Rotary harrowed, seed sown: 18 Oct, 1988. Chlortoluron applied: 21 Oct. N applied: 21 Apr, 1989. Remaining weedkillers applied: 5 May. Combine harvested: 9 Aug.

S. beans: Heavy spring-tine cultivated, rotary harrowed: 29 Mar, 1989. Seed sown: 30 Mar. Insecticide applied: 10 May. Combine harvested: 14 Aug.

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89/R/CS/212

NOTE: Plant and soil samples were taken on nine occasions during the season to assess take-all. Post-harvest soil samples were taken to measure the suppressiveness of the soil to take-all.

GRAIN TONNES/HECTARE

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

PREVCROP	
W9 W W	5.28
W2 BE W	5.83
BE2 W W	5.75
BE1 W W	5.90
W2 W W	5.25
W3 W W	6.02
W1 W BE	5.51
Mean	5.65

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

PREVCROP
0.441

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.541	9.6

GRAIN MEAN DM% 89.0

PLOT AREA HARVESTED 0.00289

https://doi.org/10.23637/ERADOC-1-40

89/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 fifth year, w. wheat.

For previous years see 85-88/R/CS/302.

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

Whole plot dimensions: 12.0 x 24.0.

Treatments: All combinations of:-

Whole plots

1. **FUNGCIDE** Fungicides applied cumulatively to 1985, 1986, 1987 and 1988 treatments:

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

Sub plots

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

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

NOTES: (1) Fungicide treatments were applied in 200 l on 15 Nov, 1988 and 29 Mar, 1989.
(2) The eyespot inoculum was colonised on oat seed and this was broadcast in October, 1984.

Basal applications: Manures: (0:18:36) at 920 kg. 'Nitram' at 580 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Chlortoluron at 3.5 kg in 200 l. Metsulfuron-methyl at 6.0 g in 400 l.

Seed: Avalon, sown at 190 kg.

Cultivations, etc.:- Rotary cultivated: 6 Sept, 1988. PK applied: 22 Sept. Glyphosate applied: 1 Oct. Heavy spring-tine cultivated: 14 Oct. Cultivated with rotary grubber, seed sown: 17 Oct. Chlortoluron applied: 21 Oct. N applied: 15 Apr, 1989. Metsulfuron-methyl applied: 3 May. Combine harvested: 3 Aug.
NOTE: Eyespot and sharp eyespot were assessed in July.

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89/R/CS/302

GRAIN TONNES/HECTARE

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

EYE INOC / FUNGCIDE	NATURAL	W 19R 1S	W 1R 19S	R 19R 1S	R 1R 19S	Mean
NONE	7.29	6.95	7.01	6.85	7.50	7.15
CARB	7.09	7.05	7.37	6.91	7.10	7.10
PRO	6.85	6.78	7.01	7.27	7.27	7.01
CARB+PRO	7.55	6.73	7.51	7.38	7.92	7.44
Mean	7.19	6.88	7.22	7.10	7.45	7.17

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

EYE INOC	FUNGCIDE* EYE INOC	
0.226	0.451	min.rep
0.195	0.391	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	0.451	6.3

GRAIN MEAN DM% 85.9

SUB PLOT AREA HARVESTED 0.00138

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/309 and 89/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, R. Moffitt, W. Powell, A.D. Todd.

Associate sponsor: D.S. Powlson.

The fifth year, w. wheat.

For previous years see 85-88/R&W/CS/309.

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

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

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

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

BURNT	Burnt
CHOPPED	Chopped and spread (duplicated)

2. **CULTIVTN** Cultivations:

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

NOTES: (1) Straw was chopped by trailed straw chopper and spread on 5 Sept, 1988 (R), 7 Sept (W) and burnt, 6 Sept (R), 7 Sept (W).
(2) A heavy spring-tine cultivator was used to cultivate to 10 cm depth, on 14 Sept (R), 21 Sept (W). A chisel plough was used to cultivate to 20 cm depth, on 15 Sept (R) and a deep-tine cultivator to 20 cm on 21 Sept (W).
(3) Ploughed plots were ploughed to 20 cm depth on: 14 Sept (R), 30 Sept (W).

Basal applications:
Great Knott III (R): Manures: Magnesian limestone at 5.0 t (0:18:36) at 920 kg. 'Nitram' at 120 kg, followed by 580 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Metsulfuron-methyl at 6.0 g with fluroxypyr at 0.15 kg in 200 l. Fungicides: Chlorothalonil at 1.0 kg in 200 l. Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 200 l.

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89/R/CS/309 and 89/W/CS/309

Basal applications:
Far Field I (W): Manures: (0:18:36) at 920 kg. 'Nitram' at 120 kg followed by 590 kg. Weedkillers: Paraquat at 0.80 kg ion in 220 l. Isoproturon at 1.5 kg in 220 l. Fungicides: Chlorothalonil at 1.0 kg in 220 l. Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 220 l.

Seed: Rendezvous, sown at 180 kg.

Cultivations, etc.:-
Great Knott III (R): Magnesian limestone applied: 6 Sept, 1988. PK applied: 29 Sept. Paraquat applied: 18 Oct. Rotary harrowed, seed sown, harrowed: 19 Oct. Isoproturon applied: 29 Oct. N applied: 21 Feb, 1989 and 14 Apr. Metsulfuron-methyl and fluroxypyr applied: 15 Apr. Chlorothalonil applied: 19 May. Propiconazole and tridemorph applied: 20 June. Combine harvested: 5 Aug.
Far Field I (W): PK applied: 16 Sept, 1988. Subsoiled with tines 140 cm apart 56 cm deep: 20 Sept. Rolled: 3 Oct. Paraquat applied: 19 Oct. Spring-tine cultivated, seed sown, harrowed: 21 Oct. Isoproturon applied: 8 Dec. N applied: 8 Mar, 1989 and 28 Apr. Chlorothalonil applied: 23 May. Propiconazole and tridemorph applied: 22 June. Combine harvested: 4 Aug.

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

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

GRAIN TONNES/HECTARE

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

CULTIVTN / STRAW	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
BURNT	7.24	7.68	7.41	7.58	7.48
CHOPPED	6.73	7.33	7.10	7.45	7.16
Mean	6.90	7.45	7.20	7.49	7.26

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

STRAW	CULTIVTN	STRAW CULTIVTN	
		0.250	min.rep
0.108	0.144	0.216	max-min
		0.177	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	0.353	4.9

GRAIN MEAN DM% 87.8

PLOT AREA HARVESTED 0.00621

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

GRAIN TONNES/HECTARE

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

CULTIVTN / STRAW	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
BURNT	7.46	6.77	7.41	7.24	7.22
CHOPPED	7.55	6.89	7.27	7.38	7.27
Mean	7.52	6.85	7.32	7.33	7.25

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

STRAW	CULTIVTN	STRAW CULTIVTN	
		0.403	min.rep
0.175	0.233	0.349	max-min
		0.285	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	0.403	5.6

GRAIN MEAN DM% 87.3

PLOT AREA HARVESTED 0.00884

https://doi.org/10.23637/ERADOC-1-40 *pp 84*

89/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, R. Moffitt, W. Powell, A.D. Todd.

The fifth year, w. wheat.

For previous years see 85-88/R/CS/311.

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

Whole plot dimensions: 9.0 x 57.0.

Treatments: Combinations of:-

Whole plots

1. **STRAW**		Treatments to straw of previous wheat:
	BURNT	Burnt on 6 Sept, 1988
	BALED	Baled and removed on 30 Aug
	CHOPPED	Chopped on 6 Sept
2. **CULTTIME**		Time of cultivation, to 10 cm depth:
	EARLY	Cultivated by rotary grubber on 13 Sept, 1988
	LATER	Cultivated by rotary grubber on 29 Sept

Sub plots

3. **AUT N**		Autumn N as 'Nitram' applied just before cultivation:
	0	None
	50	50 kg N on 13 Sept, 1988 (CULTTIME EARLY), 29 Sept (CULTTIME LATER)
4. **FUNGCIDE**		Fungicides:
	O	None
	FULL	Full programme:- Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l on 15 Apr, 1989 Propiconazole at 0.125 kg in 200 l on 24 May Propiconazole at 0.125 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l on 13 June
5. **INSCTCDE**		Insecticides:
	O	None
	FON+PIR	Fonofos at 1.4 kg in 200 l on 26 Jan, 1989 and pirimicarb at 0.14 kg in 200 l on 13 June

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/311

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

0	None
METHCARB	Methiocarb at 0.22 kg in autumn 1986

Basal applications: Manures: Magnesian limestone at 5.0 t. (0:18:36) at 920 kg. 'Nitram' at 120 kg and later at 580 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Chlortoluron at 3.5 kg in 200 l. Metsulfuron-methyl at 6.0 g with fluroxypyr at 0.20 kg in 200 l.

Seed: Mission, sown at 160 kg.

Cultivations, etc.:- Magnesian limestone applied: 7 Sept, 1988. PK applied: 29 Sept. Paraquat applied: 18 Oct. Rotary harrowed, seed sown: 19 Oct. Chlortoluron applied: 22 Oct. First N applied: 23 Feb, 1989. Second N applied: 15 Apr. Metsulfuron-methyl with fluroxypyr applied: 26 Apr. Combine harvested: 8 Aug.

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

GRAIN TONNES/HECTARE

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

CULTTIME	EARLY	LATER	Mean
STRAW			
BURNT	7.05	6.95	7.00
BALED	6.76	6.80	6.78
CHOPPED	6.65	6.82	6.74
Mean	6.82	6.86	6.84

AUT N	0	50	Mean
STRAW			
BURNT	7.28	6.72	7.00
BALED	6.88	6.68	6.78
CHOPPED	6.80	6.67	6.74
Mean	6.99	6.69	6.84

AUT N	0	50	Mean
CULTTIME			
EARLY	6.97	6.67	6.82
LATER	7.01	6.70	6.86
Mean	6.99	6.69	6.84

FUNGCIDE	O	FULL	Mean
STRAW			
BURNT	6.89	7.12	7.00
BALED	6.67	6.89	6.78
CHOPPED	6.44	7.03	6.74
Mean	6.67	7.01	6.84

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/311

GRAIN TONNES/HECTARE

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

FUNGCIDE	O	FULL	Mean
CULTTIME			
EARLY	6.67	6.98	6.82
LATER	6.67	7.04	6.86
Mean	6.67	7.01	6.84

FUNGCIDE	O	FULL	Mean
AUT N			
0	6.80	7.17	6.99
50	6.53	6.85	6.69
Mean	6.67	7.01	6.84

INSCTCDE	O	FON+PIR	Mean
STRAW			
BURNT	6.87	7.14	7.00
BALED	6.59	6.97	6.78
CHOPPED	6.54	6.93	6.74
Mean	6.67	7.01	6.84

INSCTCDE	O	FON+PIR	Mean
CULTTIME			
EARLY	6.70	6.95	6.82
LATER	6.63	7.08	6.86
Mean	6.67	7.01	6.84

INSCTCDE	O	FON+PIR	Mean
AUT N			
0	6.78	7.20	6.99
50	6.55	6.83	6.69
Mean	6.67	7.01	6.84

INSCTCDE	O	FON+PIR	Mean
FUNGCIDE			
O	6.49	6.84	6.67
FULL	6.84	7.18	7.01
Mean	6.67	7.01	6.84

MOLLCIDE	O	METHCARB	Mean
STRAW			
BURNT	7.05	6.95	7.00
BALED	6.72	6.83	6.78
CHOPPED	6.84	6.63	6.74
Mean	6.87	6.81	6.84

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/311

GRAIN TONNES/HECTARE

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

MOLLCIDE	O	METHCARB	Mean
CULTTIME			
EARLY	6.78	6.86	6.82
LATER	6.96	6.75	6.86
Mean	6.87	6.81	6.84

MOLLCIDE	O	METHCARB	Mean
AUT N			
0	7.00	6.97	6.99
50	6.74	6.64	6.69
Mean	6.87	6.81	6.84

MOLLCIDE	O	METHCARB	Mean
FUNGCIDE			
O	6.66	6.67	6.67
FULL	7.08	6.94	7.01
Mean	6.87	6.81	6.84

MOLLCIDE	O	METHCARB	Mean
INSCTCDE			
O	6.73	6.61	6.67
FON+PIR	7.02	7.01	7.01
Mean	6.87	6.81	6.84

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

AUT N	**FUNGCIDE**	**INSCTCDE**	**MOLLCIDE**
0.117	0.117	0.117	0.117

STRAW*	**CULTTIME***	**STRAW***	**CULTTIME***
AUT N	**AUT N**	**FUNGCIDE**	**FUNGCIDE**
0.203	0.166	0.203	0.166

AUT N	**STRAW***	**CULTTIME***	**AUT N**
FUNGCIDE	**INSCTCDE**	**INSCTCDE**	**INSCTCDE**
0.166	0.203	0.166	0.166

FUNGCIDE	**STRAW***	**CULTTIME***	**AUT N**
INSCTCDE	**MOLLCIDE**	**MOLLCIDE**	**MOLLCIDE**
0.166	0.203	0.166	0.166

FUNGCIDE	**INSCTCDE**
MOLLCIDE	**MOLLCIDE**
0.166	0.166

* Within the same level of **STRAW**, **CULTTIME** or **STRAW.CULTTIME** only

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/311

GRAIN TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
WP.SP	20	0.407	5.9

GRAIN MEAN DM% 89.9

SUB PLOT AREA HARVESTED 0.00276

https://doi.org/10.23637/ERADOC-1-40 *pp 89*

89/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 second year, w. barley, w. oats, w. triticale, w. wheat.

For previous year see 88/R/CS/323

Design: 3 randomised blocks of 26 plots.

Whole plot dimensions: 3.0 x 10.0.

CROPSEQ	Crop sequence (1988, 1989 respectively):
WB WB	W. barley, w. barley (5 plots per block)
WO WB	W. oats, w. barley
WT WB	W. triticale, w. barley
WW WB	W. wheat, w. barley
SB WB	S. barley, w. barley
WB WO	W. barley, w. oats
WT WO	W. triticale, w. oats
WW WO	W. wheat, w. oats
WO WT	W. oats, w. triticale
WT WT	W. triticale, w. triticale (5 plots per block)
WW WT	W. wheat, w. triticale
WO WW	W. oats, w. wheat
WW WW	W. wheat, w. wheat (6 plots per block)

Standard applications: Manures: (0:17:34) at 300 kg. N at 30 kg to all cereals followed by N at 170 kg (w. wheat), 150 kg (w. barley) and 120 kg (w. oats and w. triticale), all as 'Nitram'. Weedkillers: Glyphosate at 0.27 kg in 200 l. Methabenzthiazuron at 1.6 kg in 200 l. Metsulfuron-methyl at 6.0 g with fluroxypyr at 0.20 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

SEED: W. barley: Magie, sown at 150 kg.
W. oats: Image, sown at 190 kg.
W. triticale: Cumulus, sown at 180 kg.
W. wheat: Mercia, sown at 180 kg.

Cultivations, etc.:- Rotary cultivated: 5 Sept, 1988. Glyphosate applied: 1 Oct. PK applied: 11 Oct. Heavy spring-tine cultivated: 17 Oct. Rotary harrowed, seed sown: 24 Oct. Methabenzthiazuron applied: 29 Oct. First N applied: 23 Feb, 1989. Second N applied: 14 Apr. Metsulfuron-methyl with fluroxypyr applied: 26 Apr. Fungicide applied: 19 May. Combine harvested: 21 July (w. barley), 25 July (w. oats), 4 Aug (w. wheat) and 7 Aug (w. triticale).

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

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/323

W. WHEAT, W.BARLEY, W. TRITICALE, W. OATS

GRAIN TONNES/HECTARE

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

CROPSEQ	
WB WB	7.65
WO WB	8.16
WT WB	7.70
WW WB	8.10
SB WB	8.03
WB WO	8.02
WT WO	7.54
WW WO	7.54
WO WT	7.44
WT WT	7.52
WW WT	8.00
WO WW	8.41
WW WW	8.22
Mean	7.85

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

CROPSEQ	
0.276	min.rep
0.211	max-min

	CROPSEQ
max-min	WB WB 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	63	0.338	4.3

GRAIN MEAN DM% 89.0

PLOT AREA HARVESTED 0.00274

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/326 and 89/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 third year, w. wheat.

For previous years see 87-88/R&W/CS/326.

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

Whole plot dimensions: 3.0 x 13.5 (R).
3.0 x 14.5 (W).

Treatments:

STRAW Amounts of straw incorporated into seedbed (t ha 85% DM), cumulative to previous annual dressings:

		R	W
NONE	None	-	-
NORMAL	Normal	3.3	5.8
2 NORMAL	Twice normal	6.6	11.6
4 NORMAL	Four times normal	13.2	23.2

NOTES: (1) Straw treatments were applied on 2 Sept (R), 5 Sept (W) and chopped by trailed straw chopper and spread on 5 Sept, 1988 (R), 7 Sept (W).
(2) At Rothamsted straw was incorporated by 'I.E.R. Mixaplough' on 14 Sept. At Woburn it was heavy-tine cultivated in to 10 cm twice on 21 Sept, spring-tined with crumbler attached on 21 Oct.

Basal applications:
Great Knott III (R): Manures: Magnesian limestone at 5.0 t. (0:18:36) at 920 kg. 'Nitram' at 120 kg followed by 580 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Metsulfuron-methyl at 6.0 g with fluroxypyr at 0.15 kg in 200 l. Fungicides: Chlorothalonil at 1.0 kg in 200 l. Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 200 l.
Far Field I (W): Manures: (0:18:36) at 920 kg. 'Nitram' at 120 kg followed by 590 kg. Weedkillers: Glyphosate at 1.1 kg in 220 l. Paraquat at 0.80 kg ion in 220 l. Isoproturon at 1.5 kg in 220 l. Fungicides: Chlorothalonil at 1.0 kg in 220 l. Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 220 l.

Seed: Rendezvous, sown at 180 kg.

https://doi.org/10.23637/ERADOC-1-40 *pp 92*

89/R/CS/326 and 89/W/CS/326

Cultivations, etc.:-

Great Knott III (R): Magnesian limestone applied: 6 Sept, 1988. Ploughed: 14 Sept. PK applied: 29 Sept. Paraquat applied: 18 Oct. Rotary harrowed, seed sown, harrowed: 19 Oct. Isoproturon applied: 29 Oct. N applied: 21 Feb, 1989 and 14 Apr. Metsulfuron-methyl and fluroxypyr applied: 15 Apr. Chlorothalonil applied: 19 May. Propiconazole and tridemorph applied: 20 June. Combine harvested: 5 Aug.

Far Field I (W): PK applied: 16 Sept, 1988. Subsoiled with tines 140 cm apart, 40 cm deep: 20 Sept. Rolled: 3 Oct. Paraquat applied: 19 Oct. Spring-tine cultivated with crumbler attached, seed sown, harrowed: 21 Oct. Isoproturon applied: 8 Dec. N applied: 8 Mar, 1989 and 28 Apr. Chlorothalonil applied: 23 May. Propiconazole and tridemorph applied: 22 June. Combine harvested: 4 Aug.

NOTES: (1) Establishment counts were made in autumn. Shoot numbers and dry weight at growth stage 30, dry weight and fertile ear numbers after anthesis and harvest index were measured.

(2) Foliar diseases and foot and root rots were assessed in summer.

https://doi.org/10.23637/ERADOC-1-40

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

GRAIN TONNES/HECTARE

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

STRAW	
NONE	7.42
NORMAL	7.33
2 NORMAL	7.39
4 NORMAL	7.24
Mean	7.35

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

STRAW
0.193

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.273	3.7

GRAIN MEAN DM% 87.0

PLOT AREA HARVESTED 0.00299

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

GRAIN TONNES/HECTARE

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

STRAW	
NONE	7.72
NORMAL	7.43
2 NORMAL	7.45
4 NORMAL	7.60
Mean	7.55

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

STRAW
0.337

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.413	5.5

GRAIN MEAN DM% 86.9

PLOT AREA HARVESTED 0.00434

https://doi.org/10.23637/ERADOC-1-40 *pp 94*

89/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 second year, lucerne.

For previous year see 88/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** Rates of carbofuran (kg) 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

NOTES: (1) Carbofuran was applied to lucerne on 7 Apr, 1988 at sowing.
(2) Two additional blocks were sown in autumn 1988 but they failed to establish. These blocks were sown to Progreta peas on 20 Apr, 1989, no treatments, no yields, to maintain the population of D. dipsaci.

Basal applications: Manures: (0:18:36) at 500 kg. Weedkiller: 2,4-DB at 2.1 kg in 220 l.

Cultivations, etc.:- Weedkiller applied: 11 Nov, 1988. PK applied: 16 Nov. Cut: 25 May, 1989, 25 July and 2 Oct.

https://doi.org/10.23637/ERADOC-1-40 *pp 95*

89/R/CS/327

1ST CUT (25/5/89) DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
VARIETY			
EUROPE	1.88	5.02	3.45
EUVA	2.32	5.31	3.81
VELA	1.78	4.27	3.02
VERTUS	3.80	5.33	4.56
Mean	2.44	4.98	3.71

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	3.64	3.26	3.45
EUVA	3.90	3.72	3.81
VELA	3.05	3.00	3.02
VERTUS	5.05	4.08	4.56
Mean	3.91	3.51	3.71

ROWSPACE	15	30	Mean
CARBRATE			
0.0	2.73	2.15	2.44
1.5	5.09	4.87	4.98
Mean	3.91	3.51	3.71

	ROWSPACE	15	30
VARIETY	CARBRATE		
EUROPE	0.0	2.05	1.71
	1.5	5.23	4.81
EUVA	0.0	2.59	2.05
	1.5	5.22	5.39
VELA	0.0	2.19	1.37
	1.5	3.91	4.63
VERTUS	0.0	4.12	3.48
	1.5	5.98	4.67

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	6.08	5.90	5.64	5.80	5.86

GRAND MEAN 4.14

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.363	0.181	0.128	0.128

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.256	0.256	0.181	0.363

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/327

1ST CUT (25/5/89) DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.363	8.8

1ST CUT MEAN DM% 16.5

2ND CUT (25/7/89) DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
VARIETY			
EUROPE	3.87	5.40	4.63
EUVA	4.89	6.31	5.60
VELA	3.04	3.80	3.42
VERTUS	5.45	6.07	5.76
Mean	4.31	5.39	4.85

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	4.93	4.33	4.63
EUVA	6.05	5.15	5.60
VELA	3.24	3.61	3.42
VERTUS	6.26	5.27	5.76
Mean	5.12	4.59	4.85

ROWSPACE	15	30	Mean
CARBRATE			
0.0	4.70	3.93	4.31
1.5	5.54	5.25	5.39
Mean	5.12	4.59	4.85

	ROWSPACE	15	30
VARIETY	**CARBRATE**		
EUROPE	0.0	3.62	4.11
	1.5	6.24	4.55
EUVA	0.0	6.14	3.64
	1.5	5.96	6.65
VELA	0.0	2.96	3.13
	1.5	3.51	4.09
VERTUS	0.0	6.07	4.83
	1.5	6.44	5.70

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	7.72	6.11	5.81	6.13	6.44

GRAND MEAN 5.17

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89/R/CS/327

2ND CUT (25/7/89) DRY MATTER TONNES/HECTARE

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.908	0.454	0.321	0.321

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.642	0.642	0.454	0.908

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.908	17.6

2ND CUT MEAN DM% 29.3

3RD CUT (2/10/89) DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
VARIETY			
EUROPE	1.41	1.63	1.52
EUVA	1.79	2.16	1.97
VELA	0.78	0.68	0.73
VERTUS	1.26	1.86	1.56
Mean	1.31	1.58	1.44

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	1.96	1.08	1.52
EUVA	2.17	1.78	1.97
VELA	0.60	0.86	0.73
VERTUS	1.64	1.47	1.56
Mean	1.59	1.30	1.44

ROWSPACE	15	30	Mean
CARBRATE			
0.0	1.49	1.13	1.31
1.5	1.69	1.47	1.58
Mean	1.59	1.30	1.44

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/327

3RD CUT (2/10/89) DRY MATTER TONNES/HECTARE

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

ROWSPACE		15	30
VARIETY	CARBRATE		
EUROPE	0.0	1.35	1.47
	1.5	2.56	0.70
EUVA	0.0	2.71	0.87
	1.5	1.63	2.69
VELA	0.0	0.48	1.09
	1.5	0.72	0.63
VERTUS	0.0	1.44	1.08
	1.5	1.84	1.87

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	2.94	2.86	1.73	1.58	2.28

GRAND MEAN 1.61

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.710	0.355	0.251	0.251

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
0.502	0.502	0.355	0.710

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.710	44.1

3RD CUT MEAN DM% 27.3

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
VARIETY			
EUROPE	7.15	12.04	9.60
EUVA	9.00	13.77	11.38
VELA	5.60	8.75	7.18
VERTUS	10.51	13.25	11.88
Mean	8.07	11.95	10.01

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/327

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTRE

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

ROWSPACE	15	30	Mean
VARIETY			
EUROPE	10.52	8.67	9.60
EUVA	12.12	10.64	11.38
VELA	6.88	7.47	7.18
VERTUS	12.95	10.81	11.88
Mean	10.62	9.40	10.01

ROWSPACE	15	30	Mean
CARBRATE			
0.0	8.93	7.21	8.07
1.5	12.31	11.59	11.95
Mean	10.62	9.40	10.01

	ROWSPACE	15	30
VARIETY	CARBRATE		
EUROPE	0.0	7.02	7.29
	1.5	14.03	10.06
EUVA	0.0	11.43	6.56
	1.5	12.81	14.73
VELA	0.0	5.62	5.59
	1.5	8.15	9.35
VERTUS	0.0	11.63	9.39
	1.5	14.27	12.24

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	16.74	14.88	13.17	13.51	14.57

GRAND MEAN 10.92

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
1.748	0.874	0.618	0.618

VARIETY CARBRATE	VARIETY ROWSPACE	CARBRATE ROWSPACE	VARIETY CARBRATE ROWSPACE
1.236	1.236	0.874	1.748

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	1.748	16.0

TOTAL OF 3 CUTS MEAN DM% 24.4

PLOT AREA HARVESTED ROW SPACE 30CM 0.00045
ALL OTHER PLOTS 0.00039

https://doi.org/10.23637/ERADOC-1-40

89/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 first year, w. wheat.

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:
NONE	None (duplicated)
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 sown at 212 kg.
(2) The sequence of cultivations was identical for all treatments: Plough to 23 cm on 5 Oct, 1988, cultivate to level on 22 Oct, traverse with fertilizer drill to 10 cm on 26 Oct, rotary harrow to 10 cm and sow wheat with combine drill on 27 Oct.
(3) An additional treatment, required for comparisons in future years, was sown with w. oats.

Basal applications: Manures: (0:18:36) at 920 kg. 'Nitram' at 580 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Methabenzthiazuron at 1.6 kg in 200 l. Mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l.

Seed: W. wheat: Mercia, sown at 190 kg.
W. oats: Image, sown at 190 kg.

Cultivations, etc.:- Rotary cultivated: 19 Aug, 1988. PK applied: 16 Sept. Paraquat applied: 19 Sept. Methabenzthiazuron applied: 3 Nov. N applied: 18 Apr, 1989. Mecoprop, bromoxynil and ioxynil applied: 4 May. Fungicides applied: 10 May. Combine harvested: 4 Aug (w. wheat), 17 Aug (w. oats). Previous crops: W. beans 1987, w. oats 1988.

NOTE: Plant samples were taken 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, before and after cultivations.

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89/R/CS/331

GRAIN TONNES/HECTARE

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

INOCMETH	
NONE	7.11
I PRE PL	6.96
N PRE PL	7.11
I PRE SO	6.88
N PRE SO	7.35
I CD	6.58
N CD	7.12
Mean	7.03

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

INOCMETH	
0.168	min.rep
0.145	max-min

	INOCMETH
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	22	0.237	3.4

GRAIN MEAN DM% 87.1

PLOT AREA HARVESTED 0.00506

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/333

COMPARISON OF COMBINABLE CROPS

Object: To compare yields and other attributes of a range of combinable crops and to study their effects on a following crop of w. wheat - Long Hoos VI/VII 1.

Sponsors: J. McEwen, D.P. Yeoman, R.J. Darby, M.V. Hewitt.

The second year, w. wheat.

For previous year see 88/R/CS/333.

Design: 3 randomised blocks of 12 plots split into 2.

Whole plot dimensions: 2.5 x 8.0.

Treatments: All combinations of:-

Whole plots

1. **PREVCROP** Crops in 1988:

W BEANS	W. beans, Vicia faba
W OATS	W. oats
W PEAS	W. peas, Pisum sativum
W RAPE	W. oilseed rape
W WHEAT	W. wheat
S BEANS	S. beans, Vicia faba
S LUPINS	S. lupins, Lupinus albus
S PEAS	S. peas, Pisum sativum
SNFLOWER	Sunflowers
FALLOW/C	Fallow, cultivated
FALLOW/P	Fallow, paraquat applied on four occasions
RYEGRASS	One-year ryegrass, cut and produce returned

Sub plots

2. **SPRING N** Nitrogen fertilizer applied on 18 Apr, 1989:

0	None
N	N applied, amount depending on quantity in crop and soil in spring.

NOTE: Amounts of N applied (kg N) as 'Nitro-Chalk' were:

After **PREVCROP**		
	FALLOW/C	170
	W PEAS, S BEANS, S PEAS	180
	FALLOW/P	190
	W BEANS, W RAPE	200
	S LUPINS	210
	SUNFLOWERS	220
	W WHEAT, RYEGRASS	230
	W OATS	240

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89/R/CS/333

Standard applications: Weedkillers: Paraquat at 0.60 kg ion in 220 l except after lupins. Isoproturon at 2.5 kg with mecoprop at 1.5 kg in 220 l except after lupins. Isoproturon at 2.5 kg with mecoprop at 0.42 kg in 220 l after lupins only. Isoproturon at 2.5 kg with mecoprop at 1.7 kg with cyanazine at 0.46 kg and clopyralid at 0.08 kg in 220 l to all plots. Difenzoquat at 0.99 kg applied with a wetting agent ('Agral' at 1.0 l) in 220 l. Fungicides: Propiconazole at 0.12 kg in 220 l. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.38 kg in 220 l. Molluscicide: Metaldehyde at 0.60 kg.

Seed: W. wheat: Mercia, sown at 200 kg.

Cultivations, etc.:- Paraquat applied except after lupins: 9 Sept, 1988. Deep-tine cultivated, except after lupins: 12 Sept. Rotary cultivated and seed sown except after lupins: 19 Sept. After lupin plots spring-tine cultivated, seed sown: 4 Oct. Isoproturon and mecoprop applied except after lupins: 19 Oct, and after lupins: 31 Oct and again to all plots with cyanazine and clopyralid: 6 Jan, 1989. Difenzoquat applied: 8 Feb. Propiconazole applied: 8 Mar. Metaldehyde applied: 15 Mar. Carbendazim, maneb and tridemorph applied: 26 Apr. Combine harvested: 28 July.

NOTE: Because the grain was spilt before weighing, the yield of one plot was lost, with treatment S BEANS N. An estimated value was used in the analysis.

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89/R/CS/333

GRAIN TONNES/HECTARE

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

SPRING N	O	N	Mean
PREVCROP			
W BEANS	6.75	9.63	8.19
W OATS	3.82	8.81	6.31
W PEAS	6.82	9.17	7.99
W RAPE	6.61	9.24	7.92
W WHEAT	2.51	7.20	4.85
S BEANS	7.47	9.80	8.64
S LUPINS	6.66	9.42	8.04
S PEAS	6.96	9.51	8.24
SNFLOWER	4.86	9.14	7.00
FALLOW/C	8.10	9.70	8.90
FALLOW/P	7.43	9.75	8.59
RYEGRASS	3.68	7.55	5.62
Mean	5.97	9.08	7.52

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

PREVCROP	SPRING N	PREVCROP SPRING N
0.380	0.157	0.541

Except when comparing means with the same level(s) of PREVCROP 0.545

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	22	0.465	6.2
BLOCK.WP.SP	23	0.667	8.9

GRAIN MEAN DM% 88.0

SUB PLOT AREA HARVESTED 0.00055

https://doi.org/10.23637/ERADOC-1-40

89/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 first year, w. wheat, forage rape, ryegrass and trefoil.

Design: 3 randomised blocks of 7 plots.

Whole plot dimensions: 10.0 x 24.0.

Treatments:

LAND TRT	Land treatment, after s. wheat 1988:
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: S. wheat straw baled and carted: 8 Sept, 1988. Ploughed: 12 Sept. Rotary harrowed: 13 Sept. Rotary harrowed, seed sown: 4 Oct. N applied at 180 kg as 'Nitram': 21 Apr, 1989. Weedkillers: Bromoxynil at 0.34 kg and clopyralid at 0.07 kg with mecoprop at 2.5 kg in 220 l applied: 3 May. Fungicides: Propiconazole at 0.12 kg in 220 l applied: 12 June. Combine harvested: 8 Aug.

CA RA: S. wheat straw baled and carted: 8 Sept, 1988. Ploughed: 12 Sept. Rotary harrowed, Italian ryegrass sown at 30 kg, harrowed: 13 Sept. Topped: 4 May, 1989 and 27 June.

SA CA FA: S. wheat straw chopped: 9 Sept, 1988. Ploughed: 12 Sept. Rotary harrowed, Giant forage rape sown at 8.0 kg, harrowed: 13 Sept. Topped: 4 May, 1989 and 27 June.

CA CS: S. wheat straw baled and carted: 8 Sept, 1988. Ploughed: 12 Sept. Spring-tine cultivated: 29 Mar, 1989. Shallow cultivated with thistle bar: 26 June.

SA CS: S. wheat straw chopped: 9 Sept, 1988. Cultivated with sweep tines 7 cm deep: 3 May, 1989 and 12 June.

WT: S. wheat straw baled and carted: 8 Sept, 1988. Topped: 4 May, 1989 and 27 June.

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89/W/CS/336

Standard applications, seed and cultivations, etc.:-
WT CS TS: S. wheat straw baled and carted: 8 Sept, 1988. Weeds topped, ploughed: 29 Mar, 1989. Rotary harrowed with crumbler attached, rolled, spike harrowed with crumbler attached, trefoil, inoculated Rhizobium, sown at 10 kg, rolled: 15 May.
Previous crops: Potatoes 1987, s. wheat 1988.

NOTE: Assessments of soil N, dry matter and plant cover were made in autumn, spring and summer.

GRAIN TONNES/HECTARE

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

LAND TRT	CA WW
	2.86

MEAN DM% 88.8

PLOT AREA HARVESTED 0.00732

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89/R/CS/337

PREVIOUS CROPS AND N

Object: To study the effects of a range of crops on the nitrogen requirements, quality and yield of a subsequent w. barley crop - Webbs.

Sponsors: D.G. Christian, N.L. Carreck.

The first year, w. barley, w. oats, w. beans, s. oilseed rape, potatoes.

Design: 3 randomised blocks of 5 plots.

Whole plot dimensions: 21.0 x 20.0.

Treatments:

CROP	Crops:
W BARLEY	W. barley
W BEANS	W. beans
W OATS	W. oats
W RAPE	W. oilseed rape
POTATOES	Potatoes

NOTE: Winter oilseed rape failed and was replaced by s. oilseed rape, yields not taken.

Standard applications:

All crops: Manures: (0:18:36) at 920 kg.
W. barley: Manure: 'Nitram' at 360 kg. Weedkiller: Isoproturon at 2.5 kg in 200 l. Fungicide: Propiconazole at 0.12 kg in 200 l.
W. beans: Weedkillers: Simazine at 0.17 kg and trietazine at 1.2 kg in 200 l. Insecticide: Deltamethrin at 7.5 g in 400 l.
W. oats: Manure: 'Nitram' at 290 kg. Weedkiller: Methabenzthiazuron at 1.6 kg in 200 l.
W. oilseed rape (failed): Manure: 'Nitram' at 220 kg (to two of three plots only). Weedkiller: Propyzamide at 0.70 kg in 200 l.
S. oilseed rape: Manure: 'Nitram' at 220 kg (to two plots given N to w.oilseed rape) and 440 kg to remaining plot. Weedkiller: Propachlor at 4.3 kg in 450 l.
Potatoes: Manure: 'Nitram' at 640 kg. Weedkiller: Metribuzin at 1.0 kg in 300 l. Fungicides: Mancozeb at 1.4 kg in 200 l on three occasions and at 1.0 kg in 200 l on a fourth occasion.

Seed: W. barley: Halcyon, sown at 150 kg.
W. beans: Bourdon, dressed with thiabendazole and thiram, sown at 240 kg.
W. oats: Image, sown at 190 kg.
W. oilseed rape: Ariana, dressed gamma HCH, thiram and fenpropimorph, sown at 8 kg.
S. oilseed rape: Topaz, dressed gamma HCH, thiram and fenpropimorph, sown at 8 kg.
Potatoes: Desiree.

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Cultivations, etc.:-

All crops: Heavy spring-tine cultivated: 30 Aug, 1988. PK applied: 9 Sept.
W. barley: Rotary harrowed, seed sown: 18 Oct, 1988. Weedkiller applied: 16 Nov. N applied: 30 Mar, 1989. Fungicide applied: 16 May. Combine harvested: 21 July.
W. beans: Rotary harrowed, seed sown: 18 Oct, 1988. Weedkillers applied: 4 Nov. Insecticide applied: 10 May. Combine harvested: 14 Aug.
W. oats: Rotary harrowed, seed sown: 18 Oct, 1988. Weedkiller applied: 29 Oct. N applied: 18 Apr, 1989. Combine harvested: 25 July.
W. oilseed rape: Seed sown: 9 Sept, 1988. Weedkiller applied: 4 Nov. N applied (to two plots): 23 Feb, 1989. Crop destroyed by cultivating with rotary grubber: 15 Apr.
S. oilseed rape: N applied: 20 Apr, 1989. Rotary harrowed twice, seed sown: 21 Apr. Weedkiller applied: 1 June. Cut with forage harvester: 29 Aug.
Potatoes: Ploughed: 19 Oct, 1988. N applied: 20 Apr, 1989. Rotary harrowed: 24 Apr. Planted: 3 May. Rotary ridged: 26 May. Metribuzin applied: 31 May. Mancozeb applied: 3 July, 17 July, 28 July, 14 Aug. Haulm mechanically destroyed: 21 Aug. Lifted: 8 Sept.
Previous crops: W. oilseed rape 1987, w. wheat 1988.

NOTES: (1) Soil samples were taken from rape plots in April 1989, to determine N content.
(2) Crop samples were taken from each crop in August, just before harvest, to determine total dry matter yield and N content.

https://doi.org/10.23637/ERADOC-1-40

89/R/CS/337

GRAIN TONNES/HECTARE

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

	CROP
W BARLEY	6.85
W BEANS	5.38
W OATS	6.73
Mean	6.32

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

CROP
0.743

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	4	0.910	14.4

GRAIN MEAN DM% 87.3

PLOT AREA HARVESTED 0.00230

POTATOES

TOTAL TUBERS TONNES/HECTARE

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

CROP	POTATOES
	26.4

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89/R/CS/338

CONTROL OF VOLUNTEERS

Object: To study the residual effects in w. oats of a range of methods of volunteer control in w. wheat in the preceding year - Summerdells II.

Sponsors: R. Moffitt, D.G. Christian.

The second year, w. oats.

For previous year see 88/R/WW/12.

Design: 3 replicates of 6 x 3 criss-cross.

Column plot dimensions: 6.0 x 23.0.

Treatments: All combinations of:-

1. **PRIMCULT** Primary cultivations in previous year:

NONE	None until just before sowing
DYNDRIVE	'Bomford Dynadrive'
DISC	Disc
PLOUGH	Plough
ROTAVATE	Rotary cultivate
TINE	Tine

2. **PRSOWCON** Pre-sowing volunteer control in previous year:

GLYPHOS	Glyphosate
PARAQUAT	Paraquat
ROT HARR	Rotary harrow

NOTES: (1) In 1987, disc and tine treatments were cultivated twice, the others once.
(2) All plots were disced twice and rotary harrowed on 7 Nov, 1987. All were ploughed on 11 Oct, 1988 and rotary harrowed on 28 Oct.
(3) 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.

Basal applications: Manure: 'Nitram' at 360 kg. Weedkiller: Methabenzthiazuron at 1.6 kg in 200 l. Fungicide: Fenpropimorph at 0.75 kg with the growth regulator and wetting agent in 200 l. Growth regulator: Chlormequat chloride at 1.6 kg with a wetting agent ('Enhance' at 0.036 l).

Seed: Image, sown at 190 kg.

Cultivations, etc.:- Seed sown: 28 Oct, 1988. Weedkiller applied: 29 Oct. N applied: 16 Apr, 1989. Fungicide with growth regulator and wetting agent applied: 16 May. Combine harvested: 23 July. Previous crops: W. barley 1987, w. wheat 1988.

NOTE: Volunteers were assessed at crop anthesis. Since volunteers were absent, yields were not taken.

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89/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. wheat and the extent to which responses are affected by amounts of nitrogen fertilizer - Woburn Butt Close II.

Sponsor: S.P. McGrath.

The first year, w. wheat.

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 4.0 x 10.0.

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 'Nitram':

   0
   180
   230

Basal applications: Weedkillers: Paraquat at 0.80 kg ion in 220 l. Isoproturon at 1.5 kg in 220 l. Insecticide: Fonofos at 1.4 kg in 220 l. Fungicides: Carbendazim at 0.15 kg and prochloraz at 0.40 kg in 220 l. Propiconazole at 0.12 kg in 220 l.

Seed: Mercia, sown at 150 kg.

Cultivations, etc.:- Ploughed: 7 July, 1988. Paraquat applied: 19 Oct. Spring-tine cultivated, seed sown, harrowed: 21 Oct. Isoproturon applied: 8 Dec. Insecticide applied: 30 Jan, 1989. N and S treatments applied: 19 Apr. Carbendazim and prochloraz applied: 17 May. Propiconazole applied: 12 June. Combine harvested: 8 Aug. Previous crops: W. wheat 1987, fallow 1988.

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89/W/CS/339

GRAIN TONNES/HECTARE

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

S N	0	10	20	40	Mean
0	2.94	2.20	2.29	1.87	2.32
180	4.64	4.51	4.77	3.84	4.44
230	4.47	5.26	4.13	4.45	4.58
Mean	4.02	3.99	3.73	3.38	3.78

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

S	N	S N
0.331	0.287	0.573

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	22	0.702	18.6

GRAIN MEAN DM% 88.6

STRAW TONNES/HECTARE

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

S N	0	10	20	40	Mean
0	1.37	1.04	0.95	1.06	1.10
180	3.99	3.38	3.48	3.47	3.58
230	3.53	3.71	3.67	4.05	3.74
Mean	2.96	2.71	2.70	2.86	2.81

STRAW MEAN DM% 90.6

PLOT AREA HARVESTED 0.00165

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/1 and 89/W/WW/1

WINTER WHEAT

VARIETIES

Object: To study a selection of newer varieties of w. wheat on land in rotation (pathogen free) and after wheat (pathogen infected) - Rothamsted Pastures (pathogen free RH) and Summerdells I (pathogen infected RD), Woburn Lansome II (pathogen free WH).

Sponsor: R. Moffitt.

Design: Two blocks of 2 whole plots split into 7 (RH,RD), 4 blocks of 8 plots (WH).

Whole plot dimensions: 27.0 x 12.0 (RH,RD)
48.0 x 12.0 (WH)

Treatments: All combinations of:-

Whole plots

1. **INSCTCDE** Insecticide (R only):

NONE	None
PIRIMICA	Pirimicarb at 0.14 kg in 200 l on 20 June, 1989

Sub plots (R), whole plots (WH):

2. **VARIETY** Varieties:

ALEXAND	Alexandria (WH only)
APOLLO	Apollo
APOSTLE	Apostle
AVALON	Avalon
HORNET	Hornet
MERCIA	Mercia
PASTICHE	Pastiche
RENDEZVO	Rendezvous

Basal applications:

Pastures (RH): Manure: 'Nitram' at 360 kg. Weedkillers: Fluroxypyr at 0.20 kg with bromoxynil at 0.27 kg and ioxynil at 0.27 kg in 200 l. Fungicides: Propiconazole at 0.12 kg with chlorothalonil at 1.0 kg in 200 l.

Summerdells I (RD): Manures: (0:18:36) at 920 kg. 'Nitram' at 580 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Isoproturon at 2.5 kg in 200 l. Fungicides: Propiconazole at 0.12 kg with chlorothalonil at 1.0 kg in 200 l.

Lansome II (WH): Manure: 'Nitram' at 460 kg. Weedkillers: Bromoxynil at 0.34 kg and clopyralid at 0.07 kg with mecoprop at 2.5 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with chlorothalonil at 1.0 kg in 220 l.

Seed: Varieties sown at 180 kg (R).
Varieties sown at 160 kg (W).

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89/R/WW/1 and 89/W/WW/1

Cultivations, etc.:-

Pastures (RH): Heavy spring-tine cultivated twice: 1 Nov, 1988. Rotary harrowed, seed sown and harrowed: 2 Nov. N applied: 19 Apr, 1989. Weedkillers applied: 2 May. Fungicides applied: 16 June. Combine harvested: 7 Aug. Previous crops: S. beans 1987, potatoes 1988.

Summerdells I (RD): Straw burnt: 21 Sept, 1988. Rotary cultivated: 22 Sept. PK applied: 2 Oct. Glyphosate applied: 22 Oct. Heavy spring-tine cultivated: 30 Oct. Rotary harrowed, seed sown, harrowed: 2 Nov. Isoproturon applied: 16 Nov. N applied: 16 Apr, 1989. Fungicides applied: 16 June. Combine harvested: 8 Aug. Previous crops: W. wheat 1987, s. wheat 1988.

Lansome II (WH): Heavy spring-tine cultivated: 3 Nov, 1988. Spike-harrowed with crumbler attached, seed sown: 4 Nov. N applied: 29 Apr, 1989. Weedkillers applied: 2 May. Fungicides applied: 12 June. Combine harvested: 8 Aug. Previous crops: S. barley 1987, potatoes 1988.

89/R/WW/1 PASTURES (RH)

GRAIN TONNES/HECTARE

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

INSCTCDE / **VARIETY**	NONE	PIRIMICA	Mean
APOLLO	8.90	8.70	8.80
APOSTLE	8.85	8.65	8.75
AVALON	8.39	8.68	8.54
HORNET	9.11	8.84	8.97
MERCIA	8.72	8.66	8.69
PASTICHE	7.91	8.09	8.00
RENDEZVO	8.72	8.54	8.63
Mean	8.66	8.60	8.63

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

VARIETY	**INSCTCDE*** **VARIETY**
0.208	0.295

* Within the same level of **INSCTCDE** only

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

Stratum	d.f.	s.e.	cv%
WP.SP	12	0.295	3.4

GRAIN MEAN DM% 89.8

SUB PLOT AREA HARVESTED 0.00245

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/1 SUMMERDELLS (RD)

GRAIN TONNES/HECTARE

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

INSCTCDE / **VARIETY**	NONE	PIRIMICA	Mean
APOLLO	8.47	8.18	8.32
APOSTLE	7.87	7.22	7.54
AVALON	7.15	6.73	6.94
HORNET	6.95	7.36	7.16
MERCIA	7.93	7.92	7.93
PASTICHE	6.86	6.29	6.57
RENDEZVO	7.49	6.37	6.93
Mean	7.53	7.15	7.34

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

VARIETY	**VARIETY*** **INSCTCDE**
0.351	0.496

* Within the same level of **INSCTCDE** only

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

Stratum	d.f.	s.e.	cv%
WP.SP	12	0.496	6.8

GRAIN MEAN DM% 89.7

SUB PLOT AREA HARVESTED 0.00245

https://doi.org/10.23637/ERADOC-1-40

89/W/WW/1 LANSOME (W)

GRAIN TONNES/HECTARE

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

VARIETY	
ALEXAND	3.96
APOLLO	6.10
APOSTLE	5.57
AVALON	5.45
HORNET	4.93
MERCIA	5.89
PASTICHE	4.92
RENDEZVO	5.79
Mean	5.33

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

VARIETY
0.446

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

Stratum	d.f.	s.e.	cv%
WP.SP	21	0.631	11.8

GRAIN MEAN DM% 89.7

SUB PLOT AREA HARVESTED 0.00330

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/2

WINTER WHEAT

CONTROL OF VOLUNTEERS

Object: To compare methods of volunteer control in winter wheat after w. and s. barley - Scout N, Great Field I.

Sponsors: R. Moffitt, D.G. Christian.

Design: 3 replicates of 6 x 3 criss-cross.

Column plot dimensions: 6.0 x 23.0.

Treatments: All combinations of:-

1. **PRIMCULT** Primary cultivations:

NONE	None until just before sowing
DYNDRIVE	'Bomford Dynadrive'
DISC	Disc
PLOUGH	Plough
ROTAVATE	Rotary cultivate
TINE	Tine

2. **PRSOWCON** Pre-sowing volunteer control:

GLYPHOS	Glyphosate at 0.27 kg in 200 l on 1 Oct, 1988 (Scout N), 17 Oct (Great Field I)
PARAQUAT	Paraquat at 0.60 kg ion in 200 l on above dates
ROT HARR	Rotary harrowed on 3 Oct (Scout N), 28 Oct (Great Field I)

NOTES: (1) Primary cultivation treatments were carried out on 19 Aug, 1988 (Scout N) and 5 Sept (Great Field I). **PRIMCULT** DISC and **PRIMCULT** TINE were cultivated twice in Scout N.

(2) All plots were disced twice on 3 Oct (Scout N) and 27 Oct (Great Field I) and seed sown on 4 Oct and 28 Oct respectively.

(3) 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.

(4) A 1 m strip of Plaisant w. barley was broadcast on the surface, by drill at 100 kg on one end of each plot on Great Field I only. It was broadcast before any treatments were applied on 2 Sept, 1988.

Basal applications:

Scout N: Manure: 'Nitram' at 600 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Fenpropimorph at 0.56 kg in 200 l. Molluscicide: Methiocarb at 0.22 kg.

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89/R/WW/2

Basal applications:
Great Field I: Manure: 'Nitram' at 580 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg in 200 l.

Seed: Mercia, sown at 180 kg.

Cultivations, etc.:-
Scout N: Chlortoluron applied: 21 Oct, 1988. Methiocarb applied: 30 Jan, 1989. N applied: 10 Apr. Remaining weedkillers with prochloraz and carbendazim applied: 2 May. Fenpropimorph applied: 28 June. Combine harvested: 4 Aug. Previous crops: W. barley 1987 and 1988.
Great Field I: Chlortoluron applied: 16 Nov, 1988. N applied: 19 Apr, 1989. Remaining weedkillers applied: 4 May. Combine harvested: 4 Aug. Previous crops: W. wheat 1987, s. barley 1988.

NOTES: (1) Volunteer plants were assessed in October after sowing and before crop emergence.
(2) Ears of volunteer plants were counted at anthesis of the sown crop.
(3) Percentage contamination of harvested grain by volunteer grain was measured.

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89/R/WW/2 SCOUT N AFTER W. BARLEY

GRAIN TONNES/HECTARE

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

PRSOWCON PRIMCULT	GLYPHOS	PARAQUAT	ROT HARR	Mean
NONE	4.17	4.75	4.12	4.35
DYNDRIVE	3.95	4.75	3.60	4.10
DISC	3.75	4.39	3.89	4.01
PLOUGH	4.75	4.64	4.17	4.52
ROTAVATE	4.26	5.21	4.19	4.55
TINE	3.57	4.17	3.34	3.70
Mean	4.07	4.65	3.89	4.20

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

PRIMCULT	PRSOWCON	PRIMCULT PRSOWCON
0.252	0.265	0.432

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

PRIMCULT	0.398
PRSOWCON	0.366

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP1	10	0.309	7.4
BLOCK.WP2	4	0.324	7.7
BLOCK.WP1.WP2	20	0.398	9.5

GRAIN MEAN DM% 86.7

SUB PLOT AREA HARVESTED 0.00161

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89/R/WW/2 GREAT FIELD I AFTER S. BARLEY

GRAIN TONNES/HECTARE

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

PRSOWCON / **PRIMCULT**	GLYPHOS	PARAQUAT	ROT HARR	Mean
NONE	5.42	5.15	5.64	5.40
DYNDRIVE	5.16	4.78	5.34	5.09
DISC	6.12	5.57	5.91	5.87
PLOUGH	5.36	5.11	5.21	5.22
ROTAVATE	5.38	5.34	5.51	5.41
TINE	5.76	5.47	5.73	5.65
Mean	5.53	5.24	5.56	5.44

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

PRIMCULT	**PRSOWCON**	**PRIMCULT PRSOWCON**
0.281	0.229	0.402

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

PRIMCULT	0.319
PRSOWCON	0.344

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP1	10	0.345	6.3
BLOCK.WP2	4	0.281	5.2
BLOCK.WP1.WP2	20	0.297	5.5

GRAIN MEAN DM% 87.3

SUB PLOT AREA HARVESTED 0.00161

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89/R/WW/3

WINTER WHEAT

N AND CROP PHYSIOLOGY

Object: To study, in crops given optimal or less than optimal N, the dynamics of late N within the plant, the effects on flag leaf photosynthesis and protein retention and the N status of individual organs - Little Knott I.

Sponsors: G.F.J. Milford, D.W. Lawlor, P.B. Barraclough.

Associate sponsor: D.S. Powlson.

Design: 3 randomised blocks of 9 plots.

Whole plot dimensions: 3.0 x 9.0.

Treatments: All combinations of:-

1. **EARLY N** — Nitrogen fertilizer (kg N) applied as 'Nitro-Chalk' divided in a 1:2:1 ratio between 30 Mar, 1989, 14 Apr and 5 May respectively:

   0
   80
   200

2. **LATE N** — Nitrogen fertilizer applied late:

0	None
NLEAF	To foliage, 40 kg N as urea in 225 l in two equal applications on 25 May, 1989 and 26 May
NSOIL	To soil, 40 kg N as prilled urea on 25 May

plus two extra treatments given EARLY N 200 and magnesium at 2.5 kg on 23 June and on 7 July:

EARLYNMG

NONE	None
UREA	40 kg N as urea in 225 l in two equal applications on 23 June, 1989, and 24 June

Basal applications: Manures: (0:18:36) at 280 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Paraquat at 0.60 kg ion in 200 l. Metsulfuron-methyl at 6.0 g with the prochloraz in 220 l. Fungicides: Prochloraz at 0.40 kg. Propiconazole at 0.12 kg with chlorothalonil at 1.0 kg in 220 l. Insecticide: Fonofos at 1.4 kg in 200 l.

Seed: Avalon, sown at 170 kg.

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89/R/WW/3

Cultivations, etc.:- Rotary cultivated: 17 Sept, 1988. Glyphosate applied: 17 Oct. Paraquat applied: 24 Oct. Heavy spring-tine cultivated: 26 Oct. PK applied: 28 Oct. Ploughed: 29 Oct. Rotary harrowed: 1 Nov. Rotary harrowed, seed sown: 3 Nov. Fonofos applied: 26 Jan, 1989. Metsulfuron-methyl with prochloraz applied: 3 May. Propiconazole with chlorothalonil applied: 15 June. Combine harvested: 3 Aug. Previous crops: S. beans 1987, w. oats 1988.

NOTE: Samples were taken for measurements of crop and grain growth and N content, weekly from April until maturity.

GRAIN TONNES/HECTARE

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

LATE N / **EARLY N**	0	NLEAF	NSOIL	Mean
0	3.19	3.55	3.95	3.56
80	5.95	5.69	5.61	5.75
200	6.94	6.73	6.49	6.72
Mean	5.36	5.32	5.35	5.34

EARLYNMG	NONE	UREA	Mean
	6.68	6.63	6.66

GRAND MEAN 5.58

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

EARLY N	**LATE N**	**EARLY N LATE N & EARLYNMG**
0.287	0.287	0.497

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.608	10.9

GRAIN MEAN DM% 85.0

PLOT AREA HARVESTED 0.00207

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/4

WINTER WHEAT

FACTORS AFFECTING TAKE-ALL

Object: To study the effects of a range of factors on the incidence of take-all and on the yield of w. wheat - White Horse II.

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

Design: A single replicate of 2 x 2 x 2 x 2 x 4.

Whole plot dimensions: 3.0 x 10.0.

Treatments: All combinations of:-

1. **SOWDATE** — Dates of sowing:

22 SEPT	22 September, 1988
28 OCT	28 October

2. **SOILFUNG** — Application of fungicide to the seedbed:

NONE	None
NUARIMOL	Nuarimol at 1.1 kg in 375 l

3. **SEEDRATE** — Seed rates:

   100 KG
   200 KG

4. **AUTUMN N** — N application to the seedbed:

0	None
60	60 kg N as 'Nitro-Chalk' on 21 Sept, 1988 or 27 Oct for successive SOWDATES

5. **SPRING N** — Nitrogen fertilizer (kg N) in spring, as 'Nitro-Chalk', applied 20 Apr, 1989:

   100
   150
   200
   250

Basal applications: Manures: (0:18:36) at 920 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Fluroxypyr at 0.20 kg in 200 l. Fungicide: Fenpropimorph at 0.75 kg in 200 l.

Cultivations, etc.:- Heavy spring-tine cultivated: 17 Sept, 1988. PK applied: 19 Sept. Rotary harrowed: 20 Sept. Chlortoluron applied: 16 Nov. Fluroxypyr applied: 8 May 1989. Fungicide applied: 23 May. Combine harvested: 8 Aug. Previous crops: W. wheat 1987 and 1988.

NOTE: Plant samples were taken in mid-April and June to assess take-all, eyespot, sharp eyespot, damage by stem-boring larvae (April only) and brown foot rot (June only). Grain quality was measured.

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89/R/WW/4

GRAIN TONNES/HECTARE

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

SOILFUNG	NONE	NUARIMOL	Mean
SOWDATE			
22 SEPT	6.58	6.81	6.69
28 OCT	6.91	6.99	6.95
Mean	6.74	6.90	6.82

SEEDRATE	100 KG	200 KG	Mean
SOWDATE			
22 SEPT	6.68	6.70	6.69
28 OCT	6.86	7.03	6.95
Mean	6.77	6.87	6.82

SEEDRATE	100 KG	200 KG	Mean
SOILFUNG			
NONE	6.68	6.81	6.74
NUARIMOL	6.86	6.93	6.90
Mean	6.77	6.87	6.82

AUTUMN N	0	60	Mean
SOWDATE			
22 SEPT	6.55	6.84	6.69
28 OCT	6.86	7.04	6.95
Mean	6.70	6.94	6.82

AUTUMN N	0	60	Mean
SOILFUNG			
NONE	6.58	6.91	6.74
NUARIMOL	6.82	6.97	6.90
Mean	6.70	6.94	6.82

AUTUMN N	0	60	Mean
SEEDRATE			
100 KG	6.68	6.86	6.77
200 KG	6.72	7.01	6.87
Mean	6.70	6.94	6.82

SPRING N	100	150	200	250	Mean
SOWDATE					
22 SEPT	6.52	6.79	6.76	6.71	6.69
28 OCT	6.88	7.01	6.99	6.92	6.95
Mean	6.70	6.90	6.87	6.81	6.82

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89/R/WW/4

GRAIN TONNES/HECTARE

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

SPRING N / **SOILFUNG**	100	150	200	250	Mean
NONE	6.51	6.88	6.93	6.66	6.74
NUARIMOL	6.89	6.92	6.82	6.97	6.90
Mean	6.70	6.90	6.87	6.81	6.82

SPRING N / **SEEDRATE**	100	150	200	250	Mean
100 KG	6.70	6.83	6.85	6.70	6.77
200 KG	6.70	6.96	6.90	6.93	6.87
Mean	6.70	6.90	6.87	6.81	6.82

SPRING N / **AUTUMN N**	100	150	200	250	Mean
0	6.49	6.74	6.84	6.74	6.70
60	6.91	7.06	6.90	6.89	6.94
Mean	6.70	6.90	6.87	6.81	6.82

SOWDATE	**SEEDRATE** / **SOILFUNG**	100 KG	200 KG
22 SEPT	NONE	6.53	6.63
	NUARIMOL	6.83	6.78
28 OCT	NONE	6.83	6.98
	NUARIMOL	6.89	7.09

SOWDATE	**AUTUMN N** / **SOILFUNG**	0	60
22 SEPT	NONE	6.41	6.75
	NUARIMOL	6.68	6.93
28 OCT	NONE	6.76	7.06
	NUARIMOL	6.96	7.02

SOWDATE	**AUTUMN N** / **SEEDRATE**	0	60
22 SEPT	100 KG	6.49	6.87
	200 KG	6.60	6.81
28 OCT	100 KG	6.87	6.85
	200 KG	6.85	7.22

SOILFUNG	**AUTUMN N** / **SEEDRATE**	0	60
NONE	100 KG	6.50	6.87
	200 KG	6.67	6.95
NUARIMOL	100 KG	6.86	6.86
	200 KG	6.78	7.08

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/4

GRAIN TONNES/HECTARE

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

	SPRING N	100	150	200	250
SOWDATE	SOILFUNG				
22 SEPT	NONE	6.18	6.76	6.94	6.44
	NUARIMOL	6.87	6.81	6.57	6.98
28 OCT	NONE	6.85	6.99	6.91	6.88
	NUARIMOL	6.90	7.03	7.06	6.96

	SPRING N	100	150	200	250
SOWDATE	SEEDRATE				
22 SEPT	100 KG	6.56	6.71	6.87	6.58
	200 KG	6.48	6.86	6.64	6.83
28 OCT	100 KG	6.84	6.95	6.83	6.81
	200 KG	6.91	7.06	7.15	7.02

	SPRING N	100	150	200	250
SOILFUNG	SEEDRATE				
NONE	100 KG	6.48	6.92	6.81	6.52
	200 KG	6.55	6.83	7.05	6.79
NUARIMOL	100 KG	6.93	6.74	6.89	6.88
	200 KG	6.84	7.09	6.74	7.06

	SPRING N	100	150	200	250
SOWDATE	AUTUMN N				
22 SEPT	0	6.39	6.66	6.60	6.54
	60	6.66	6.91	6.91	6.88
28 OCT	0	6.58	6.82	7.08	6.94
	60	7.17	7.20	6.89	6.89

	SPRING N	100	150	200	250
SOILFUNG	AUTUMN N				
NONE	0	6.36	6.66	6.86	6.44
	60	6.67	7.09	6.99	6.88
NUARIMOL	0	6.61	6.81	6.82	7.04
	60	7.16	7.02	6.81	6.90

	SPRING N	100	150	200	250
SEEDRATE	AUTUMN N				
100 KG	0	6.44	6.72	6.88	6.67
	60	6.97	6.95	6.81	6.72
200 KG	0	6.53	6.76	6.80	6.81
	60	6.86	7.17	6.99	7.05

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89/R/WW/4

GRAIN TONNES/HECTARE

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

SOWDATE	**SOILFUNG**	**SEEDRATE**	**AUTUMN N**
0.064	0.064	0.064	0.064
SPRING N	**SOWDATE SOILFUNG**	**SOWDATE SEEDRATE**	**SOILFUNG SEEDRATE**
0.090	0.090	0.090	0.090
SOWDATE AUTUMN N	**SOILFUNG AUTUMN N**	**SEEDRATE AUTUMN N**	**SOWDATE SPRING N**
0.090	0.090	0.090	0.128
SOILFUNG SPRING N	**SEEDRATE SPRING N**	**AUTUMN N SPRING N**	**SOWDATE SOILFUNG SEEDRATE**
0.128	0.128	0.128	0.128
SOWDATE SOILFUNG AUTUMN N	**SOWDATE SEEDRATE AUTUMN N**	**SOILFUNG SEEDRATE AUTUMN N**	**SOWDATE* SOILFUNG SPRING N**
0.128	0.128	0.128	0.180
SOWDATE SEEDRATE SPRING N	**SOILFUNG SEEDRATE SPRING N**	**SOWDATE AUTUMN N SPRING N**	**SOILFUNG AUTUMN N SPRING N**
0.180	0.180	0.180	0.180
SEEDRATE AUTUMN N SPRING N			
0.180			

* Only when comparing means with the same level of **SOWDATE.SOILFUNG.NIT**, where **NIT** has 2 levels. The first corresponding to levels 100, 250 of **SPRING N** and the second to the other 2 levels.

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.255	3.7

GRAIN MEAN DM% 89.1

PLOT AREA HARVESTED 0.00226

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89/R/WW/5

WINTER WHEAT

APHICIDE, N AND FUNGICIDE

Object: To determine the economic thresholds for cereal aphids with different levels of inputs - Black Horse II.

Sponsor: N. Carter, X. Zhou.

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 3.0 x 12.0.

Treatments: All combinations of:-

1. **APHICIDE** — Aphicide:

   NONE — None
   PIRIMICA — Pirimicarb applied at 0.14 kg in 200 l on 31 May, 1989, 13 June and 28 June

2. **N RATE** — Nitrogen fertilizer (kg N) as 'Nitram' on 18 Apr, 1989:

   80
   120
   160

3. **FUNGCIDE** — Fungicides:

   NONE — None
   31+39+65 — Fungicide sprays at growth stages 31, 39 and 65:
   G.S. 31 - Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l on 15 Apr, 1989
   G.S. 39 - Propiconazole at 0.125 kg in 200 l on 17 May
   G.S. 65 - Propiconazole at 0.125 kg with chlorothalonil at 1.0 kg in 200 l on 13 June

Basal applications: Weedkillers: Chlortoluron at 3.5 kg in 200 l. Metsulfuron-methyl at 6.0 g in 400 l. Insecticide: Deltamethrin at 6.2 g in 200 l. Growth regulator: Chlormequat at 1.3 kg in 200 l.

Seed: Avalon, sown at 180 kg.

Cultivations, etc.:- Rotary cultivated: 6 Aug, 1988. Ploughed: 19 Sept. Heavy spring-tine cultivated: 26 Sept. Rotary harrowed, seed sown: 30 Sept. Chlortoluron applied: 21 Oct. Insecticide applied: 7 Nov. Growth regulator applied: 19 Apr, 1989. Metsulfuron-methyl applied: 3 May. Combine harvested: 3 Aug. Previous crops: W. barley 1987, w. oilseed rape 1988.

NOTE: Aphids were counted from mid-April until early July. Plant dry weights were measured at anthesis. Disease assessments were made in mid-June. Components of yield were measured.

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89/R/WW/5

GRAIN TONNES/HECTARE

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

N RATE	80	120	160	Mean
APHICIDE				
NONE	8.32	8.26	8.01	8.20
PIRIMICA	8.61	8.21	8.11	8.31
Mean	8.46	8.23	8.06	8.25

FUNGCIDE	NONE	31+39+65	Mean
APHICIDE			
NONE	8.02	8.37	8.20
PIRIMICA	8.18	8.44	8.31
Mean	8.10	8.41	8.25

FUNGCIDE	NONE	31+39+65	Mean
N RATE			
80	8.29	8.64	8.46
120	8.00	8.46	8.23
160	8.00	8.12	8.06
Mean	8.10	8.41	8.25

	FUNGCIDE	NONE	31+39+65
APHICIDE	**N RATE**		
NONE	80	7.89	8.75
	120	8.24	8.27
	160	7.92	8.10
PIRIMICA	80	8.69	8.53
	120	7.77	8.65
	160	8.08	8.15

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

APHICIDE	**N RATE**	**FUNGCIDE**	**APHICIDE N RATE**
0.104	0.128	0.104	0.181

APHICIDE FUNGCIDE	**N RATE FUNGCIDE**	**APHICIDE N RATE FUNGCIDE**
0.148	0.181	0.256

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	22	0.313	3.8

GRAIN MEAN DM% 85.7

PLOT AREA HARVESTED 0.00331

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/6

WINTER WHEAT

CONTROL OF EYESPOT AND SEPTORIA

Object: To test effects of different strategies on disease control and yield under different degrees of risk from eyespot and Septoria - Black Horse I N.

Sponsors: A. Goulds, D. Henry.

Associate Sponsors: J.F. Jenkyn, D.J. Royle (LARS).

Design: 3 whole plots divided into 40 sub-plots arranged as 4 replicates of 10 treatments.

Whole plot dimensions: 123 x 63.0.

Treatments: All combinations of:-

Whole plots

1.	**VARIETY**	Variety:
	AVALON	Avalon
	LONGBOW	Longbow
	RENDEZVO	Rendezvous

Sub plots

2.	**FUNGCIDE**	Fungicides applied according to growth stage or disease forecast:
	O	None (duplicated on Rendezvous)
	F1	Prochloraz on 26 April, 1989 (G.S.31) (duplicated on Avalon and Longbow)
	F2	Prochloraz on 17 May (G.S.37), propiconazole on 14 June (G.S.59) (triplicated)
	F3	Prochloraz on 26 April, propiconazole on 31 May
	F4	Prochloraz on 26 April, propiconazole on 24 May (G.S.39)
	F5	Prochloraz on 26 April, propiconazole on 14 June
	F6	Prochloraz on 17 May

NOTES: (1) Fungicides were applied according to growth stages or in response to disease forecasts. Some growth stage and forecast spray timings coincided leading to duplication of some treatments.
(2) Prochloraz was applied at 0.40 kg in 200 l.
(3) Propiconazole was applied at 0.125 kg in 200 l.

Basal applications: Manures: 'Nitram' at 580 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Isoproturon at 2.5 kg in 200 l. Metsulfuron-methyl at 0.0060 kg in 400 l. Molluscicide: Methiocarb at 0.22 kg.

Seed: Varieties, sown at 190 kg.

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89/R/WW/6

Cultivations, etc.:- Heavy spring-tine cultivated: 31 Aug, 1988. Glyphosate applied: 1 Oct. Heavy spring-tine cultivated: 14 Oct. Seed sown: 17 Oct. Isoproturon applied: 14 Nov. Molluscicide applied: 5 Dec. N applied: 15 Apr, 1989. Metsulfuron-methyl applied: 3 May. Combine harvested: 2 Aug. Previous crops: W. oilseed rape 1987, w. wheat 1988.

NOTE: Eyespot and septoria were assessed at regular intervals throughout the season. Thousand grain weights and specific weights were taken.

89/R/WW/6 AVALON

GRAIN TONNES/HECTARE

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

FUNGCIDE	
O	5.88
F1	6.81
F2	6.57
F3	6.34
F4	5.87
F5	6.80
F6	6.46
Mean	6.47

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

FUNGCIDE	
0.397	between O,F3,F4,F5,F6
0.324	F2 v any of O,F3,F4,F5,F6
0.343	F1 v any of O,F3,F4,F5,F6
0.256	F1 v F2

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.562	8.7

GRAIN MEAN DM% 86.1

PLOT AREA HARVESTED 0.00256

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/6 LONGBOW

GRAIN TONNES/HECTARE

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

FUNGCIDE	
O	7.02
F1	7.82
F2	7.68
F3	7.89
F4	7.69
F5	7.64
F6	7.64
Mean	7.66

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

FUNGCIDE	
0.369	between O,F3,F4,F5,F6
0.301	F2 v any of O,F3,F4,F5,F6
0.319	F1 v any of O,F3,F4,F5,F6
0.238	F1 v F2

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.521	6.8

GRAIN MEAN DM% 85.8

PLOT AREA HARVESTED 0.00256

https://doi.org/10.23637/ERADOC-1-40

89/R/WW/6 RENDEZVOUS

GRAIN TONNES/HECTARE

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

FUNGCIDE	
O	6.59
F1	6.48
F2	6.90
F3	6.79
F4	6.68
F5	6.57
F6	6.95
Mean	6.74

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

FUNGCIDE	
0.171	between F1,F3,F4,F5,F6
0.139	F2 v any of F1,F3,F4,F5,F6
0.148	O v any of F1,F3,F4,F5,F6
0.110	O v F2

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.242	3.6

GRAIN MEAN DM% 86.0

PLOT AREA HARVESTED 0.00256

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89/R/WW/9 and 89/W/WW/9

WINTER WHEAT

CONTROL OF SLUGS

Object: To compare two experimental bait poisons with two standard bait poisons in preventing slug damage to w. wheat - Rothamsted (R) Pastures and Woburn (W) Warren Field II.

Sponsors: I.F. Henderson, N. Coward, G. Turner.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

MOLLCIDE	Molluscicides:
NONE	None
AAA	Tris (2,4-pentandionate) Al III (10% a.i.)
ENH	Tris (1-oxo-1,2-diazabutan-2-oxido) Fe III (10% a.i.)
METHIO B	Methiocarb, Bayer formulation as 'Draza' (4% a.i.)
METHIO R	Methiocarb, Rothamsted formulation (4% a.i.)
METALD P	Metaldehyde, Plant Protection formulation as 'Mini Pellets' (6% a.i.)
METALD R	Metaldehyde, Rothamsted formulation (6% a.i.)
NONE RFP	Rothamsted formulation pellets, no molluscicide

NOTE: All baits were applied at 5.5 kg formulated product on 8 Nov, 1988 (R) and 4 Nov (W).

Basal applications:

Pastures (R): Manure: 'Nitram' at 360 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Chlortoluron at 3.5 kg in 200 l. Fluroxypyr at 0.20 kg in 200 l.

Warren Field II (W): Manures: Magnesian limestone at 7.5 t. 'Nitram' at 470 kg. Weedkiller: Isoproturon at 2.1 kg in 220 l. Fungicide: Propiconazole at 0.12 kg in 220 l.

Seed: Mercia, sown at 180 kg (R).
Mercia, sown at 160 kg (W).

Cultivations, etc.:-

Pastures (R): Glyphosate applied: 28 Oct, 1988. Cultivated by rotary grubber: 7 Nov. Seed sown, harrowed: 8 Nov. Chlortoluron applied: 16 Nov. N applied: 19 Apr, 1989. Fluroxypyr applied: 8 May. Combine harvested: 4 Aug. Previous crops: Ley 1987 and 1988.

Warren Field II (W): Magnesian limestone applied: 14 Sept, 1988. Rotary harrowed with crumbler attached: 4 Oct. Rotary harrowed with crumbler attached, seed sown: 2 Nov. N applied: 19 Apr, 1989. Weedkiller applied: 6 May. Fungicide applied: 5 June. Combine harvested: 8 Aug. Previous crops: S. barley 1987, s. rape 1988.

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89/R/WW/9 PASTURES (R)

GRAIN TONNES/HECTARE

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

MOLLCIDE	
NONE	4.75
AAA	5.06
ENH	5.29
METHIO B	5.29
METHIO R	5.21
METALD P	5.29
METALD R	5.28
NONE RFP	5.28
Mean	5.18

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

MOLLCIDE
0.329

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.402	7.8

GRAIN MEAN DM% 86.6

PLOT AREA HARVESTED 0.00230

https://doi.org/10.23637/ERADOC-1-40

89/W/WW/9 WARREN FIELD II (W)

GRAIN TONNES/HECTARE

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

MOLLCIDE	
NONE	6.73
AAA	7.31
ENH	5.01
METHIO B	6.29
METHIO R	5.24
METALD P	6.29
METALD R	5.93
NONE RFP	5.92
Mean	6.09

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

MOLLCIDE
0.931

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	1.140	18.7

GRAIN MEAN DM% 90.1

PLOT AREA HARVESTED 0.00300

https://doi.org/10.23637/ERADOC-1-40

89/R/B/1

WINTER BARLEY

FACTORS LIMITING YIELD

Object: To study the effects of a range of factors on the quality and yield of winter barley - Great Knott I.

Sponsors: J.F. Jenkyn, R.J.Gutteridge, R.T. Plumb, D.G. Christian, R.J. Darby, S.H.T. Harper, L.A. Mullen, N. Carter, G.J.S. Ross.

Associate sponsors: B.R. Kerry, G.F.J. Milford, Dr. E.D. Baxter (Brewing Research Foundation).

Design: A single replicate of 2 x 2 x 2 x 2 x 2 x 2 + 24 extra plots.

Whole plot dimensions: 3.0 x 18.2.

Treatments: All combinations of the following, all sown early (20 Sept, 1988) and given cypermethrin at 0.025 kg in 220 l on 28 Oct:

1. **PREVCROP**	Previous cropping:	
	BARLEY	Potatoes 1986, w. wheat 1987, w. barley 1988
	OATS	Potatoes 1986, w. wheat 1987, w. oats 1988
2. **WINTER N**	Nitrogen fertilizer in winter (kg N) as urea (46% N):	
	0	None
	NOV+FEB	On 16 Nov, 1988 20 to BARLEY, 49 to OATS, on 20 Feb, 1989 25 to BARLEY and OATS
3. **SPRING N**	Nitrogen fertilizer in spring (kg N) as 'Nitro-Chalk':	
	85	
	160	
4. **N TIME**	Timing of spring nitrogen application:	
	14 MAR	14 March, 1989
	10 APR	10 April
5. **E FUNG**	Early fungicides:	
	NONE	None
	TFSD	Triadimenol and fuberidazole seed dressing
6. **L FUNG**	Late fungicides:	
	NONE	None
	SPRAYS	Foliar sprays of prochloraz at 0.40 kg, carbendazim at 0.15 kg and tridemorph at 0.38 kg in 220 l on 12 Apr, 1989. Propiconazole at 0.125 kg and tridemorph at 0.22 kg in 220 l on 19 May

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plus all combinations of the following, all after barley and given late fungicides and 85 kg N in spring, not given cypermethrin in the autumn:

1. **SOWDATEV** Sowing dates:

20 SEPT	20 September, 1988
17 OCT	17 October

2. **WINTR NV** Nitrogen fertilizer in winter (kg N) as urea (46 %N):

0	None
20+25	20 on 16 Nov, 1988, 25 on 20 Feb, 1989

3. **E FUNGV** Early fungicides:

NONE	None
TFSD	Triadimenol and fuberidazole seed dressing

4. **N TIMEV** Timing of spring nitrogen application:

14 MAR	14 March, 1989
10 APR	10 April

plus 2 extra treatments following fallow, sown 20 September and given early and late fungicides, cypermethrin, 85 kg spring nitrogen but not given winter nitrogen:

N TIMEF Timing of spring nitrogen application:

14 MAR	14 March, 1989 (duplicated)
10 APR	10 April (duplicated)

plus 1 extra treatment following barley, sown 20 September given early and late fungicides, cypermethrin, 160 kg spring nitrogen in April:

WINTER NX Extra winter nitrogen (kg N):

45+25	45 kg on 16 Nov, 1988, 25 kg on 20 Feb, 1989 (duplicated)

plus 1 extra treatment following barley, sown 20 September, and given early and late fungicides, cypermethrin but no nitrogen:

EXTRA NO

0+0+0	No nitrogen (duplicated)

Basal applications: Manure: Magnesian limestone at 5.0 t. Weedkillers: Glyphosate at 0.27 kg in 200 l. Paraquat at 0.60 kg ion in 200 l. Chlortoluron at 3.5 kg in 200 l. Metsulfuron-methyl at 6.0 g with isoproturon at 1.5 kg in 200 l. Growth regulators: 2-chloroethyl-phosphonic acid at 0.31 kg and mepiquat chloride at 0.61 kg with a wetting agent ('Citowett' at 0.08 l) in 200 l.

Seed: Magie, sown at 300 seeds per square metre.

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89/R/B/1

Cultivations, etc.:- Rotary cultivated : 10 Aug, 1988. Glyphosate applied, magnesian limestone applied: 6 Sept. Paraquat applied: 19 Sept. Cultivated with rotary grubber, rotary harrowed, first sowing date plots rotary harrowed again, seed sown: 20 Sept. Second sowing date plots rotary harrowed, seed sown: 17 Oct. Chlortoluron applied: 15 Nov. Growth regulators with wetting agent applied: 19 Apr, 1989. Metsulfuron-methyl with isoproturon applied: 26 Apr. Combine harvested: 13 July. Previous crops: S. barley, w. wheat 1987, w. barley, w. oats, fallow 1988.

NOTES: (1) Soil was sampled to measure nitrate and ammonium contents in October, 1988 and February, 1989. Crop samples were taken from November to June to measure nitrate N concentrations.
(2) Plants were sampled in March, April, May and July to measure plant and shoot numbers, dry weights and nitrogen uptakes. After harvest thousand grain weights were measured.
(3) Leaf diseases, take-all, eyespot, barley yellow dwarf virus and aphid numbers were assessed.

GRAIN TONNES/HECTARE

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

WINTER N	0	NOV+FEB	Mean
PREVCROP			
BARLEY	6.98	7.75	7.36
OATS	7.36	7.95	7.65
Mean	7.17	7.85	7.51

E FUNG	NONE	TFSD	Mean
PREVCROP			
BARLEY	7.22	7.51	7.36
OATS	7.64	7.67	7.65
Mean	7.43	7.59	7.51

E FUNG	NONE	TFSD	Mean
WINTER N			
0	7.05	7.28	7.17
NOV+FEB	7.81	7.90	7.85
Mean	7.43	7.59	7.51

L FUNG	NONE	SPRAYS	Mean
PREVCROP			
BARLEY	6.94	7.79	7.36
OATS	7.27	8.04	7.65
Mean	7.10	7.92	7.51

https://doi.org/10.23637/ERADOC-1-40

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GRAIN TONNES/HECTARE

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

L FUNG	NONE	SPRAYS	Mean
WINTER N			
0	6.90	7.44	7.17
NOV+FEB	7.31	8.40	7.85
Mean	7.10	7.92	7.51

L FUNG	NONE	SPRAYS	Mean
E FUNG			
NONE	6.99	7.87	7.43
TFSD	7.21	7.97	7.59
Mean	7.10	7.92	7.51

SPRING N	85	160	Mean
PREVCROP			
BARLEY	7.11	7.62	7.36
OATS	7.48	7.83	7.65
Mean	7.30	7.72	7.51

SPRING N	85	160	Mean
WINTER N			
0	6.89	7.44	7.17
NOV+FEB	7.70	8.00	7.85
Mean	7.30	7.72	7.51

SPRING N	85	160	Mean
E FUNG			
NONE	7.22	7.64	7.43
TFSD	7.37	7.81	7.59
Mean	7.30	7.72	7.51

SPRING N	85	160	Mean
L FUNG			
NONE	6.89	7.32	7.10
SPRAYS	7.71	8.13	7.92
Mean	7.30	7.72	7.51

N TIME	14 MAR	10 APR	Mean
PREVCROP			
BARLEY	7.48	7.25	7.36
OATS	7.67	7.64	7.65
Mean	7.58	7.44	7.51

https://doi.org/10.23637/ERADOC-1-40

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GRAIN TONNES/HECTARE

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

N TIME / WINTER N	14 MAR	10 APR	Mean
0	7.32	7.01	7.17
NOV+FEB	7.83	7.87	7.85
Mean	7.58	7.44	7.51

N TIME / E FUNG	14 MAR	10 APR	Mean
NONE	7.59	7.27	7.43
TFSD	7.56	7.62	7.59
Mean	7.58	7.44	7.51

N TIME / L FUNG	14 MAR	10 APR	Mean
NONE	7.09	7.12	7.10
SPRAYS	8.07	7.77	7.92
Mean	7.58	7.44	7.51

N TIME / SPRING N	14 MAR	10 APR	Mean
85	7.29	7.30	7.30
160	7.86	7.59	7.72
Mean	7.58	7.44	7.51

PREVCROP	E FUNG / WINTER N	NONE	TFSD
BARLEY	0	6.74	7.22
	NOV+FEB	7.69	7.81
OATS	0	7.37	7.35
	NOV+FEB	7.92	7.99

PREVCROP	L FUNG / WINTER N	NONE	SPRAYS
BARLEY	0	6.74	7.22
	NOV+FEB	7.13	8.37
OATS	0	7.05	7.66
	NOV+FEB	7.48	8.43

PREVCROP	L FUNG / E FUNG	NONE	SPRAYS
BARLEY	NONE	6.70	7.73
	TFSD	7.17	7.86
OATS	NONE	7.27	8.01
	TFSD	7.26	8.08

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GRAIN TONNES/HECTARE

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

	L FUNG	NONE	SPRAYS
WINTER N	E FUNG		
0	NONE	6.80	7.31
	TFSD	7.00	7.57
NOV+FEB	NONE	7.18	8.43
	TFSD	7.43	8.36

	SPRING N	85	160
PREVCROP	WINTER N		
BARLEY	0	6.65	7.31
	NOV+FEB	7.57	7.93
OATS	0	7.14	7.58
	NOV+FEB	7.82	8.08

	SPRING N	85	160
PREVCROP	E FUNG		
BARLEY	NONE	6.93	7.51
	TFSD	7.30	7.72
OATS	NONE	7.52	7.76
	TFSD	7.44	7.90

	SPRING N	85	160
WINTER N	E FUNG		
0	NONE	6.80	7.31
	TFSD	6.99	7.58
NOV+FEB	NONE	7.65	7.96
	TFSD	7.75	8.05

	SPRING N	85	160
PREVCROP	L FUNG		
BARLEY	NONE	6.68	7.19
	SPRAYS	7.55	8.04
OATS	NONE	7.09	7.44
	SPRAYS	7.87	8.22

	SPRING N	85	160
WINTER N	L FUNG		
0	NONE	6.66	7.13
	SPRAYS	7.13	7.75
NOV+FEB	NONE	7.11	7.50
	SPRAYS	8.28	8.51

	SPRING N	85	160
E FUNG	L FUNG		
NONE	NONE	6.74	7.23
	SPRAYS	7.71	8.04
TFSD	NONE	7.03	7.40
	SPRAYS	7.71	8.23

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GRAIN TONNES/HECTARE

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

N TIME	14 MAR	10 APR
PREVCROP WINTER N		
BARLEY 0	7.15	6.81
NOV+FEB	7.82	7.68
OATS 0	7.49	7.22
NOV+FEB	7.84	8.06

N TIME	14 MAR	10 APR
PREVCROP E FUNG		
BARLEY NONE	7.42	7.01
TFSD	7.54	7.48
OATS NONE	7.75	7.53
TFSD	7.58	7.75

N TIME	14 MAR	10 APR
WINTER N E FUNG		
0 NONE	7.29	6.82
TFSD	7.35	7.21
NOV+FEB NONE	7.89	7.73
TFSD	7.77	8.02

N TIME	14 MAR	10 APR
PREVCROP L FUNG		
BARLEY NONE	7.04	6.83
SPRAYS	7.92	7.66
OATS NONE	7.13	7.41
SPRAYS	8.21	7.88

N TIME	14 MAR	10 APR
WINTER N L FUNG		
0 NONE	7.00	6.79
SPRAYS	7.64	7.24
NOV+FEB NONE	7.17	7.44
SPRAYS	8.49	8.30

N TIME	14 MAR	10 APR
E FUNG L FUNG		
NONE NONE	7.19	6.79
SPRAYS	7.99	7.75
TFSD NONE	6.98	7.44
SPRAYS	8.14	7.79

N TIME	14 MAR	10 APR
PREVCROP SPRING N		
BARLEY 85	7.13	7.10
160	7.84	7.40
OATS 85	7.46	7.50
160	7.88	7.78

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GRAIN TONNES/HECTARE

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

WINTER N	N TIME SPRING N	14 MAR	10 APR
0	85	6.98	6.81
	160	7.66	7.22
NOV+FEB	85	7.61	7.79
	160	8.05	7.96

E FUNG	N TIME SPRING N	14 MAR	10 APR
NONE	85	7.29	7.16
	160	7.89	7.38
TFSD	85	7.30	7.44
	160	7.83	7.80

L FUNG	N TIME SPRING N	14 MAR	10 APR
NONE	85	6.87	6.90
	160	7.30	7.33
SPRAYS	85	7.71	7.70
	160	8.42	7.84

WINTR NV SOWDATEV	0	20+25	Mean
20 SEPT	6.31	6.29	6.30
17 OCT	6.39	6.66	6.53
Mean	6.35	6.48	6.41

E FUNGV SOWDATEV	NONE	TFSD	Mean
20 SEPT	6.19	6.41	6.30
17 OCT	6.41	6.65	6.53
Mean	6.30	6.53	6.41

E FUNGV WINTR NV	NONE	TFSD	Mean
0	6.21	6.50	6.35
20+25	6.39	6.57	6.48
Mean	6.30	6.53	6.41

N TIMEV SOWDATEV	14 MAR	10 APR	Mean
20 SEPT	6.43	6.18	6.30
17 OCT	6.52	6.54	6.53
Mean	6.47	6.36	6.41

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GRAIN TONNES/HECTARE

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

N TIMEV / WINTR NV	14 MAR	10 APR	Mean
0	6.51	6.20	6.35
20+25	6.44	6.52	6.48
Mean	6.47	6.36	6.41

N TIMEV / E FUNGV	14 MAR	10 APR	Mean
NONE	6.29	6.31	6.30
TFSD	6.66	6.41	6.53
Mean	6.47	6.36	6.41

N TIMEF	14 MAR	10 APR	Mean
	9.04	8.24	8.64

WINTR NX	45+25
	8.69

EXTRA N0	0+0+0
	4.19

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

(not including extra plots)

Margin of two factor tables	0.052
Two factor tables	0.074
Three factor tables	0.105

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

Stratum	d.f.	s.e.	cv%
WP	22	0.210	2.8

GRAIN MEAN DM% 86.3

PLOT AREA HARVESTED 0.00245

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STRAW TONNES/HECTARE

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

WINTER N	0	NOV+FEB	Mean
PREVCROP			
BARLEY	2.85	3.40	3.13
OATS	3.27	3.94	3.60
Mean	3.06	3.67	3.37

E FUNG	NONE	TFSD	Mean
PREVCROP			
BARLEY	2.95	3.30	3.13
OATS	3.57	3.64	3.60
Mean	3.26	3.47	3.37

E FUNG	NONE	TFSD	Mean
WINTER N			
0	2.98	3.15	3.06
NOV+FEB	3.54	3.80	3.67
Mean	3.26	3.47	3.37

L FUNG	NONE	SPRAYS	Mean
PREVCROP			
BARLEY	2.82	3.43	3.13
OATS	3.33	3.87	3.60
Mean	3.08	3.65	3.37

L FUNG	NONE	SPRAYS	Mean
WINTER N			
0	2.87	3.25	3.06
NOV+FEB	3.28	4.06	3.67
Mean	3.08	3.65	3.37

L FUNG	NONE	SPRAYS	Mean
E FUNG			
NONE	2.96	3.56	3.26
TFSD	3.20	3.74	3.47
Mean	3.08	3.65	3.37

SPRING N	85	160	Mean
PREVCROP			
BARLEY	2.91	3.34	3.13
OATS	3.40	3.81	3.60
Mean	3.16	3.58	3.37

https://doi.org/10.23637/ERADOC-1-40

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STRAW TONNES/HECTARE

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

SPRING N	85	160	Mean
WINTER N			
0	2.85	3.28	3.06
NOV+FEB	3.47	3.87	3.67
Mean	3.16	3.58	3.37

SPRING N	85	160	Mean
E FUNG			
NONE	3.08	3.44	3.26
TFSD	3.23	3.72	3.47
Mean	3.16	3.58	3.37

SPRING N	85	160	Mean
L FUNG			
NONE	2.93	3.23	3.08
SPRAYS	3.38	3.92	3.65
Mean	3.16	3.58	3.37

N TIME	14 MAR	10 APR	Mean
PREVCROP			
BARLEY	3.39	2.87	3.13
OATS	3.74	3.46	3.60
Mean	3.57	3.17	3.37

N TIME	14 MAR	10 APR	Mean
WINTER N			
0	3.27	2.86	3.06
NOV+FEB	3.87	3.47	3.67
Mean	3.57	3.17	3.37

N TIME	14 MAR	10 APR	Mean
E FUNG			
NONE	3.48	3.04	3.26
TFSD	3.66	3.29	3.47
Mean	3.57	3.17	3.37

N TIME	14 MAR	10 APR	Mean
L FUNG			
NONE	3.20	2.96	3.08
SPRAYS	3.93	3.37	3.65
Mean	3.57	3.17	3.37

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STRAW TONNES/HECTARE

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

N TIME	14 MAR	10 APR	Mean
SPRING N			
85	3.31	3.01	3.16
160	3.83	3.32	3.58
Mean	3.57	3.17	3.37

	E FUNG	NONE	TFSD
PREVCROP	WINTER N		
BARLEY	0	2.69	3.02
	NOV+FEB	3.22	3.58
OATS	0	3.27	3.27
	NOV+FEB	3.86	4.01

	L FUNG	NONE	SPRAYS
PREVCROP	WINTER N		
BARLEY	0	2.65	3.05
	NOV+FEB	3.00	3.81
OATS	0	3.10	3.44
	NOV+FEB	3.57	4.30

	L FUNG	NONE	SPRAYS
PREVCROP	E FUNG		
BARLEY	NONE	2.57	3.34
	TFSD	3.08	3.52
OATS	NONE	3.35	3.78
	TFSD	3.32	3.96

	L FUNG	NONE	SPRAYS
WINTER N	E FUNG		
0	NONE	2.86	3.09
	TFSD	2.89	3.40
NOV+FEB	NONE	3.05	4.03
	TFSD	3.51	4.08

	SPRING N	85	160
PREVCROP	WINTER N		
BARLEY	0	2.60	3.10
	NOV+FEB	3.22	3.58
OATS	0	3.09	3.45
	NOV+FEB	3.71	4.16

	SPRING N	85	160
PREVCROP	E FUNG		
BARLEY	NONE	2.63	3.28
	TFSD	3.20	3.41
OATS	NONE	3.54	3.59
	TFSD	3.26	4.02

https://doi.org/10.23637/ERADOC-1-40

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STRAW TONNES/HECTARE

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

	SPRING N	85	160
WINTER N	E FUNG		
0	NONE	2.81	3.14
	TFSD	2.88	3.41
NOV+FEB	NONE	3.36	3.73
	TFSD	3.58	4.02

	SPRING N	85	160
PREVCROP	L FUNG		
BARLEY	NONE	2.69	2.96
	SPRAYS	3.14	3.72
OATS	NONE	3.18	3.49
	SPRAYS	3.62	4.12

	SPRING N	85	160
WINTER N	L FUNG		
0	NONE	2.76	2.99
	SPRAYS	2.93	3.56
NOV+FEB	NONE	3.11	3.46
	SPRAYS	3.83	4.28

	SPRING N	85	160
E FUNG	L FUNG		
NONE	NONE	2.84	3.07
	SPRAYS	3.33	3.80
TFSD	NONE	3.02	3.38
	SPRAYS	3.44	4.05

	N TIME	14 MAR	10 APR
PREVCROP	WINTER N		
BARLEY	0	3.13	2.57
	NOV+FEB	3.64	3.16
OATS	0	3.40	3.14
	NOV+FEB	4.09	3.79

	N TIME	14 MAR	10 APR
PREVCROP	E FUNG		
BARLEY	NONE	3.22	2.69
	TFSD	3.56	3.04
OATS	NONE	3.73	3.40
	TFSD	3.75	3.53

	N TIME	14 MAR	10 APR
WINTER N	E FUNG		
0	NONE	3.17	2.79
	TFSD	3.36	2.93
NOV+FEB	NONE	3.78	3.30
	TFSD	3.95	3.65

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STRAW TONNES/HECTARE

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

	N TIME	14 MAR	10 APR
PREVCROP	L FUNG		
BARLEY	NONE	3.07	2.58
	SPRAYS	3.70	3.16
OATS	NONE	3.33	3.34
	SPRAYS	4.16	3.59

	N TIME	14 MAR	10 APR
WINTER N	L FUNG		
0	NONE	3.02	2.73
	SPRAYS	3.52	2.98
NOV+FEB	NONE	3.38	3.18
	SPRAYS	4.35	3.76

	N TIME	14 MAR	10 APR
E FUNG	L FUNG		
NONE	NONE	3.15	2.77
	SPRAYS	3.80	3.32
TFSD	NONE	3.25	3.15
	SPRAYS	4.06	3.42

	N TIME	14 MAR	10 APR
PREVCROP	SPRING N		
BARLEY	85	3.12	2.71
	160	3.66	3.02
OATS	85	3.50	3.30
	160	3.99	3.63

	N TIME	14 MAR	10 APR
WINTER N	SPRING N		
0	85	2.99	2.70
	160	3.54	3.02
NOV+FEB	85	3.62	3.32
	160	4.12	3.63

	N TIME	14 MAR	10 APR
E FUNG	SPRING N		
NONE	85	3.24	2.93
	160	3.71	3.16
TFSD	85	3.37	3.09
	160	3.94	3.49

	N TIME	14 MAR	10 APR
L FUNG	SPRING N		
NONE	85	3.05	2.82
	160	3.36	3.10
SPRAYS	85	3.57	3.20
	160	4.30	3.55

https://doi.org/10.23637/ERADOC-1-40

89/R/B/1

STRAW TONNES/HECTARE

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

WINTR NV	0	20+25	Mean
SOWDATEV			
20 SEPT	2.87	3.25	3.06
17 OCT	3.37	3.86	3.62
Mean	3.12	3.55	3.34

E FUNGV	NONE	TFSD	Mean
SOWDATEV			
20 SEPT	3.09	3.03	3.06
17 OCT	3.56	3.67	3.62
Mean	3.33	3.35	3.34

E FUNGV	NONE	TFSD	Mean
WINTR NV			
0	3.09	3.15	3.12
20+25	3.56	3.55	3.55
Mean	3.33	3.35	3.34

N TIMEV	14 MAR	10 APR	Mean
SOWDATEV			
20 SEPT	3.41	2.71	3.06
17 OCT	3.71	3.52	3.62
Mean	3.56	3.11	3.34

N TIMEV	14 MAR	10 APR	Mean
WINTR NV			
0	3.44	2.81	3.12
20+25	3.69	3.42	3.55
Mean	3.56	3.11	3.34

N TIMEV	14 MAR	10 APR	Mean
E FUNGV			
NONE	3.58	3.07	3.33
TFSD	3.54	3.16	3.35
Mean	3.56	3.11	3.34

N TIMEF	14 MAR	10 APR	Mean
	4.96	3.94	4.45

WINTR NX	45+25
	4.30

EXTRA N0	0+0+0
	1.25

STRAW MEAN DM% 94.0

PLOT AREA HARVESTED 0.00245

https://doi.org/10.23637/ERADOC-1-40

89/R/B/2

WINTER BARLEY

SOWING DATES, APHIDS AND BYDV

Object: To study the relationship of aphid numbers in suction trap samples to crop populations and the incidence of BYDV on winter barley sown on a range of dates - Great Field II.

Sponsors: N. Carter, R.J. Gutteridge, J.F. Jenkyn, R.T. Plumb.

Design: 4 randomised blocks of 10 plots.

Whole plot dimensions: 3.0 x 23.0 N.BLOCKS.
3.0 x 18.0 S.BLOCKS.

Treatments: All combinations of:-

1. **SOWDATE** Dates of sowing:

12 SEPT	12 September, 1988
22 SEPT	22 September
3 OCT	3 October
17 OCT	17 October
27 OCT	27 October

2. **APHICIDE** Aphicide:

NONE	None
CYPERMET	Cypermethrin at 0.025 kg in 380 l on 7 Nov, 1988 except on SOWDATE 27 OCT, applied on 11 Jan, 1989

NOTE: All SOWDATE treatments were cultivated by rotary grubber on 12 Sept, 1988 and rotary harrowed on the day of sowing.

Basal applications: Manures: 'Nitram' at 480 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Chlortoluron at 3.5 kg in 200 l. Isoproturon at 1.5 kg with mecoprop at 2.2 kg, ioxynil at 0.28 kg and bromoxynil at 0.28 kg in 200 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.38 kg in 200 l.

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- Rotary cultivated: 11 Aug, 1988, and 15 Aug. Glyphosate applied: 6 Sept. Chlortoluron applied: 16 Nov. N applied: 19 Apr, 1989. Remaining weedkillers applied: 2 May. Fungicides applied: 10 May. Combine harvested: 14 July. Previous crops: W. barley 1987 and 1988.

NOTE: Aphids were sampled from late September to June. Visual estimates of BYDV were made throughout the season, a more detailed estimate was made at the end of April. Components of yield were measured. Take-all was assessed in summer.

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GRAIN TONNES/HECTARE

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

APHICIDE / SOWDATE	NONE	CYPERMET	Mean
12 SEPT	3.22	3.79	3.50
22 SEPT	3.54	4.26	3.90
3 OCT	3.49	3.75	3.62
17 OCT	2.92	3.37	3.14
27 OCT	3.42	3.68	3.55
Mean	3.32	3.77	3.54

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

SOWDATE	APHICIDE	SOWDATE APHICIDE
0.166	0.105	0.235

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	27	0.332	9.4

GRAIN MEAN DM% 85.0

PLOT AREA HARVESTED 0.00230

https://doi.org/10.23637/ERADOC-1-40

89/R/B/3

WINTER BARLEY

VARIETIES

Object: To study the yields of some of the newer winter barley varieties and to compare them with a standard and a naked oat - Great Knott I.

Sponsors: R. Moffitt, J.F. Jenkyn.

Design: 4 randomised blocks of 9 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

VARIETY	Varieties and crops:
HALCYO B	Halcyon, barley
IGRI B	Igri, barley
MAGIE B	Magie, barley (duplicated)
MG S600 B	Magie with 'Seamac 600' spray
MARINKA B	Marinka, barley
VIXEN B	Vixen, barley
IMAGE SO	Image, standard oat
KYNON NO	Kynon, naked oat

NOTE: The 'Seamac 600' was applied at 5.6 l in 220 l on 28 Apr, 1989.

Basal applications: Manures: Magnesian limestone at 5.0 t. 'Nitram' at 360 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l. Isoproturon at 2.5 kg in 200 l. Metsulfuron-methyl at 6.0 g with fluroxypyr at 0.20 kg in 200 l. Growth regulators: 2-chloroethylphosphonic acid at 0.31 kg and mepiquat chloride at 0.61 kg with a wetting agent ('Citowett' at 0.08 l) in 200 l.

Seed: Barley varieties sown at 150 kg.
Oat varieties sown at 190 kg.

Cultivations, etc.:- Magnesian limestone applied: 6 Sept, 1988. Rotary cultivated: 14 Sept. Glyphosate applied: 19 Oct. Heavy spring-tine cultivated: 29 Oct. Rotary harrowed, seed sown: 2 Nov. Isoproturon applied: 16 Nov. N applied, growth regulators with wetting agent applied: 19 Apr, 1989. Metsulfuron-methyl with fluroxypyr applied: 26 Apr. Combine harvested: 21 July (barley), 25 July (oats). Previous crops: S. barley 1987, w. wheat 1988.

NOTES: (1) Samples were taken for disease assessment in June.
(2) Malting quality was assessed on the grain from some treatments.

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89/R/B/3

GRAIN TONNES/HECTARE

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

VARIETY	
HALCYO B	5.88
IGRI B	5.06
MAGIE B	5.38
MG S600 B	5.38
MARINKA B	5.47
VIXEN B	2.58
IMAGE SO	3.99
KYNON NO	2.40
Mean	4.61

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

VARIETY	
0.223	min.rep
0.193	max-min

	VARIETY
max-min	MAGIE B 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	25	0.315	6.8

GRAIN MEAN DM% 83.7

PLOT AREA HARVESTED 0.00204

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89/R/B/4

WINTER BARLEY

VARIETIES AND BYDV

Object: To measure the relative rates of spread of three strains of barley yellow dwarf virus (BYDV) on two varieties of winter barley and to measure their effects on yield - Delafield.

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

Design: 5 randomised blocks of 6 plots split into 4 sub plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

Whole plots

1. **VARIETY** Varieties:

   IGRI
   VIXEN

2. **INS DATE** Insecticide and date of application:

CYPER E	Cypermethrin at 0.02 kg in 260 l on 28 October, 1988
CYPER M	Cypermethrin at 0.02 kg in 260 l on 5 December
PIRIM L	Pirimicarb at 0.14 kg in 200 l on 28 March, 1989

Sub plots

3. **V STRAIN** BYDV strain:

NONE	Uninoculated
MAV	Sitobion (Macrosiphum) avenae virus
PAV	Padi and avenae virus
RPV	Rhopalosiphum padi virus

NOTES: (1) On 3 Oct, 1988, aphids were introduced to the centre of relevant plots to spread the three isolates of BYDV as above.
(2) The aphid species Sitobion avenae was used for MAV, and Rhopalosiphum padi for RPV and PAV.

Basal applications: Manures: Magnesian limestone at 5.0 t. 'Nitram' at 480 kg. Weedkillers: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l. Isoproturon at 2.5 kg with mecoprop at 1.7 kg in 200 l. Metsulfuron-methyl at 6.0 g with fluroxypyr at 0.15 kg in 400 l. Glyphosate at 0.36 kg with a wetting agent, tallow amine ethoxylate at 0.80 kg, in 200 l. Fungicide: Propiconazole at 0.12 kg in 200 l.

Seed: Varieties, sown at 150 kg.

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89/R/B/4

Cultivations, etc.:- Straw chopped: 10 Aug, 1988. Rotary cultivated: 15 Aug. Magnesian limestone applied: 22 Aug. Diquat with wetting agent applied: 9 Sept. Cultivated with rotary grubber twice, rotary harrowed, seed sown: 10 Sept. Isoproturon and mecoprop applied: 3 Nov. N applied: 12 Apr, 1989. Metsulfuron-methyl with fluroxypyr applied: 15 Apr. Fungicide applied: 10 May. Glyphosate with tallow amine ethoxylate applied: 6 July. Combine harvested: 13 July. Previous crops: W. wheat 1987, w. oilseed rape 1988.

NOTE: Aphid survival was monitored for one to two weeks after release. Visual symptoms of BYDV were assessed throughout the season and a more detailed assessment was made in early February.

GRAIN TONNES/HECTARE

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

INS DATE / **VARIETY**	CYPER E	CYPER M	PIRIM L	Mean
IGRI	7.83	7.85	5.63	7.10
VIXEN	8.36	8.11	8.38	8.28
Mean	8.10	7.98	7.00	7.69

V STRAIN / **VARIETY**	NONE	MAV	PAV	RPV	Mean
IGRI	7.28	7.10	7.13	6.92	7.10
VIXEN	8.24	8.43	8.34	8.11	8.28
Mean	7.76	7.76	7.73	7.51	7.69

V STRAIN / **INS DATE**	NONE	MAV	PAV	RPV	Mean
CYPER E	8.32	8.07	8.18	7.81	8.10
CYPER M	7.89	8.13	7.95	7.94	7.98
PIRIM L	7.07	7.09	7.06	6.78	7.00
Mean	7.76	7.76	7.73	7.51	7.69

VARIETY	**V STRAIN** / **INS DATE**	NONE	MAV	PAV	RPV
IGRI	CYPER E	8.02	7.66	7.98	7.68
	CYPER M	7.77	7.82	8.00	7.83
	PIRIM L	6.04	5.81	5.40	5.25
VIXEN	CYPER E	8.62	8.48	8.39	7.95
	CYPER M	8.02	8.44	7.90	8.06
	PIRIM L	8.10	8.38	8.72	8.31

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89/R/B/4

GRAIN TONNES/HECTARE

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

VARIETY	INS DATE	V STRAIN	VARIETY INS DATE
0.144	0.177	0.140	0.250

VARIETY V STRAIN	INS DATE V STRAIN	VARIETY INS DATE V STRAIN
0.224	0.274	0.388

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

VARIETY	0.198
INS DATE	0.242
VARIETY.INS DATE	0.343

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.395	5.1
BLOCK.WP.SP	72	0.542	7.0

GRAIN MEAN DM% 85.8

SUB PLOT AREA HARVESTED 0.00047

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89/R/B/5

WINTER BARLEY

CONTROL OF VOLUNTEERS

Object: To compare methods of volunteer control in winter barley - Black Horse I S.

Sponsors: R. Moffitt, D.G. Christian.

Design: 3 replicates of 6 x 3 criss-cross.

Column plot dimensions: 6.0 x 23.0.

Treatments: All combinations of:-

1. **PRIMCULT** Primary cultivations:

NONE	None until just before sowing
DYNDRIVE	'Bomford Dynadrive'
DISC	Disc
PLOUGH	Plough
ROTAVATE	Rotary cultivate
TINE	Tine

2. **PRSOWCON** Pre-sowing volunteer control:

GLYPHOS	Glyphosate at 0.27 kg in 200 l on 17 Oct, 1988
PARAQUAT	Paraquat at 0.60 kg ion in 200 l on 17 Oct
ROT HARR	Rotary harrow on 18 Oct

NOTES: (1) Primary cultivation treatments were carried out on 13 Sept, 1988.
(2) All plots were disced twice and seed sown on 18 Oct.
(3) 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.

Basal applications: Manure: 'Nitram' at 420 kg. Weedkillers: Chlortoluron at 3.5 kg in 200 l. Metsulfuron-methyl at 6.0 g in 400 l. Fungicide: Propiconazole at 0.12 kg in 200 l.

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- Chlortoluron applied: 22 Oct, 1988. N applied: 12 Apr, 1989. Metsulfuron-methyl applied: 3 May. Fungicide applied: 17 May. Combine harvested: 14 July. Previous crops: W. wheat 1987 and 1988.

NOTES: (1) Volunteer plants were assessed in October after sowing and before crop emergence.
(2) Ears of volunteer plants were counted at anthesis of the sown crop.
(3) Percentage contamination of harvested grain by volunteer grain was measured.

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89/R/B/5

GRAIN TONNES/HECTARE

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

PRSOWCON	GLYPHOS	PARAQUAT	ROT HARR	Mean
PRIMCULT				
NONE	6.05	6.17	5.81	6.01
DYNDRIVE	5.73	5.99	5.98	5.90
DISC	6.18	5.94	6.05	6.06
PLOUGH	5.63	6.00	6.02	5.89
ROTAVATE	6.24	5.71	5.51	5.82
TINE	6.16	5.84	5.91	5.97
Mean	6.00	5.94	5.88	5.94

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

	PRIMCULT	**PRSOWCON**	**PRIMCULT PRSOWCON**
	0.223	0.151	0.335
Except when comparing means with the same level(s) of			
PRIMCULT			0.298
PRSOWCON			0.321

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP1	4	0.185	3.1
BLOCK.WP2	10	0.274	4.6
BLOCK.WP1.WP2	20	0.345	5.8

GRAIN MEAN DM% 85.7

SUB PLOT AREA HARVESTED 0.00161

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89/R/B/7

SPRING BARLEY

VARIETIES AND N

Object: To compare the quality, yield and dormancy of two varieties of s. barley at two rates of nitrogen - Bones Close.

Sponsors: D.G. Christian, R. Moffitt.

Design: 3 randomised blocks of 4 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

Whole plots

1. **VARIETY** Varieties:

   KLAXON
   NATASHA

2. **N** Nitrogen fertilizer (kg N), as 'Nitram' on 29 Mar, 1989:

   100
   140

Basal applications: Weedkillers: Mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 200 l.

Seed: Varieties, sown at 160 kg.

Cultivations, etc.:- Ploughed: 17 Nov, 1988. Rotary harrowed: 28 Mar, 1989. Rotary harrowed, seed sown: 29 Mar. Weedkillers applied: 17 May. Combine harvested: 15 Aug. Previous crops: Potatoes 1987, s. barley 1988.

NOTES: (1) Plants were sampled in mid-June and early August to measure total dry matter and N.
(2) From late June until maturity ears were sampled fortnightly from certain plots, to measure grain growth, N content, grain viability and dormancy.
(3) Volunteer plants were assessed in October after sowing and before emergence.
(4) Ears of volunteers were counted at crop anthesis.
(5) Percentage contamination of harvested grain was measured.

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89/R/B/7

GRAIN TONNES/HECTARE

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

N	100	140	Mean
VARIETY			
KLAXON	3.24	3.16	3.20
NATASHA	3.05	3.14	3.10
Mean	3.15	3.15	3.15

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

VARIETY	N	VARIETY N
0.198	0.198	0.281

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.344	10.9

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00204

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89/R/LP/1

WINTER LUPINS

VARIETIES, SOWING DATES AND SEED DRESSINGS

Object: To compare three varieties of lupin (Lupinus albus) sown at two sowing dates with and without a seed dressing - Long Hoos III 6.

Sponsors: J. McEwen, H.L. Jones, D.P. Yeoman, A.W. Ferguson, J.F. Jenkyn.

Design: 2 randomised blocks of 12 plots.

Whole plot dimensions: 1.8 x 9.0.

Treatments: All combinations of:-

Whole plots

1. **VARIETY**	Varieties:	
	C 8	C 8
	LUCKY	Lucky
	VLADIMIR	Vladimir
2. **SOW DATE**	Dates of sowing:	
	21 SEPT	21 September, 1988
	2 NOV	2 November
3. **FUNGCIDE**	Fungicides:	
	NONE	None
	F+C+T+B	Fosetyl-aluminium, captan and thiabendazole, to seed plus benomyl at 0.50 kg and chlorothalonil at 1.0 kg applied in 220 l on 15 Mar, 1989

NOTE: Plots were netted from October to May.

Basal applications: Manure: Muriate of potash at 520 kg. Weedkillers: Terbutryne at 0.98 kg and terbuthylazine at 0.42 kg in 220 l repeated at 0.49 kg and 0.21 kg respectively in 220 l to first sowing only. Metamitron at 2.8 kg applied with the benomyl, chlorothalonil and pirimicarb in 220 l. Fungicides: Benomyl at 0.50 kg with chlorothalonil at 1.0 kg. Benomyl at 0.56 kg applied with pirimicarb in 220 l. Insecticides: Pirimicarb at 0.14 kg on two occasions. Deltamethrin at 7.5 g in 220 l. Molluscicides: Methiocarb at 0.60 kg to first sowing and at 0.27 kg to second sowing. Metaldehyde at 0.94 kg.

Seed: Sown at 60 seeds per square metre.

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Cultivations, etc.:- Ploughed: 7 June, 1988. Rotary cultivated: 5 Aug. K applied: 15 Sept. Rotary harrowed, first sowing date seed sown: 21 Sept. Terbutryne and terbuthylazine applied: 29 and 30 Sept to first sowing only. Methiocarb applied to first sowing: 26 Oct. Second sowing date seed sown, terbutryne and terbuthylazine applied and methiocarb applied: 2 Nov. Metaldehyde applied: 15 Mar, 1989. Metamitron, benomyl, chlorothalonil and pirimicarb applied: 28 Apr. Deltamethrin applied: 9 May. Pirimicarb and benomyl applied: 9 June. Combine harvested: 23 Aug. Previous crops : Potatoes 1987, fallow 1988.

NOTE: All plots sown with **VARIETY** VLADIMIR failed and have been omitted from the analysis.

https://doi.org/10.23637/ERADOC-1-40

89/R/LP/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE	NONE	F+C+T+B	Mean
VARIETY			
C 8	2.10	1.31	1.71
LUCKY	2.08	1.75	1.91
Mean	2.09	1.53	1.81

SOW DATE	21 SEPT	2 NOV	Mean
VARIETY			
C 8	1.82	1.59	1.71
LUCKY	1.76	2.07	1.91
Mean	1.79	1.83	1.81

SOW DATE	21 SEPT	2 NOV	Mean
FUNGCIDE			
NONE	2.21	1.98	2.09
F+C+T+B	1.37	1.68	1.53
Mean	1.79	1.83	1.81

	SOW DATE	21 SEPT	2 NOV
VARIETY	**FUNGCIDE**		
C 8	NONE	2.29	1.92
	F+C+T+B	1.36	1.27
LUCKY	NONE	2.13	2.04
	F+C+T+B	1.39	2.10

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

VARIETY	**FUNGCIDE**	**SOW DATE**	**VARIETY FUNGCIDE**
0.202	0.202	0.202	0.286

VARIETY SOW DATE	**FUNGCIDE SOW DATE**	**VARIETY FUNGCIDE SOW DATE**
0.286	0.286	0.404

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.404	22.3

GRAIN MEAN DM% 87.7

PLOT AREA HARVESTED 0.00162

https://doi.org/10.23637/ERADOC-1-40

89/R/LP/2

SPRING LUPINS

VERNALIZATION STUDY

Object: To study the effects of a range of periods of vernalization on the growth, date of maturity and yield of two varieties of lupins (Lupinus albus) - Long Hoos IV O & E S.W.

Sponsors: G.F.J. Milford, L.A. Mullen, D.P. Yeoman.

Design: A single replicate of 28 plots.

Whole plot dimensions: 1.5 x 2.0.

Treatments: All combinations of:-

1. **SOWDATE** Dates of sowing:

   8 MARCH
   29 MARCH

2. **VARIETY** Varieties:

   C8
   VLADIMIR

3. **VERNTIME** Period of vernalization at 1 degree C:

   NONE
   1 WEEK
   2 WEEKS
   3 WEEKS
   4 WEEKS
   5 WEEKS
   6 WEEKS

Basal applications: Manures: (0:18:36) at 1080 kg. Magnesian limestone at 2.6 t. Weedkillers: Glyphosate at 0.72 kg in 220 l. Paraquat at 0.54 kg ion in 220 l. Terbutryne at 0.98 kg and terbuthylazine at 0.42 kg in 220 l. Insecticides: Deltamethrin at 7.5 g in 220 l. Pirimicarb at 0.14 kg in 220 l. Molluscicides: Methiocarb at 0.40 kg applied twice. Metaldehyde at 0.94 kg.

Cultivations, etc.:- Glyphosate applied: 13 Oct, 1988. PK applied: 26 Oct. Paraquat applied: 24 Nov. Magnesian limestone applied: 30 Nov. Ploughed: 8 Dec. Rotary cultivated, first sowing date seed sown, methiocarb applied: 8 Mar, 1989. Terbutryne and terbuthylazine applied to first sowing, methiocarb applied: 15 Mar. Rotary cultivated, second sowing date seed sown, rolled: 29 Mar. Terbutryne and terbuthylazine applied to second sowing: 30 Mar. Metaldehyde applied: 31 Mar. Deltamethrin applied: 9 May. Pirimicarb applied: 5 July. Hand harvested: 20 Sept. Previous crops: S.barley 1987 and 1988.

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89/R/LP/2

NOTES: (1) All plots sown with **VARIETY** VLADIMIR failed and only the results from **VARIETY** C8 are presented.
(2) Grain mean dry matter percentages are not available.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOW DATE	8 MARCH	29 MARCH	Mean
VERNTIME			
NONE	0.80	0.93	0.86
1 WEEK	0.42	0.59	0.51
2 WEEKS	0.09	0.92	0.51
3 WEEKS	0.81	1.14	0.97
4 WEEKS	0.53	0.85	0.69
5 WEEKS	0.88	1.29	1.08
6 WEEKS	0.21	1.14	0.67
Mean	0.53	0.98	0.76

PLOT AREA HARVESTED 0.00030

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89/R/RA/1

WINTER OILSEED RAPE

FACTORS LIMITING YIELD

Object: To study the effects of a range of factors on the incidence of pests and diseases and on the growth and yield of w. oilseed rape - Osier.

Sponsors: C.J. Rawlinson, R.J. Darby, P.G.N. Digby, J.E. Leach, I.H. Williams, D.P. Yeoman.

Associate sponsors: P.B. Barraclough, J. Lacey, S.P. McGrath.

Design: A single replicate of 2 x 2 x 2 x 2 x 2 x 2 + 3 replicates of 2 x 6 + 20 extra plots.

Whole plot dimensions: 3.0 x 21.0.

Treatments: All combinations of:-

1. **SEEDRATE** — Seed rates (sown on rows 17 cm apart):

4 KG	
8 KG	

2. **SOW DATE** — Dates of sowing:

17 AUG	17 August, 1988
7 SEP	7 September

3. **N RATE** — Amounts of N fertilizer (kg N), as 'Nitro-Chalk', applied on 16 Feb, 1989, and 28 Mar in addition to a basal application of 50 kg N as 'Nitram' to the seedbed:

25+25	
50+100	

4. **FUNGCIDE** — Fungicides:

NONE	None
SPRAYED	Prochloraz at 0.50 kg in 220 l on 8 Nov, 1988, to SOW DATE 17 AUG plots only on 21 Mar, 1989 and to SOWDATE 7 SEP plots only on 12 Apr. Iprodione at 0.50 kg in 220 l on 2 June

5. **GROWREG** — Growth regulator:

NONE	None
TRIAPEN	Triapenthenol at 0.70 kg in 220 l on 21 Mar, 1989 to SOW DATE 17 AUG and on 12 Apr to SOW DATE 7 SEP

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6. **INSCTCDE** Insecticides:

NONE	None
DE+MA+TR	Deltamethrin at 62 g in 220 l on 4 Oct, 1988 and 11 Nov Malathion at 1.3 kg in 220 l on 12 Apr, 1989 Triazophos at 0.42 kg in 220 l on 5 June

plus three replicates of all combinations of the following (sown later in rows 17 cm apart and given seedbed nitrogen, growth regulator, insecticides and fungicides):

1. **SEEDRA N** Seed rate:

8 KG
16 KG

2. **N RATE N** Amounts of N fertilizer (kg N) as divided applications on 16 Feb and 28 Mar:

0+0
25+25
25+75
50+100
50+150
75+175

plus three replicates of two extra treatments (sown later at 16 kg in rows 12 cm apart and given seedbed nitrogen, growth regulator, insecticides and fungicides):

N RATE P Amounts of N fertilizer as divided applications on 16 Feb and 28 Mar (kg N):

0+0
75+175

plus two replicates of three extra treatments (sown later, at 8 kg in rows 17 cm apart and given 50+100 kg N, growth regulator, insecticides and fungicides and oxamyl at 5 kg to the seedbed)

SULPHUR Rates of sulphur (kg S) as calcium sulphate, applied on 28 Mar, 1989:

0
25
50

plus two replicates of two extra treatments, sown at 8 kg in rows 17 cm apart and given 50+100 kg N and insecticides:

FUNG ALT Alternative fungicides 'HWG 1608' applied on three occasions:

H 17 AUG	Sown on 17 August, 1988, fungicide on 8 Nov, 21 Mar, 1989 and 2 June
H 7 SEP	Sown on 7 September, 1988, fungicide on 8 Nov, 13 Apr, 1989 and 2 June

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plus four extra plots, sown at 8 kg in rows 17 cm apart, given no nitrogen:

EXTRA NO	Sowing dates and agrochemicals:
17AUG TIF	Sown on 17 August, 1988 given growth regulator, insecticides and fungicides (triplicated)
7SEP O	Sown on 7 September, none

NOTES: (1) The alternative fungicide 'HWG 1608' (proposed common name terbuconazole) was applied at 250 g active ingredient in 220 l on the first occasion and 375 g a.i. in 220 l for the remainder.

(2) Because of errors in spray application two plots were incorrectly treated. These were the combination of **SEEDRA N** 8 with **N RATE N** 25+25 and one of the plots of **EXTRA NO**, 17AUG TIF. These plots were not used in the analysis.

Basal applications: Manures: 'Nitram' at 140 kg. Weedkillers: TCA at 10 kg in 200 l. Metazachlor at 1.2 kg with fluazifop-p-butyl at 0.19 kg and a wetting agent ('Enhance' at 0.26 l) in 260 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

Cultivations, etc.:- Heavy spring-tine cultivated, rotary cultivated: 9 Aug, 1988. Basal N applied, TCA applied: 16 Aug. Remaining weedkillers applied: 30 Sept. Desiccant with wetting agent applied: 12 July, 1989. Combine harvested **SOW DATE** 17 AUG: 18 July and **SOW DATE** 7 SEP: 20 July. Previous crops: W. wheat 1987, w. barley 1988.

NOTE: Observations were made during the season on diseases, pests, N in plants and soil, dry matter accumulation, leaf areas, light interception and lodging. Glucosinolate and oil contents of grain were measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE	4 KG	8 KG	Mean
SOW DATE			
17 AUG	3.41	3.41	3.41
7 SEP	3.19	3.28	3.23
Mean	3.30	3.34	3.32

N RATE	25+25	50+100	Mean
SOW DATE			
17 AUG	3.55	3.27	3.41
7 SEP	3.28	3.18	3.23
Mean	3.42	3.23	3.32

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89/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N RATE	25+25	50+100	Mean
SEEDRATE			
4 KG	3.38	3.22	3.30
8 KG	3.45	3.23	3.34
Mean	3.42	3.23	3.32

GROWREG	NONE	TRIAPEN	Mean
SOW DATE			
17 AUG	3.26	3.56	3.41
7 SEP	3.23	3.24	3.23
Mean	3.24	3.40	3.32

GROWREG	NONE	TRIAPEN	Mean
SEEDRATE			
4 KG	3.21	3.39	3.30
8 KG	3.28	3.41	3.34
Mean	3.24	3.40	3.32

GROWREG	NONE	TRIAPEN	Mean
N RATE			
25+25	3.33	3.50	3.42
50+100	3.16	3.30	3.23
Mean	3.24	3.40	3.32

INSCTCDE	NONE	DE+MA+TR	Mean
SOW DATE			
17 AUG	3.31	3.50	3.41
7 SEP	3.08	3.39	3.23
Mean	3.20	3.45	3.32

INSCTCDE	NONE	DE+MA+TR	Mean
SEEDRATE			
4 KG	3.21	3.39	3.30
8 KG	3.18	3.50	3.34
Mean	3.20	3.45	3.32

INSCTCDE	NONE	DE+MA+TR	Mean
N RATE			
25+25	3.28	3.55	3.42
50+100	3.11	3.34	3.23
Mean	3.20	3.45	3.32

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

INSCTCDE	NONE	DE+MA+TR	Mean
GROWREG			
NONE	3.21	3.28	3.24
TRIAPEN	3.18	3.61	3.40
Mean	3.20	3.45	3.32

FUNGCIDE	NONE	SPRAYED	Mean
SOW DATE			
17 AUG	3.26	3.56	3.41
7 SEP	3.22	3.25	3.23
Mean	3.24	3.40	3.32

FUNGCIDE	NONE	SPRAYED	Mean
SEEDRATE			
4 KG	3.23	3.37	3.30
8 KG	3.25	3.44	3.34
Mean	3.24	3.40	3.32

FUNGCIDE	NONE	SPRAYED	Mean
N RATE			
25+25	3.31	3.52	3.42
50+100	3.17	3.29	3.23
Mean	3.24	3.40	3.32

FUNGCIDE	NONE	SPRAYED	Mean
GROWREG			
NONE	3.17	3.32	3.24
TRIAPEN	3.31	3.49	3.40
Mean	3.24	3.40	3.32

FUNGCIDE	NONE	SPRAYED	Mean
INSCTCDE			
NONE	3.20	3.19	3.20
DE+MA+TR	3.28	3.61	3.45
Mean	3.24	3.40	3.32

	N RATE	25+25	50+100
SOW DATE	**SEEDRATE**		
17 AUG	4 KG	3.59	3.22
	8 KG	3.50	3.32
7 SEP	4 KG	3.17	3.22
	8 KG	3.40	3.15

https://doi.org/10.23637/ERADOC-1-40

89/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	GROWREG	NONE	TRIAPEN
SOW DATE	SEEDRATE		
17 AUG	4 KG	3.23	3.58
	8 KG	3.29	3.53
7 SEP	4 KG	3.18	3.20
	8 KG	3.27	3.28

	GROWREG	NONE	TRIAPEN
SOW DATE	N RATE		
17 AUG	50	3.46	3.63
	150	3.06	3.48
7 SEP	50	3.20	3.36
	150	3.25	3.12

	GROWREG	NONE	TRIAPEN
SEEDRATE	N RATE		
4 KG	50	3.24	3.52
	150	3.18	3.27
8 KG	50	3.42	3.48
	150	3.14	3.33

	INSCTCDE	NONE	DE+MA+TR
SOW DATE	SEEDRATE		
17 AUG	4 KG	3.35	3.47
	8 KG	3.28	3.54
7 SEP	4 KG	3.08	3.31
	8 KG	3.08	3.47

	INSCTCDE	NONE	DE+MA+TR
SOW DATE	N RATE		
17 AUG	25+25	3.39	3.71
	50+100	3.24	3.30
7 SEP	25+25	3.18	3.39
	50+100	2.98	3.39

	INSCTCDE	NONE	DE+MA+TR
SEEDRATE	N RATE		
4 KG	50	3.30	3.46
	150	3.12	3.32
8 KG	50	3.27	3.64
	150	3.10	3.37

	INSCTCDE	NONE	DE+MA+TR
SOW DATE	GROWREG		
17 AUG	NONE	3.31	3.21
	TRIAPEN	3.32	3.80
7 SEP	NONE	3.11	3.34
	TRIAPEN	3.05	3.43

https://doi.org/10.23637/ERADOC-1-40

89/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	INSCTCDE	NONE	DE+MA+TR
SEEDRATE	**GROWREG**		
4 KG	NONE	3.25	3.17
	TRIAPEN	3.18	3.61
8 KG	NONE	3.17	3.39
	TRIAPEN	3.19	3.62

	INSCTCDE	NONE	DE+MA+TR
N RATE	**GROWREG**		
50	NONE	3.29	3.37
	TRIAPEN	3.28	3.72
150	NONE	3.13	3.18
	TRIAPEN	3.09	3.50

	FUNGCIDE	NONE	SPRAYED
SOW DATE	**SEEDRATE**		
17 AUG	4 KG	3.21	3.61
	8 KG	3.31	3.51
7 SEP	4 KG	3.26	3.13
	8 KG	3.18	3.37

	FUNGCIDE	NONE	SPRAYED
SOW DATE	**N RATE**		
17 AUG	25+25	3.37	3.73
	50+100	3.15	3.39
7 SEP	25+25	3.25	3.31
	50+100	3.18	3.18

	FUNGCIDE	NONE	SPRAYED
SEEDRATE	**N RATE**		
4 KG	25+25	3.35	3.41
	50+100	3.12	3.32
8 KG	25+25	3.27	3.63
	50+100	3.22	3.25

	FUNGCIDE	NONE	SPRAYED
SOW DATE	**GROWREG**		
17 AUG	NONE	3.09	3.44
	TRIAPEN	3.43	3.68
7 SEP	NONE	3.25	3.21
	TRIAPEN	3.19	3.29

	FUNGCIDE	NONE	SPRAYED
SEEDRATE	**GROWREG**		
4 KG	NONE	3.20	3.21
	TRIAPEN	3.26	3.52
8 KG	NONE	3.13	3.43
	TRIAPEN	3.36	3.46

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89/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	FUNGCIDE	NONE	SPRAYED
N RATE	**GROWREG**		
25+25	NONE	3.26	3.41
	TRIAPEN	3.36	3.63
50+100	NONE	3.08	3.23
	TRIAPEN	3.26	3.34

	FUNGCIDE	NONE	SPRAYED
SOW DATE	**INSCTCDE**		
17 AUG	NONE	3.22	3.41
	DE+MA+TR	3.30	3.71
7 SEP	NONE	3.18	2.98
	DE+MA+TR	3.26	3.52

	FUNGCIDE	NONE	SPRAYED
SEEDRATE	**INSCTCDE**		
4 KG	NONE	3.25	3.18
	DE+MA+TR	3.22	3.56
8 KG	NONE	3.15	3.21
	DE+MA+TR	3.34	3.67

	FUNGCIDE	NONE	SPRAYED
N RATE	**INSCTCDE**		
25+25	NONE	3.24	3.33
	DE+MA+TR	3.38	3.71
50+100	NONE	3.16	3.06
	DE+MA+TR	3.17	3.52

	FUNGCIDE	NONE	SPRAYED
GROWREG	**INSCTCDE**		
NONE	NONE	3.18	3.24
	DE+MA+TR	3.16	3.40
TRIAPEN	NONE	3.22	3.15
	DE+MA+TR	3.40	3.83

SEEDRA N	8 KG	16 KG	Mean
N RATE N			
0+0	3.40	3.04	3.22
25+25	3.24	3.21	3.23
25+75	3.62	3.30	3.46
50+100	3.10	3.17	3.14
50+150	3.08	3.16	3.12
75+175	3.18	3.20	3.19
Mean	3.27	3.18	3.23

N RATE P	0+0	75+175	Mean
	3.22	3.14	3.18

SULPHUR	0	25	50	Mean
	3.39	3.57	3.41	3.46

FUNG ALT	H 17 AUG	H 7 SEP	Mean
	3.84	3.67	3.76

https://doi.org/10.23637/ERADOC-1-40

89/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

EXTRA NO	17AUG TIF	7SEP O	Mean
	4.22	3.44	3.96

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

(not including extra plots)

Margin of two factor tables	0.088
Two factor tables	0.124
Three factor tables	0.176

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.351	10.6

GRAIN MEAN DM% 85.4

PLOT AREA HARVESTED 0.00299

https://doi.org/10.23637/ERADOC-1-40

89/W/RA/1

WINTER OILSEED RAPE

HARVESTING AND CROP STRUCTURE

Object: To study the effects of seed rate and growth regulator on the yield and harvest losses of w. oilseed rape - Warren Field I.

Sponsors: R. Moffitt, C.J. Rawlinson.

Design: 3 randomised blocks of 4 plots split into 7 sub-plots.

Whole plot dimensions: 24.0 x 10.0.

Treatments: All combinations of:-

Whole plots

1. **SEEDRATE** Seed rates:

   6 KG
   16 KG

2. **GROW REG** Growth regulator applied 2 May, 1989:

   NONE None
   BAS111 'BAS11106W' at 0.9 l in 250 l

NOTE: Yields and harvest losses were recorded for one sub-plot per plot using a conventional combine harvester. Additional subplots were included to test the performance of the Institute of Engineering Research stripping harvester. Harvest losses from this machine were recorded but not yields.

Basal applications: Manures: Magnesian limestone at 7.5 t. N at 100 kg as 'Nitram' twice. Weedkillers: Fluazifop-p-butyl at 0.19 kg in 220 l. Benazolin at 0.38 kg and clopyralid at 0.06 kg in 220 l. Insecticide: Alphacypermethrin at 0.02 kg in 220 l.

Seed: Ariana.

Cultivations, etc.:- Barley straw burnt: 30 Aug, 1988. Spike harrowed twice with crumbler attached, seed sown, rolled: 5 Sept. Fluazifop-p-butyl applied: 23 Nov. Benazolin and clopyralid applied: 12 Dec. N applied: 8 Mar, 1989 and 19 Apr. Insecticide applied: 27 May. Harvested: 14 Aug. Previous crops: W. barley 1987, s. barley 1988.

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89/W/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

GROW REG SEEDRATE	NONE	BAS111	Mean
6 KG	2.46	2.80	2.63
16 KG	2.49	2.42	2.45
Mean	2.48	2.61	2.54

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

SEEDRATE	GROW REG	SEEDRATE GROW REG
0.200	0.200	0.283

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.346	13.6

GRAIN MEAN DM% 89.2

SUB PLOT AREA HARVESTED 0.00305

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89/R/RA/2

WINTER OILSEED RAPE

SEED RATES AND ROW SPACINGS

Object: To study the effects of a range of row-widths and seed rates on the growth and yield of w. oilseed rape - Appletree.

Sponsor: D.P. Yeoman.

Design: 3 randomised blocks of 11 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

1. **SEEDRATE** Seed rates:

   4 KG
   6 KG
   8 KG

2. **ROWSPACE** Row spacings:

   17.5 CM
   35 CM
   52.5 CM

plus two extra treatments, sown at 2 kg seed rate:-

EXTRA	Row spacings:
2 KG 35	35 cm
2 KG 52.5	52.5 cm

Basal applications: Manure: 'Nitram' at 440 kg. Weedkillers: Metazachlor at 1.2 kg with fluazifop-p-butyl at 0.19 kg and a wetting agent ('Enhance' at 0.26 l) in 260 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.50 l) in 520 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

Cultivations, etc.:- Rotary cultivated: 22 Aug, 1988. Cultivated by rotary grubber: 7 Sept. Rotary harrowed, seed sown: 8 Sept. Weedkillers with wetting agent applied: 30 Sept. N applied: 14 Feb, 1989. Desiccant with wetting agent applied: 11 July. Combine harvested: 18 July. Previous crops: W. wheat 1987, w. barley 1988.

NOTE: Plant counts were made at establishment and in spring.

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89/R/RA/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

ROWSPACE / SEEDRATE	17.5 CM	35 CM	52.5 CM	Mean
4 KG	1.54	1.24	1.47	1.42
6 KG	1.65	1.40	1.88	1.64
8 KG	1.41	1.34	1.96	1.57
Mean	1.54	1.33	1.77	1.54

EXTRA	2 KG 35	2 KG 52.5	Mean
	1.05	1.58	1.32

GRAND MEAN 1.50

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

SEEDRATE	ROWSPACE	SEEDRATE ROWSPACE & EXTRA
0.130	0.130	0.225

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.276	18.4

GRAIN MEAN DM% 76.4

PLOT AREA HARVESTED 0.00345

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89/R/RA/3

WINTER OILSEED RAPE

VARIETIES, PESTS AND DISEASES

Object: To investigate the effects of full pest and disease control on a range of low glucosinolate varieties compared with Bienvenu - Osier.

Sponsors: C.J. Rawlinson, I.H. Williams.

Design: 2 randomised blocks of 24 plots.

Whole plot dimensions: 3.0 x 21.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

ARIANA	Ariana
BIENVENU	Bienvenu
CAPRCORN	Capricorn
COBRA	Cobra
LIBRAVO	Libravo
TAPIDOR	Tapidor

2. **INSCTCDE** Insecticides:

NONE	None
FULL	Deltamethrin at 6.2 g in 200 l on 1 Oct, 1988, and 7 Nov. Azinphos methyl at 0.40 kg and demeton-S-methyl sulphone at 0.12 kg in 300 l on 29 Mar, 1989. Triazophos at 0.42 kg in 260 l on 2 June.

3. **FUNGCIDE** Fungicides:

NONE	None
FULL	Prochloraz at 0.50 kg in 200 l on 7 Nov, 1988 and 29 Mar, 1989. Iprodione at 0.50 kg in 260 l on 2 June.

Basal applications: Manure: 'Nitram' at 140 kg on two occasions and on a third occasion at 290 kg. Weedkillers: TCA at 10 kg in 200 l. Metazachlor at 1.2 kg with fluazifop-p-butyl at 0.19 kg and a wetting agent ('Enhance' at 0.26 l) in 260 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Varieties, sown at 8.0 kg.

Cultivations, etc.:- Heavy spring-tine cultivated, rotary cultivated: 9 Aug, 1988. First N applied, TCA applied: 16 Aug. Seed sown: 22 Aug. Remaining weedkillers with wetting agent applied: 30 Sept. Second N applied: 2 Mar, 1989. Third N applied: 28 Mar. Desiccant with wetting agent applied: 12 July. Combine harvested: 15 July. Previous crops: W. wheat 1987, w. barley 1988.

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89/R/RA/3

NOTE: Disease assessments were made on eight occasions throughout the season and pest numbers were recorded in autumn, spring and summer. Microflora of leaf and pods were assessed until harvest. Glucosinolate contents in plant tissues and grain were measured throughout the season.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

INSCTCDE / **VARIETY**	NONE	FULL	Mean
ARIANA	2.71	3.26	2.99
BIENVENU	3.39	3.41	3.40
CAPRCORN	2.87	4.02	3.45
COBRA	2.64	3.46	3.05
LIBRAVO	2.85	3.52	3.18
TAPIDOR	2.70	3.63	3.17
Mean	2.86	3.55	3.21

FUNGCIDE / **VARIETY**	NONE	FULL	Mean
ARIANA	2.73	3.24	2.99
BIENVENU	3.24	3.56	3.40
CAPRCORN	3.29	3.61	3.45
COBRA	2.95	3.14	3.05
LIBRAVO	3.10	3.27	3.18
TAPIDOR	3.03	3.30	3.17
Mean	3.06	3.35	3.21

FUNGCIDE / **INSCTCDE**	NONE	FULL	Mean
NONE	2.73	2.99	2.86
FULL	3.38	3.72	3.55
Mean	3.06	3.35	3.21

VARIETY	**FUNGCIDE** / **INSCTCDE**	NONE	FULL
ARIANA	NONE	2.58	2.84
	FULL	2.88	3.65
BIENVENU	NONE	3.36	3.42
	FULL	3.11	3.70
CAPRCORN	NONE	2.54	3.20
	FULL	4.03	4.01
COBRA	NONE	2.58	2.70
	FULL	3.33	3.59
LIBRAVO	NONE	2.78	2.93
	FULL	3.43	3.61
TAPIDOR	NONE	2.54	2.86
	FULL	3.53	3.74

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89/R/RA/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VARIETY	INSCTCDE	FUNGCIDE	VARIETY INSCTCDE
0.163	0.094	0.094	0.230

VARIETY FUNGCIDE	INSCTCDE FUNGCIDE	VARIETY INSCTCDE FUNGCIDE
0.230	0.133	0.325

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	23	0.325	10.2

GRAIN MEAN DM% 78.0

PLOT AREA HARVESTED 0.00405

https://doi.org/10.23637/ERADOC-1-40

89/R/RA/4

WINTER OILSEED RAPE

STRAW TREATMENTS BEFORE SOWING

Object: To study the effects of a range of methods of treating cereal straw on the establishment and yield of w. oilseed rape sown on two dates, with and without seedbed N - Appletree.

Sponsors: R.J. Darby, D.P Yeoman.

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

Whole plot dimensions: 6.0 x 31.0.

Treatments: All combinations of:-

Whole plots

1. **STR DISP** Disposal of straw:

BURN	Burnt 17 Aug, 1988
CHOP	Chopped 17 Aug
BALE	Baled 9 Aug and bales removed

2. **CULTIVTN** Method of primary cultivation, on 19 Aug, 1988:

TINE CULT	Tine cultivated, without inversion
PLOUGH	Ploughed

Sub plots

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

25 AUG	25 Aug, 1988
8 SEPT	8 Sept

Sub sub plots

4. **SDBED N** Seedbed nitrogen (kg N) as 'Nitram' on 23 Aug, 1988:

0
50

NOTES: (1) All plots were rotary cultivated on 22 Aug, 1988.
(2) CULTIVTN TINE CULT plots were cultivated twice by rotary grubber and CULTIVTN PLOUGH plots once on 24 Aug.
(3) All plots were rotary harrowed and harrowed before drilling. All plots were harrowed in and rolled after drilling.

Basal applications: Manure: 'Nitram' at 440 kg. Weedkillers: Metazachlor at 1.2 kg with fluazifop-p-butyl at 0.19 kg and a wetting agent ('Enhance' at 0.26 l) in 260 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.50 l) in 500 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph, sown at 8.0 kg.

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89/R/RA/4

Cultivations, etc.:- Weedkillers with wetting agent applied: 30 Sept, 1988. Basal N applied: 14 Feb, 1989. Desiccant with wetting agent applied: 11 July. Combine harvested: 17 July. Previous crops: W. wheat 1987, w. barley 1988.

NOTE: Emergence counts were made in autumn and plant counts in early March. Percentages of oil in the grain were measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

CULTIVTN	TINE CULT	PLOUGH	Mean
STR DISP			
BURN	1.84	2.16	2.00
CHOP	1.56	2.23	1.90
BALE	2.32	2.39	2.36
Mean	1.91	2.26	2.08

SOW DATE	25 AUG	8 SEPT	Mean
STR DISP			
BURN	1.75	2.24	2.00
CHOP	1.77	2.02	1.90
BALE	2.16	2.55	2.36
Mean	1.90	2.27	2.08

SOW DATE	25 AUG	8 SEPT	Mean
CULTIVTN			
TINE CULT	1.91	1.91	1.91
PLOUGH	1.89	2.63	2.26
Mean	1.90	2.27	2.08

SDBED N	0	50	Mean
STR DISP			
BURN	1.86	2.13	2.00
CHOP	1.83	1.97	1.90
BALE	2.27	2.44	2.36
Mean	1.99	2.18	2.08

SDBED N	0	50	Mean
CULTIVTN			
TINE CULT	1.83	1.99	1.91
PLOUGH	2.15	2.37	2.26
Mean	1.99	2.18	2.08

SDBED N	0	50	Mean
SOW DATE			
25 AUG	1.78	2.01	1.90
8 SEPT	2.19	2.35	2.27
Mean	1.99	2.18	2.08

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89/R/RA/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	SOW DATE	25 AUG	8 SEPT
STR DISP	CULTIVTN		
BURN	TINE CULT	1.73	1.94
	PLOUGH	1.76	2.55
CHOP	TINE CULT	1.66	1.47
	PLOUGH	1.89	2.57
BALE	TINE CULT	2.32	2.32
	PLOUGH	2.01	2.78

	SDBED N	0	50
STR DISP	CULTIVTN		
BURN	TINE CULT	1.68	1.99
	PLOUGH	2.04	2.27
CHOP	TINE CULT	1.53	1.60
	PLOUGH	2.13	2.34
BALE	TINE CULT	2.27	2.37
	PLOUGH	2.27	2.52

	SDBED N	0	50
STR DISP	SOW DATE		
BURN	25 AUG	1.70	1.80
	8 SEPT	2.02	2.46
CHOP	25 AUG	1.57	1.98
	8 SEPT	2.08	1.95
BALE	25 AUG	2.07	2.26
	8 SEPT	2.47	2.63

	SDBED N	0	50
CULTIVTN	SOW DATE		
TINE CULT	25 AUG	1.76	2.05
	8 SEPT	1.89	1.92
PLOUGH	25 AUG	1.80	1.97
	8 SEPT	2.49	2.77

		SDBED N	0	50
STR DISP	CULTIVTN	SOW DATE		
BURN	TINE CULT	25 AUG	1.58	1.88
		8 SEPT	1.77	2.10
	PLOUGH	25 AUG	1.82	1.71
		8 SEPT	2.27	2.83
CHOP	TINE CULT	25 AUG	1.44	1.88
		8 SEPT	1.61	1.32
	PLOUGH	25 AUG	1.70	2.09
		8 SEPT	2.56	2.58
BALE	TINE CULT	25 AUG	2.25	2.40
		8 SEPT	2.29	2.34
	PLOUGH	25 AUG	1.88	2.13
		8 SEPT	2.65	2.91

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89/R/RA/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

STR DISP	CULTIVTN	SOW DATE	SDBED N
0.216	0.176	0.072	0.071

STR DISP CULTIVTN	STR DISP SOW DATE	CULTIVTN SOW DATE	STR DISP SDBED N
0.306	0.234	0.191	0.233

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

STR DISP	0.125		0.122
CULTIVTN		0.102	

CULTIVTN SDBED N	SOW DATE SDBED N	STR DISP CULTIVTN SOW DATE	STR DISP CULTIVTN SDBED N
0.190	0.101	0.330	0.329

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

CULTIVTN	0.100		
SOW DATE	0.100		
STR DISP.CULTIVTN		0.177	0.173

STR DISP SOW DATE SDBED N	CULTIVTN SOW DATE SDBED N	STR DISP CULTIVTN SOW DATE SDBED N
0.264	0.215	0.373

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

STR DISP	0.175	
CULTIVTN	0.143	
STR DISP.CULTIVTN		0.248
STR DISP.SOW DATE	0.173	
CULTIVTN.SOW DATE	0.141	
STR DISP.CULTIVTN.SDBED N		0.244

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.374	18.0
BLOCK.WP.SP	12	0.217	10.4
BLOCK.WP.SP.SSP	24	0.299	14.4

GRAIN MEAN DM% 72.7

PLOT AREA HARVESTED 0.00345

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89/R/RA/5

WINTER OILSEED RAPE

OVERSOWING IN WHEAT

Object: To study the establishment of rape after s. wheat by oversowing into the wheat - Summerdells II.

Sponsors: R.J. Darby, D.P. Yeoman.

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

Whole plot dimensions: 8.0 x 15.0.

Treatments: All combinations of:-

Whole plots

1.	**SOWING**	Methods of sowing and straw disposal:
	OVERS BA	Oversown on 7 Sept, 1988, straw baled on 9 Sept and bales removed
	OVERS CH	Oversown on 7 Sept, straw chopped and spread on 9 Sept
	CONVEN S	Straw baled on 9 Sept and bales removed, conventionally sown into conventionally prepared seedbed
2.	**SEEDRATE**	Seed rate (kg):
	8	
	16	

Sub plots

N RATE	Nitrogen fertilizer as 'Nitram':
0	None
50	50 kg N to seedbed (post-sowing to OVERS BA and OVERS CH) on 13 Sept, 1988

NOTES: (1) Oversowing was done into standing s. wheat. The wheat was harvested the next day.
(2) SOWING CONVEN S plots were cultivated by rotary grubber on 12 Sept, 1988, rotary harrowed and the seed sown on 14 Sept.

Basal applications: Manures: 'Nitram' at 580 kg. Weedkillers: Metazachlor at 1.2 kg with fluazifop-p-butyl at 0.19 kg in 260 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.50 l) in 520 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

Cultivations, etc.:- Weedkillers applied: 17 Oct, 1988. Basal N applied: 14 Feb, 1989. Desiccant with wetting agent applied: 11 July. Combine harvested: 20 July. Previous crops: W. barley 1987, s. wheat 1988.
NOTE: Plant counts were made in autumn and in early March. Percentages of oil in the grain were measured.

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89/R/RA/5

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE / SOWING	8	16	Mean
OVERS BA	1.83	1.79	1.81
OVERS CH	0.91	1.41	1.16
CONVEN S	1.04	1.33	1.18
Mean	1.26	1.51	1.38

N RATE / SOWING	0	50	Mean
OVERS BA	1.53	2.09	1.81
OVERS CH	0.68	1.64	1.16
CONVEN S	0.92	1.45	1.18
Mean	1.04	1.73	1.38

N RATE / SEEDRATE	0	50	Mean
8	1.06	1.46	1.26
16	1.02	1.99	1.51
Mean	1.04	1.73	1.38

N RATE		0	50
SOWING	SEEDRATE		
OVERS BA	8	1.64	2.02
	16	1.43	2.16
OVERS CH	8	0.72	1.09
	16	0.63	2.19
CONVEN S	8	0.82	1.27
	16	1.01	1.64

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

SOWING	SEEDRATE	N RATE	SOWING SEEDRATE
0.220	0.179	0.200	0.310

SOWING N RATE	SEEDRATE N RATE	SOWING SEEDRATE N RATE
0.329	0.268	0.465

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

SOWING	0.346
SEEDRATE	0.283
SOWING.SEEDRATE	0.489

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.380	27.5
BLOCK.WP.SP	12	0.599	43.3

GRAIN MEAN DM% 90.8 SUB PLOT AREA HARVESTED 0.00345

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89/R/RA/10

WINTER OILSEED RAPE

TIMES AND METHODS OF HARVEST

Object: To investigate the effects of fungicide and times and methods of harvest on the yield and glucosinolate content of the seed - Appletree and Drapers.

Sponsors: C.J. Rawlinson, G.F.J. Milford, A. Porter, J. Fieldsend.

Design: 4 blocks of 2 whole plots each split into 3 sub-plots each split into 3 sub-sub-plots. Two blocks were sited in Appletree and 2 in Drapers.

Whole plot dimensions: 78.0 x 14.0 Appletree.
24.0 x 64.0 Drapers.

Treatments: All combinations of:-

Whole plots

1. **FUNGCIDE** Fungicide at stem extension:

NONE	None
PROCHLOR	Prochloraz at 0.50 kg in 200 l on 5 May, 1989

Sub plots

2. **HAR METH** Method of harvest:

DIRECT	No pre-harvest treatment
DESICATE	Desiccated with diquat before combining
SWATHE	Swathed before combining

Sub sub plots

3. **HAR TIME** Time of harvest:

EARLY
NORMAL
LATE

NOTES: (1) **HAR METH** DESICATE plots were desiccated with diquat at 0.60 kg ion in 520 l. For **HAR TIME** EARLY and NORMAL the wetting agent 'Agral' (at 0.50 l) was added and these were desiccated on 29 June, 1989 and 12 July respectively. **HAR TIME** LATE plots had the wetting agent 'Enhance' (at 0.52 l) added and these were desiccated on 24 July.

(2) **HAR METH** SWATHE plots were swathed on the same dates for each **HAR TIME** that desiccation was done.

(3) Combine harvesting dates were:

HAR METH	**HAR TIME:** EARLY	NORMAL	LATE
DIRECT	24 July	24 July	31 July
DESICATE	12 July	19 July	31 July
SWATHE	12 July	19 July	31 July

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89/R/RA/10

Standard applications:
Appletree: Manure: 'Nitram' at 440 kg. Weedkillers: Metazachlor at 1.2 kg with fluazifop-p-butyl at 0.19 kg and a wetting agent ('Enhance' at 0.26 l) in 260 l.
Drapers: Manure: 'Nitram' at 720 kg. Weedkillers: Clopyralid at 0.07 kg and propyzamide at 0.70 kg in 300 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph, sown at 8.0 kg.

Cultivations, etc.:-
Appletree: Rotary cultivated: 22 Aug, 1988. Cultivated with rotary grubber: 7 Sept. Rotary harrowed: 8 Sept. Seed sown: 9 Sept. Weedkillers with wetting agent applied: 30 Sept. N applied: 14 Feb, 1989. Previous crops: W. wheat 1987, w. barley 1988.
Drapers: Heavy spring-tine cultivated: 31 Aug, 1988. Rotary cultivated: 5 Sept. Seed sown: 10 Sept. Weedkillers applied: 19 Oct. N applied: 15 Feb, 1989. Previous crops: W. oilseed rape 1987, w. wheat 1988.

NOTE: Seed samples were taken frequently from June until harvest for glucosinolate analysis. Disease assessments (Drapers only) were made at 600, 800, 1000 and 1200 accumulated day degrees centigrade from the onset of flowering.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

HAR METH	DIRECT	DESICATE	SWATHE	Mean
FUNGCIDE				
NONE	2.83	2.46	2.19	2.50
PROCHLOR	2.69	1.85	2.15	2.23
Mean	2.76	2.16	2.17	2.36

HAR TIME	EARLY	NORMAL	LATE	Mean
FUNGCIDE				
NONE	2.46	2.43	2.60	2.50
PROCHLOR	2.21	2.15	2.33	2.23
Mean	2.33	2.29	2.47	2.36

HAR TIME	EARLY	NORMAL	LATE	Mean
HAR METH				
DIRECT	2.87	2.67	2.75	2.76
DESICATE	1.85	2.09	2.54	2.16
SWATHE	2.28	2.12	2.11	2.17
Mean	2.33	2.29	2.47	2.36

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89/R/RA/10

GRAIN (AT 90% DRY MATTER) TONNES/HECTRE

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

FUNGCIDE	HAR TIME / HAR METH	EARLY	NORMAL	LATE
NONE	DIRECT	2.90	2.76	2.85
	DESICATE	2.17	2.36	2.85
	SWATHE	2.30	2.17	2.10
PROCHLOR	DIRECT	2.85	2.58	2.66
	DESICATE	1.53	1.81	2.22
	SWATHE	2.27	2.07	2.12

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

HAR METH	HAR TIME	FUNGCIDE* HAR METH
0.206	0.082	0.292

FUNGCIDE* HAR TIME	HAR METH HAR TIME	FUNGCIDE* HAR METH HAR TIME
0.116	0.237	0.335

Except when comparing means with the same level(s) of
HAR METH 0.142
FUNGCIDE.HAR METH 0.201

* within the same level of FUNGCIDE only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	12	0.413	17.5
BLOCK.WP.SP.SSP	36	0.284	12.0

GRAIN MEAN DM% 84.2

SUB PLOT AREA HARVESTED HAR METH SWATHE 0.00518
OTHER HAR METH 0.00322

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89/R/SU/1

SUNFLOWERS

VARIETIES AND SOWING DATES

Object: To study the effects of five sowing dates on the rates of vegetative and floral development, days to maturity, disease and yield of two varieties of sunflowers - Long Hoos I/II.

Sponsors: V.J. Church, R.A. Gutteridge, C.J. Rawlinson.

Design: 3 randomised blocks of 10 plots.

Whole plot dimensions: 3.5 x 10.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

SUNB 246	Sunbred 246
S 47	S47

2. **SOWDATE** Sowing date:

28 MAR	28 March, 1989
19 APR	19 April
2 MAY	2 May
10 MAY	10 May
18 MAY	18 May

NOTE: The two latest sowing dates established very poorly and yields were not taken from them.

Basal applications: Manures: (0:18:36) at 925 kg. 'Nitram' at 150 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l. Molluscicide: Metaldehyde at 0.60 kg.

Seed: Varieties sown at 120,000 seeds per hectare.

Cultivations, etc.:- PK applied: 28 Sept, 1988. Glyphosate applied: 22 Oct. Ploughed: 16 Dec. N applied, trifluralin applied and rotary cultivated, first sowing done, rolled: 28 Mar, 1989. Linuron applied: 30 Mar, 24 Apr, 4, 11 & 18 May (separately after each sowing). Metaldehyde applied: 31 Mar. Rotary cultivated, second sowing done: 19 Apr. Rotary cultivated remaining plots, third sowing done: 2 May. Third sowing rolled: 3 May. Fourth sowing done: 10 May. Fourth sowing rolled: 11 May. Last sowing done, rolled: 18 May. Irrigated 12 mm: 9 June and 25 mm: 15 June. Hand harvested: S47, first sowing: 9 & 15 Aug, S47, second sowing: 15 Aug, S47, third sowing: 22 Aug, SUNB 246, first and second sowing: 4 Sept, SUNB 246, third sowing: 13 Sept. Previous crops: W. wheat 1987, s. beans 1988.

NOTE: The plots were covered by a bird-proof net from April to maturity. Growth stages were monitored twice weekly, number of leaves were counted weekly before flowering, heights and head diameters were measured after flowering. Plants were counted before harvest. Botrytis was assessed on five occasions.

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89/R/SU/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOWDATE VARIETY	28 MAR	19 APR	2 MAY	Mean
SUNB 246	4.38	3.99	4.38	4.25
S 47	2.68	2.81	2.87	2.79
Mean	3.53	3.40	3.63	3.52

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

VARIETY	SOWDATE	VARIETY SOWDATE
0.121	0.148	0.209

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	10	0.256	7.3

GRAIN MEAN DM% 61.1

PLOT AREA HARVESTED 0.00150

https://doi.org/10.23637/ERADOC-1-40

89/R/SU/2

SUNFLOWERS

VARIETIES & SEED RATES

Object: To test the effects of four seed rates on plant growth, disease incidence and yield of two varieties - Long Hoos I/II.

Sponsors: C.J. Rawlinson, V.J. Church, R.A. Gutteridge.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 2.5 x 8.0.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

   S47
   VINCENT

2. **SEEDRATE** Seed rate (number of seeds sown per square metre):

   8
   12
   16
   20

Basal applications: Manures: (0:18:36) at 925 kg. 'Nitram' at 150 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 220 l.

Cultivations, etc.:- PK applied: 28 Sept, 1988. Glyphosate applied: 22 Oct. Ploughed: 16 Dec. N applied: 14 Apr, 1989. Trifluralin applied, rotary cultivated: 20 Apr. Seed sown: 21 Apr. Rolled, linuron applied: 24 Apr. Irrigated 12 mm: 5 June and 25 mm: 13 June. Desiccant applied to S47: 18 Aug. Desiccant applied to Vincent: 4 Sept. Hand harvested S47: 21 Aug. Hand harvested Vincent: 8 Sept. Previous crops: W. wheat 1987, s. beans 1988.

NOTE: The plots were covered by a bird-proof net from early May to maturity. Growth stages were monitored fortnightly. Head diameters and heights were measured. Botrytis was assessed in August. Plants were counted before harvest.

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89/R/SU/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE / VARIETY	8	12	16	20	Mean
S47	2.84	2.74	2.94	2.07	2.65
VINCENT	3.42	4.41	3.91	3.40	3.78
Mean	3.13	3.57	3.43	2.73	3.22

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

VARIETY	SEEDRATE	VARIETY SEEDRATE
0.200	0.282	0.399

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.489	15.2

GRAIN MEAN DM% 78.3

PLOT AREA HARVESTED 0.00160

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89/R/SU/3

SUNFLOWERS

METHODS OF APPLYING FUNGICIDES

Object: To study the effects of mist-blown application of fungicide on the control of Botrytis and on yield of sunflowers - Long Hoos I/II.

Sponsors: C.J. Rawlinson, V.J. Church, R.A. Gutteridge.

Design: 2 separated 3 x 3 Latin squares with complete directional neighbour balance.

Whole plot dimensions: 2.5 x 10.0.

Treatments:

SPRAYER	Sprayers:
NONE	None
HYDRAUL	Standard hydraulic sprayer
MIST BLO	Mist blower

NOTE: The sprayers applied prochloraz at 0.50 kg with vinclozolin at 0.50 kg in 220 l on 12, 18 and 19 July, 1989.

Basal applications: Manures: (0:18:36) at 925 kg. 'Nitram' at 150 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 220 l.

Seed: S47, sown at 120,000 seeds per hectare.

Cultivations, etc.:- PK applied: 28 Sept, 1988. Glyphosate applied: 22 Oct. Ploughed: 16 Dec. N applied: 14 Apr, 1989. Trifluralin applied, rotary cultivated: 20 Apr. Seed sown: 28 Apr. Rolled: 2 May. Linuron applied: 4 May. Irrigated 12 mm: 9 June. Hand harvested: 22 Aug. Previous crops: W. wheat 1987, s. beans 1988.

NOTE: The plots were covered by a bird-proof net from early May to maturity. Growth stages were monitored throughout the season. Botrytis was assessed in August. Plants were counted before harvest.

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89/R/SU/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SPRAYER	NONE	HYDRAUL	MIST BLO	Mean
	2.60	2.65	2.63	2.62

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

SPRAYER
0.087

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

Stratum	d.f.	s.e.	cv%
SQUARE.ROW	4	0.186	7.1
SQUARE.COL	4	0.087	3.3
SQUARE.ROW.COL	6	0.151	5.7

GRAIN MEAN DM% 77.9

PLOT AREA HARVESTED 0.00200

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89/R/SU/4

SUNFLOWERS

VARIETIES AND BOTRYTIS

Object: To compare two varieties of sunflower for their yield and resistance to Botrytis - Long Hoos I/II.

Sponsors: V.J. Church, B.D.L. Fitt, C.J. Rawlinson.

Design: 3 blocks each of 2 replicates of 2 plots.

Whole plot dimensions: 2.5 x 10.0.

Treatments:

VARIETY	Varieties:
CRZ	CRz, susceptible to Botrytis
H4 PZ	H4 Pz, resistant to Botrytis

Basal applications: Manures: (0:18:36) at 925 kg. 'Nitram' at 150 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l.

Seed: Varieties sown at 120,000 seeds per hectare.

Cultivations, etc.:- PK applied: 28 Sept, 1988. Glyphosate applied: 22 Oct. Ploughed: 16 Dec. N applied: 14 Apr, 1989. Trifluralin applied, rotary cultivated: 20 Apr. Seed sown: 21 Apr. Rolled, linuron applied: 24 Apr. Hand harvested CRZ: 13 Sept. Hand harvested H4 PZ: 21 Sept. Previous crops: W. wheat 1987, s. beans 1988.

NOTE: The plots were covered by a bird-proof net from late April to maturity. Growth stages were monitored fortnightly. Botrytis was assessed on four occasions towards maturity. Plants were counted before harvest.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VARIETY	CRZ	H4 PZ	Mean
	3.78	3.82	3.80

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

VARIETY
0.202

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	8	0.349	9.2

GRAIN MEAN DM% 59.8 PLOT AREA HARVESTED 0.00200

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89/R/LN/2

LINSEED

PESTS & DISEASES

Object: To study the effects of insecticidal and fungicidal treatments on the pests, pathogens and yields of linseed - Ex-allotments.

Sponsors: A.W. Ferguson, B.D.L. Fitt, R.A. Gutteridge.

Design: 6 randomised blocks of 4 plots.

Whole plot dimensions: 3.0 x 11.0.

Treatments: All combinations of:-

1. **INSCTCDE** Insecticide:

NONE	None
DELTA	Deltamethrin at 7.5 g in 200 l on 19 May, 1989 and in 260 l on 5 June and in 200 l on 19 June and 24 July

2. **FUNGCIDE** Fungicides:

NONE	None
IPR+PR	Iprodione at 0.50 kg in 200 l on 19 June, 1989. Prochloraz at 0.50 kg in 200 l on 4 July. Prochloraz (as seed dressing) at 0.40 g/kg seed

Basal applications: Manures: 'Nitram' at 250 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Bentazone at 0.96 kg with clopyralid at 0.038 kg and bromoxynil at 0.18 kg in 260 l. MCPA at 0.48 kg in 200 l. Desiccant: Glyphosate at 1.4 kg in 200 l.

Seed: Antares, sown at 90 kg.

Cultivations, etc.:- Ploughed: 7 Dec, 1988. Glyphosate weedkiller applied: 27 Mar, 1989. N applied: 30 Mar. Spring-tine cultivated: 18 Apr. Rotary harrowed twice, seed sown: 21 Apr. Bentazone with clopyralid and bromoxynil applied: 1 June. MCPA applied: 9 June. Desiccant applied: 18 Aug. Combine harvested: 4 Sept. Previous crops: Linseed 1987 and 1988.

NOTE: Insects were sampled and insect damage assessed, fortnightly, from emergence to maturity. Fungal disease incidence was assessed at emergence, at intervals throughout the season, and on the seed after harvest.

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89/R/LN/2

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE / INSCTCDE	NONE	IPR+PR	Mean
NONE	1.31	1.43	1.37
DELTA	1.32	1.42	1.37
Mean	1.32	1.43	1.37

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

INSCTCDE	FUNGCIDE	INSCTCDE FUNGCIDE
0.090	0.090	0.128

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.222	16.2

GRAIN MEAN DM% 93.2

PLOT AREA HARVESTED 0.00207

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89/R/P/13

POTATOES

FUNGICIDES WITH THE SEED

Object: To study the effects of fungicides applied with the seed at planting on the yield and tuber diseases of potatoes - Great Harpenden II.

Sponsors: R. Moffitt, G.A. Hide.

Design: 4 randomised blocks of 8 plots.

Whole plot dimensions: 1.5 x 6.10.

Treatments: All combinations of:-

1. **VARIETY** Varieties:

   DESIREE
   ESTIMA

2. **SOILFUNG** Fungicides, per t of seed, applied in the ridge at planting:

NONE	None
THIA+IMA	Thiabendazole at 30 g plus imazalil at 10 g
TOLC MET	Tolclofos methyl at 250 g

plus two extra treatments with fungicides, applied to the seed of Estima only, before planting:

SD FN ES

THIA+IMA	Thiabendazole at 30 g plus imazalil at 10 g per t of seed
TOLC MET	Tolclofos methyl at 125 g per t of seed

NOTES: (1) SOILFUNG applications were made with a powder applicator placing the fungicide alongside the potatoes at planting.
(2) SD FN ES treatments were applied to tubers by electrostatic sprayer in 0.44 l of water per tonne of seed on 10 Apr, 1989.
(3) Irrigation was applied on 14 June (12mm), 15 June (12mm), 22 June (25mm), 29 June (25mm).

Basal applications: Manures: (0:18:36) at 920 kg. FYM at 60 t. (13:13:20) at 1510 kg. Weedkiller: Linuron at 1.6 kg in 400 l. Fungicides: Mancozeb at 1.4 kg in 200 l on three occasions and at 1.0 kg in 200 l on a fourth occasion. Fentin hydroxide at 0.27 kg in 260 l.

Cultivations, etc.:- PK applied: 27 Sept, 1988. FYM applied: 23 Nov - 7 Dec. Ploughed: 12 Dec. NPK applied: 31 Mar, 1989. Rotary harrowed, potatoes planted: 3 May. Ridged: 24 May. Linuron applied: 28 May. Mancozeb applied: 3 July, 17 July, 28 July, 14 Aug. Fentin hydroxide applied: 30 Aug. Haulm mechanically destroyed: 18 Sept. Lifted: 13 Oct. Previous crops: W. barley 1987 and 1988.

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89/R/P/13

NOTE: Tubers were examined at harvest for blemishing diseases and some were stored to observe disease development.

TOTAL TUBERS TONNES/HECTARE

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

SOILFUNG / VARIETY	NONE	THIA+IMA	TOLC MET	Mean
DESIREE	56.0	56.9	51.8	54.9
ESTIMA	56.4	54.6	52.5	54.5
Mean	56.2	55.8	52.2	54.7

SD FN ES	THIA+IMA	TOLC MET	Mean
	44.3	46.0	45.2

GRAND MEAN 52.3

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

VARIETY	SOILFUNG	VARIETY SOILFUNG & SD FN ES
1.87	2.29	3.24

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	21	4.58	8.8

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

SOILFUNG / VARIETY	NONE	THIA+IMA	TOLC MET	Mean
DESIREE	97.0	96.6	96.8	96.8
ESTIMA	95.9	96.6	96.9	96.5
Mean	96.4	96.6	96.9	96.7

SD FN ES	THIA+IMA	TOLC MET	Mean
	96.9	96.8	96.9

GRAND MEAN 96.7

PLOT AREA HARVESTED 0.00091

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89/R/M/1

MIXED 1

COMPARISON OF COMBINES

Object: To evaluate the suitability of three combines for plot work in respect of purity of sample and accuracy when working on slopes - White Horse I.

Sponsors: R. Moffitt, M.N. Rogers.

Design: A systematic split-plot design of 48 whole plots arranged as shown below.

R	W	R	W	R	W	R	W	Top of slope
W	W	W	W	W	W	W	W	
W	W	W	W	W	W	W	W	
R	R	R	R	R	R	R	R	
W	W	W	W	W	W	W	W	
W*	W	W	W	W	W	W	W	Bottom of slope

* Combines started here (after harvesting a dummy wheat plot downhill), worked up the column of plots then down the next column etc.

R = rye W = wheat

NOTES: (1) Each whole plot was systematically divided to compare the three combine harvesters.
(2) There were 10 m headlands between contiguous rye and wheat plots. These were removed before combining the plots. There were 1 m paths between contiguous wheat plots.

Whole plot dimensions: 9.0 x 9.0.

Treatments:

Whole plots

1. **CROP** Crop:

   WHEAT W. wheat
   RYE W. rye

2. **DIRECTN** Combine direction in relation to slope:

   UP Up slope
   DOWN Down slope

3. **ORDER** Order of combining:

   BEGIN First plot in column
   STRAIGHT Central plots in column
   END Last plot in column

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89/R/M/1

Sub plots

4. **COMBINE** Combine type:

CLAAS	Claas 25
DEUTZ-F	Deutz-Fahr 660
W STEIGER	Wintersteiger

Basal applications: Manure: 'Nitram' at 360 kg. Weedkillers: Methabenzthiazuron at 1.6 kg in 200 l. Bromoxynil at 0.27 kg and ioxynil at 0.27 kg in 200 l.

Seed: W. wheat: Avalon, sown at 180 kg.
W. rye: Admiral, sown at 180 kg.

Cultivations, etc.:- Heavy spring-tine cultivated three times: 2 Nov, 1988. Rotary harrowed, seed sown: 3 Nov. Methabenzthiazuron applied: 16 Nov. N applied: 19 Apr, 1989. Bromoxynil and ioxynil applied: 26 Apr. Combine harvested: 9 Aug. Previous crops: W. oats 1987, potatoes 1988.

NOTE: The Claas combine was improperly adjusted and performed atypically. Yields from this machine have therefore been excluded from the analysis.

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89/R/M/1

GRAIN TONNES/HECTARE

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

COMBINE	DEUTZ-F	W STEIGER
	7.31	7.01

CROP	DIRECTN ORDER	UP BEGIN	UP STRAIGHT	UP END	DOWN BEGIN	DOWN STRAIGHT	DOWN END
WHEAT		7.58	7.57	7.56		7.75	7.64
RYE			5.79		5.91	5.52	

CROP	DIRECTN	ORDER	COMBINE	DEUTZ-F	W STEIGER
WHEAT	UP	BEGIN		7.82	7.34
		STRAIGHT		7.72	7.41
		END		7.78	7.34
	DOWN	STRAIGHT		8.05	7.44
		END		7.98	7.30
RYE	UP	STRAIGHT		5.89	5.69
	DOWN	BEGIN		5.92	5.90
		STRAIGHT		5.04	6.00

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

COMBINE	CROP DIRECTN ORDER	CROP DIRECTN ORDER COMBINE	
0.055	0.170	0.217	min.rep
	0.139	0.177	max-min
	0.098	0.125	max.rep
Except when comparing means with the same level(s) of			
CROP.DIRECTN.ORDER		0.191	min.rep
		0.156	max-min
		0.110	max.rep

max.rep **CROP** WHEAT and **ORDER** STRAIGHT
min.rep any of the remainder
max-min **CROP** WHEAT and **ORDER** STRAIGHT v any of the remainder

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

Stratum	d.f.	s.e.	cv%
WP	40	0.240	3.4
WP.SP	40	0.271	3.8

GRAIN MEAN DM% 89.3

SUBPLOT AREA HARVESTED DEUTZ-F 0.00207
SUBPLOT AREA HARVESTED W STEIGER 0.00144

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METEOROLOGICAL RECORDS 1989 – 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	64 (+15)	5.2 (+2.4)	3.5	6.5	7.8
FEB	92 (+31)	5.4 (+2.3)	3.2	5.9	7.0
MAR	104 (-5)	7.6 (+2.4)	5.0	6.9	7.1
APR	134 (-6)	6.3 (-1.5)	3.8	8.1	7.9
MAY	297 (+109)	12.9 (+1.9)	8.9	12.3	9.9
JUNE	254 (+57)	14.3 (+0.3)	9.0	14.4	12.1
JULY	282 (+101)	18.2 (+2.5)	12.7	16.8	14.1
AUG	273 (+106)	16.9 (+1.2)	11.8	16.4	15.0
SEPT	122 (-18)	15.2 (+1.6)	11.3	15.1	14.5
OCT	106 (+6)	11.5 (+1.3)	9.3	12.5	13.2
NOV	113 (+51)	5.6 (-0.3)	4.0	8.8	11.1
DEC	26 (-20)	5.1 (+1.0)	4.3	6.5	8.4
YEAR*	1868 (+427)	10.4 (+1.2)	7.2	10.9	10.7

MONTH	Ground frosts (2)	Total rainfall:mm 12.7cm (5 in) gauge	Rain days (3)	Drainage through 50.8cm (20 in) soil:mm	Wind km per hour (4)
JAN	19	39 (-24)	12	27	6.8
FEB	22	53 (+1)	16	34	11.1
MAR	14	61 (+9)	17	38	10.3
APR	15	98 (+51)	21	58	8.7
MAY	9	4 (-47)	4	1	6.3
JUNE	7	28 (-30)	10	0	6.0
JULY	1	47 (-5)	10	6	6.3
AUG	1	38 (-24)	8	0	7.2
SEPT	2	15 (-44)	10	0	6.9
OCT	7	63 (+4)	17	23	8.6
NOV	22	39 (-31)	14	31	6.1
DEC	14	157 (+88)	19	139	7.8
YEAR*	133	641 (-52)	158	357	7.7

30-year means are for the period 1951-80

(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 1989 – WOBURN

(Departure from 30-year means in brackets)

Mean temperature: C

MONTH	Total sunshine: hours		Air(1)		Dew point	In ground under grass 30 cm	100 cm	Ground frosts (2)	Total rainfall: mm 12.7 cm (5in)		Rain gauge	Rain days (3)	Wind km per hour (4)
JAN	66	(+16)	6.0	(+2.7)	3.6	6.1	7.9	14	33	(−20)		11	8.4
FEB	90	(+29)	5.7	(+2.3)	2.8	5.7	7.0	15	59	(+17)		16	12.5
MAR	96	(−11)	8.0	(+2.7)	4.5	7.0	7.1	7	55	(+5)		16	10.9
APR	125	(−7)	6.4	(−1.3)	3.8	7.8	7.9	16	99	(+54)		20	7.4
MAY	282	(+99)	12.9	(+2.0)	9.3	13.4	10.1	6	29	(−21)		5	6.1
JUNE	233	(+41)	14.3	(+0.3)	12.9	16.4	13.0	6	39	(−17)		11	5.5
JULY	259	(+83)	18.1	(+2.2)	16.2	19.1	15.6	0	40	(−10)		10	5.3
AUG	247	(+85)	16.9	(+1.3)	14.2	17.7	16.1	0	24	(−42)		7	7.4
SEPT	133	(−3)	15.2	(+1.6)	11.8	16.0	15.4	2	16	(−38)		9	6.2
OCT	89	(−11)	12.1	(+1.8)	9.6	12.6	13.8	3	51	(−2)		15	9.2
NOV	93	(+31)	5.7	(−0.6)	3.8	8.0	11.3	16	31	(−29)		8	5.0
DEC	16	(−29)	5.2	(+0.9)	3.8	5.7	8.3	12	146	(+88)		15	6.1
YEAR*	1729	(+321)	10.5	(+1.4)	8.0	11.3	11.1	97	622	(−15)		143	7.5

30-year means are for the period 1951-80

(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 (yd^2)	= 0·8361 m^2
1 acre (ac) (=4840 yd^2)	= 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:

$2\frac{1}{3} \times P = P_2O_5$	$\frac{3}{7} \times P_2O_5 = P$
$1\frac{1}{5} \times K = K_2O$	$\frac{5}{6} \times K_2O = K$
$1\frac{2}{5} \times Ca = CaO$	$\frac{7}{10} \times CaO = Ca$
$1\frac{2}{3} \times Mg = MgO$	$\frac{3}{5} \times MgO = Mg$

For accurate conversions:

To convert	*Multiply by*	*To convert*	*Multiply by*
P_2O_5 to P	0·4364	P to P_2O_5	2·2915
K_2O to K	0·8301	K to K_2O	1·2047
CaO to Ca	0·7146	Ca to CaO	1·3994
MgO to Mg	0·6031	Mg to MgO	1·6581

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