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ROTHAMSTED RESEARCH

Yields of the Field Experiments 1987



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AFRC, Institute of Arable Crops Research

Rothamsted Experimental Station

Harpenden

YIELDS of the FIELD EXPERIMENTS 1987

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

Price: Twelve pounds.

Published 1988

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CONVENTIONS 1987

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% P2O5, 10% K2O), 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 at Rothamsted and Woburn which are harvested by combine the 'blank-row' technique is used to distinguish the areas taken for yield from the discard areas. For example when seed is drilled in rows 7 in. (18 cm) apart appropriate coulters are prevented from sowing and 8 or 16 rows are left for yield according to the cutter-bar width of the combine to be used. If the row-spacing is other than 7 in. a similar arrangement is used but with a different number of rows.

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

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

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

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

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

width of cutter bar x length of rows.

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

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

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

Tables of means

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

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

Standard errors

NOTES: (1) This report gives standard errors of differences, not of means.
(2) Annotations (e.g. * min rep, max-min, max rep) to S.E.Ds are only explained the first time they occur in any experiment.

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87/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 144th 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, 74-86/R/BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00298
	1	0.00548
	4,5,6,and 7	0.00453
	8 and 9	0.00477
Potatoes:	3	0.00695

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
17NO+3FH	17	N2(A)	N2 1/2(P K (Na) Mg)	NO+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

\+ 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.

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87/R/BK/1

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 (triple superphosphate in 1974)
K: 90 kg K as sulphate of potash
Na: 55 kg Na as sulphate of soda
(Na): 16 kg Na as sulphate of soda until 1973
Mg: 30 kg Mg annually to Plot 14, 35 kg Mg every third year to other plots since 1974. All as kieserite since 1974, previously as sulphate of magnesia annually
D: Farmyard manure at 35 tonnes
C: Castor meal to supply 96 kg N
F: P K (Na) Mg H: Half rate

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

SECTION	Section	68	69	70, 71, 72, 73, 74, 75, and 76	77	78	79	80	81	82	83	84	85	86	87
SC0/W36B	0*	W	W	W	W	W	W	W	W	W	W	W	W	W	W
SC1/W21B	1	W	W	W	W	W	W	W	W	W	W	W	W	W	W
-	2	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F
POTATOES	3	W	W	F	W	W	F	W	W	W	W	W	W	F	P
SC4/W2B	4	W	P	BE	W	P	P	W	F	P	W	F	P	W	W
SCS/W1	5	W	F	W	W	F	W	W	W	W	W	W	F	P	W
SC6/W10B	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W
SC6/W10S	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W
SC7/W3B	7	P	BE	W	P	BE	W	F	P	W	F	P	W	W	W
SC8/W6B	8+	W	W	W	W	W	W	W	F	W	W	W	W	W	W
SC9/W29B	9	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

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

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87/R/BK/1

Standard applications:
W. wheat: Manures: Chalk at 2.9 t (sections 0, 4 and 5 only). Weedkillers (not applied to section 8): Methabenzthiazuron at 3.2 kg in 200 l. Clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicides (not applied to section 6): Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l with the growth regulator. Fenpropimorph at 0.75 kg with chlorothalonil at 1.0 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 (not applied to section 6): Chlormequat chloride at 1.3 kg.
Potatoes: Weedkiller: Linuron at 1.6 kg in 500 l. Fungicides: Mancozeb at 1.4 kg on four occasions in 200 l, applied with the insecticide on the second. Fentin hydroxide at 0.28 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg. Haulm desiccant: Diquat at 0.80 kg ion in 500 l.
Fallow: Weedkiller: Glyphosate at 1.4 kg in 200 l on two occasions.

Seed: W. wheat: Brimstone, dressed fonofos, and Squareheads Master, untreated, both sown at 190 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-
All Sections:
Kieserite, sulphate of soda and castor meal applied: 19 Sept, 1986. Sulphate of potash applied: 22 Sept. Superphosphate applied: 6 Oct. FYM applied, ploughed, disced, rotary harrowed: 8 Oct.
Cropped Sections:
W. wheat: Straw chopped (section 0): 5 Sept, 1986. Chalk applied (sections 0, 4 and 5): 26 Sept. Rotary harrowed, seed sown: 10 Oct. Methabenzthiazuron applied (except section 8): 17 Oct. N treatments applied: 14 Apr, 1987. Remaining weedkillers applied (except section 8): 15 Apr. Prochloraz, carbendazim and the growth regulator applied (except section 6): 6 May. Fenpropimorph and chlorothalonil applied (except section 6): 16 June. Propiconazole with carbendazim and maneb applied (except section 6): 10 July. Combine harvested: 8 Sept.
Potatoes: Heavy spring-tine cultivated: 17 Feb, 1987. N treatments applied: 14 Apr. Rotary harrowed, potatoes planted: 16 Apr. Rotary ridged: 27 Apr. Weedkiller applied: 30 Apr. Mancozeb applied: 24 June, 8 July, 28 July and 10 Aug. Pirimicarb applied: 8 July. Fentin hydroxide applied: 28 Aug. Haulm desiccant applied: 4 Sept. Lifted: 23 Sept.
Fallow: Heavy spring-tine cultivated: 17 Feb, 1987. Rotary harrowed: 27 Apr. Deep-tine cultivated: 28 Apr. Spring-tine cultivated: 29 Apr. Glyphosate applied: 22 June. Heavy spring-tine cultivated: 30 June. Glyphosate applied: 17 Aug.

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87/R/BK/1 W. WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	5/W1B	4/W2B	7/W3B	8/W5B	6/W10B	6/W10S	1/W21B	9W29B	0/W36B	Mean
01DN4PK	7.90	8.16	8.74	*	5.69	*	*	*	*	7.62
21DN2	8.92	9.32	8.44	1.88	7.32	*	8.54	8.97	7.42	7.60
22D	9.45	6.44	6.21	2.10	7.05	*	6.67	7.70	6.57	6.53
030	1.86	1.15	1.10	2.29	1.33	1.04	1.47	1.24	1.52	1.44
05F	2.04	1.28	0.93	2.61	1.47	1.02	1.41	1.31	1.28	1.48
06N1F	4.77	4.01	2.01	3.23	3.39	2.22	3.21	3.55	3.28	3.30
07N2F	6.95	5.51	3.99	2.02	4.37	3.04	5.32	4.89	4.62	4.52
08N3F	8.25	6.52	5.50	1.93	6.35	3.05	5.95	6.47	5.70	5.52
09N4F	8.77	7.09	6.53	2.34	5.79	2.87	6.18	6.71	6.01	5.81
10N2	6.46	6.49	3.77	1.55	3.45	2.19	3.18	2.90	2.90	3.66
11N2P	6.11	5.64	5.12	1.97	4.18	3.16	4.69	3.89	4.95	4.41
12N2PNA	6.88	5.58	4.82	2.23	4.89	3.21	4.39	4.88	4.98	4.65
13N2PK	6.86	5.39	4.12	1.65	4.40	2.65	5.24	5.54	4.54	4.49
14N2PKMG	6.82	5.73	3.83	1.95	4.67	2.89	5.22	5.40	5.04	4.62
15N5F	9.06	7.53	4.93	1.29	4.74	2.25	6.84	6.81	6.52	5.55
16N6F	9.32	7.78	6.02	2.13	4.37	2.09	7.54	6.96	4.92	5.68
17NO+3FN	8.16	6.74	4.96	2.03	6.15	3.43	6.91	6.39	6.39	5.68
18N1+3FN	9.03	8.06	5.60	2.37	6.26	2.37	7.10	6.37	7.20	6.04
19C	6.08	4.33	2.30	2.32	2.06	1.62	3.68	2.49	2.61	3.05
20NKMG	*	*	*	*	*	*	1.64	*	2.08	1.86

GRAIN MEAN DM% 78.0

STRAW TONNES/HECTARE

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

SECTION PLOT	5/W1B	1/W21B	Mean
01DN4PK	6.52	*	6.52
21DN2	7.30	6.21	6.76
22D	5.57	4.96	5.26
030	0.92	*	0.92
05F	0.91	0.97	0.94
06N1F	2.07	2.50	2.29
07N2F	3.02	2.80	2.91
08N3F	3.68	*	3.68
09N4F	4.44	4.00	4.22
10N2	2.75	3.33	3.04
11N2P	2.67	1.93	2.30
12N2PNA	3.15	1.94	2.55
13N2PK	3.21	2.81	3.01
14N2PKMG	3.67	2.71	3.19
15N5F	4.47	3.76	4.12
16N6F	5.09	4.59	4.84
17NO+3FN	4.47	3.57	4.02
18N1+3FN	5.06	4.42	4.74
19C	2.63	3.32	2.97
20NKMG	*	1.33	1.33

STRAW MEAN DM% 85.6

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87/R/BK/1 POTATOES

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

PLOT	TOTAL TUBERS TONNES/ HECTARE	% WARE 3.81 CM (1.5 INCH) RIDDLE
01DN4PK	38.3	94.7
21DN2	36.9	91.3
22D	35.9	96.1
030	9.5	94.4
05F	17.4	94.9
06N1F	25.3	89.8
07N2F	32.0	92.9
08N3F	42.5	94.6
09N4F	43.0	98.0
10N2	5.5	84.2
11N2P	6.6	66.7
12N2PNA	6.9	69.2
13N2PK	22.3	85.4
14N2PKMG	35.3	92.9
15N5F	40.9	94.6
16N6F	40.1	97.1
17N3FH	27.4	97.0
18N3FH	26.8	96.9
19C	17.4	94.3

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87/R/HB/2

HOOSFIELD

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 136th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-86/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	-	-

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)
K: 90 kg K as sulphate of potash
(Na): 16 kg Na as sulphate of soda until 1973

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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

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

Basal applications: Weedkillers: Glyphosate at 1.4 kg in 200 l. Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

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

Cultivations, etc.:- Glyphosate applied: 6 Nov, 1986. Silicate of soda, K and P applied: 28 Nov. FYM applied, ploughed: 2 Dec. Spring-tine cultivated, seed sown: 16 Mar, 1987. N applied: 24 Apr. Remaining weedkillers applied: 5 May. Fungicide applied: 29 May. Combine harvested: 21 Aug.

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87/R/HB/2

GRAIN TONNES/HECTARE

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

N / MANURE	0	48	96	144	Mean
---	0.95	1.56	2.27	1.98	1.69
-P-	2.38	3.92	3.39	3.35	3.26
--K	1.82	2.66	3.47	2.94	2.72
-PK	2.30	3.64	5.26	5.54	4.19
A--	1.46	1.56	1.48	2.36	1.72
AP-	2.79	3.79	2.43	1.81	2.71
A-K	1.48	1.97	2.38	2.85	2.17
APK	2.51	4.14	5.47	5.77	4.47
N----	1.82	2.59	2.12	2.95	2.37
NP---	2.65	4.28	3.32	2.34	3.15
N-K--	1.60	1.70	2.21	2.32	1.96
NPK--	2.91	4.39	5.10	5.74	4.54
N--S-	1.80	3.45	3.23	2.99	2.87
NP-S-	2.88	3.91	4.43	4.47	3.92
N-KS-	1.90	3.04	4.42	5.23	3.65
NPKS-	2.47	4.56	5.48	5.68	4.55
N---S	1.83	2.13	2.46	3.46	2.47
NP--S	3.43	4.21	5.34	4.29	4.32
N-K-S	1.74	2.73	3.11	2.49	2.52
NPK-S	2.67	3.83	5.01	6.23	4.44
N--SS	1.73	2.49	3.06	3.37	2.66
NP-SS	3.39	4.75	4.61	4.70	4.36
N-KSS	1.57	2.76	3.27	3.39	2.75
NPKSS	2.11	4.52	6.30	5.44	4.59
C(--)	1.83	3.39	3.70	4.18	3.28
C(P-)	2.64	3.98	4.08	4.46	3.79
C(-K)	1.54	4.02	3.92	5.00	3.62
C(PK)	1.97	3.90	5.01	5.31	4.05
D	5.89	6.14	5.87	6.18	6.02
(D)	1.98	4.34	3.96	3.98	3.57
(A)	2.90	3.59	3.83	4.01	3.58
-	2.21	2.52	2.81	1.96	2.37
Mean	2.29	3.45	3.84	3.96	3.38

GRAIN MEAN DM% 84.8

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87/R/HB/2

STRAW TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.35	0.72	0.91	0.91	0.72
-P-	0.91	1.85	1.85	2.59	1.80
--K	0.71	1.23	2.15	2.02	1.53
-PK	1.09	2.16	3.10	3.68	2.51
A--	0.54	0.73	0.72	1.10	0.77
AP-	1.10	2.01	1.66	1.29	1.52
A-K	0.72	1.42	1.24	1.41	1.20
APK	1.09	1.97	3.26	3.97	2.57
D	3.54	4.35	4.68	4.69	4.32
(D)	0.96	2.40	2.20	2.64	2.05
(A)	1.19	1.92	1.94	2.17	1.81
-	0.72	1.43	1.69	2.27	1.53
Mean	1.08	1.85	2.12	2.39	1.86

STRAW MEAN DM% 89.2

PLOT AREA HARVESTED 0.00161

EXTRA PLOTS

GRAIN TONNES/HECTARE

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

MANURE	551AN2PK	561--PK	571NN2--	581NN2--	Mean
MGNESIUM					
0	4.34	1.04	3.76	2.30	2.86
35	4.97	1.39	3.69	2.35	3.10
Mean	4.65	1.22	3.72	2.33	2.98

GRAIN MEAN DM% 85.3

PLOT AREA HARVESTED 0.00344

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87/R/WF/3

WHEAT AND FALLOW

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

The 132nd year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-86/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 190 kg.

Cultivations, etc.:-
Wheat plot: Rotary harrowed, seed sown: 11 Oct, 1986. Combine harvested: 1 Sept, 1987.
Fallow plot: Ploughed: 10 Oct, 1986. Rotary harrowed: 27 Apr, 1987. Deep-tine cultivated: 28 Apr. Heavy spring-tine cultivated: 22 June, 30 June. Cultivated by rotary grubber: 19 Aug.

GRAIN AND STRAW TONNES/HECTARE

	GRAIN	STRAW
YIELD	1.06	0.76
MEAN DM%	82.8	87.5
PLOT AREA HARVESTED	0.06009	

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87/R/EX/4

EXHAUSTION LAND

Object: To study the residual effects of manures applied 1856-1901, and of additional phosphate applied since 1986, on the yield of continuous s. barley - Hoosfield.

The 132nd year, s. barley.

For previous years see 'Details' 1967, 1973 and 74-86/R/EX/4.

Treatments: All combinations of:-

Whole plots

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

0	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:

0	None
P1	44 kg P as superphosphate
P2	87 kg P as superphosphate
P3	131 kg P as superphosphate

plus all combinations of:-

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

0	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. N87 — 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 in the combination OLD RES, P were given N at 144 kg as 'Nitram' and K at 83 kg as muriate of potash.

Basal applications: Weedkillers: Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

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87/R/EX/4

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

Cultivations, etc.:- P and K applied: 10 Oct, 1986. Ploughed: 6 Nov. Spring-tine cultivated, seed sown: 19 Mar, 1987. N applied: 23 Apr. Weedkillers applied: 28 May. Fungicide applied: 24 June. Combine harvested: 21 Aug.

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	2.80	4.31	4.52	4.57	4.05
D	3.79	4.72	4.82	5.05	4.60
N	2.57	4.17	4.70	4.33	3.94
P	4.07	4.43	4.69	4.37	4.39
NPKNAMG	3.75	4.47	4.77	4.98	4.49
Mean	3.39	4.42	4.70	4.66	4.29

GRAIN MEAN DM% 87.4

STRAW TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
OLD RES					
0	1.17	2.63	2.88	2.48	2.29
D	2.35	3.15	3.24	3.39	3.03
N	1.13	2.32	3.05	2.74	2.31
P	2.26	3.14	2.90	2.88	2.79
NPKNAMG	2.19	2.87	2.94	3.00	2.75
Mean	1.82	2.82	3.00	2.90	2.63

STRAW MEAN DM% 76.5

PLOT AREA HARVESTED 0.00728

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87/R/EX/4

NITROGEN PLOTS

GRAIN TONNES/HECTARE

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

N87 / OLD RES	0	48	96	144	Mean
0	0.66	1.71	1.32	1.58	1.32
D	2.17	4.54	3.28	3.45	3.36
N*	1.11	1.77	1.25	1.51	1.41
PK	1.36	2.60	2.03	2.45	2.11
N*PK	1.47	3.82	2.38	2.35	2.51
Mean	1.35	2.89	2.05	2.27	2.14

GRAIN MEAN DM% 86.6

STRAW TONNES/HECTARE

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

N87 / OLD RES	0	48	96	144	Mean
0	0.41	0.75	0.77	0.88	0.70
D	1.06	1.96	1.64	2.06	1.68
N*	0.63	0.89	0.64	0.94	0.77
PK	0.95	1.67	1.67	1.99	1.57
N*PK	1.09	1.59	1.22	1.45	1.34
Mean	0.83	1.37	1.19	1.46	1.21

STRAW MEAN DM% 72.9

PLOT AREA HARVESTED 0.00728

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87/R/PG/5

PARK GRASS

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

The 132nd year, hay.

For previous years see 'Details' 1967 and 1973 and 74-86/R/PG/5.

Treatments: Combinations of:-

Whole plots

1. MANURE Fertilizers and organic manures:

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

N1, N2, N3:	48, 96, 144 kg N as sulphate of ammonia
N1*, N2*:	48, 96 kg N as nitrate of soda (30 kg N to Plot 20, only in years with no farmyard manure)
P:	35 kg P (15 kg P to Plot 20, only in years with no farmyard manure) as single superphosphate (triple superphosphate in 1974)
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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87/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
D0	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.:- Superphosphate applied: 27 Nov, 1986. Remaining mineral fertilizers applied: 10 Dec. Fish meal applied: 11 Dec. Chain harrowed: 17 Apr, 1987. N applied: 22 Apr. Cut: 29 June, 3 Dec.

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87/R/PG/5

1ST CUT (29/6/87) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	2.99	2.80	1.66	0.48	1.98
0(D)	2.45	3.07	1.86	1.36	2.18
0/PLOT3	2.26	3.41	1.50	1.39	2.14
P	2.91	3.18	2.45	2.38	2.73
N2P	3.79	3.52	3.68	2.72	3.43
N1MIN	5.48	4.98			5.23
MIN	5.13	4.94	4.34	3.59	4.50
PNAMG	3.10	3.29	3.07	2.99	3.11
N2MIN	5.24	6.00	5.45	4.78	5.37
N2PNAMG	3.94	3.69	3.47	2.27	3.34
N3MIN	6.19	5.82	5.74	5.20	5.73
N3MINSI	6.67	6.20	5.63	5.17	5.92
0/PLOT12	2.51	1.96	1.53	1.71	1.93
D/F	4.52	4.87	4.61	4.29	4.57
N2*MIN	6.12	6.08	5.76	5.10	5.76
MIN(N2*)	4.52	5.02	2.69	3.01	3.81
N1*MIN	4.81	5.79	4.88	4.03	4.88
N1*	2.91	2.96	2.81	2.71	2.85
N2KNAMG0			0.86	0.60	0.73
N2KNAMG2	3.21				3.21
N2KNAMG1	2.98	2.60			2.79
D0	4.43				4.43
D2	4.96				4.96
D1	4.39				4.39
D/N*PK0	5.40				5.40
D/N*PK2	5.68				5.68
D/N*PK1	5.00				5.00

1ST CUT MEAN DM% 22.7

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87/R/PG/5

2ND CUT (3/12/87) DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	3.04	2.49	2.36	1.02	2.23
0(D)	2.93	2.58	2.51	2.53	2.64
0/PLOT3	2.67	2.78	3.45	4.24	3.28
P	2.66	2.81	3.29	5.13	3.47
N2P	2.15	1.61	2.16	1.28	1.80
N1MIN	2.60	2.69			2.65
MIN	3.38	3.04	3.20	3.45	3.27
PNAMG	2.77	3.36	4.98	4.34	3.86
N2MIN	2.54	3.08	2.40	1.24	2.32
N2PNAMG	2.07	2.13	2.91	0.88	2.00
N3MIN	3.54	3.29	3.35	2.80	3.24
N3MINSI	4.47	3.89	3.05	3.25	3.67
0/PLOT12	3.08	2.76	2.03	2.84	2.68
D/F	6.09	6.77	4.43	3.51	5.20
N2*MIN	1.82	3.44	2.40	3.68	2.84
MIN(N2*)	3.31	3.36	2.88	3.00	3.14
N1*MIN	3.42	2.84	2.81	2.42	2.87
N1*	2.71	3.21	4.21	2.86	3.25
N2KNAMG0			1.89	1.21	1.55
N2KNAMG2	3.27				3.27
N2KNAMG1	2.99	2.71			2.85
D0	4.41				4.41
D2	4.02				4.02
D1	3.70				3.70
D/N*PK0	4.24				4.24
D/N*PK2	3.95				3.95
D/N*PK1	3.89				3.89

2ND CUT MEAN DM% 33.4

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87/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

LIME / MANURE	A	B	C	D	MEAN
N1	6.03	5.28	4.03	1.50	4.21
0(D)	5.38	5.64	4.37	3.89	4.82
0/PLOT3	4.93	6.19	4.95	5.62	5.42
P	5.56	5.99	5.74	7.51	6.20
N2P	5.95	5.14	5.84	4.00	5.23
N1MIN	8.08	7.67			7.88
MIN	8.51	7.98	7.54	7.05	7.77
PNAMG	5.87	6.65	8.05	7.34	6.98
N2MIN	7.77	9.08	7.86	6.02	7.68
N2PNAMG	6.02	5.82	6.38	3.15	5.34
N3MIN	9.73	9.10	9.08	7.99	8.98
N3MINSI	11.14	10.09	8.68	8.42	9.59
0/PLOT12	5.59	4.72	3.56	4.54	4.60
D/F	10.62	11.64	9.04	7.80	9.77
N2*MIN	7.94	9.52	8.16	8.78	8.60
MIN(N2*)	7.83	8.39	5.57	6.01	6.95
N1*MIN	8.23	8.63	7.69	6.45	7.75
N1*	5.62	6.17	7.01	5.57	6.09
N2KNAMG0			2.75	1.81	2.28
N2KNAMG2	6.48				6.48
N2KNAMG1	5.97	5.31			5.64
D0	8.83				8.83
D2	8.98				8.98
D1	8.09				8.09
D/N*PK0	9.63				9.63
D/N*PK2	9.63				9.63
D/N*PK1	8.89				8.89

TOTAL OF 2 CUTS MEAN DM% 28.1

PLOT AREA HARVESTED 0.00002

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87/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 18th year of revised scheme, ley.

For previous years see 'Details' 1967 and 1973, and 74-86/R/AG/6.

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

Basal applications: Manures: 'Nitram' at 130 kg and later at 200 kg.

Cultivations, etc.:- First N applied: 6 Apr, 1987. Cut: 4 June. Second N applied: 12 June.

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87/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 fourth year of grass/clover. The 13th year of grass on the rest of the experiment.

For previous years see 'Details' 1967 and 1973 and 74-86/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 (triple superphosphate 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 1987 (kg N per cut) as 'Nitram' and residues of forms of N previously each supplying 96 kg N per annum:
75	75, previously nitrate of soda, section 3
100	100, previously sulphate of ammonia, section 4
125	125, previously sulphate of ammonia + castor meal, section 5
150	150, previously castor meal, section 6

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

plus one plot MANURE KMG 100

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

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

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87/R/BN/7

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

Cultivations, etc.:-
All sections: P applied: 27 Nov, 1986. K applied: 28 Nov. Cut: 2 June, 1987, 26 Aug, 2 Dec.
Grass (Sections 3, 4, 5 and 6) only: N applied: 11 June, 28 Aug.

GRASS

1ST CUT (2/6/87) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	4.40	5.49	5.89	5.83	5.40
DPK	5.47	6.18	6.46	6.27	6.09
PKMG	3.59	4.40	5.84	6.37	5.05
P	2.33	2.34	2.25	1.79	2.18
PK	4.11	5.52	5.53	5.34	5.13
PMG	3.06	2.33	2.21	1.95	2.39
0	2.49	2.12	1.88	1.88	2.09
Mean	3.64	4.06	4.29	4.21	4.05

MANURE KMG 100 4.98

Grand mean 4.08

1ST CUT MEAN DM% 20.2

2ND CUT (26/8/87) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	4.44	5.46	5.57	5.73	5.30
DPK	5.14	5.50	6.17	5.44	5.56
PKMG	4.15	4.89	4.87	5.03	4.73
P	2.96	1.55	0.94	0.95	1.60
PK	4.26	4.69	5.13	4.98	4.76
PMG	2.98	1.94	1.47	1.12	1.88
0	2.22	1.69	1.07	1.20	1.55
Mean	3.74	3.67	3.60	3.49	3.63

MANURE KMG 100 4.96

Grand mean 3.67

2ND CUT MEAN DM% 26.9

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87/R/BN/7

GRASS

3RD CUT (2/12/87) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	1.60	2.08	2.40	2.16	2.06
DPK	1.80	2.50	2.59	2.44	2.33
PKMG	1.38	1.50	1.85	1.78	1.63
P	0.94	0.73	0.33	0.64	0.66
PK	1.49	1.90	2.24	2.01	1.91
PMG	0.70	0.48	0.34	0.48	0.50
0	0.28	0.27	0.30	0.31	0.29
Mean	1.17	1.35	1.43	1.40	1.34

MANURE KMG 100 1.88

Grand mean 1.36

3RD CUT MEAN DM% 22.9

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	10.45	13.03	13.86	13.72	12.76
DPK	12.42	14.18	15.22	14.14	13.99
PKMG	9.13	10.79	12.56	13.18	11.41
P	6.23	4.62	3.51	3.38	4.44
PK	9.86	12.11	12.90	12.33	11.80
PMG	6.74	4.76	4.02	3.56	4.77
0	4.99	4.09	3.25	3.40	3.93
Mean	8.54	9.08	9.33	9.10	9.01

MANURE KMG 100 11.82

Grand mean 9.11

TOTAL OF 3 CUTS MEAN DM% 23.3

PLOT AREA HARVESTED 0.00568

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87/R/BN/7

GRASS/CLOVER

1ST CUT (2/6/87) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	3.16	3.12	2.48	1.54	1.90	2.05	1.56	2.26

1ST CUT MEAN DM% 19.8

2ND CUT (26/8/87) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	2.51	2.80	2.27	2.18	2.48	2.91	1.85	2.43

2ND CUT MEAN DM% 18.2

3RD CUT (2/12/87) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	0.64	0.54	0.39	0.19	0.23	0.17	0.20	0.34

3RD CUT MEAN DM% 24.5

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	6.31	6.46	5.13	3.92	4.61	5.13	3.61	5.02

TOTAL OF 3 CUTS MEAN DM% 20.8

PLOT AREA HARVESTED 0.00568

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87/R/GC/8

GARDEN CLOVER

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

Sponsor: J. McEwen.

The 134th year, red clover.

For previous years see 'Details' 1967 and 1973, and 74-86/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.02 x 1.42.

Treatments:

FUNG RES	Residual effects of fungicide to control Sclerotinia trifoliorum:
NONE	None
BENOMYL	Benomyl sprays during winter, last applied December 1985

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

NOTE: Additional K was applied to replace that removed by the crop in 1986. FUNG RES NONE required 360 and 263 kg K20 to the first and second blocks respectively, FUNG RES BENOMYL 267 and 258 kg K20. This was applied as muriate of potash, one third in spring 1987 and one third after the first and second cuts.

Seed: Hungaropoly, sown at 34 kg.

Cultivations, etc.:- Hand dug, root stumps carted: 25 Sept, 1986. Chalk, PK and Mg applied: 3 Oct. Sown, K and aldicarb applied: 15 Apr, 1987. Cut and K applied: 30 July, 1 Sept. Cut: 25 Sept.

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87/R/GC/8

1ST CUT (30/7/87) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	2.87	3.28	3.08

1ST CUT MEAN DM% 12.6

2ND CUT (1/9/87) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	2.40	2.21	2.30

2ND CUT MEAN DM% 13.0

3RD CUT (25/9/87) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	0.91	0.73	0.82

3RD CUT MEAN DM% 12.0

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	6.18	6.22	6.20

TOTAL OF 3 CUTS MEAN DM% 12.5

PLOT AREA HARVESTED 0.00010

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87/R/RN/1 and 87/R/RN/2

LEY ARABLE

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

Sponsor: A.E. Johnston.

The 39th year, old grass, leys, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-86/R/RN/1 and 2.

The experiment is duplicated on:-

HIGHFIELD — A site with much organic matter initially (ploughed out from permanent grass) (87/R/RN/1)

FOSTERS — A site with little organic matter initially (87/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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87/R/RN/1 and 87/R/RN/2

Additional treatments to 3rd test crop w. wheat:-

Sub plots

FYMRES68 Farmyard manure residues, last applied 1968:

NONE None
FYM 30 tonnes on each occasion

Sub plots

N Nitrogen fertilizer in 1987 (kg N) as 'Nitram':

0
50
100
150

Standard applications:
3rd Treatment crops:
All crops: Manures: Chalk at 5.8 t (Highfield only).
Lucerne: Manures: (0:18:36) at 630 kg.
All-grass ley: Manures: (0:18:36) at 420 kg. (25:0:16) at 300 kg in spring and after the first cut.
Clover-grass ley: Manures: (0:18:36) at 420 kg.
S. oats: Manures: (20:10:10) at 350 kg. Weedkillers: Clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 500 l.
3rd Test crop:
W. wheat: Manures: (0:24:24), combine drilled at 210 kg. Weedkillers: Isoproturon at 2.5 kg, clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l.
Reseeded grass and old grass: Manures: Chalk at 5.8 t (to plots in 3rd treatment crop blocks on Highfield and to plots in 3rd test crop blocks on Fosters). (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: S. oats: Rollo, sown at 190 kg.
W. wheat: Avalon, sown at 180 kg.

Cultivations, etc.:-
3rd Treatment crops:
All Crops: Chalk applied (Highfield only): 28 Nov, 1986.
Lucerne: PK applied: 24 Feb, 1987. Cut: 1 June, 11 Aug.
All-grass ley and clover-grass ley: PK applied: 24 Feb, 1987. NK applied to all-grass ley: 31 Mar, 3 June. Cut: 1 June, 11 Aug.
S. oats: Ploughed: 28 Nov, 1986. Spring-tine cultivated: 19 Mar, 1987. NPK applied, spring-tine cultivated, seed sown: 21 Mar. Weedkillers applied: 8 May. Combine harvested: 9 Sept.
3rd Test crop wheat: Ploughed: 30 Sept, 1986 (Fosters), 1 Oct (Highfield). PK applied: 1 Oct. Rotary harrowed: 3 Oct. Seed sown: 4 Oct. N applied: 14 Apr, 1987. Weedkillers applied: 15 Apr. Combine harvested: 1 Sept.
Reseeded grass and old grass: Chalk applied: 28 Nov, 1986. PK applied: 24 Feb, 1987. NK applied to all-grass half plots: 31 Mar, 3 June, 29 Aug. Cut: 1 June, 27 Aug, 2 Dec.

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87/R/RN/1 AND 87/R/RN/2

DRY MATTER: TONNES/HECTARE

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

	HIGHFIELD	FOSTERS
CLOVER-GRASS LEY		
TOTAL OF 2 CUTS	7.10	7.37
MEAN DM%	19.0	17.8
ALL-GRASS LEY		
TOTAL OF 2 CUTS	7.69	7.74
MEAN DM%	25.5	23.4
LUCERNE		
TOTAL OF 2 CUTS	8.58	9.00
MEAN DM%	19.3	18.4

OLD GRASS	HIGHFIELD	
TOTAL OF 3 CUTS	C	N
39TH EXPTL YEAR		
BLOCKS 1 & 4	6.46	10.07
BLOCK 2	6.73	10.67
MEAN DM%	20.5	21.4

RESEEDED GRASS

TOTAL OF 3 CUTS

		HIGHFIELD			FOSTERS	
	BLOCKS	C	N	BLOCKS	C	N
39TH EXPTL YEAR	1 & 4	7.12	10.09	1 & 3	7.42	10.85
39TH EXPTL YEAR (SEEDED 1949 RESEEDED 1973)	2 & 3	6.46	11.76	2 & 4	7.93	10.45
MEAN DM%		19.5	20.9		19.0	23.0

OATS:

	HIGHFIELD	FOSTERS
GRAIN TONNES/HECTARE	7.51	7.35
MEAN DM%	84.6	83.5

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87/R/RN/1 HIGHFIELD W.WHEAT 3RD TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES68	NONE	FYM	Mean
ROTATION			
LUCERNE	5.34	5.48	5.41
CLOGRA	5.96	5.97	5.97
GRASS	5.79	5.50	5.64
ARABLE	5.10	5.17	5.14
Mean	5.55	5.53	5.54

N	0	50	100	150	Mean
ROTATION					
LUCERNE	3.70	5.26	6.42	6.28	5.41
CLOGRA	4.02	6.07	6.44	7.34	5.97
GRASS	3.50	5.55	6.35	7.17	5.64
ARABLE	3.26	4.83	5.74	6.71	5.14
Mean	3.62	5.43	6.24	6.88	5.54

N	0	50	100	150	Mean
FYMRES68					
NONE	3.78	5.53	6.21	6.68	5.55
FYM	3.46	5.33	6.27	7.07	5.53
Mean	3.62	5.43	6.24	6.88	5.54

	N	0	50	100	150
ROTATION	FYMRES68				
LUCERNE	NONE	3.78	5.76	5.77	6.07
	FYM	3.62	4.76	7.07	6.48
CLOGRA	NONE	4.21	5.69	6.75	7.20
	FYM	3.83	6.44	6.13	7.48
GRASS	NONE	3.98	5.63	6.94	6.60
	FYM	3.03	5.47	5.75	7.75
ARABLE	NONE	3.17	5.03	5.37	6.84
	FYM	3.36	4.64	6.12	6.57

GRAIN MEAN DM% 82.7

PLOT AREA HARVESTED 0.00663

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87/R/RN/2 FOSTERS W.WHEAT 3RD TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES68 / ROTATION	NONE	FYM	Mean
LUCERNE	5.35	5.61	5.48
CLOGRA	5.29	5.24	5.27
GRASS	5.34	5.53	5.43
ARABLE	4.95	4.73	4.84
Mean	5.23	5.28	5.25

N / ROTATION	0	50	100	150	Mean
LUCERNE	3.42	5.31	5.96	7.23	5.48
CLOGRA	3.56	5.24	5.87	6.41	5.27
GRASS	3.69	5.19	6.13	6.72	5.43
ARABLE	2.86	4.73	5.63	6.14	4.84
Mean	3.38	5.12	5.90	6.62	5.25

N / FYMRES68	0	50	100	150	Mean
NONE	3.42	5.10	5.85	6.56	5.23
FYM	3.34	5.13	5.94	6.69	5.28
Mean	3.38	5.12	5.90	6.62	5.25

N	0	50	100	150
ROTATION / FYMRES68				
LUCERNE NONE	3.11	5.32	5.87	7.12
LUCERNE FYM	3.73	5.29	6.06	7.35
CLOGRA NONE	3.74	5.10	5.97	6.36
CLOGRA FYM	3.37	5.38	5.77	6.45
GRASS NONE	3.74	5.26	5.77	6.58
GRASS FYM	3.64	5.12	6.49	6.85
ARABLE NONE	3.09	4.73	5.80	6.19
ARABLE FYM	2.64	4.72	5.46	6.09

GRAIN MEAN DM% 81.4

PLOT AREA HARVESTED 0.00663

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87/W/RN/3

LEY/ARABLE

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

Sponsor: A.E. Johnston.

The 50th year, leys, w. beans, w. wheat, s. barley.

For previous years see 'Details' 1967 & 1973 and 74-86/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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87/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. FYMRES66 — Farmyard manure residues, last applied 1966:

   NONE — None
   FYM — 38 tonnes on each occasion

1/8 plots

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

   0
   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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87/W/RN/3

1/2 plots

2. FYMRES65 Farmyard manure residues, last applied 1965:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

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

0
60
120
180

Treatments to leys:

FYM RES Farmyard manure residues:

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

Corrective K dressings (kg K20) 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	339	276
LC	126	75
AF	540	552
AB	452	527
Ex-alternating rotations		
LN 8 ploughed for w. wheat	163	213
LN 8 not ploughed	301	351
LC 8 ploughed for w. wheat	100	213
LC 8 not ploughed	0	100

Standard applications:-

Grass ley and clover/grass ley, 1st year: Manures: (0:18:36) at 410 kg. N at 77 kg to grass ley and 50 kg to clover/grass as 'Nitram'. (25:0:16) at 300 kg to grass ley, K20 at 48 kg as muriate of potash to clover/grass ley. Weedkillers: Glyphosate at 1.4 kg in 200 l. Paraquat at 0.40 kg ion in 200 l.

Grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Manures: Magnesian limestone at 5.0 t to 5th year only. (0:18:36) at 410 kg. (25:0:16) at 300 kg in spring and after 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 year only. (0:18:36) at 410 kg. K20 at 48 kg as muriate of potash in spring and after each cut except the last.

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S. barley, 1st and 2nd treatment crops: Manures: (20:10:10) at 400 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 2.5 kg in 200 l applied with the tridemorph. Fungicides: Tridemorph at 0.52 kg. Triadimenol at 0.062 kg with tridemorph at 0.37 kg in 200 l.

W. beans, 3rd treatment crop: Manures: (0:20:20) at 200 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trietazine at 0.72 kg with simazine at 0.10 kg in 240 l.

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

W. wheat, 1st test crop: Manures: (0:24:24) at 260 kg. Weedkillers: Glyphosate at 1.5 kg in 200 l. Clopyralid at 0.07 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 240 l. Fungicides: Fenpropimorph at 0.75 kg with chlorothalonil at 0.75 kg in 200 l. Propiconazole at 0.12 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 200 l. Insecticide: Carbofuran at 7.5 kg.

S. barley, 2nd test crop: Manures: Magnesian limestone at 5.0 t, (0:20:20) at 310 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 2.5 kg in 200 l applied with the tridemorph. Fungicides: Tridemorph at 0.52 kg. Triadimenol at 0.062 kg with tridemorph at 0.38 kg in 200 l. Insecticide: Carbofuran at 7.5 kg.

Seed: Grass ley: Climax timothy at 17 kg and meadow fescue at 17 kg, mixture sown at 34 kg.
Clover/grass ley: Climax timothy at 16 kg, meadow fescue at 14 kg and Huia white clover at 4.0 kg, mixture sown at 34 kg.
S. barley: Klaxon, sown at 160 kg.
W. beans: Bourdon, sown at 250 kg.
W. wheat: Mercia, sown at 190 kg.

Cultivations, etc.:- Treatment crops:

Grass ley and clover/grass ley, 1st year: Glyphosate applied: 19 Sept, 1986. Ploughed: 4 Dec. Spring-tine cultivated: 6 May, 1987 and 12 May. N and PK applied: 29 May. Paraquat applied, spike harrowed with crumbler attached, seed sown and rolled: 1 June. NK applied to grass ley, K applied to clover/grass ley: 17 Aug. Cut: 12 Aug and 15 Dec.

Grass ley and clover/grass ley, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th years: Magnesian limestone applied to 5th year only: 28 Nov, 1986. Corrective K applied to 4th year only: 26 Jan, 1987. PK applied: 10 Mar. NK applied to grass ley and K applied to clover/grass ley: 2 Apr, 26 June and 17 Aug. Cut: 16 June, 12 Aug and 15 Dec.

S. barley, 1st and 2nd treatment crops: Glyphosate applied: 19 Sept, 1986. Ploughed: 1st treatment crop: 4 Dec, 2nd treatment crop: 1 Dec. Spike harrowed with crumbler attached, NPK applied, seed sown: 17 Mar, 1987. Clopyralid, bromoxynil, mecoprop and tridemorph applied: 29 May. Triadimenol and tridemorph applied: 4 July. Combine harvested: 21 Aug.

W. beans, 3rd treatment crop: Glyphosate applied: 19 Sept, 1986. PK applied, seed sown, ploughed, harrowed: 12 Nov. Trietazine and simazine applied: 13 Nov. Combine harvested: 26 Sept, 1987.

Fallow, 1st and 2nd treatment years: Glyphosate applied to 1st year only: 19 Sept, 1986. Ploughed; 1st year: 4 Dec, 2nd year: 1 Dec. Spring-tine cultivated: 6 and 12 May, 1987. Cultivated with thistlebar: 29 June.

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87/W/RN/3

Test crops:
W. wheat, 1st test crop: Glyphosate applied: 19 Sept, 1986. Ploughed: 30 Sept. Rolled, PK applied: 1 Oct. Carbofuran applied, rotary cultivated with crumbler attached, seed sown, harrowed: 2 Oct. Corrective K applied: 26 Jan, 1987. N applied, clopyralid, bromoxynil and mecoprop applied: 14 Apr. Fenpropimorph and chlorothalonil applied: 15 June. Propiconazole, carbendazim and maneb applied: 29 June. Combine harvested: 7 Sept.
S. barley, 2nd test crop: Glyphosate applied: 19 Sept, 1986. Magnesian limestone applied: 28 Nov. Ploughed: 1 Dec. Spike harrowed with crumbler attached, PK applied, carbofuran applied, harrowed, seed sown: 17 Mar, 1987. N applied: 8 Apr. Clopyralid, bromoxynil, mecoprop and tridemorph applied: 29 May. Triadimenol and tridemorph applied: 4 July. Combine harvested: 21 Aug.

LEYS

1ST CUTTING OCCASION (16/6/87) DRY MATTER TONNES/HECTARE

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

FYM RES	NONE	FYM	Mean
LEY			
LC1	*	*	*
LC2	5.80	6.34	6.07
LC3	5.06	5.22	5.14
LN1	*	*	*
LN2	6.69	6.56	6.63
LN3	5.37	5.54	5.45
LLC1	*	*	*
LLC2	6.07	4.99	5.53
LLC3	4.67	4.65	4.66
LLC4	5.86	6.05	5.95
LLC5	5.71	6.50	6.10
LLC6	5.43	5.01	5.22
LLC7	4.21	5.33	4.77
LLC8	5.13	5.25	5.19
LLN1	*	*	*
LLN2	7.93	7.72	7.82
LLN3	7.30	6.87	7.08
LLN4	7.27	6.53	6.90
LLN5	6.02	6.89	6.46
LLN6	6.90	7.60	7.25
LLN7	6.81	6.78	6.80
LLN8	7.30	6.32	6.81
Mean	6.08	6.12	6.10

1ST CUT MEAN DM% 22.0

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87/W/RN/3

LEYS

2ND CUTTING OCCASION (12/8/87) DRY MATTER TONNES/HECTARE

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

FYM RES	NONE	FYM	Mean
LEY			
LC1	2.96	3.24	3.10
LC2	1.23	1.34	1.28
LC3	2.62	2.70	2.66
LN1	2.98	2.59	2.78
LN2	2.82	3.06	2.94
LN3	2.36	3.41	2.88
LLC1	1.75	1.86	1.80
LLC2	2.03	2.43	2.23
LLC3	2.65	2.62	2.63
LLC4	2.95	2.91	2.93
LLC5	1.97	2.02	1.99
LLC6	1.01	0.94	0.98
LLC7	1.08	1.01	1.04
LLC8	2.11	2.07	2.09
LLN1	2.20	2.18	2.19
LLN2	2.61	2.53	2.57
LLN3	2.83	2.84	2.83
LLN4	2.46	2.31	2.38
LLN5	2.84	2.85	2.84
LLN6	4.00	3.88	3.94
LLN7	3.30	3.47	3.38
LLN8	2.87	3.62	3.25
Mean	2.44	2.54	2.49

2ND CUT MEAN DM% 18.7

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87/W/RN/3

LEYS

3RD CUTTING OCCASION (15/12/87) DRY MATTER TONNES/HECTARE

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

FYM RES	NONE	FYM	Mean
LEY			
LC1	1.12	1.56	1.34
LC2	1.45	1.03	1.24
LC3	*	*	*
LN1	1.62	2.33	1.97
LN2	2.39	2.31	2.35
LN3	*	*	*
LLC1	2.22	1.16	1.69
LLC2	2.27	1.77	2.02
LLC3	1.48	1.18	1.33
LLC4	1.02	0.77	0.89
LLC5	1.07	1.73	1.40
LLC6	0.54	0.77	0.65
LLC7	1.97	0.77	1.37
LLC8	*	*	*
LLN1	2.60	2.63	2.62
LLN2	2.67	2.34	2.51
LLN3	0.84	1.15	1.00
LLN4	1.45	1.86	1.66
LLN5	1.79	1.83	1.81
LLN6	3.51	4.01	3.76
LLN7	3.49	4.48	3.99
LLN8	*	*	*
Mean	1.86	1.87	1.87

3RD CUT MEAN DM% 29.9

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LEYS

TOTAL OF 3 CUTTING OCCASIONS DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	4.08	4.80	4.44
LC2	8.48	8.71	8.59
LC3	7.68	7.92	7.80
LN1	4.59	4.92	4.76
LN2	11.90	11.93	11.91
LN3	7.73	8.94	8.34
LLC1	3.97	3.03	3.50
LLC2	10.36	9.19	9.78
LLC3	8.80	8.45	8.63
LLC4	9.83	9.73	9.78
LLC5	8.74	10.25	9.49
LLC6	6.97	6.72	6.84
LLC7	7.26	7.11	7.18
LLC8	7.24	7.32	7.28
LLN1	4.81	4.81	4.81
LLN2	13.21	12.59	12.90
LLN3	10.96	10.86	10.91
LLN4	11.18	10.70	10.94
LLN5	10.65	11.58	11.11
LLN6	14.41	15.48	14.94
LLN7	13.60	14.73	14.17
LLN8	10.16	9.94	10.05
Mean	8.94	9.08	9.01

TOTAL OF 3 CUTTING OCCASIONS MEAN DM% 22.9

PLOT AREA HARVESTED 0.00204

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87/W/RN/3

WINTER WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES66	NONE	FYM	Mean
ROTATION			
LN 8	6.79	6.41	6.60
LN 3	6.40	6.43	6.42
LC 8	7.16	7.43	7.30
LC 3	7.13	6.92	7.02
AF	5.18	5.62	5.40
AB	5.84	6.74	6.29
Mean	6.42	6.59	6.50

N	0	70	140	210	Mean
ROTATION					
LN 8	4.80	6.74	7.86	7.00	6.60
LN 3	4.41	6.55	7.59	7.13	6.42
LC 8	5.26	7.48	8.31	8.13	7.30
LC 3	5.51	7.24	7.74	7.61	7.02
AF	3.02	5.56	6.60	6.43	5.40
AB	4.39	6.18	6.75	7.84	6.29
Mean	4.56	6.62	7.47	7.36	6.50

N	0	70	140	210	Mean
FYMRES66					
NONE	4.56	6.30	7.29	7.52	6.42
FYM	4.57	6.95	7.66	7.19	6.59
Mean	4.56	6.62	7.47	7.36	6.50

	N	0	70	140	210
ROTATION	FYMRES66				
LN 8	NONE	4.93	6.76	7.75	7.72
	FYM	4.66	6.71	7.97	6.28
LN 3	NONE	4.52	6.32	7.43	7.33
	FYM	4.29	6.79	7.74	6.92
LC 8	NONE	4.94	6.84	8.59	8.27
	FYM	5.58	8.12	8.04	7.98
LC 3	NONE	5.55	7.06	8.01	7.91
	FYM	5.47	7.41	7.47	7.32
AF	NONE	2.82	5.15	6.20	6.57
	FYM	3.22	5.98	7.01	6.28
AB	NONE	4.58	5.67	5.77	7.32
	FYM	4.19	6.68	7.73	8.35

GRAIN MEAN DM% 73.7

PLOT AREA HARVESTED 0.00251

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87/W/RN/3

SPRING BARLEY 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES65	NONE	FYM	Mean
ROTATION			
LN 8	6.24	6.10	6.17
LN 3	5.75	5.42	5.58
LC 8	6.23	6.13	6.18
LC 3	5.78	5.86	5.82
AF	4.73	4.94	4.84
AB	5.01	4.94	4.98
Mean	5.63	5.57	5.60

N	0	60	120	180	Mean
ROTATION					
LN 8	4.81	6.77	7.03	6.07	6.17
LN 3	4.06	5.91	6.56	5.80	5.58
LC 8	5.22	6.61	6.41	6.48	6.18
LC 3	4.83	6.59	6.31	5.57	5.82
AF	2.10	4.77	6.12	6.34	4.84
AB	2.49	5.31	6.06	6.05	4.98
Mean	3.92	6.00	6.42	6.05	5.60

N	0	60	120	180	Mean
FYMRES65					
NONE	3.89	5.96	6.48	6.18	5.63
FYM	3.95	6.03	6.35	5.92	5.57
Mean	3.92	6.00	6.42	6.05	5.60

N		0	60	120	180
ROTATION	FYMRES65				
LN 8	NONE	4.63	6.42	7.56	6.36
	FYM	4.99	7.12	6.49	5.78
LN 3	NONE	4.28	6.10	6.64	5.98
	FYM	3.84	5.73	6.47	5.62
LC 8	NONE	5.11	6.69	6.68	6.46
	FYM	5.34	6.54	6.15	6.50
LC 3	NONE	4.93	6.78	6.17	5.26
	FYM	4.73	6.40	6.45	5.87
AF	NONE	2.26	4.33	5.71	6.62
	FYM	1.95	5.22	6.53	6.06
AB	NONE	2.13	5.42	6.09	6.42
	FYM	2.84	5.20	6.04	5.69

GRAIN MEAN DM% 86.1

PLOT AREA HARVESTED 0.00251

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87/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 46th year, clover.

For previous years see 'Details' 1967 & 1973, 74-80/W/RN/4 and 83-86/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, 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. NPERCUT		Nitrogen (kg N) per cut, as 'Nitram':
	0	
	100	

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87/W/RN/4

To Series B, fourth 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. NPERCUT		Nitrogen (kg N) per cut, as 'Nitram':
	0	
	100	

NOTE: Series B became very weedy and yields were not taken.

Basal applications:
Series A and B: Manures: K20 at 150 kg as muriate of potash. Weedkillers: Benazolin, 2,4-DB and MCPA (as 'Legumex Extra' at 7 l) in 200 l.

Cultivations, etc.:- Basal K and treatment N applied: 3 Apr, 1987. Weedkillers applied: 27 May. Cut: 18 June (Series A): 23 June (Series B). Treatment N applied: 26 June. Cut: 19 Aug (Series A only).

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87/W/RN/4 WHITE CLOVER SERIES A

1ST CUT (18/6/87) DRY MATTER TONNES/HECTARE

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

OM RESID OM RATE	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	3.48	3.80	3.71	3.63	3.65
50	3.72	3.46	3.52	3.58	3.57
Mean	3.60	3.63	3.62	3.60	3.61

NPERCUT OM RATE	0	100	Mean
25	3.67	3.63	3.65
50	3.63	3.51	3.57
Mean	3.65	3.57	3.61

NPERCUT OM RESID	0	100	Mean
FYM	3.65	3.54	3.60
SEWAGE	3.66	3.60	3.63
SEW COM	3.62	3.62	3.62
VEG COM	3.67	3.53	3.60
Mean	3.65	3.57	3.61

	NPERCUT	0	100
OM RATE	OM RESID		
25	FYM	3.47	3.48
	SEWAGE	3.73	3.87
	SEW COM	3.72	3.70
	VEG COM	3.76	3.50
50	FYM	3.83	3.60
	SEWAGE	3.58	3.34
	SEW COM	3.51	3.54
	VEG COM	3.59	3.57

NONE	NPERCUT	0	100	Mean
		3.70	3.48	3.59

Grand mean 3.61

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

Table	OM RESID	OM RATE	NPERCUT	OM RESID OM RATE
s.e.d.	0.171	0.121	0.096	0.241

Table	OM RESID NPERCUT	OM RATE NPERCUT	OM RESID OM RATE NPERCUT	NONENPER
s.e.d.	0.218	0.154	0.308	0.192

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

OM RESID	0.192		
OM RATE		0.135	
OM RESID.OM RATE			0.271

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87/W/RN/4 WHITE CLOVER SERIES A

1ST CUT (18/6/87) DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.341	9.5
BLOCK.WP.SP	31	0.383	10.6

1ST CUT MEAN DM% 11.1

PLOT AREA HARVESTED 0.00053

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87/W/RN/4 WHITE CLOVER SERIES A

2ND CUT (19/8/87) DRY MATTER TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	3.24	2.95	3.23	3.15	3.14
50	3.35	3.23	3.17	3.15	3.23
Mean	3.30	3.09	3.20	3.15	3.18

NPERCUT / OM RATE	0	100	Mean
25	3.07	3.21	3.14
50	3.21	3.24	3.23
Mean	3.14	3.23	3.18

NPERCUT / OM RESID	0	100	Mean
FYM	3.20	3.40	3.30
SEWAGE	3.04	3.14	3.09
SEW COM	3.17	3.23	3.20
VEG COM	3.17	3.14	3.15
Mean	3.14	3.23	3.18

OM RATE	NPERCUT / OM RESID	0	100
25	FYM	3.14	3.34
	SEWAGE	2.81	3.08
	SEW COM	3.14	3.32
	VEG COM	3.20	3.11
50	FYM	3.25	3.45
	SEWAGE	3.26	3.21
	SEW COM	3.20	3.13
	VEG COM	3.13	3.17

NONE	NPERCUT	0	100	Mean
		3.09	3.33	3.21

Grand mean 3.19

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

Table	OM RESID	OM RATE	NPERCUT	OM RESID OM RATE
s.e.d.	0.140	0.099	0.079	0.198

Table	OM RESID NPERCUT	OM RATE NPERCUT	OM RESID OM RATE NPERCUT	NONENPER
s.e.d.	0.179	0.127	0.253	0.158

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

OM RESID	0.158		
OM RATE		0.112	
OM RESID.OM RATE			0.224

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87/W/RN/4 WHITE CLOVER SERIES A

2ND CUT (19/8/87) DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.280	8.8
BLOCK.WP.SP	31	0.316	9.9

2ND CUT MEAN DM% 12.3

PLOT AREA HARVESTED 0.00052

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87/W/RN/4 WHITE CLOVER SERIES A

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

OM RESID / OM RATE	FYM	SEWAGE	SEW COM	VEG COM	Mean
25	6.72	6.75	6.94	6.78	6.80
50	7.07	6.69	6.69	6.73	6.80
Mean	6.89	6.72	6.82	6.76	6.80

NPERCUT / OM RATE	0	100	Mean
25	6.75	6.85	6.80
50	6.84	6.75	6.80
Mean	6.79	6.80	6.80

NPERCUT / OM RESID	0	100	Mean
FYM	6.85	6.94	6.89
SEWAGE	6.69	6.75	6.72
SEW COM	6.79	6.84	6.82
VEG COM	6.84	6.67	6.76
Mean	6.79	6.80	6.80

OM RATE	NPERCUT / OM RESID	0	100
25	FYM	6.61	6.82
	SEWAGE	6.55	6.94
	SEW COM	6.86	7.02
	VEG COM	6.96	6.60
50	FYM	7.09	7.05
	SEWAGE	6.84	6.55
	SEW COM	6.71	6.67
	VEG COM	6.72	6.75

NONE	NPERCUT	0	100	Mean
		6.78	6.81	6.79

Grand mean 6.80

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

Table	OM RESID	OM RATE	NPERCUT	OM RESID OM RATE
s.e.d.	0.260	0.184	0.127	0.367

Table	OM RESID NPERCUT	OM RATE NPERCUT	OM RESID OM RATE NPERCUT	NONENPER
s.e.d.	0.315	0.223	0.446	0.253

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

OM RESID	0.253		
OM RATE		0.179	
OM RESID.OM RATE			0.358

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87/W/RN/4 WHITE CLOVER SERIES A

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	28	0.519	7.6
BLOCK.WP.SP	31	0.507	7.5

TOTAL OF 2 CUTS MEAN DM% 11.7

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87/R/RN/5

ARABLE REFERENCE PLOTS

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

Sponsor: A. Penny.

The 32nd year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980; w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 28th 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 31st 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 69-86/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

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

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

NOTES: (1) All w. wheat on these plots receives a standard dressing of 82 kg MgO as Epsom salts.
(2) Cereals receive 20 kg of N1 and 40 kg of N2 in February or March, remainder in April.
(3) In 1987 w. oats on the original plots given MANURE 0, N1, P and NP failed during the winter and were sown to s. oats.

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87/R/RN/5

Additional plots

MANURE	Fertilizers from 1980 to 1987 and in previous years:
1980-87	Until 1979
0	0
N2PK	N2 PK
N2PKMG	N2 PK MG CA
N2PKS	N2 PK CA S
N2PKMGS	N2 PK MG S
N1PKMGS	N2 PK CA MG S
N3PKMGS	N2 PK CA MG S TE

N: In 1987: 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 P2O5 as potassium dihydrogen phosphate.
K: 251 kg K2O total. As potassium dihydrogen phosphate (83 kg K2O) on all PK plots. In addition plots without S receive 168 kg K2O as potassium chloride, plots with S receive 92 kg K2O as potassium sulphate plus 76 kg K2O as potassium chloride. Since 1978 all PK plots receive, in addition to the standard total, 126 kg K2O for potatoes, applied in autumn as potassium chloride.
MG: 126 kg MgO as magnesium chloride.
CA: 126 kg CaO as calcium carbonate until 1979. In 1980 plots not previously given Ca received calcium carbonate at 7.5 t, except 0 which was given 5.0 t.
S: 30 kg S supplied by the potassium sulphate.
TE: Trace element mixture which included Mn, Cu, Zn, B, Mo, Ca and Fe.

Standard applications:
Original and additional plots:
All cereals: Weedkillers: Mecoprop at 0.72 kg, bromoxynil at 0.16 kg and ioxynil at 0.16 kg in 220 l on two occasions, with isoproturon (except to oats) at 2.1 kg on the first occasion. Fungicides: Prochloraz at 0.37 kg and carbendazim at 0.14 kg with tridemorph at 0.52 kg in 220 l. Propiconazole at 0.13 kg with captafol at 1.0 kg in 220 l. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.37 kg with chlorothalonil at 1.1 kg and the insecticide in 220 l. Insecticide: Pirimicarb at 0.14 kg.
W. wheat: Manures: MgO at 82 kg as Epsom salts. Growth regulator: Chlormequat at 1.9 kg in 220 l.
W. barley: Growth regulator: Mepiquat chloride at 0.85 kg and 2-chloroethylphosphonic acid at 0.43 kg in 220 l.
W. oats: Growth regulator: Chlormequat at 1.9 kg in 220 l (none to s. oats).
Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 220 l. Fungicides: Mancozeb at 1.3 kg in 220 l on three occasions, applied with the insecticide on the second. Applied on a fourth occasion to later-harvested plots only. Insecticide: Pirimicarb at 0.14 kg.

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Seed: W. wheat: Galahad, sown at 210 kg.
W. barley: Panda, sown at 190 kg.
W. oats: Bulwark, sown at 210 kg.
S. oats: Dula, sown at 180 kg.
Potatoes: Cara.
Grass-clover ley: RVP Italian ryegrass and Hungaropoly red clover.

Cultivations, etc.:-
Original and additional plots:
All cereals: Mecoprop, bromoxynil, ioxynil and (except to oats) isoproturon applied: 20 Nov, 1986. First N treatments applied: 24 Mar, 1987. Mecoprop, bromoxynil, ioxynil applied: 10 Apr. Second N treatments applied, prochloraz, carbendazim with tridemorph applied: 24 Apr. Growth regulators applied: 1 May (to barley) and 6 May to wheat and oats (except re-sown plots). Propiconazole and captafol applied: 13 May (to barley), 20 May (to wheat additional plots) and 28 May (to wheat original plots and oats). Carbendazim, maneb, tridemorph, chlorothalonil and pirimicarb applied: 23 June.
W. wheat: Rotary cultivated, P, K, Mg and S applied (S to additional plots only), seed sown and raked in: 25 Sept, 1986. Hand harvested: 17 Aug, 1987.
W. barley: Rotary cultivated, P and K and (to additional plots only) Mg and S applied: 1 Sept, 1986. Seed sown and raked in: 17 Sept. Hand harvested: 31 July, 1987.
W. & s. oats: Rotary cultivated, P and K and (to additional plots only) Mg and S applied: 16 Sept, 1986. Seed sown and raked in: 2 Oct. S. oats sown: 26 Mar, 1987. Hand harvested: 11 Aug. Spring oats harvested: 1 Sept.
Potatoes: Extra K applied (to additional plots except nil only): 2 Oct, 1986. FYM applied to original plots and all original plots dug by hand: 1 Dec. All additional plots dug by hand, P, K and (to additional plots only), Mg and S applied: 2 Dec. N applied, rotary cultivated, potatoes planted: 22 Apr, 1987. Weedkillers applied: 13 May. Mancozeb applied: 24 June, 7 July and 28 July. Insecticide applied: 7 July. Plots given neither FYM nor K on original plots and plot given no fertilizer on additional plots harvested by hand, mancozeb applied to remaining plots: 14 Aug. Remaining plots harvested by hand: 29 Sept (original plots) and 30 Sept (additional plots).
Grass-clover ley: Rotary cultivated: 11 Aug, 1986. Seed sown and raked in: 12 Aug. P, K and (to additional plots only), Mg and S applied: 2 Dec. N applied: 24 Mar, 1987. Cut: 19 May, 20 July and 28 Sept.
Permanent grass: P and K applied: 2 Dec, 1986. FYM applied: 12 Mar, 1987. First N applied: 24 Mar. Cut, second N applied: 19 May. Cut, third N applied: 20 July. Cut: 28 Sept.

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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	2.41	2.60	2.62	1.94	1.20	1.75	1.16	4.11
N1	3.21	3.81	3.73	3.40	2.30	1.85	1.25	5.40
P	4.37	4.24	3.02	2.52	1.95	1.50	0.90	4.34
N1P	1.01	1.83	3.60	3.78	3.75	1.54	0.68	5.98
K	4.07	4.23	2.43	2.27	2.19	2.88	1.98	7.05
N1K	5.77	6.67	4.91	4.24	2.58	2.47	1.39	6.44
PK	4.72	4.75	3.49	3.08	3.65	4.78	3.65	12.09
N1PK	8.03	7.83	7.85	5.73	4.57	4.81	3.56	12.93
N2PK	8.57	9.26	8.46	6.33	5.58	4.43	3.59	13.60
D	6.12	6.75	3.64	3.69	3.56	4.25	3.37	11.19
N1PKD	9.50	10.35	8.24	5.76	5.16	5.16	3.95	14.27
N2PKD	9.65	11.87	9.23	7.95	5.02	5.27	3.91	14.20
MEAN DM%	80.6	53.7	81.2	61.9	23.4	19.2	22.4	21.7

	W. OATS:		POTATOES:	PERMANENT GRASS : DRY MATTER			
	GRAIN	STRAW	TOTAL TUBERS	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE							
0	3.00*	2.37*	12.5	0.57	0.90	0.84	2.31
N1	4.38*	3.16*	14.2	1.40	2.07	2.11	5.59
P	2.78*	2.54*	8.1	0.57	1.17	0.92	2.67
N1P	2.73*	2.82*	7.3	1.99	2.56	2.22	6.77
K	2.76	2.88	34.4	0.74	1.01	1.03	2.78
N1K	4.94	5.16	36.7	1.56	2.60	2.05	6.22
PK	3.94	4.25	50.2	0.82	1.26	1.27	3.36
N1PK	7.64	8.12	62.7	2.40	3.02	2.90	8.32
N2PK	8.02	11.45	58.2	3.67	4.52	3.55	11.73
D	4.56	5.26	71.9	3.92	2.42	2.73	9.08
N1PKD	8.41	11.43	83.0	4.51	3.96	3.66	12.13
N2PKD	7.71	13.46	74.6	4.70	4.99	4.41	14.09
MEAN DM%	79.1	40.9	21.0	28.3	24.3	29.4	27.3

* S. OATS

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ADDITIONAL PLOTS

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

	W. WHEAT: GRAIN	W. WHEAT: STRAW	W. BARLEY: GRAIN	W. BARLEY: STRAW	W. OATS: GRAIN	W. OATS: STRAW	POTATOES: TOTAL TUBERS
MANURES							
0	2.85	2.70	2.70	2.07	2.73	2.74	9.1
N2PK	9.00	8.90	9.03	7.39	7.67	11.21	69.8
N2PKMG	8.02	8.70	8.56	6.42	8.23	13.20	69.2
N2PKS	7.52	7.85	9.04	6.97	8.01	10.31	66.5
N2PKMGS	8.47	8.72	8.67	7.28	7.92	12.38	78.8
N1PKMGS	8.28	8.64	8.34	6.56	8.17	11.21	74.4
N3PKMGS	8.69	9.35	8.99	7.21	7.40	10.69	69.4
MEAN DM%	79.3	44.5	80.6	62.4	78.4	44.8	21.5

	LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURES				
0	1.79	1.57	1.31	4.66
N2PK	4.99	5.36	3.52	13.87
N2PKMG	5.04	4.79	3.90	13.73
N2PKS	5.05	4.98	4.13	14.16
N2PKMGS	4.24	5.07	3.92	13.24
N1PKMGS	4.32	4.53	3.81	12.66
N3PKMGS	4.67	4.40	3.51	12.58
MEAN DM%	22.1	17.2	22.1	20.5

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87/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 27th year, w. barley.

For previous years see 'Details' 1967 and 1973 and 74-86/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: 27 Aug, 1986
ROTA DIG	Cultivated by rotary digger: 8 Sept
DEEPTINE	Deep-tine cultivated, 3 times: 27 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 twice on 27 August, 1986 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 6 Aug, 1986 and was burnt on XTR BURN on 13 Aug and these plots were spring-tine cultivated on 14 Aug. All plots were sprayed with paraquat at 0.60 kg ion in 200 l on 29 Sept, rotary harrowed on 30 Sept and drilled on 1 Oct.

(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.

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Basal applications: Manures: Chalk at 5.0 t. 'Nitram' at 460 kg.
Weedkillers: Isoproturon at 2.5 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l.

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- Chalk applied: 24 Sept, 1986. N applied: 20 Mar, 1987. Weedkillers applied: 16 Apr. Combine harvested: 7 Aug.

GRAIN TONNES/HECTARE

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

SUBSOIL[82] CLT CHOP	NONE	CNVNTIAL	PARAPLOW	Mean
PLOUGH	5.58	5.58	5.78	5.65
ROTA DIG	5.78	5.61	6.19	5.86
DEEPTINE	5.79	5.54	5.86	5.73
Mean	5.72	5.57	5.95	5.75

XTR BURN	NONE	CNVNTIAL	PARAPLOW	Mean
	5.89	4.34	4.29	4.84

Grand mean 5.52

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

Table	XTR BURN	CLT CHOP	SUBSOIL[82]	CLT CHOP SUBSOIL[82]
s.e.d.	0.463	0.267	0.267	0.463

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.463	8.4

GRAIN MEAN DM% 85.0

PLOT AREA HARVESTED 0.00280

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87/W/RN/12

ORGANIC MANURING

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

Sponsor: A.E. Johnston.

The 23rd year, w. wheat, w. oats, ley.

For previous years see 'Details' 1973 and 74-86/W/RN/12.

Design for w. wheat: 2 blocks of 8 plots split into 6
W. oats: 2 blocks of 4 plots
6th and 8th year leys: 2 blocks of 4 plots.

Whole plot dimensions: 8.53 x 30.5.

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

W. wheat 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	Fertilizer only in both periods rates of P, K and Mg equivalent to amounts in straw (+P)

Sub plots

2. N — Nitrogen fertilizer in 1987 (kg N) as 'Nitro-Chalk':

0
50
100
150
200
250

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W. oats tested:

MANURE	Organic manures and fertilizers in 1986 (not applied in 1987), cumulative to 1985, 1983 and 1982 and to those applied in the preliminary period:
FYM	Farmyard manure at 50 tonnes
STRAW	Straw at 7.5 tonnes plus P205 at 140 kg, K20 at 140 kg, MgO at 50 kg
FERT-FYM	P205 at 280 kg, K20 at 560 kg, MgO at 100 kg
FERT-STR	P205 at 140 kg, K20 at 280 kg, MgO at 50 kg

All leys were clover/grass (LC) without N. 6th year leys tested:

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

8th year leys tested:

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

Standard applications:
W. wheat: Manures: (0:18:36) at 560 kg. Mn at 0.16 kg as manganese sulphate in 240 l applied with the prochloraz, carbendazim and growth regulator. Weedkillers: Glyphosate at 1.4 kg in 200 l. Chlortoluron at 5.6 kg in 200 l. Clopyralid at 0.07 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 240 l. Fungicides: Prochloraz at 0.34 kg with carbendazim at 0.13 kg. Fenpropimorph at 0.75 kg with chlorothalonil at 0.75 kg in 200 l. Propiconazole at 0.12 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 200 l. Growth regulator: Chlormequat chloride at 1.1 kg. Insecticide: Carbofuran at 7.5 kg. Molluscicide: Methiocarb at 0.22 kg.
W. oats: Manure: N at 90 kg as 'Nitram'. Weedkiller: Clopyralid at 0.07 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 240 l.
Leys, 6th and 8th years: Manures: MgO at 50 kg as kieserite. (0:18:36) at 780 kg.

Seed: W. wheat: Mercia, sown at 190 kg.
W. oats: Bulwark, sown at 140 kg.

Cultivations, etc.:-
W. wheat: After leys only: Plough and roll: 25 July, 1986. Subsoiled, with 25 cm wings on tines 30 cm deep and 70 cm apart, in two directions at right angles: 28 Aug. All wheat plots: Glyphosate applied: 16 Sept. Methiocarb applied: 18 Sept. Ploughed plots after oats: 24 Sept. PK applied, insecticide applied, rotary harrowed with crumbler attached: 24 Sept. Seed sown: 25 Sept. Chlortoluron applied: 9 Oct. Clopyralid, bromoxynil and mecoprop applied: 14 Apr, 1987. N treatments applied: 16 Apr. Manganese, prochloraz, carbendazim and chlormequat applied: 21 Apr. Fenpropimorph and chlorothalonil

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Cultivations, etc.:-

applied: 5 June. Propiconazole, carbendazim and maneb applied: 29 June. Combine harvested: 1 Sept.
W. oats: Ploughed: 25 Sept, 1986. Rotary cultivated with crumbler attached, seed sown: 2 Oct. Clopyralid, bromoxynil and mecoprop applied: 27 Apr, 1987. N applied: 5 May. Combine harvested: 20 Aug.
Leys, 6th and 8th years: PK and Mg applied: 10 Mar, 1987. Cut: 18 June and 12 Aug.

WINTER WHEAT

GRAIN TONNES/HECTARE

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

N / TREATMNT	0	50	100	150	200	250	Mean
LC 8 GM	5.23	7.74	8.46	8.72	8.40	7.78	7.72
LC 8 PT	5.32	7.37	7.51	8.43	8.37	8.39	7.57
LC 6 LC	5.98	7.04	8.59	8.49	7.62	8.40	7.69
LC 6 LN	6.15	7.73	8.05	7.97	8.60	8.21	7.78
FYM	4.03	5.82	7.22	6.48	7.51	8.00	6.51
STRAW	2.95	3.89	5.82	7.16	6.50	7.75	5.68
FERT-FYM	1.36	3.05	4.48	5.06	5.25	5.77	4.16
FERT-STR	2.07	4.18	4.92	4.84	5.15	6.19	4.56
Mean	4.14	5.85	6.88	7.14	7.18	7.56	6.46

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

Table	TREATMNT	N	TREATMNT N
s.e.d.	0.832	0.192	0.968
Except when comparing means with the same level(s) of TREATMNT			0.543

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.832	12.9
BLOCK.WP.SP	40	0.543	8.4

GRAIN MEAN DM% 81.6

SUB PLOT AREA HARVESTED 0.00254

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87/W/RN/12

WINTER OATS

GRAIN TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT-FYM	FERT-STR	Mean
	5.15	4.94	4.29	5.03	4.85

GRAIN MEAN DM% 83.5

STRAW TONNES/HECTARE

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

MANURE	FYM	STRAW	FERT-FYM	FERT-STR	Mean
	5.59	4.81	4.14	4.80	4.84

STRAW MEAN DM% 76.6

PLOT AREA HARVESTED 0.00796

6TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT (18/6/87)	2ND CUT (12/8/87)	TOTAL OF 2 CUTS
PREV LEY			
LC(LC)	6.05	2.48	8.53
LC(LN)	6.11	1.93	8.04
MEAN	6.08	2.20	8.28
MEAN DM%	21.6	16.9	19.2

8TH YEAR LEY

DRY MATTER TONNES/HECTARE

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

	1ST CUT (18/6/87)	2ND CUT (12/8/87)	TOTAL OF 2 CUTS
PREV MAN			
LC(GM)	4.39	2.39	6.77
LC(PT)	4.63	2.31	6.94
MEAN	4.51	2.35	6.86
MEAN DM%	20.2	17.5	18.9

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87/W/RN/13

INTENSIVE CEREALS

Object: To study the effects of intensive cereal cropping on yield, incidence of soil-borne pathogens and organic matter in the soil - Woburn Stackyard I.

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

The 22nd year, w. wheat.

For previous years see 'Details' 1973 and 74-86/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 wheat experiment 1877-1954 and one in which the cereal was s. barley, sown on part of the site of the classical barley experiment 1877-1954. From 1981 the experiment 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 with all combinations of the following treatments:

Whole plots

1. LEY AGE Length of ley:

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

Sub plots

2. N Nitrogen fertilizer in 1987 (kg N) as 'Nitro-Chalk':

   0
   50
   100
   150
   200
   250

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Standard applications: Manures: (0:18:36) at 560 kg. Mn at 0.16 kg as manganese sulphate in 240 l applied with the prochloraz, carbendazim and growth regulator. Weedkillers: Glyphosate at 1.4 kg in 200 l. Chlortoluron at 5.6 kg in 200 l. Clopyralid at 0.07 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 240 l. Fungicides: Prochloraz at 0.34 kg with carbendazim at 0.13 kg. Fenpropimorph at 0.75 kg with chlorothalonil at 0.75 kg in 200 l. Propiconazole at 0.12 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 200 l. Growth regulator: Chlormequat at 1.1 kg. Insecticide: Carbofuran at 7.5 kg. Molluscicide: Methiocarb at 0.22 kg.

Seed: Mercia, sown at 190 kg.

Cultivations, etc.:- Ploughed and rolled: 17 July, 1986. Subsoiled with 25 cm wings on tines 30 cm deep and 70 cm apart, in two directions at right angles: 28 Aug. Glyphosate applied: 16 Sept. Methiocarb applied: 18 Sept. PK applied, carbofuran applied, rotary harrowed with crumbler attached, seed sown: 25 Sept. Chlortoluron applied: 9 Oct. Mn, prochloraz, carbendazim, chlormequat applied: 14 Apr, 1987. Clopyralid, bromoxynil and mecoprop applied subsequently: 14 Apr. N applied: 23 Apr. Fenpropimorph and chlorothalonil applied: 5 June. Propiconazole, carbendazim and maneb applied: 29 June. Combine harvested: 1 Sept.

GRAIN TONNES/HECTARE

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

N	0	50	100	150	200	250	Mean
LEY AGE							
1 YEAR	4.86	6.33	7.94	7.96	7.99	8.51	7.27
2 YEARS	5.82	8.22	8.73	8.87	9.01	9.08	8.29
3 YEARS	7.72	8.60	8.85	9.36	9.18	9.36	8.84
4 YEARS	8.37	8.94	8.85	9.28	9.43	8.96	8.97
5 YEARS	8.37	8.94	8.85	9.28	9.06	9.22	8.95
6 YEARS	8.24	8.63	8.62	8.77	8.16	8.99	8.57
Mean	7.23	8.28	8.64	8.92	8.81	9.02	8.48

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

Table	LEY AGE	N	LEY AGE N
s.e.d.	0.271	0.158	0.445
Except when comparing means with the same level(s) of LEY AGE			0.387

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.383	4.5
BLOCK.WP.SP	90	0.547	6.5

GRAIN MEAN DM% 82.6

SUB PLOT AREA HARVESTED 0.00165

https://doi.org/10.23637/ERADOC-1-37 *pp 70*

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87/R/RN/17

RATES OF P AND K TO THE SUBSOIL

Object: To study the effects of a range of rates and frequencies of application of P and K to the subsoil, singly and together, on the yields and nutrient uptakes of a rotation of crops - Meadow.

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

The seventh year, potatoes, s. barley, s. beans, w. wheat.

For previous years see 81-86/R/RN/17.

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

Whole plotdimensions: 3.0 x 14.0.

Treatments to each series:

TREATMNT — Extra P and K and primary cultivation tool in autumn 1980 only, except on A plots, treatments repeated annually, and F plots treatments repeated four yearly:

	P2O5(kg)	K2O(kg)	Tool	
- - -	0	0	Plough	(duplicated)
P6 K6 T	1000	500 to topsoil	"	(")
- - S	0	0	Wye double-digger	(triplicated)
- - SA	0	0	" " "	(duplicated)
- - SF	0	0	" " "	
P2 - SA	63	0 to subsoil	" " "	
P3 - SF	125	0 " "	" " "	
P4 - S	250	0 " "	" " "	
P5 - S	500	0 " "	" " "	
P5 - SF	500	0 " "	" " "	
P6 - S	1000	0 " "	" " "	
- K2 SA	0	31 " "	" " "	
- K3 SF	0	63 " "	" " "	
- K4 S	0	125 " "	" " "	
- K5 S	0	250 " "	" " "	
- K5 SF	0	250 " "	" " "	
- K6 S	0	350 " "	" " "	
P1 K1 SA	31	16 " "	" " "	
P1 K3 SA	31	63 " "	" " "	
P2 K2 SA	63	31 " "	" " "	
P3 K1 SA	125	16 " "	" " "	
P3 K3 SA	125	63 " "	" " "	
P3 K4 SF	125	125 " "	" " "	
P4 K3 SF	250	63 " "	" " "	
P4 K4 S	250	125 " "	" " "	
P4 K5 S	250	250 " "	" " "	
P4 K5 SF	250	250 " "	" " "	
P4 K6 S	250	350 " "	" " "	
P5 K4 S	500	125 " "	" " "	
P5 K4 SF	500	125 " "	" " "	
P5 K5 S	500	250 " "	" " "	
P5 K6 S	500	350 " "	" " "	
P6 K4 S	1000	125 " "	" " "	
P6 K5 S	1000	250 " "	" " "	
P6 K6 S	1000	350 " "	" " "	

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NOTES: (1) Subsoiling was done with the Wye double-digger which turns a furrow with a conventional plough share, to a depth of 23 cm, and at the same time rotary cultivates the bottom of the adjacent furrow to a further depth of 15 cm. When applying P and K this was distributed ahead of the rotary cultivator.
(2) The topsoil PK dressing was equally divided before and after ploughing.
(3) All plots were conventionally ploughed each autumn unless the Wye double-digging treatment was due.
(4) The rate of 350 kg K20 applied was in error for 500 kg K20.

Standard applications:
Potatoes: Manures: (10:10:15+4.5 Mg) at 1960 kg. Weedkiller: Linuron at 1.6 kg in 500 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions, applied with the pirimicarb on the second occasion. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg: Desiccant: Diquat at 0.80 kg ion in 300 l.
S. barley: Manures: (20:10:10) at 630 kg. Weedkillers: Clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.
S. beans: Weedkillers: Trietazine at 1.2 kg and simazine at 0.17 kg in 500 l. Insecticide: Phorate at 4.5 kg.
W. wheat: Manures: (0:18:36) at 350 kg. 'Nitram' at 590 kg. Weedkillers: Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

Seed: Potatoes: Pentland Crown.
S. barley: Klaxon, dressed triadimenol and fuberidazole, sown at 160 kg.
S. beans: Minden, sown at 260 kg.
W. wheat: Avalon, sown at 200 kg.

Cultivations, etc.:-
All crops: Treatments applied by double-digger: 29 Oct, 1986 and 30 Oct. Ploughed: 31 Oct.
Potatoes: Heavy spring-tine cultivated: 20 Feb, 1987. NPK+Mg applied: 14 Apr. Heavy spring-tine cultivated: 15 Apr. Rotary harrowed, potatoes planted: 16 Apr. Rotary ridged: 27 Apr. Linuron applied: 8 May. Mancozeb applied: 24 June, 8 July, 28 July, 10 Aug. Insecticide applied: 8 July. Fentin hydroxide applied: 28 Aug, 9 Sept. Desiccant applied: 21 Sept. Haulm mechanically destroyed: 3 Oct. Lifted: 19 Oct.
S. barley: Heavy spring-tine cultivated: 20 Feb, 1987. NPK applied, spring-tine cultivated: 16 Mar. Rotary harrowed, seed sown: 17 Mar. Weedkillers applied: 6 May. Fungicide applied: 24 June. Combine harvested: 20 Aug.
S. beans: Heavy spring-tine cultivated: 20 Feb, 1987. Phorate applied, spring-tine cultivated: 16 Mar. Rotary harrowed, seed sown: 18 Mar. Weedkillers applied: 30 Mar. Combine harvested: 18 Sept.
W. wheat: PK applied, rotary harrowed, seed sown: 7 Nov, 1986. N applied: 17 Apr, 1987. Weedkillers applied: 8 May. Fungicide applied: 24 June. Combine harvested: 31 Aug.

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87/R/RN/17

SERIES III POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	64.6
P6 K6 T	60.0
- - S	61.7
- - SA	62.2
- - SF	63.6
P2 - SA	62.4
P3 - SF	71.5
P4 - S	50.7
P5 - S	65.4
P5 - SF	66.9
P6 - S	68.1
- K2 SA	62.6
- K3 SF	65.0
- K4 S	68.1
- K5 S	70.1
- K5 SF	66.6
- K6 S	70.8
P1 K1 SA	61.8
P1 K3 SA	67.6
P2 K2 SA	69.5
P3 K1 SA	67.9
P3 K3 SA	65.7
P3 K4 SF	71.8
P4 K3 SF	63.0
P4 K4 S	62.3
P4 K5 S	65.0
P4 K5 SF	68.8
P4 K6 S	68.1
P5 K4 S	68.7
P5 K4 SF	67.8
P5 K5 S	70.5
P5 K6 S	64.6
P6 K4 S	67.0
P6 K5 S	67.7
P6 K6 S	69.2
Mean	65.4

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

Table	TREATMNT	
s.e.d.	7.14	min.rep
	5.83	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	5.05	7.7

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87/R/RN/17

SERIES III POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	97.6
P6 K6 T	98.5
- - S	98.2
- - SA	98.5
- - SF	97.6
P2 - SA	97.8
P3 - SF	98.8
P4 - S	97.7
P5 - S	98.5
P5 - SF	98.0
P6 - S	98.3
- K2 SA	98.5
- K3 SF	98.1
- K4 S	97.7
- K5 S	97.7
- K5 SF	98.3
- K6 S	98.1
P1 K1 SA	96.7
P1 K3 SA	98.4
P2 K2 SA	98.2
P3 K1 SA	99.1
P3 K3 SA	97.3
P3 K4 SF	98.8
P4 K3 SF	98.2
P4 K4 S	97.9
P4 K5 S	98.3
P4 K5 SF	97.9
P4 K6 S	98.5
P5 K4 S	97.5
P5 K4 SF	98.1
P5 K5 S	99.3
P5 K6 S	96.9
P6 K4 S	98.4
P6 K5 S	98.1
P6 K6 S	99.3
Mean	98.1

PLOT AREA HARVESTED 0.00210

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

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

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87/R/RN/17

SERIES IV WINTER BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.02
P6 K6 T	6.92
- - S	6.95
- - SA	7.22
- - SF	6.73
P2 - SA	7.42
P3 - SF	7.12
P4 - S	6.99
P5 - S	6.98
P5 - SF	7.23
P6 - S	6.50
- K2 SA	7.28
- K3 SF	7.10
- K4 S	7.21
- K5 S	7.37
- K5 SF	7.05
- K6 S	6.92
P1 K1 SA	7.10
P1 K3 SA	6.82
P2 K2 SA	6.90
P3 K1 SA	6.82
P3 K3 SA	7.40
P3 K4 SF	7.18
P4 K3 SF	7.10
P4 K4 S	7.01
P4 K5 S	7.30
P4 K5 SF	7.33
P4 K6 S	7.12
P5 K4 S	7.09
P5 K4 SF	6.86
P5 K5 S	7.08
P5 K6 S	7.05
P6 K4 S	6.58
P6 K5 S	6.36
P6 K6 S	7.00
Mean	7.03

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

Table	TREATMNT	
s.e.d.	0.206	min.rep
	0.168	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.146	2.1

GRAIN MEAN DM% 86.0 PLOT AREA HARVESTED 0.00286

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87/R/RN/17

SERIES I SPRING BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	4.50
P6 K6 T	4.31
- - S	4.51
- - SA	4.83
- - SF	4.14
P2 - SA	4.34
P3 - SF	4.43
P4 - S	4.07
P5 - S	4.14
P5 - SF	4.97
P6 - S	4.68
- K2 SA	4.74
- K3 SF	4.77
- K4 S	4.80
- K5 S	4.41
- K5 SF	4.81
- K6 S	4.72
P1 K1 SA	4.63
P1 K3 SA	4.53
P2 K2 SA	4.88
P3 K1 SA	4.70
P3 K3 SA	4.01
P3 K4 SF	4.75
P4 K3 SF	4.32
P4 K4 S	3.82
P4 K5 S	4.50
P4 K5 SF	4.27
P4 K6 S	4.63
P5 K4 S	5.04
P5 K4 SF	4.93
P5 K5 S	4.43
P5 K6 S	4.80
P6 K4 S	4.55
P6 K5 S	4.44
P6 K6 S	4.44
Mean	4.54

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

Table	TREATMNT	
s.e.d.	0.430	min.rep
	0.351	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.304	6.7

GRAIN MEAN DM% 81.9 PLOT AREA HARVESTED 0.00386

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87/R/RN/17

SERIES II WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	6.69
P6 K6 T	7.41
- - S	6.62
- - SA	6.90
- - SF	5.93
P2 - SA	7.10
P3 - SF	7.79
P4 - S	7.15
P5 - S	7.28
P5 - SF	6.99
P6 - S	6.85
- K2 SA	6.81
- K3 SF	5.53
- K4 S	7.35
- K5 S	6.74
- K5 SF	7.08
- K6 S	5.17
P1 K1 SA	7.58
P1 K3 SA	7.24
P2 K2 SA	7.49
P3 K1 SA	7.56
P3 K3 SA	7.27
P3 K4 SF	8.14
P4 K3 SF	7.24
P4 K4 S	7.29
P4 K5 S	6.65
P4 K5 SF	7.01
P4 K6 S	7.88
P5 K4 S	6.33
P5 K4 SF	7.31
P5 K5 S	6.29
P5 K6 S	6.82
P6 K4 S	6.90
P6 K5 S	6.63
P6 K6 S	7.10
Mean	6.96

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

Table	TREATMNT	
s.e.d.	0.624	min.rep
	0.510	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.441	6.3

GRAIN MEAN DM% 83.0 PLOT AREA HARVESTED 0.00274

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87/R/CS/10 and 87/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.

Sponsors: S.P. McGrath, J. McEwen, D.P. Yeoman.

The 26th year, Lupinus albus.

For previous years see 'Details' 1967, 1973 and 74-86/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):

R	W	Rothamsted total 1962-78	Rothamsted total 1982-87	Woburn total 1962-78	Woburn total 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 R & W	1981 R & W	1982 R & W	1983 R	1983 W
0	0	0	0	0	0
P1	0	P1	P1	0	P2
P2	P	P1	0	P2	P2
P3	P	P3	P1	P2	P4

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

Sub plots

3. MANGNESE — Manganese applied in 1987:

0	None
MN	Manganese sprays

NOTES: (1) Until 1978 test P was applied cumulatively, rates varied with crop, K was also applied cumulatively, to P1 and P3 plots. Since 1981 K has been applied basally (none in 1986 and 1987).
(2) On Sawyers I (R) manganese was applied as manganese lignin polycarboxylate ('Stoller Manganese' at 3.0 l in 200 l on 5 June, 1987 and at 9.0 l in 200 l on 11 Aug).
(3) On Stackyard C (W) manganese was applied at 0.19 kg Mn on 4 June, 1987 and 0.57 kg Mn on 4 Aug as manganese sulphate in 200 l.

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87/R/CS/10 and 87/W/CS/10

Basal applications:-
Sawyers I (R): Weedkillers: Terbutryne at 0.98 kg with terbuthylazine at 0.42 kg in 200 l. Fungicide: Benomyl at 0.50 kg applied with the insecticide and a wetting agent ('Agral' at 0.06 l) in 200 l. Insecticide: Pirimicarb at 0.14 kg.
Stackyard C (W): Weedkillers: Glyphosate at 1.4 kg in 200 l. Terbutryne at 0.56 kg with terbuthylazine at 0.24 kg in 240 l. Fungicide: Benomyl at 1.0 kg applied with the pirimicarb and a wetting agent ('Enhance' at 0.06 l) in 200 l. Insecticides: Deltamethrin at 0.038 kg in 200 l. Pirimicarb at 0.15 kg.

Seed: Sawyers I (R): Vladimir, sown at 260 kg.
Stackyard C (W): Vladimir, sown at 250 kg.

Cultivations, etc.:-
Sawyers I (R): Chalk treatments applied: 13 Nov, 1986. Ploughed: 14 Nov. Spring-tine cultivated, rotary harrowed, seed sown, harrowed: 31 Mar, 1987. Weedkillers applied: 13 Apr. Fungicide and insecticide applied: 9 July. Combine harvested: 17 Nov.
Stackyard C (W): Glyphosate applied: 16 Sept, 1986. Chalk treatments applied: 13 Nov. Ploughed: 28 Nov. Spike harrowed with crumbler attached, seed sown: 6 Apr, 1987. Harrowed, terbutryne and terbuthylazine applied: 13 Apr. Deltamethrin applied: 8 May. Benomyl and pirimicarb applied: 13 July. Combine harvested: 18 Nov.

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
0	0.71	1.33	2.28	2.97	1.82
15	2.86	2.25	3.47	2.65	2.81
24.5	2.98	2.24	3.69	2.56	2.87
52.5	2.87	2.31	4.04	3.17	3.10
Mean	2.36	2.03	3.37	2.84	2.65

MANGNESE	0	MN	Mean
CHALK			
0	1.89	1.76	1.82
15	2.69	2.92	2.81
24.5	2.98	2.75	2.87
52.5	3.04	3.15	3.10
Mean	2.65	2.64	2.65

MANGNESE	0	MN	Mean
P			
0	2.38	2.33	2.36
P1	2.12	1.94	2.03
P2	3.32	3.42	3.37
P3	2.78	2.89	2.84
Mean	2.65	2.64	2.65

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

GRAIN TONNES/HECTARE

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

CHALK	MANGNESE P	0	MN
0	0	0.66	0.77
	P1	1.41	1.25
	P2	2.25	2.32
	P3	3.24	2.71
15	0	2.73	2.98
	P1	2.27	2.22
	P2	3.52	3.43
	P3	2.26	3.03
24.5	0	3.02	2.94
	P1	2.48	1.99
	P2	3.86	3.52
	P3	2.56	2.56
52.5	0	3.10	2.64
	P1	2.31	2.32
	P2	3.68	4.40
	P3	3.08	3.25

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

Table	CHALK	P	MANGNESE	CHALK P
s.e.d.	0.233	0.233	0.114	0.466

Table	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
s.e.d.	0.283	0.283	0.567

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

CHALK	0.228		
P		0.228	
CHALK.P			0.456

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.466	17.6
BLOCK.WP.SP	16	0.456	17.2

GRAIN MEAN DM% 65.2

SUB PLOT AREA HARVESTED 0.00177

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
0	2.17	1.99	1.87	1.81	1.96
9	1.91	1.72	1.66	1.55	1.71
25.5	2.04	1.44	1.38	1.57	1.61
45.5	1.98	1.49	1.68	1.31	1.62
Mean	2.03	1.66	1.65	1.56	1.72

MANGNESE	0	MN	Mean
CHALK			
0	2.09	1.83	1.96
9	1.72	1.70	1.71
25.5	1.57	1.64	1.61
45.5	1.68	1.56	1.62
Mean	1.77	1.68	1.72

MANGNESE	0	MN	Mean
P			
0	2.12	1.94	2.03
P1	1.73	1.60	1.66
P2	1.57	1.73	1.65
P3	1.66	1.46	1.56
Mean	1.77	1.68	1.72

	MANGNESE	0	MN
CHALK	P		
0	0	2.63	1.72
	P1	1.82	2.17
	P2	1.84	1.90
	P3	2.08	1.54
9	0	1.95	1.88
	P1	1.89	1.56
	P2	1.35	1.97
	P3	1.71	1.39
25.5	0	1.78	2.29
	P1	1.47	1.41
	P2	1.37	1.40
	P3	1.67	1.46
45.5	0	2.09	1.87
	P1	1.74	1.25
	P2	1.71	1.66
	P3	1.17	1.44

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

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

Table	CHALK	P	MANGNESE	CHALK P
s.e.d.	0.107	0.107	0.098	0.214

Table	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
s.e.d.	0.175	0.175	0.351

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

CHALK	0.197	
P		0.197
CHALK.P		0.393

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.214	12.4
BLOCK.WP.SP	16	0.393	22.8

GRAIN MEAN DM% 60.3

SUB PLOT AREA HARVESTED 0.00172

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87/W/CS/34

NEMATICIDES IN CROP SEQUENCE

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

Sponsor: A.G. Whitehead.

The 19th year, potatoes, w. wheat, s. barley.

For previous years see 71/W/CS/34(t), 72/W/CS/34(t) and 73-86/W/CS/34.

Design: 4 series of 3 blocks of 10 plots.

Whole plot dimensions: 4.27 x 9.14.

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

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

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

* Treatments applied to potatoes, subsequent crops test residual effects. In 1987 planned new treatments were not applied to Series I and yields were not taken.

Treatments to potatoes (Series II): All combinations of:-

1. NEMACIDE[84] Residues of nematicides applied 1984:

   ALDICARB
   SDS38697
   SDS46995

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

   SINGLE Single (2.8 kg of aldicarb, 1.4 kg of SDS materials)
   DOUBLE Double (5.6 kg of aldicarb, 2.8 kg of SDS materials)
   QUAD Quadruple (11.2 kg of aldicarb, 5.6 kg of SDS materials)

plus one untreated plot per block

RATE

NONE

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87/W/CS/34

Treatments to s. barley (Series III): All combinations of:-

1. NEMACIDE[85]	Residues of nematicides applied 1985:	
	OXAMYL	Oxamyl
	SDS46995	'SDS 46995'
	THIODICA	Thiodicarb
2. RATE	Rates of nematicide (a.i.):	
	SINGLE	Single (1.4 kg of 'SDS 46995', 2.8 kg of other materials)
	DOUBLE	Double (2.8 kg of 'SDS 46995', 5.6 kg of other materials)
	QUAD	Quadruple (5.6 kg of 'SDS 46995', 11.2 kg of other materials)

plus one untreated plot per block

RATE

NONE

Treatments to w. wheat (Series IV):

1. NEMACIDE[86]	Residues of nematicides and rates (a.i.) applied 1986:	
	AL 3.3	Aldicarb at 3.3 kg
	AL 6.6	Aldicarb at 6.6 kg
	AL S 3.3	Aldicarb, slow release formulation at 3.3 kg
	AL S 6.6	Aldicarb, slow release formulation at 6.6 kg
	ETH 7.5	Ethoprophos at 7.5 kg
	MB 5.0	'MB 41380' at 5.0 kg
	MB 7.5	'MB 41380' at 7.5 kg
	MB 10.0	'MB 41380' at 10.0 kg
	OX 5.0	Oxamyl at 5.0 kg
	NONE	None

Standard applications:

Potatoes (Series I and II): Manures: (10:10:15+4.5 Mg) at 2300 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l to Series II only. Linuron at 1.6 kg in 200 l. Fungicides: Mancozeb at 1.4 kg on four occasions in 200 l, applied with the pirimicarb on the second. Fentin hydroxide at 0.28 kg on two occasions in 200 l. Nematicide: Oxamyl at 5.6 kg to Series I only. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.

W. wheat (Series IV): Manures: N at 210 kg as 'Nitram'. Weedkillers: Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 2.5 kg applied with the tridemorph in 200 l. Fungicides: Tridemorph at 0.52 kg. Triadimenol at 0.062 kg with tridemorph at 0.38 kg in 200 l.

S. barley (Series III): Manures: (20:10:10) at 630 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 2.5 kg applied with the tridemorph in 200 l. Fungicides: Tridemorph at 0.52 kg. Triadimenol at 0.062 kg with tridemorph at 0.38 kg in 200 l.

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Seed: Potatoes: Pentland Crown.
W. wheat: Avalon, sown at 210 kg.
S. barley: Klaxon, sown at 160 kg.

Cultivations, etc.:-
Potatoes (Series I and II): Glyphosate applied (Series II only): 19 Sept, 1986. Ploughed (Series II only): 21 Nov. Spring-tine cultivated: 18 Feb, 1987. NPK Mg applied: 21 Apr. Oxamyl applied (Series I only), rotary cultivated, potatoes planted: 27 Apr. Rotary ridged: 15 May. Linuron applied: 25 May. Mancozeb applied: 24 June, 8 July, 26 July, 5 Aug. Pirimicarb applied: 8 July. Fentin hydroxide applied: 18 Aug, 4 Sept. Desiccant applied: 18 Sept. Haulm mechanically destroyed: 1 Oct. Lifted; (Series I): 12 Oct, (Series II): 13 Oct.
W. wheat (Series IV): Spring-tine cultivated, rotary harrowed with crumbler attached, seed sown, harrowed: 4 Dec, 1986. N applied: 5 May, 1987. Weedkillers and tridemorph applied: 29 May. Triadimenol and tridemorph applied: 4 July. Combine harvested: 15 Sept.
S. barley (Series III): Glyphosate applied: 19 Sept, 1986. Ploughed: 21 Nov. Spring-tine cultivated: 18 Feb, 1987. NPK applied, spike harrowed with crumbler attached, seed sown: 19 Mar. Clopyralid, bromoxynil, mecoprop and tridemorph applied: 29 May. Triadimenol and tridemorph applied: 4 July. Combine harvested: 21 Aug.

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87/W/CS/34

POTATOES SERIES II

TOTAL TUBERS TONNES/HECTARE

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

RATE NEMACIDE[84]	SINGLE	DOUBLE	QUAD	Mean
ALDICARB	38.4	37.7	40.7	38.9
SDS38697	29.1	38.2	38.8	35.3
SDS46995	36.1	35.2	34.8	35.4
Mean	34.5	37.0	38.1	36.5

RATE NONE 30.6

Grand mean 35.9

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

Table	NEMACIDE[84]	RATE NEMACIDE[84]	RATE & RATE NONE
s.e.d.	1.22	1.22	2.11

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	2.58	7.2

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

RATE NEMACIDE[84]	SINGLE	DOUBLE	QUAD	Mean
ALDICARB	86.3	83.8	86.0	85.4
SDS38697	85.9	85.1	84.7	85.2
SDS46995	86.6	86.0	83.8	85.5
Mean	86.2	84.9	84.8	85.3

RATE NONE 83.7

Grand mean 85.2

PLOT AREA HARVESTED 0.00130

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W. WHEAT SERIES IV

GRAIN TONNES/HECTARE

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

NEMACIDE[86]	
AL 3.3	4.39
AL 6.6	4.67
AL S 3.3	4.19
AL S 6.6	5.36
ETH 7.5	4.45
MB 5.0	4.39
MB 7.5	4.94
MB 10.0	5.39
OX 5.0	4.60
NONE	4.21
Mean	4.66

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

Table	NEMACIDE[86]
s.e.d.	0.498

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.610	13.1

GRAIN MEAN DM% 81.3

PLOT AREA HARVESTED 0.00251

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87/W/CS/34

S. BARLEY SERIES III

GRAIN TONNES/HECTARE

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

RATE NEMACIDE[85]	SINGLE	DOUBLE	QUAD	Mean
OXAMYL	5.10	4.79	4.86	4.92
SDS46995	5.16	4.96	4.88	5.00
THIODICA	4.98	4.92	5.23	5.04
Mean	5.08	4.89	4.99	4.99

RATE NONE 4.22

Grand mean 4.91

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

Table	NEMACIDE[85]	RATE NEMACIDE[85]	RATE & RATE NONE
s.e.d.	0.237	0.237	0.411

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.504	10.3

GRAIN MEAN DM% 88.1

PLOT AREA HARVESTED 0.00251

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87/R/CS/133

CONTROL OF PATHOGENS

Object: To study the effects of a range of chemicals on the incidence of pathogens and yield of continuous maize - Long Hoos VI/VII 6.

Sponsors: A.J. Barnard, D.J. Hooper, D. Hornby, R.T. Plumb.

The 14th year, forage maize.

For previous years see 74-86/R/CS/133.

Design: 3 randomised blocks of 9 plots.

Whole plot dimensions: 2.13 x 18.3.

Treatments:-

CHEM RES	Residual effect of chemicals applied annually in previous years (except as stated), none in 1987:
NONE	None (2 plots per block)
ALDICARB	Aldicarb, 4.5 kg as granules to seedbed
BENOMYL	Benomyl, 11.2 kg as dust to seedbed
DAZOMET	Dazomet, 450 kg as granules in early spring (not applied 1975, 1979, 1981 and 1986)
PERMETH	Permethrin, as foliar spray (in 1979, 1984 and 1985 only)
PHORATE	Phorate, 1.68 kg as granules to seedbed
PIRIMICA	Pirimicarb, as foliar spray (in 1979, 1984 and 1985 only)
BE+DA+PH	Benomyl + dazomet (not applied 1975, 1979, 1981, and 1986) + phorate, at above rates and times

Basal applications: Manure: 'Nitro-Chalk' at 550 kg. Weedkiller: Atrazine at 1.7 kg in 220 l.

Seed: Fronica, sown at 100,000 seeds per hectare.

Cultivations, etc.:- Ploughed: 24 Dec, 1986. N applied, spring-tine cultivated twice, seed sown: 6 May, 1987. Rolled, weedkiller applied: 7 May. Harvested by hand: 3 Nov.

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87/R/CS/133

FORAGE DRY MATTER TONNES/HECTARE

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

CHEM RES	
NONE	9.04
ALDICARB	9.30
BENOMYL	8.98
DAZOMET	10.06
PERMETH	9.05
PHORATE	9.00
PIRIMICA	8.85
BE+DA+PH	8.61
Mean	9.10

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

Table	CHEM RES	
s.e.d.	0.763	min.rep
	0.661	max-min

	CHEM RES
max-min	NONE v any of remainder
min.rep	any of remainder

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	17	0.935	10.3

FORAGE MEAN DM% 20.8

PLOT AREA HARVESTED 0.00065

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87/R/CS/140

CHEMICAL REFERENCE PLOTS

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

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

The 14th year, s. barley.

For previous years see 74-86/R/CS/140.

Design: Single replicate of 32 plots.

Whole plot dimensions: 4.06 x 4.57.

Treatments, applied cumulatively except as stated:

All combinations of:-

1.	WEEDKLLR	Weedkiller in autumn:
	NONE	None
	GLYPHOS	Glyphosate at 1.4 kg to barley stubble each autumn from 1979 to 1984 at 0.72 kg in 1985 and at 0.54 kg in 1986
2.	FUNGCIDE[1]	Fungicide in autumn:
	NONE	None
	TRIADIM	Triadimefon at 0.25 kg in autumn 1981, 1982, 1984, 1985 and 1986, 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 22 Sept, 1986 and 13 Oct respectively. Other treatments were applied on 19 Mar, 1987.

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Basal applications: Manures: (0:18:36) at 1060 kg, 'Nitro-Chalk' at 550 kg. Weedkillers: Bentazone at 0.80 kg, dichlorprop at 1.08 kg, and MCPA at 0.64 kg in 220 l applied with the fungicide. Fungicide: Tridemorph at 0.52 kg.

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

Cultivations, etc.:- PK applied: 16 Sept, 1986. Rotary cultivated: 13 Oct. Ploughed: 26 Nov. Spring-tine cultivated, seedbed treatments applied, rotary harrowed, seed sown and N applied: 19 Mar, 1987. Weedkillers and fungicide applied: 6 May. Combine harvested: 21 Aug.

GRAIN TONNES/HECTARE

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

FUNGCIDE[1]	NONE	TRIADIM	Mean
WEEDKLLR			
NONE	5.26	5.40	5.33
GLYPHOS	5.13	5.24	5.18
Mean	5.19	5.32	5.26

FUNGCIDE[2]	NONE	BENOMYL	Mean
WEEDKLLR			
NONE	5.42	5.24	5.33
GLYPHOS	5.26	5.10	5.18
Mean	5.34	5.17	5.26

FUNGCIDE[2]	NONE	BENOMYL	Mean
FUNGCIDE[1]			
NONE	5.35	5.04	5.19
TRIADIM	5.34	5.30	5.32
Mean	5.34	5.17	5.26

INSCTCDE	NONE	CHLORFEN	Mean
WEEDKLLR			
NONE	5.31	5.35	5.33
GLYPHOS	5.26	5.10	5.18
Mean	5.29	5.23	5.26

INSCTCDE	NONE	CHLORFEN	Mean
FUNGCIDE[1]			
NONE	5.31	5.08	5.19
TRIADIM	5.26	5.37	5.32
Mean	5.29	5.23	5.26

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GRAIN TONNES/HECTARE

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

INSCTCDE FUNGCIDE[2]	NONE	CHLORFEN	Mean
NONE	5.33	5.36	5.34
BENOMYL	5.24	5.09	5.17
Mean	5.29	5.23	5.26

NEMACIDE WEEDKLLR	NONE	ALDICARB	Mean
NONE	5.45	5.21	5.33
GLYPHOS	5.21	5.15	5.18
Mean	5.33	5.18	5.26

NEMACIDE FUNGCIDE[1]	NONE	ALDICARB	Mean
NONE	5.23	5.16	5.19
TRIADIM	5.42	5.21	5.32
Mean	5.33	5.18	5.26

NEMACIDE FUNGCIDE[2]	NONE	ALDICARB	Mean
NONE	5.46	5.23	5.34
BENOMYL	5.20	5.14	5.17
Mean	5.33	5.18	5.26

NEMACIDE INSCTCDE	NONE	ALDICARB	Mean
NONE	5.38	5.19	5.29
CHLORFEN	5.27	5.18	5.23
Mean	5.33	5.18	5.26

FUNGCIDE[2] WEEDKLLR FUNGCIDE[1]	NONE	BENOMYL
NONE NONE	5.41	5.11
TRIADIM	5.44	5.36
GLYPHOS NONE	5.29	4.96
TRIADIM	5.23	5.24

INSCTCDE WEEDKLLR FUNGCIDE[1]	NONE	CHLORFEN
NONE NONE	5.22	5.30
TRIADIM	5.40	5.40
GLYPHOS NONE	5.39	4.86
TRIADIM	5.13	5.34

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GRAIN TONNES/HECTARE

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

	INSCTCDE	NONE	CHLORFEN
WEEDKLLR	FUNGCIDE[2]		
NONE	NONE	5.40	5.45
	BENOMYL	5.22	5.26
GLYPHOS	NONE	5.26	5.27
	BENOMYL	5.27	4.93

	INSCTCDE	NONE	CHLORFEN
FUNGCIDE[1]	FUNGCIDE[2]		
NONE	NONE	5.39	5.31
	BENOMYL	5.23	4.85
TRIADIM	NONE	5.26	5.41
	BENOMYL	5.26	5.34

	NEMACIDE	NONE	ALDICARB
WEEDKLLR	FUNGCIDE[1]		
NONE	NONE	5.34	5.19
	TRIADIM	5.56	5.24
GLYPHOS	NONE	5.13	5.13
	TRIADIM	5.29	5.18

	NEMACIDE	NONE	ALDICARB
WEEDKLLR	FUNGCIDE[2]		
NONE	NONE	5.55	5.29
	BENOMYL	5.34	5.14
GLYPHOS	NONE	5.36	5.17
	BENOMYL	5.06	5.14

	NEMACIDE	NONE	ALDICARB
FUNGCIDE[1]	FUNGCIDE[2]		
NONE	NONE	5.50	5.20
	BENOMYL	4.96	5.11
TRIADIM	NONE	5.41	5.26
	BENOMYL	5.43	5.17

	NEMACIDE	NONE	ALDICARB
WEEDKLLR	INSCTCDE		
NONE	NONE	5.42	5.20
	CHLORFEN	5.47	5.23
GLYPHOS	NONE	5.35	5.18
	CHLORFEN	5.07	5.13

	NEMACIDE	NONE	ALDICARB
FUNGCIDE[1]	INSCTCDE		
NONE	NONE	5.35	5.26
	CHLORFEN	5.11	5.05
TRIADIM	NONE	5.42	5.11
	CHLORFEN	5.43	5.32

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GRAIN TONNES/HECTARE

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

FUNGCIDE[2]	NEMACIDE INSCTCDE	NONE	ALDICARB
NONE	NONE	5.43	5.23
	CHLORFEN	5.49	5.23
BENOMYL	NONE	5.34	5.15
	CHLORFEN	5.06	5.13

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

Margins of two factor tables	0.151
Two factor tables	0.214
Three factor tables	0.303

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

Stratum	d.f.	s.e.	cv%
WP	6	0.428	8.1

GRAIN MEAN DM% 87.6

PLOT AREA HARVESTED 0.00075

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87/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 tenth year, s. beans, w. wheat.

For previous years see 78-86/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 1987:

	1984	1985	1986
CONT W	W	W	W
FIRST W	W	BE	W
SECOND W	BE	W	W
THIRD W	W	W	W
BEANS 1	W	W	BE (duplicated)
BEANS 2	W	BE	BE

BE = s. beans, W = w. wheat

NOTE: One additional crop sequence was in s. beans 1987, yields not taken.

Standard applications:
W. wheat: Manures: Chalk at 5.0 t. 'Nitram' at 410 kg. Weedkillers: Isoproturon at 2.5 kg in 200 l. Fluroxypyr at 0.20 kg with clopyralid at 0.05 kg and bromoxynil at 0.24 kg in 500 l.

Seed: W. wheat: Avalon, sown at 180 kg.
S. beans: Minden, sown at 260 kg.

Cultivations, etc.:-
Both crops: Chalk applied: 24 Sept, 1986. Ploughed: 29 Sept. Rotary harrowed: 30 Sept.
W. wheat: Seed sown: 1 Oct, 1986. Isoproturon applied: 14 Apr, 1987. N applied: 17 Apr. Remaining weedkillers applied: 21 Apr. Combine harvested: 1 Sept.
S. beans: Rotary harrowed: 20 Mar, 1987. Seed sown: 31 Mar. Hand hoed: 27 May. Combine harvested: 21 Sept.

NOTE: Take-all was assessed in soil and in w. wheat roots.

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87/R/CS/212

GRAIN TONNES/HECTARE

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

PREVCROP	CONT W	FIRST W	SECOND W	THIRD W	BEANS 1	BEANS 2	Mean
	4.63	4.90	4.68	5.07	5.24	6.00	5.11

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

Table	PREVCROP	
s.e.d.	0.351	min.rep
	0.304	max-min

	PREVCROP
max-min	BEANS 1 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	13	0.430	8.4

GRAIN MEAN DM% 85.4

PLOT AREA HARVESTED 0.00303

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87/W/CS/245

MINIMUM CULTIVATION AND DEEP PK

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

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

The eighth year, w. wheat and w. barley.

For previous years see 80-86/W/CS/245.

Column plot dimensions: 4.27 x 57.6.

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

Treatments: All combinations of:-

Series:

1. SER CROP		Series, crops and previous cropping:
	SER1 SB1	Series I, s. barley in rotation after w. oilseed rape, w. wheat
	SER2 WW10	Series II, w. wheat, tenth cereal after a break crop
	SER3 WB10	Series III, w. barley, tenth cereal after a break crop

Column plots: All combinations (duplicated) of:

2. PK SUB		Extra PK and subsoil treatments:
	---	None, mouldboard ploughed
	--S	None, subsoiled
	PKS	PK to subsoil
3. YEAR		Years of applying PK SUB:
	1980	In autumn 1979
	1980/3/6	In autumn 1979, autumn 1982 and autumn 1985
4. DRILL		Drills and associated cultivations:
	CNVNTIAL	Mouldboard ploughed, conventionally drilled
	DIRECT	Direct drilled (duplicated) (conventionally drilled in years when factor 2 involves autumn ploughing)

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Row plots:

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

W. wheat

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

S. & W. barley

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

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

EXTRA

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

NOTES: (1) Rates of extra P and K were 500 kg P2O5, as superphosphate, 250 kg K2O as muriate of potash.
(2) Subsoiling was done with the Wye double-digger which turns a furrow with a conventional plough share, to a depth of 23 cm, and at the same time rotary cultivates the bottom of the adjacent furrow to a further depth of 15 cm. When applying P and K this was distributed ahead of the rotary cultivator.
(3) The topsoil PK dressing was equally divided before and after ploughing.
(4) Standard pathogen control in 1987 was conventional seed dressing and, on Series II only, methiocarb pellets at sowing. Enhanced pathogen control had in addition, propiconazole at 0.25 kg in 200 l applied on 29 June, 1987, and, on Series II and III only, prochloraz at 0.40 kg in 200 l applied on 27 May.
(5) All plots with the combination YEAR 1980/3/6; DRILL DIRECT were mouldboard ploughed and conventionally drilled in error in 1987.

Standard applications:
Series I, s. barley: Manures: (5:14:30) at 340 kg. Weedkillers: Paraquat at 0.40 kg ion in 200 l on two occasions. Clopyralid at 0.05 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 200 l.
Series II, w. wheat: Manures: (5:14:30) at 340 kg. Weedkillers: Paraquat at 0.40 kg ion in 200 l. Isoproturon at 1.5 kg, clopyralid at 0.05 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 240 l. Growth regulator: Chlormequat chloride at 1.1 kg in 200 l.

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87/W/CS/245

Series III, w. barley: Manures: (5:14:30) at 340 kg. Weedkillers: Paraquat at 0.40 kg ion in 200 l. Isoproturon at 1.5 kg, clopyralid at 0.05 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 240 l. Growth regulators: Mepiquat chloride at 0.61 kg, 2-chloroethylphosphonic acid at 0.31 kg applied with a wetting agent ('Citowett' at 0.8 l) in 200 l.

Seed: Series I, s. barley: Klaxon, sown at 160 kg.
Series II, w. wheat: Avalon, with methiocarb pellets, sown at 200 kg.
Series III: W. barley: Igri, sown at 180 kg.

Cultivations, etc.:-
Series I, s. barley: Straw burnt: 8 Sept, 1986. Heavy spring-tine cultivated: 9 Sept. Ploughed treatment applied: 12 Sept. These plots disced twice: 18 Sept. These plots rolled: 19 Sept. Disced: 27 Sept. Spike harrowed with crumbler attached: 2 Oct. Rolled: 3 Oct. Paraquat applied: 3 Nov, 16 Mar, 1987. Spike harrowed with crumbler attached, seed sown, NPK applied: 16 Mar. N treatments applied: 1 May. Clopyralid, bromoxynil and mecoprop applied: 27 May. Combine harvested: 8 Sept.
Series II, w. wheat: Straw burnt: 8 Sept, 1986. Heavy spring-tine cultivated: 9 Sept. Ploughed treatment applied: 12-15 Sept. These plots disced four times: 18 Sept. These plots rolled: 19 Sept. Disced: 27 Sept. Rotary harrowed: 2 Oct. Rolled: 3 Oct. Paraquat applied: 3 Nov. Seed sown, NPK applied, harrowed: 7 Nov. Isoproturon, clopyralid, bromoxynil and mecoprop applied: 27 Apr. N treatments applied: 1 May. Growth regulator applied: 27 May. Combine harvested: 14 Sept.
Series III, w. barley: Straw burnt: 8 Sept, 1986. Heavy spring-tine cultivated: 9 Sept. Ploughed treatment applied: 15 Sept. These plots disced twice: 18 Sept. These plots rolled: 19 Sept. Disced: 27 Sept. Spike harrowed with crumbler attached: 2 Oct. Rolled: 3 Oct. Paraquat applied: 3 Nov. Seed sown, NPK applied, harrowed: 5 Dec. Isoproturon, clopyralid, bromoxynil and mecoprop applied: 27 Apr, 1987. N treatments applied: 1 May. Growth regulators applied: 27 May. Combine harvested: 10 Sept.

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87/W/CS/245 SPRING BARLEY SERIES I

GRAIN TONNES/HECTARE

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

PK SUB N PATH	---	--S	PKS	Mean
75 ENHD	5.11	4.67	4.13	4.63
150 ENHD	4.71	4.07	4.48	4.42
150/225E	4.64	4.41	4.33	4.46
150 STND	4.27	4.23	3.56	4.02
Mean	4.68	4.35	4.12	4.38

YEAR N PATH	1980	1980/3/6	Mean
75 ENHD	5.13	4.14	4.63
150 ENHD	4.49	4.35	4.42
150/225E	4.70	4.22	4.46
150 STND	4.05	3.99	4.02
Mean	4.59	4.18	4.38

YEAR PK SUB	1980	1980/3/6	Mean
---	4.72	4.64	4.68
--S	4.81	3.89	4.35
PKS	4.24	4.01	4.12
Mean	4.59	4.18	4.38

DRILL N PATH	CNVNTIAL	DIRECT	Mean
75 ENHD	4.23	4.84	4.63
150 ENHD	4.23	4.52	4.42
150/225E	4.03	4.67	4.46
150 STND	3.86	4.10	4.02
Mean	4.09	4.53	4.38

DRILL PK SUB	CNVNTIAL	DIRECT	Mean
---	4.42	4.81	4.68
--S	3.86	4.59	4.35
PKS	3.99	4.19	4.12
Mean	4.09	4.53	4.38

DRILL YEAR	CNVNTIAL	DIRECT	Mean
1980	4.39	4.69	4.59
1980/3/6	3.78	4.37	4.18
Mean	4.09	4.53	4.38

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87/W/CS/245 SPRING BARLEY SERIES I

GRAIN TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1980/3/6	1980	1980/3/6	1980	1980/3/6
N PATH						
75 ENHD	5.05	5.16	5.52	3.83	4.81	3.44
150 ENHD	4.73	4.69	4.26	3.89	4.47	4.48
150/225E	4.70	4.57	5.16	3.66	4.24	4.43
150 STND	4.42	4.13	4.29	4.17	3.45	3.68

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
75 ENHD	4.27	5.52	4.57	4.72	3.86	4.26
150 ENHD	4.61	4.76	3.62	4.30	4.46	4.49
150/225E	4.31	4.80	3.66	4.79	4.12	4.44
150 STND	4.49	4.17	3.58	4.56	3.51	3.59

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	4.89	5.25	3.58	4.42
150 ENHD	4.26	4.60	4.20	4.43
150/225E	4.55	4.77	3.51	4.58
150 STND	3.87	4.14	3.85	4.07

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	4.58	4.80	4.26	4.83
--S	4.45	4.99	3.27	4.20
PKS	4.15	4.29	3.82	4.10

PK SUB	---			
YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	4.62	5.27	3.92	5.78
150 ENHD	4.74	4.73	4.49	4.79
150/225E	4.78	4.65	3.84	4.94
150 STND	4.19	4.53	4.79	3.80

PK SUB	--S			
YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	5.81	5.37	3.33	4.08
150 ENHD	3.52	4.63	3.73	3.97
150/225E	4.40	5.54	2.92	4.04
150 STND	4.07	4.41	3.09	4.71

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87/W/CS/245 SPRING BARLEY SERIES I

GRAIN TONNES/HECTARE

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

PK SUB YEAR DRILL N PATH	PKS 1980 CNVNTIAL	DIRECT	1980/3/6 CNVNTIAL	DIRECT
75 ENHD	4.24	5.10	3.47	3.42
150 ENHD	4.54	4.44	4.38	4.53
150/225E	4.47	4.12	3.77	4.76
150 STND	3.36	3.49	3.67	3.68

N PATH EXTRA	75 ENHD	150 ENHD	150/225E	150 STND	Mean
TPK 80 D	5.03	5.47	5.44	3.93	4.97
TPK 80 C	4.48	3.93	4.35	4.82	4.40
Mean	4.75	4.70	4.90	4.38	4.68

N PATH	PK SUB	YEAR DRILL	1980 CNVNTIAL	DIRECT	1980/3/6 CNVNTIAL	DIRECT
75 ENHD	---		4.62	5.27	3.92	5.78
	--S		5.81	5.37	3.33	4.08
	PKS		4.24	5.10	3.47	3.42
150 ENHD	---		4.74	4.73	4.49	4.79
	--S		3.52	4.63	3.73	3.97
	PKS		4.54	4.44	4.38	4.53
150/225E	---		4.78	4.65	3.84	4.94
	--S		4.40	5.54	2.92	4.04
	PKS		4.47	4.12	3.77	4.76
150 STND	---		4.19	4.53	4.79	3.80
	--S		4.07	4.41	3.09	4.71
	PKS		3.36	3.49	3.67	3.68

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

Table	EXTRA	PK SUB	YEAR	DRILL	
s.e.d.	0.568	0.232	0.189	0.201	
Table	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL	
s.e.d.	0.365	0.298	0.328	0.316	
Table	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
s.e.d.	0.402	0.328			min rep
	0.348	0.284	0.894	0.516	max-min
	0.284	0.232			max rep
Table	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
s.e.d.	0.632	0.516	0.568	0.894	min rep
	0.547	0.447	0.492	0.774	max-min
	0.447	0.365	0.402	0.632	max rep

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GRAIN TONNES/HECTARE

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

* Within the same level of N PATH only

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

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

Stratum	d.f.	s.e.	cv%
WP1	6	0.402	9.1
WP1.WP2	18	0.563	12.8

GRAIN MEAN DM% 80.0

SUB PLOT AREA HARVESTED 0.00341

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87/W/CS/245 WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB N PATH	---	--S	PKS	Mean
75 ENHD	4.13	3.78	3.94	3.95
150 ENHD	4.66	4.43	4.56	4.55
225 ENHD	5.27	4.94	5.07	5.09
150 STND	3.77	3.62	3.30	3.56
Mean	4.46	4.19	4.22	4.29

YEAR N PATH	1980	1980/3/6	Mean
75 ENHD	3.87	4.03	3.95
150 ENHD	4.37	4.73	4.55
225 ENHD	4.85	5.34	5.09
150 STND	3.10	4.02	3.56
Mean	4.05	4.53	4.29

YEAR PK SUB	1980	1980/3/6	Mean
---	4.39	4.52	4.46
--S	3.91	4.47	4.19
PKS	3.84	4.60	4.22
Mean	4.05	4.53	4.29

DRILL N PATH	CNVNTIAL	DIRECT	Mean
75 ENHD	3.93	3.96	3.95
150 ENHD	4.52	4.56	4.55
225 ENHD	5.18	5.05	5.09
150 STND	4.07	3.31	3.56
Mean	4.43	4.22	4.29

DRILL PK SUB	CNVNTIAL	DIRECT	Mean
---	4.38	4.49	4.46
--S	4.42	4.08	4.19
PKS	4.48	4.08	4.22
Mean	4.43	4.22	4.29

DRILL YEAR	CNVNTIAL	DIRECT	Mean
1980	4.54	3.80	4.05
1980/3/6	4.32	4.63	4.53
Mean	4.43	4.22	4.29

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87/W/CS/245 WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1980/3/6	1980	1980/3/6	1980	1980/3/6
N PATH						
75 ENHD	4.04	4.21	3.69	3.87	3.86	4.02
150 ENHD	4.71	4.61	4.31	4.55	4.09	5.02
225 ENHD	5.15	5.39	4.71	5.17	4.70	5.45
150 STND	3.67	3.86	2.94	4.30	2.69	3.90

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
75 ENHD	3.94	4.22	3.83	3.76	4.04	3.89
150 ENHD	4.42	4.78	4.47	4.41	4.66	4.50
225 ENHD	5.20	5.30	5.22	4.80	5.13	5.05
150 STND	3.97	3.67	4.16	3.35	4.09	2.90

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	4.05	3.77	3.82	4.14
150 ENHD	4.48	4.32	4.56	4.81
225 ENHD	5.53	4.51	4.84	5.59
150 STND	4.09	2.61	4.06	4.00

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	4.71	4.23	4.05	4.75
--S	4.47	3.63	4.37	4.53
PKS	4.42	3.54	4.54	4.63

PK SUB	---			
YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	4.07	4.03	3.80	4.42
150 ENHD	4.53	4.81	4.32	4.75
225 ENHD	6.00	4.72	4.40	5.89
150 STND	4.26	3.38	3.67	3.96

PK SUB	--S			
YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	3.89	3.60	3.77	3.92
150 ENHD	4.65	4.14	4.30	4.68
225 ENHD	5.30	4.41	5.14	5.19
150 STND	4.06	2.38	4.27	4.31

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87/W/CS/245 WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB YEAR DRILL N PATH	PKS 1980 CNVNTIAL	DIRECT	1980/3/6 CNVNTIAL	DIRECT
75 ENHD	4.20	3.69	3.88	4.09
150 ENHD	4.25	4.02	5.07	4.99
225 ENHD	5.29	4.40	4.96	5.69
150 STND	3.93	2.07	4.25	3.73

N PATH EXTRA	75 ENHD	150 ENHD	225 ENHD	150 STND	Mean
TPK 80 D	4.37	4.80	4.93	3.53	4.41
TPK 80 C	4.02	4.16	5.10	4.36	4.41
Mean	4.19	4.48	5.01	3.95	4.41

N PATH	PK SUB	YEAR DRILL	1980 CNVNTIAL	DIRECT	1980/3/6 CNVNTIAL	DIRECT
75 ENHD	---		4.07	4.03	3.80	4.42
	--S		3.89	3.60	3.77	3.92
	PKS		4.20	3.69	3.88	4.09
150 ENHD	---		4.53	4.81	4.32	4.75
	--S		4.65	4.14	4.30	4.68
	PKS		4.25	4.02	5.07	4.99
225 ENHD	---		6.00	4.72	4.40	5.89
	--S		5.30	4.41	5.14	5.19
	PKS		5.29	4.40	4.96	5.69
150 STND	---		4.26	3.38	3.67	3.96
	--S		4.06	2.38	4.27	4.31
	PKS		3.93	2.07	4.25	3.73

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

Table	EXTRA	PK SUB	YEAR	DRILL	
s.e.d.	0.860	0.351	0.287	0.304	
Table	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL	
s.e.d.	0.408	0.333	0.496	0.354	
Table	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
s.e.d.	0.608	0.496			min rep
	0.527	0.430	1.000	0.578	max-min
	0.430	0.351			max rep
Table	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
s.e.d.	0.707	0.576	0.860	1.000	min rep
	0.613	0.500	0.745	0.866	max-min
	0.500	0.408	0.608	0.707	max rep

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87/W/CS/245 WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

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

* Within the same level of N PATH only

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

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

Stratum	d.f.	s.e.	cv%
WP1	6	0.608	14.1
WP1.WP2	18	0.418	9.7

GRAIN MEAN DM% 80.0

SUB PLOT AREA HARVESTED 0.00341

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87/W/CS/245 WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB N PATH	---	--S	PKS	Mean
75 ENHD	4.13	4.47	4.78	4.46
150 ENHD	5.35	5.41	5.48	5.41
150/225E	5.34	5.31	5.40	5.35
150 STND	4.52	4.53	4.46	4.51
Mean	4.83	4.93	5.03	4.93

YEAR N PATH	1980	1980/3/6	Mean
75 ENHD	4.41	4.50	4.46
150 ENHD	5.50	5.32	5.41
150/225E	5.59	5.11	5.35
150 STND	4.57	4.44	4.51
Mean	5.02	4.84	4.93

YEAR PK SUB	1980	1980/3/6	Mean
---	5.02	4.65	4.83
--S	5.05	4.81	4.93
PKS	4.98	5.07	5.03
Mean	5.02	4.84	4.93

DRILL N PATH	CNVNTIAL	DIRECT	Mean
75 ENHD	4.46	4.46	4.46
150 ENHD	5.18	5.53	5.41
150/225E	4.96	5.55	5.35
150 STND	4.14	4.69	4.51
Mean	4.68	5.06	4.93

DRILL PK SUB	CNVNTIAL	DIRECT	Mean
---	4.52	4.99	4.83
--S	4.75	5.02	4.93
PKS	4.77	5.16	5.03
Mean	4.68	5.06	4.93

DRILL YEAR	CNVNTIAL	DIRECT	Mean
1980	4.62	5.22	5.02
1980/3/6	4.74	4.90	4.84
Mean	4.68	5.06	4.93

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87/W/CS/245 WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1980/3/6	1980	1980/3/6	1980	1980/3/6
N PATH						
75 ENHD	3.89	4.36	4.61	4.32	4.73	4.83
150 ENHD	5.42	5.28	5.57	5.25	5.52	5.43
150/225E	5.87	4.82	5.50	5.13	5.40	5.39
150 STND	4.92	4.12	4.51	4.56	4.28	4.64

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
75 ENHD	4.29	4.04	4.49	4.45	4.59	4.88
150 ENHD	4.83	5.60	5.39	5.43	5.31	5.56
150/225E	4.92	5.56	4.87	5.53	5.09	5.55
150 STND	4.05	4.76	4.25	4.67	4.10	4.64

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	4.42	4.41	4.49	4.51
150 ENHD	5.11	5.70	5.25	5.36
150/225E	4.95	5.91	4.97	5.18
150 STND	4.02	4.84	4.25	4.54

YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	4.77	5.15	4.28	4.83
--S	4.52	5.31	4.99	4.73
PKS	4.59	5.18	4.95	5.13

PK SUB	---			
YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	4.43	3.63	4.15	4.46
150 ENHD	5.06	5.60	4.60	5.61
150/225E	5.24	6.18	4.60	4.93
150 STND	4.34	5.21	3.76	4.31

PK SUB	--S			
YEAR	1980		1980/3/6	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	4.46	4.69	4.53	4.22
150 ENHD	4.99	5.86	5.79	4.99
150/225E	4.75	5.87	4.99	5.19
150 STND	3.86	4.83	4.64	4.52

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87/W/CS/245 WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB / YEAR / DRILL / N PATH	PKS 1980 CNVNTIAL	PKS 1980 DIRECT	1980/3/6 CNVNTIAL	1980/3/6 DIRECT
75 ENHD	4.39	4.90	4.79	4.85
150 ENHD	5.28	5.64	5.34	5.48
150/225E	4.85	5.68	5.32	5.42
150 STND	3.84	4.49	4.36	4.79

N PATH / EXTRA	75 ENHD	150 ENHD	150/225E	150 STND	Mean
TPK 80 D	4.87	5.89	6.34	5.01	5.53
TPK 80 C	4.16	4.72	4.77	4.37	4.50
Mean	4.51	5.30	5.56	4.69	5.02

N PATH	PK SUB	YEAR / DRILL	1980 CNVNTIAL	1980 DIRECT	1980/3/6 CNVNTIAL	1980/3/6 DIRECT
75 ENHD	---		4.43	3.63	4.15	4.46
	--S		4.46	4.69	4.53	4.22
	PKS		4.39	4.90	4.79	4.85
150 ENHD	---		5.06	5.60	4.60	5.61
	--S		4.99	5.86	5.79	4.99
	PKS		5.28	5.64	5.34	5.48
150/225E	---		5.24	6.18	4.60	4.93
	--S		4.75	5.87	4.99	5.19
	PKS		4.85	5.68	5.32	5.42
150 STND	---		4.34	5.21	3.76	4.31
	--S		3.86	4.83	4.64	4.52
	PKS		3.84	4.49	4.36	4.79

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

Table	EXTRA	PK SUB	YEAR	DRILL	
s.e.d.	0.438	0.179	0.146	0.155	
Table	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL	
s.e.d.	0.250	0.204	0.253	0.216	
Table	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
s.e.d.	0.310	0.253			min rep
	0.268	0.219	0.611	0.353	max-min
	0.219	0.179			max rep
Table	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
s.e.d.	0.432	0.354	0.438	0.611	min rep
	0.374	0.306	0.379	0.529	max-min
	0.306	0.250	0.310	0.432	max rep

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87/W/CS/245 WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

* Within the same level of N PATH only

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

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

Stratum	d.f.	s.e.	cv%
WP1	6	0.310	6.3
WP1.WP2	18	0.348	7.0

GRAIN MEAN DM% 83.1

SUB PLOT AREA HARVESTED 0.00341

https://doi.org/10.23637/ERADOC-1-37 *pp 112*

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87/W/CS/273

INTENSIVE POTATOES

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

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

The sixth year, s. barley, potatoes.

For previous years see 82-86/W/CS/273.

Design: In the sixth year: 2 randomised blocks of 4 plots split into 8.

Whole plot dimensions: 9.00 x 24.7.

Treatments: All combinations of:-

Whole plots

1. VAR SEQ — Sequence of potato varieties in 1983, 1985 and 1987, all s. barley in 1982, 1984 and 1986:

	1983	1985	1987
D P D	Desiree	Maris Piper	Desiree
D D D	Desiree	Desiree	Desiree
D O D	Desiree	None (s. barley)	Desiree
O O D	None (s. barley)	None (s. barley)	Desiree

Sub plots, two replicates of:-

2. SD TREAT — Seed treatment:

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

3. NEMACIDE — Nematicide:

NONE	None
OXAMYL	Oxamyl at 5.0 kg worked in to seedbed

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

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

6 July	12
10 July	12
Total	24

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87/W/CS/273

Standard applications:
Potatoes: Manures: (0:18:36) at 420 kg, (10:10:15+4.5 Mg) at 2900 kg. Weedkiller: Linuron at 1.6 kg in 200 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions, with the pirimicarb on the second. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.
S. barley: Manure: 'Nitram' at 230 kg. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.19 kg in 200 l.

Seed: Potatoes: Desiree, phorate applied at planting.
S. barley: Triumph, dressed triadimenol and fuberidazole, sown at 160 kg.

Cultivations, etc.:-
Potatoes: PK applied: 29 Jan, 1987. Ploughed: 11 Mar. NPK Mg applied: 22 Apr. Subsoiled with 25 cm wide wings on tines 38 cm deep and 66 cm apart, oxamyl applied and rotary cultivated: 23 Apr. Potatoes planted: 24 Apr. Rotary ridged: 15 May. Linuron applied: 22 May. Mancozeb applied: 24 June, 26 July, 5 Aug. Mancozeb applied with pirimicarb: 8 July. Fentin hydroxide applied: 18 Aug, 4 Sept. Desiccant applied: 18 Sept. Haulm mechanically destroyed: 1 Oct. Lifted: 2 Oct.
S. barley: Deep-tine cultivated: 30 Jan, 1987. Ploughed: 11 Mar. Subsoiled with 25 cm wide wings on tines 38 cm deep and 66 cm apart: 23 Apr. Spike harrowed with crumbler attached, seed sown: 30 Apr. N applied: 6 May. Fungicides applied: 3 July. Combine harvested: 10 Sept.

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

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87/W/CS/273

TOTAL TUBERS TONNES/HECTARE

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

SD TREAT VAR SEQ	NONE	TOL+PRO	Mean
D P D	43.0	43.1	43.1
D D D	44.6	43.7	44.2
D O D	50.7	42.7	46.7
O O D	58.4	59.4	58.9
Mean	49.2	47.2	48.2

NEMACIDE VAR SEQ	NONE	OXAMYL	Mean
D P D	37.0	49.1	43.1
D D D	34.8	53.5	44.2
D O D	37.6	55.8	46.7
O O D	57.3	60.4	58.9
Mean	41.7	54.7	48.2

NEMACIDE SD TREAT	NONE	OXAMYL	Mean
NONE	42.4	55.9	49.2
TOL+PRO	41.0	53.5	47.2
Mean	41.7	54.7	48.2

SD TREAT	NONE		TOL+PRO	
NEMACIDE	NONE	OXAMYL	NONE	OXAMYL
VAR SEQ				
D P D	37.9	48.1	36.1	50.2
D D D	33.9	55.2	35.8	51.7
D O D	40.7	60.6	34.4	51.0
O O D	56.9	59.8	57.8	61.1

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

Table	SD TREAT	NEMACIDE	VAR SEQ* SD TREAT
s.e.d.	1.16	1.16	2.31

Table	VAR SEQ* NEMACIDE	SD TREAT NEMACIDE	VAR SEQ* SD TREAT NEMACIDE
s.e.d.	2.31	1.64	3.27

* Within the same level of VAR SEQ only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	44	4.63	9.6

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87/W/CS/273

PERCENTAGE WARE 4.44CM (1.75 INCH) RIDDLE

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

SD TREAT	NONE	TOL+PRO	Mean
VAR SEQ			
D P D	62.3	67.4	64.9
D D D	66.0	64.1	65.1
D O D	73.3	64.0	68.6
O O D	79.7	77.7	78.7
Mean	70.3	68.3	69.3

NEMACIDE	NONE	OXAMYL	Mean
VAR SEQ			
D P D	59.3	70.4	64.9
D D D	56.0	74.2	65.1
D O D	60.8	76.4	68.6
O O D	78.2	79.2	78.7
Mean	63.6	75.0	69.3

NEMACIDE	NONE	OXAMYL	Mean
SD TREAT			
NONE	64.8	75.9	70.3
TOL+PRO	62.4	74.2	68.3
Mean	63.6	75.0	69.3

SD TREAT	NONE		TOL+PRO	
NEMACIDE	NONE	OXAMYL	NONE	OXAMYL
VAR SEQ				
D P D	59.1	65.6	59.6	75.2
D D D	55.3	76.8	56.6	71.6
D O D	66.5	80.0	55.2	72.8
O O D	78.2	81.1	78.1	77.3

PLOT AREA HARVESTED 0.00075

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87/R/CS/302

EYESPOT RESISTANCE TO MBC

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

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

The third years, w. wheat.

For previous years see 85-86/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 and 1986 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 500 l on 12 Nov, 1986 repeated in 200 l on 14 Apr, 1987.
(2) The eyespot inoculum was colonised on oat seed and this was broadcast in October, 1984.

Basal applications: Manures: 'Nitram' at 590 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg with clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l.

Seed: Avalon, sown at 180 kg.

Cultivations, etc.:- Heavy spring-tine cultivated twice: 27 Aug, 1986. Paraquat applied: 18 Sept. Disced, rotary harrowed, seed sown: 30 Sept. Remaining weedkillers applied: 16 Apr, 1987. N applied: 17 Apr. Combine harvested: 1 Sept.

NOTE: Yields were not taken. Eyespot and sharp eyespot were assessed in April and July. Eyespot was characterized according to type and MBC resistance.

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87/R/CS/309 and 87/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, D.G. Christian, M.J. Goss, R.J. Gutteridge, S.H.T. Harper, J.F. Jenkyn, A.E. Johnston, B.R. Kerry, R. Moffitt, W. Powell, A.D. Todd.

Associate sponsors: D.S. Powlson, A.J. Thomasson.

The third year, w. wheat.

For previous years see 85-86/R&W/CS/309.

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

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

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

1.	STRAW	Treatments to straw from previous wheat:
	BURNT	Burnt
	CHOPPED	Chopped and spread (duplicated)
2.	CULTIVTN	Cultivations:
	TINE 10	Tine cultivated to 10 cm depth
	TN10PL20	Tine cultivated to 10 cm depth, ploughed to 20 cm
	TN10TN20	Tine cultivated to 10 cm depth and again to 20 cm
	PLOUGH20	Ploughed to 20 cm depth

NOTES: (1) Straw was chopped by trailed straw chopper and spread on 20 Aug, 1986 (R), 4 Sept (W) and burnt 2-4 Sept (R), 5 Sept (W).

(2) A heavy spring-tine cultivator was used to cultivate to 10 cm depth, on 27 Aug, 28 Aug (R), 5 Sept, 18 Sept (W). A chisel plough was used to cultivate to 20 cm depth, on 28 Aug (R) and a deep-tine cultivator to 20 cm on 15 Sept (W).

(3) Ploughed plots were ploughed to 20 cm depth on: Chopped plots 28 Aug (R), burnt plots 4 Sept (R), 19 Sept (W).

(4) In error five plots of STRAW BURNT at Rothamsted were heavy spring-tine cultivated to 10 cm on 27 Aug before burning. Two were combinations with CULTIVTN TN10PL20 the others were combinations with CULTIVTN TINE 10, TN10TN20 and PLOUGH20. All were subsequently burnt with a flame gun on 4 Sept. Combinations with CULTIVTN TN10PL20 and with PLOUGH20 were ploughed, with TINE 10 heavy spring-tine cultivated and with TN10TN20 deep-tine cultivated on 8 Sept.

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87/R/CS/309 and 87/W/CS/309

Basal applications:
Great Knott III (R): Manures: 'Nitram' at 130 kg followed by 580 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 1.8 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg with carbendazim at 0.15 kg. Propiconazole at 0.12 kg in 200 l. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l.
Far Field I (W): Manures: 'Nitram' at 120 kg followed by 600 kg. Weedkillers: Tri-allate (as 'Avadex BW' at 4.2 l) in 250 l. Isoproturon at 2.0 kg, clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 240 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 200 l. Propiconazole at 0.12 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 200 l.

Seed: Great Knott III (R) and Far Field I (W): Mission, sown at 190 kg.

Cultivations, etc.:-
Great Knott III (R): Paraquat applied: 27 Sept, 1986. Rolled: 29 Sept. Disced: 1 Oct. Rotary harrowed, seed sown, harrowed: 6 Oct. Rolled: 8 Oct. N applied: 19 Mar, 1987 and 18 Apr. Isoproturon applied: 31 Mar. Clopyralid, bromoxynil, mecoprop, prochloraz and carbendazim applied: 18 Apr. Propiconazole applied: 28 May. Propiconazole, carbendazim and maneb applied: 30 June. Combine harvested: 17 Aug.
Far Field I (W): Disced: 29 Sept, 1986. Rolled: 1 Oct. Rotary cultivated with crumbler attached, seed sown: 8 Oct. Rolled: 9 Oct. Tri-allate applied, harrowed: 10 Oct. N applied: 31 Mar, 1987 and 16 Apr. Isoproturon, clopyralid, bromoxynil and mecoprop applied: 17 Apr. Prochloraz and carbendazim applied: 7 May. Propiconazole and tridemorph applied: 5 June. Propiconazole, carbendazim and maneb applied: 30 June. Combine harvested: 18 Sept.

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

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

GRAIN TONNES/HECTARE

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

CULTIVTN	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
STRAW					
BURNT	6.04	5.92	5.67	6.36	6.00
CHOPPED	6.24	5.80	5.48	5.86	5.84
Mean	6.17	5.84	5.54	6.03	5.89

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

Table	STRAW	CULTIVTN	STRAW CULTIVTN	
s.e.d.			0.401	min.rep
	0.174	0.232	0.347	max-min
			0.284	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	0.567	9.6

GRAIN MEAN DM% 85.8

PLOT AREA HARVESTED 0.00648

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

GRAIN TONNES/HECTARE

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

CULTIVTN	TINE 10	TN10PL20	TN10TN20	PLOUGH20	Mean
STRAW					
BURNT	4.34	3.78	4.17	3.90	4.05
CHOPPED	4.80	3.75	4.45	3.63	4.16
Mean	4.64	3.76	4.36	3.72	4.12

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

Table	STRAW	CULTIVTN	STRAW CULTIVTN	
s.e.d.			0.561	min.rep
	0.243	0.324	0.486	max-min
			0.397	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	0.561	13.6

GRAIN MEAN DM% 82.8

PLOT AREA HARVESTED 0.00884

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87/R/CS/311

EFFECTS OF SHALLOW STRAW INCORPORATION

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

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

The third year, w. wheat.

For previous years see 85-86/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 8 Sept, 1986
BALED	Baled and removed on 21 Aug
CHOPPED	Chopped on 21 Aug
2. CULTTIME	Time of cultivation, to 10 cm depth:
EARLY	Cultivated by rotary grubber on 9 Sept, 1986
LATER	Cultivated by rotary grubber on 26 Sept

Sub plots

3. AUT N	Autumn N as 'Nitram' applied just before cultivation:
0	None
50	50 kg N on 9 Sept, 1986 (CULTTIME EARLY), 25 Sept (CULTTIME LATER)
4. FUNGCIDE	Fungicides:
0	None
FULL	Full programme:- Triadimefon at 0.125 kg and carbendazim at 0.25 kg in 500 l on 14 Apr, 1987 Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l on 27 Apr Propiconazole at 0.125 kg in 200 l on 28 May Propiconazole at 0.125 kg with carbendazim at 0.25 kg and maneb at 1.5 kg in 200 l on 23 June
5. INSCTCDE	Insecticide:
0	None
PIR	Pirimicarb at 0.14 kg in 200 l on 23 June, 1987

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87/R/CS/311

6. MOLLCIDE — Molluscicide:

0	None
METHCARB	Methiocarb at 0.22 kg, as pellets, broadcast on 29 Sept, 1986

Basal applications: Manures: 'Nitram' at 130 kg and later at 590 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Clopyralid at 0.05 kg and bromoxynil at 0.24 kg with mecoprop at 1.8 kg in 200 l.

Seed: Mission, sown at 190 kg.

Cultivations, etc.:- Paraquat applied: 3 Oct, 1986. Rotary harrowed: 6 Oct. Seed sown: 7 Oct. First N applied: 19 Mar, 1987. Isoproturon applied: 31 Mar. Second N, clopyralid, bromoxynil and mecoprop applied: 18 Apr. Combine harvested: 19 Aug.

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

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87/R/CS/311

GRAIN TONNES/HECTARE

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

CULTTIME	EARLY	LATER	Mean
STRAW			
BURNT	6.19	6.10	6.14
BALED	6.78	6.83	6.81
CHOPPED	6.82	5.89	6.36
Mean	6.60	6.28	6.44

AUT N	0	50	Mean
STRAW			
BURNT	6.07	6.21	6.14
BALED	6.68	6.93	6.81
CHOPPED	6.41	6.31	6.36
Mean	6.39	6.48	6.44

AUT N	0	50	Mean
CULTTIME			
EARLY	6.54	6.65	6.60
LATER	6.23	6.32	6.28
Mean	6.39	6.48	6.44

MOLLCIDE	0	METHCARB	Mean
STRAW			
BURNT	6.00	6.29	6.14
BALED	6.69	6.92	6.81
CHOPPED	6.42	6.30	6.36
Mean	6.37	6.50	6.44

MOLLCIDE	0	METHCARB	Mean
CULTTIME			
EARLY	6.46	6.73	6.60
LATER	6.28	6.27	6.28
Mean	6.37	6.50	6.44

MOLLCIDE	0	METHCARB	Mean
AUT N			
0	6.39	6.39	6.39
50	6.35	6.62	6.48
Mean	6.37	6.50	6.44

FUNGCIDE	0	FULL	Mean
STRAW			
BURNT	5.86	6.43	6.14
BALED	6.43	7.18	6.81
CHOPPED	6.03	6.68	6.36
Mean	6.11	6.77	6.44

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87/R/CS/311

GRAIN TONNES/HECTARE

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

FUNGCIDE	0	FULL	Mean
CULTTIME			
EARLY	6.32	6.88	6.60
LATER	5.90	6.65	6.28
Mean	6.11	6.77	6.44

FUNGCIDE	0	FULL	Mean
AUT N			
0	6.09	6.68	6.39
50	6.12	6.85	6.48
Mean	6.11	6.77	6.44

FUNGCIDE	0	FULL	Mean
MOLLCIDE			
0	5.99	6.75	6.37
METHCARB	6.23	6.78	6.50
Mean	6.11	6.77	6.44

INSCTCDE	0	PIR	Mean
STRAW			
BURNT	5.99	6.29	6.14
BALED	6.78	6.83	6.81
CHOPPED	6.27	6.45	6.36
Mean	6.35	6.52	6.44

INSCTCDE	0	PIR	Mean
CULTTIME			
EARLY	6.51	6.69	6.60
LATER	6.19	6.36	6.28
Mean	6.35	6.52	6.44

INSCTCDE	0	PIR	Mean
AUT N			
0	6.29	6.48	6.39
50	6.40	6.57	6.48
Mean	6.35	6.52	6.44

INSCTCDE	0	PIR	Mean
MOLLCIDE			
0	6.18	6.56	6.37
METHCARB	6.51	6.49	6.50
Mean	6.35	6.52	6.44

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87/R/CS/311

GRAIN TONNES/HECTARE

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

INSCTCDE	0	PIR	Mean
FUNGCIDE			
0	6.05	6.17	6.11
FULL	6.65	6.88	6.77
Mean	6.35	6.52	6.44

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

Table	AUT N	FUNGCIDE	INSCTCDE	MOLLCIDE
s.e.d.	0.105	0.105	0.105	0.105

Table	STRAW* AUT N	CULTTIME* AUT N	STRAW* FUNGCIDE	CULTTIME* FUNGCIDE
s.e.d.	0.183	0.149	0.183	0.149

Table	AUT N FUNGCIDE	STRAW* INSCTCDE	CULTTIME* INSCTCDE	AUT N INSCTCDE
s.e.d.	0.149	0.183	0.149	0.149

Table	FUNGCIDE INSCTCDE	STRAW* MOLLCIDE	CULTTIME* MOLLCIDE	AUT N MOLLCIDE
s.e.d.	0.149	0.183	0.149	0.149

Table	FUNGCIDE MOLLCIDE	INSCTCDE MOLLCIDE
s.e.d.	0.149	0.149

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

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

Stratum	d.f.	s.e.	cv%
WP.SP	20	0.365	5.7

GRAIN MEAN DM% 84.2

SUB PLOT AREA HARVESTED 0.00288

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87/R/CS/312

STRAW DECOMPOSITION

Object: To test the effects of two basidiomycetes on the decomposition of wheat straw from a preceding crop and on the establishment and yield of a following crop - West Barnfield I.

Sponsor: S.H.T. Harper.

The third year, w. wheat.

For previous years see 85-86/R/CS/312.

Design: 4 randomised blocks of 4 plots.

Whole plot area: 4.5 x 12.0.

Treatments: All combinations of treatments applied to chopped straw in the field, cumulative to applications in the first year:

1. TREATMNT[1] Treatment one:

NONE	None
BASID 1	Basidiomycete 1, cumulative to whey at 15 kg in 1985 and 1986

2. TREATMNT[2] Treatment two:

NONE	None
BASID 2	Basidiomycete 2, cumulative to a fungal accelerator in 1985 and 1986

NOTES: (1) Basidiomycetes 1 and 2 were naturally occurring fungi found in soil at Rothamsted and Woburn respectively.
(2) The basidiomycete fungus was colonised on wheat seed and this was spread on the surface at 1 seed per square cm on 25 Sept, 1986.
(3) Straw was chopped by a trailed straw chopper and incorporated to a depth of about 10 cm by a rotary grubber.

Basal applications: Manures: 'Nitram' at 130 kg and later at 590 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Clopyralid at 0.05 kg and bromoxynil at 0.24 kg with mecoprop at 1.8 kg in 200 l. Fungicides: Triadimefon at 0.12 kg and carbendazim at 0.25 kg in 200 l. Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg in 200 l. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.5 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg in 200 l. Molluscicide: Methiocarb at 0.22 kg.

Seed: Mission, sown at 190 kg.

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87/R/CS/312

Cultivations, etc.:- Straw chopped: 21 Aug, 1986. Cultivated with rotary grubber: 26 Sept. Methiocarb applied: 29 Sept. Paraquat applied: 3 Oct. Rotary harrowed: 6 Oct. Seed sown: 7 Oct. First N applied: 19 Mar, 1987. Isoproturon applied: 31 Mar. Triadimefon and carbendazim applied: 14 Apr. Second N, clopyralid, bromoxynil and mecoprop applied: 18 Apr. Prochloraz and carbendazim applied: 27 Apr. Propiconazole applied: 28 May. Propiconazole with carbendazim and maneb applied, insecticide applied separately: 23 June. Combine harvested: 19 Aug.

NOTE: Samples of straw were taken throughout the season for observations on the rate of decomposition.

GRAIN TONNES/HECTARE

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

TREATMNT[2] / TREATMNT[1]	NONE	BASID 2	Mean
NONE	6.85	6.54	6.70
BASID 1	6.68	6.28	6.48
Mean	6.76	6.41	6.59

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

Table	TREATMNT[1]	TREATMNT[2]	TREATMNT[1] TREATMNT[2]
s.e.d.	0.258	0.258	0.364

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.515	7.8

GRAIN MEAN DM% 83.2

PLOT AREA HARVESTED 0.00288

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87/W/CS/316

VARIETIES AND PCN TOLERANCE

Object: To study the effects of a range of populations of potato cyst nematode (PCN) on varieties differing in susceptibility - Woburn, Horsepool.

Sponsor: A.G. Whitehead.

The third year, potatoes.

For previous years see 85-86/W/CS/316.

Design: 3 randomised blocks of 32 plots.

Whole plot dimensions: 2.84 x 6.10.

Treatments: All combinations of:-

1. VARIETY[85] Potato varieties in 1985 (to establish different populations of PCN):

CARA	Cara
CROWN	Pentland Crown
CA CR	Cara plants alternating with Pentland Crown plants within the ridges
CA CA CR	Two Cara plants alternating with one Pentland Crown plant within the ridges

2. VARIETY[87] Potato varieties in 1987 (all fallow in 1986):

CROWN	Pentland Crown
DELL	Pentland Dell
DESIREE	Desiree
PIPER	Maris Piper

3. NEMACIDE[87] Nematicide applied to seedbed in 1987:

NONE	None
OXAMYL	Oxamyl at 5 kg

Basal applications: Manures: (10:10:15+4.5 Mg) at 2500 kg. Weedkiller: Linuron at 1.6 kg in 200 l. Fungicides: Mancozeb at 1.4 kg on four occasions in 200 l, with the insecticide on the second. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.

Cultivations, etc.:- Deep-tine cultivated: 16 Feb, 1987. NPK Mg applied: 16 Apr. Oxamyl applied, rotary cultivated, potatoes planted: 23 Apr. Rotary ridged: 15 May. Weedkiller applied: 25 May. Mancozeb applied: 24 June, 26 July, 5 Aug. Mancozeb and pirimicarb applied: 8 July. Fentin hydroxide applied: 18 Aug, 4 Sept. Desiccant applied: 18 Sept. Haulm mechanically destroyed: 30 Sept. Lifted: 19 Oct.

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NOTES: (1) Soil samples were taken before nematicide was applied and after harvest for cyst and egg counts of Globodera pallida.
(2) The weight of one plot was not recorded, with treatment combination CA CR, DESIREE and NONE. An estimated value was used in the analysis.

TOTAL TUBERS TONNES/HECTARE

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

VARIETY[87] VARIETY[85]	CROWN	DELL	DESIREE	PIPER	Mean
CARA	61.8	48.6	53.8	63.9	57.0
CROWN	39.1	27.6	31.9	47.5	36.5
CA CR	54.7	38.2	44.6	54.4	48.0
CA CA CR	57.3	39.2	43.2	54.8	48.6
Mean	53.3	38.4	43.4	55.1	47.5

NEMACIDE[87] VARIETY[85]	NONE	OXAMYL	Mean
CARA	54.4	59.7	57.0
CROWN	20.8	52.2	36.5
CA CR	37.5	58.4	48.0
CA CA CR	39.2	58.1	48.6
Mean	38.0	57.1	47.5

NEMACIDE[87] VARIETY[87]	NONE	OXAMYL	Mean
CROWN	44.4	62.1	53.3
DELL	25.8	51.0	38.4
DESIREE	33.9	52.9	43.4
PIPER	47.9	62.4	55.1
Mean	38.0	57.1	47.5

VARIETY[85]	NEMACIDE[87] VARIETY[87]	NONE	OXAMYL
CARA	CROWN	57.5	66.1
	DELL	44.4	52.7
	DESIREE	52.6	55.1
	PIPER	63.0	64.7
CROWN	CROWN	22.7	55.5
	DELL	9.9	45.3
	DESIREE	17.3	46.6
	PIPER	33.5	61.4
CA CR	CROWN	47.3	62.2
	DELL	21.7	54.7
	DESIREE	32.3	56.9
	PIPER	48.9	59.8
CA CA CR	CROWN	50.0	64.7
	DELL	27.3	51.1
	DESIREE	33.5	52.9
	PIPER	46.0	63.7

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

Table	VARIETY[85]	VARIETY[87]	NEMACIDE[87]	VARIETY[85] VARIETY[87]
s.e.d.	1.58	1.58	1.12	3.15

Table	VARIETY[85] NEMACIDE[87]	VARIETY[87] NEMACIDE[87]	VARIETY[85] VARIETY[87] NEMACIDE[87]
s.e.d.	2.23	2.23	4.46

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	61	5.46	11.5

PERCENTAGE WARE 4.44CM (1.75 INCH) RIDDLE

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

VARIETY[87] VARIETY[85]	CROWN	DELL	DESIREE	PIPER	Mean
CARA	92.8	87.0	91.1	87.1	89.5
CROWN	86.1	72.2	80.0	88.1	81.6
CA CR	92.4	71.7	90.2	89.4	85.9
CA CA CR	93.2	81.2	90.1	87.5	88.0
Mean	91.1	78.0	87.9	88.0	86.3

NEMACIDE[87] VARIETY[85]	NONE	OXAMYL	Mean
CARA	89.5	89.5	89.5
CROWN	71.3	92.0	81.6
CA CR	80.9	90.9	85.9
CA CA CR	85.1	91.0	88.0
Mean	81.7	90.8	86.3

NEMACIDE[87] VARIETY[87]	NONE	OXAMYL	Mean
CROWN	87.9	94.4	91.1
DELL	66.3	89.7	78.0
DESIREE	83.1	92.6	87.9
PIPER	89.4	86.7	88.0
Mean	81.7	90.8	86.3

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PERCENTAGE WARE 4.44CM (1.75 INCH) RIDDLE

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

VARIETY[85]	NEMACIDE[87] VARIETY[87]	NONE	OXAMYL
CARA	CROWN	92.5	93.0
	DELL	84.5	89.6
	DESIREE	91.7	90.4
	PIPER	89.2	85.0
CROWN	CROWN	77.2	95.0
	DELL	54.3	90.2
	DESIREE	66.5	93.6
	PIPER	87.2	89.1
CA CR	CROWN	90.0	94.9
	DELL	54.6	88.8
	DESIREE	87.7	92.8
	PIPER	91.6	87.2
CA CA CR	CROWN	92.0	94.5
	DELL	71.9	90.4
	DESIREE	86.6	93.7
	PIPER	89.7	85.4

PLOT AREA HARVESTED 0.00087

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87/R/CS/320

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 5.

Sponsors: J. McEwen, D.P. Yeoman, A.E. Johnston, R.J. Darby.

The second year, w. wheat, s. wheat.

For previous year see 86/R/CS/320.

Design: 3 randomised blocks of 10 plots split into 2.

Whole plot dimensions: 2.5 x 8.0.

Treatments: All combinations of:-

Whole plots

1. PREVCROP	Crops in 1986:	
W BEANS	W. field beans, Vicia faba	
W OATS	W. oats	
W RAPE	W. oilseed rape	
W PEAS	W. peas, Pisum sativum	
W WHEAT	W. wheat	
S BEANS	S. field beans, Vicia faba	
S LUPINS	S. lupins, Lupinus albus	
S PEAS	S. peas, Pisum sativum	
SNFLOWER	Sunflower	
FALLOW	Fallow	

Sub plots

2. SPRING N	Nitrogen fertilizer applied on 10 Apr, 1987:
0	None
N	Applied, amount depending on quantity in crop and soil in spring

NOTES: (1) Amounts of N applied (kg N) as 'Nitro-Chalk' were:

After PREVCROP	W RAPE, S PEAS, FALLOW	190
	W BEANS	200
	S BEANS, SUNFLOWERS	210
	W OATS, W WHEAT	230
	W PEAS, S LUPINS	240

(2) W. wheat after PREVCROP S LUPINS failed and was resown to s. wheat.

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87/R/CS/320

Standard applications:
After all treatments except after lupins: Weedkillers: Terbutryne at 2.8 kg with paraquat at 0.40 kg ion in 220 l. Isoproturon at 2.1 kg (2.5 kg after s. beans and sunflowers) with mecoprop at 2.8 l (2.0 l after s. beans and sunflowers) in 220 l. Cyanazine at 0.35 kg, clopyralid at 0.06 kg and mecoprop at 1.7 l in 220 l applied with the fungicides. Fungicides: Prochloraz at 0.40 kg, carbendazim at 0.15 kg.
After lupins: Weedkillers: Bentazone at 0.80 kg, dichlorprop at 1.1 kg and MCPA at 0.64 kg in 220 l applied with the fungicide. Fungicide: Tridemorph at 0.52 Kg.

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

Cultivations, etc.:-
After w. beans, w. oats, w. rape, w. peas, w. wheat and s. peas. Deep-tine cultivated, rotary cultivated: 13 Aug, 1986 (after w. oats, w. rape, w. peas and fallow only). Shallow-tine cultivated, rotary cultivated: 15 Aug (after w. wheat only). Shallow-tine cultivated: 1 Sept (after s. peas only). Spring-tine cultivated: 11 Sept (after w. beans only). Rotary cultivated: 1 Sept (11 Sept after w. beans). Power harrowed, seed sown, rolled: 23 Sept. Terbutryne and paraquat applied: 24 Sept. Isoproturon and mecoprop applied: 29 Oct and 2 Apr, 1987. Cyanazine, clopyralid, mecoprop and fungicides applied: 16 Apr. Combine harvested: 1 Sept.
After s. beans and sunflowers: Spring-tine cultivated, rotary cultivated: 2 Oct, 1986 (after s. beans only). Ploughed: 13 Oct. Spring-tine cultivated, seed sown, rolled, terbutryne and paraquat applied: 14 Oct. Isoproturon and mecoprop applied: 2 Apr, 1987. Cyanazine, clopyralid, mecoprop, prochloraz and carbendazim applied: 16 Apr. Combine harvested: 1 Sept.
After lupins: W. wheat sown, spring-tine cultivated: 4 Dec, 1986. Spring-tine cultivated, s. wheat sown, rolled: 31 Mar, 1987. Bentazone, dichlorprop, MCPA and tridemorph applied: 19 May. Combine harvested: 10 Sept.

NOTES: (1) Take-all was assessed in mid July.
(2) Amounts of ammonium and nitrate nitrogen in the soil were measured in autumn and late winter.
(3) N contents of grain were measured.
(4) The wrong rate of SPRING N was applied to two plots, those with treatment combinations S PEAS 0 and SNFLOWER N. Estimated values were used in the analysis.

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87/R/CS/320

W. WHEAT (S. WHEAT AFTER S. LUPINS)

GRAIN TONNES/HECTARE

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

SPRING N / PREVCROP	0	N	Mean
W BEANS	3.53	8.10	5.82
W OATS	2.18	8.13	5.16
W RAPE	4.10	8.63	6.37
W PEAS	3.28	7.83	5.56
W WHEAT	2.50	6.73	4.62
S BEANS	3.98	7.89	5.93
S LUPINS	3.26	4.93	4.09
S PEAS	3.43	7.88	5.65
SNFLOWER	2.71	7.78	5.24
FALLOW	5.28	7.94	6.61
Mean	3.42	7.59	5.50

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

Table	PREVCROP	SPRING N	PREVCROP SPRING N
s.e.d.	0.349	0.188	0.546
Except when comparing means with the same level(s) of PREVCROP			0.593

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.428	7.8
BLOCK.WP.SP	18	0.726	13.2

GRAIN MEAN DM% 83.2

PLOT AREA HARVESTED 0.00055

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87/W/CS/322

EFFECTS OF GLOBODERA PALLIDA

Object: To study the residual effects of a range of potato varieties differing in susceptibility to Globodera pallida and of nematicides on the numbers of Globodera pallida and on the yield of a susceptible variety grown in the second year - Far Field II.

Sponsor: A.G. Whitehead.

The second year, potatoes.

For first year see 86/W/P/3.

Design: 3 randomised blocks of 32 plots.

Whole plot dimensions: 3.0 x 4.57.

Treatments: All combinations of:-

1. VARIETY[86] Varieties in 1986, all Pentland Crown in 1987:

12290 AF	12290 AF20
A 25/11	A 25/11
CARA	Cara
CROMWELL	Cromwell
DESIREE	Desiree
DIANA	Diana
HEATHER	Heather
KIRSTY	Kirsty
MARFONA	Marfona
MORAG	Morag
PIPER	Maris Piper
ROMANO	Romano
SANTE	Sante
ZB 35/29	ZB 35/29

2. OXAMYL[86] Oxamyl (kg) in 1986, none in 1987:

0.0
5.6

plus four extra treatments:

VAR NEM[86] Varieties and nematicides in 1986, Pentland Crown, no nematicide in 1987:

CARA ALD	Cara with slow-release aldicarb at 5.6 kg
CARA CAR	Cara with carbofuran at 5.6 kg
PIPR ALD	Maris Piper with slow-release aldicarb at 5.6 kg
PIPR CAR	Maris Piper with carbofuran at 5.6 kg

Basal applications: Manures: (10:10:15+4.5 Mg) at 2290 kg. Weedkiller: Linuron at 1.6 kg in 200 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions with the pirimicarb on the second occasion. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.

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Cultivations, etc.:- Deep-tine cultivated: 30 Jan, 1987 and 16 Feb. NPK Mg applied: 22 Apr. Rotary cultivated and potatoes planted: 28 Apr. Rotary ridged: 15 May. Weedkiller applied: 18 May. Mancozeb applied: 24 June, 26 July, 5 Aug. Mancozeb and pirimicarb applied: 8 July. Fentin hydroxide applied: 18 Aug, 4 Sept. Desiccant applied: 18 Sept. Haulm mechanically destroyed: 1 Oct. Lifted: 7 Oct.

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

TOTAL TUBERS TONNES/HECTARE

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

OXAMYL[86]	0.0	5.6	Mean
VARIETY[86]			
12290 AF	45.7	58.7	52.2
A 25/11	55.1	59.5	57.3
CARA	36.9	55.2	46.0
CROMWELL	46.8	57.7	52.3
DESIREE	42.3	52.3	47.3
DIANA	37.5	56.7	47.1
HEATHER	52.0	62.7	57.3
KIRSTY	42.9	54.7	48.8
MARFONA	45.1	55.0	50.1
MORAG	53.1	58.5	55.8
PIPER	44.3	54.2	49.2
ROMANO	46.1	59.1	52.6
SANTE	46.6	55.1	50.8
ZB 35/29	54.5	55.1	54.8
Mean	46.3	56.8	51.5

VAR NEM[86]	CARA ALD	CARA CAR	PIPR ALD	PIPR CAR	Mean
	55.8	42.6	61.1	43.5	50.8

Grand mean 51.4

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

Table	VAR NEM[86]	VARIETY[86]	OXAMYL[86]	VARIETY[86] OXAMYL[86]
s.e.d.	3.80	2.69	1.02	3.80

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	62	4.66	9.1

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87/W/CS/322

PERCENTAGE WARE 4.44CM (1.75 INCH) RIDDLE

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

OXAMYL[86]	0.0	5.6	Mean
VARIETY[86]			
12290 AF	95.4	95.0	95.2
A 25/11	94.9	95.3	95.1
CARA	93.2	95.7	94.4
CROMWELL	96.0	95.4	95.7
DESIREE	94.6	96.0	95.3
DIANA	92.6	95.9	94.2
HEATHER	96.0	95.8	95.9
KIRSTY	94.2	95.0	94.6
MARFONA	94.5	95.3	94.9
MORAG	96.0	96.2	96.1
PIPER	94.0	95.8	94.9
ROMANO	95.8	96.7	96.2
SANTE	95.2	95.5	95.3
ZB 35/29	96.0	96.5	96.2
Mean	94.9	95.7	95.3

VAR NEM[86]	CARA ALD	CARA CAR	PIPR ALD	PIPR CAR	Mean
	95.5	94.2	96.2	94.5	95.1

Grand mean 95.3

PLOT AREA HARVESTED 0.00070

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87/R/CS/324

COMPARISON OF COMBINABLE CROPS

Object: To compare yields and other attributes of a range of combinable crops and to study their effects on a following crop of w. wheat - Long Hoos VI/VII 2.

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

The first year, w. oats, w. oilseed rape, w. peas, w. wheat, s. beans, s. lupins, s. peas, sunflowers and fallow.

Design: 3 randomised blocks of 10 plots.

Whole plot dimensions: 2.5 x 8.0.

Treatments:

CROP	Crops:
W OATS	W. oats
W RAPE	W. oilseed rape
W PEAS	W. peas, Pisum sativum
W WHEAT	W. wheat
S BEANS	S. field beans, Vicia faba
S LUPINS	S. lupins, Lupinus albus
S PEAS	S. peas, Pisum sativum
SNFLOWER	Sunflower

NOTE: Two plots in each block were fallowed, one of them after w. beans which failed.

Standard applications:-

All crops and fallow: Manures: Muriate of potash at 520 kg.

W. oats: Manure: N at 120 kg as 'Nitro-Chalk'. Weedkillers: Terbutryne at 1.5 kg with paraquat at 0.40 kg ion in 220 l. Cyanazine at 0.35 kg, clopyralid at 0.06 kg, mecoprop at 1.7 kg in 220 l applied with the fungicides. Fungicides: Prochloraz at 0.40 kg, carbendazim at 0.15 kg.

W. rape: Manure: N at 200 kg as 'Nitro-Chalk'. Weedkillers: Fluazifop-butyl at 0.25 kg in 220 l. Propyzamide and clopyralid applied twice (as 'Matrikerb' at 1.6 kg) in 220 l. Insecticide: Deltamethrin at 0.075 kg in 220 l on two occasions. Fungicide: Prochloraz at 0.50 kg in 220 l. Desiccant: Diquat at 0.40 kg ion in 220 l.

W. peas: Weedkillers: Paraquat at 0.40 kg ion. Trietazine at 1.2 kg with simazine at 0.17 kg in 220 l. Insecticides: Cypermethrin at 0.025 kg in 220 l applied twice, pirimicarb at 0.14 kg in 220 l. Fungicide: Benomyl at 0.55 kg applied with the pirimicarb. Desiccant: Diquat at 0.40 kg ion in 220 l.

W. wheat: Manure: N at 230 kg as 'Nitro-Chalk'. Weedkillers: Terbutryne at 2.8 kg with paraquat at 0.40 kg ion in 220 l. Isoproturon at 2.5 kg with mecoprop at 2.0 kg in 220 l. Cyanazine at 0.35 kg, clopyralid at 0.06 kg with mecoprop at 1.7 kg in 220 l applied with the fungicides. Fungicides: Prochloraz at 0.40 kg, carbendazim at 0.15 kg.

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Standard applications cont'd:-
S. beans, s. peas and s. lupins: Weedkillers: Paraquat at 0.40 kg ion in 220 l. Insecticides: Cypermethrin at 0.025 kg in 220 l applied twice, pirimicarb at 0.14 kg in 220 l. Fungicide: Benomyl at 0.55 kg applied with the pirimicarb.
S. beans and s. peas: Weedkillers: Trietazine at 1.2 kg with simazine 0.17 kg in 220 l.
S. lupins: Weedkillers: Paraquat at 0.33 kg ion with monolinuron at 0.46 kg in 220 l. Metamitron at 2.8 kg in 220 l.
Sunflowers: Manures: N at 70 kg as 'Nitro-Chalk'. Weedkillers: Paraquat at 0.40 kg ion in 220 l. Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l.
W. beans: Weedkiller: Paraquat at 0.40 kg ion in 220 l. Trietazine at 1.2 kg with simazine at 0.17 kg in 220 l. Insecticide: Cypermethrin at 0.025 kg in 220 l applied twice.
Fallow plots only: Paraquat at 0.40 kg ion in 220 l.

Seed: W. oats: Bulwark, sown at 180 kg.
W. rape: Ariana, sown at 8 kg.
W. peas: Frijaune, sown at 220 kg.
W. wheat: Avalon, sown at 200 kg.
S. beans: Minden, sown at 280 kg.
S. lupins: Vladimir, sown at 220 kg.
S. peas: Progreta, sown at 220 kg.
Sunflowers: Asmer 9, sown at 10 kg.

Cultivations, etc.:-
All plots: Shallow rotary cultivated: 19 Aug, 1986. K applied: 20 Aug. Ploughed, furrow pressed: 22 Aug.
W. oats: Spring-tine cultivated, seed sown, rolled, terbutryne and paraquat applied: 6 Oct, 1986. N applied: 8 Apr, 1987. Cyanazine, clopyralid, mecoprop, prochloraz and carbendazim applied: 16 Apr. Combine harvested: 10 Sept.
W. rape: Seed sown: 27 Aug. Fluazifop-butyl applied: 3 Oct. Deltamethrin applied: 14 Oct and 20 Nov. Propyzamide and clopyralid applied: 29 Oct and 6 Jan, 1987. Prochloraz applied: 17 Nov, 1986. N applied: 20 Feb, 1987. Diquat applied: 10 Aug. Combine harvested: 17 Aug.
W. peas: Spring-tine cultivated: 6 Oct, 1986. Paraquat applied: 29 Oct. Seed sown: 12 Nov. Trietazine and simazine applied: 18 Nov. Cypermethrin applied: 8 May, 1987 and 11 June. Pirimicarb and benomyl applied: 13 July. Diquat applied: 10 Aug. Combine harvested: 18 Aug.
W. wheat: Power harrowed, seed sown, rolled: 23 Sept, 1986. Terbutryne and paraquat applied: 24 Sept. Isoproturon and mecoprop applied: 29 Oct. N applied: 8 Apr, 1987. Cyanazine, clopyralid, mecoprop, prochloraz and carbendazim applied: 16 Apr. Combine harvested: 1 Sept.
S. beans and s. peas: Spring-tine cultivated: 6 Oct, 1986. Paraquat applied: 29 Oct. Seed sown: 18 Mar, 1987. Trietazine and simazine applied: 19 Mar. Cypermethrin applied: 8 May and 11 June. Benomyl and pirimicarb applied: 13 July. Combine harvested: S. beans 11 Sept, s. peas 14 Sept.
S. lupins: Spring-tine cultivated: 6 Oct, 1986. Paraquat applied: 29 Oct. Rotary cultivated, seed sown, rolled, monolinuron and paraquat applied: 16 Apr, 1987. Cypermethrin applied: 8 May and 11 June. Metamitron applied: 18 June. Benomyl and pirimicarb applied: 13 July. Combine harvested: 17 Nov.

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Cultivations cont'd, etc.:-
Sunflowers: Spring-tine cultivated: 6 Oct, 1986. Paraquat applied: 29 Oct. N applied, trifluralin applied, spring-tine cultivated twice and seed sown: 30 Apr, 1987. Rolled: 5 May. Linuron applied: 6 May. Harvested by hand and one plot stationary combine harvested: 28 Oct.
W. beans, later fallowed: Spring-tine cultivated: 6 Oct, 1986. Paraquat applied: 29 Oct. Seed sown: 4 Dec. Trietazine and simazine applied: 10 Dec. Cypermethrin applied: 8 May, 1987 and 11 June. Spring-tine cultivated, rotary cultivated: 29 June.
Fallow: Spring-tine cultivated: 6 Oct, 1986. Paraquat applied: 29 Oct. Spring-tine cultivated, rotary cultivated: 29 June, 1987. Previous crops: Potatoes 1985, s. barley 1986.

NOTE: Two sunflower plot yields were lost because of bird damage. Estimated values were used in the analysis.

VARIOUS CROPS

GRAIN TONNES/HECTARE

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

CROP	
W OATS	4.31
W RAPE	2.12
W PEAS	1.29
W WHEAT	7.35
S BEANS	5.22
S LUPINS	0.93
S PEAS	2.73
SNFLOWER	0.91
Mean	3.11

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

Table	CROP
s.e.d.	0.507

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	0.621	20.0

GRAIN MEAN DM% 77.1

SUB PLOT AREA HARVESTED
W. OATS, W. RAPE, W. WHEAT 0.00124
W. PEAS, S. BEANS, S. LUPINS, S.PEAS, SNFLOWER 0.00115

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87/R/CS/326 and 87/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 first year, w. wheat.

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):

		R	W
NONE	None	-	-
NORMAL	Normal	5.8	4.3
2 NORMAL	Twice normal	11.6	8.6
4 NORMAL	Four times normal	23.2	17.3

NOTES: (1) Straw was chopped by trailed straw chopper and spread on 20 Aug, 1986 (R), 4 Sept (W). Straw treatments were applied on 22 Aug (R), 8 Sept (W).
(2) At Rothamsted straw was incorporated by 'N.I.A.E. Mixaplough' on 29 Aug. At Woburn it was deep-tine cultivated in to 20 cm twice on 15 Sept, heavy spring-tine cultivated to 10 cm and disced three times on 18 Sept and disced twice on 29 Sept.

Basal applications:
Great Knott III (R): Manures: 'Nitram' at 130 kg followed by 590 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Clopyralid at 0.05 kg, bromoxynil at 0.24 kg with mecoprop at 1.8 kg in 200 l. Fungicides: Propiconazole at 0.12 kg in 200 l. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l.
Far Field I (W): Manures: 'Nitram' at 120 kg followed by 600 kg. Weedkillers: Tri-allate (as 'Avadex BW' at 4.2 l) in 250 l. Isoproturon at 2.0 kg with clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 240 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.52 kg in 200 l. Propiconazole at 0.12 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 200 l.

Seed: Great Knott III (R) and Far Field I (W): Mission, sown at 190 kg.

Cultivations, etc.:-
Great Knott III (R): Paraquat applied: 27 Sept, 1986. Rolled: 29 Sept. Disced: 1 Oct. Rotary harrowed, seed sown and harrowed: 6 Oct. N applied: 19 Mar, 1987, 18 Apr. Isoproturon applied: 31 Mar. Clopyralid, bromoxynil and mecoprop applied: 18 Apr. Propiconazole applied: 28 May. Propiconazole, carbendazim and maneb applied: 30 June. Combine harvested: 19 Aug. Previous crops: W. wheat 1985 and 1986.

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87/R/CS/326 and 87/W/CS/326

Cultivations, etc.:-
Far Field I (W): Rotary cultivated with crumbler attached, seed sown: 8 Oct, 1986. Rolled: 9 Oct. Tri-allate applied, harrowed: 10 Oct. N applied: 31 Mar, 1987, 16 Apr. Isoproturon, clopyralid, bromoxynil and mecoprop applied: 17 Apr. Propiconazole and tridemorph applied: 5 June. Propiconazole, carbendazim and maneb applied: 30 June. Combine harvested: 7 Sept. Previous crops: W. wheat 1985 and 1986.

NOTES: (1) Establishment counts were made in autumn and measurements were made of total dry matter in spring.
(2) Foliar diseases and foot and root rots were assessed in summer.

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GRAIN TONNES/HECTARE

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

STRAW	NONE	NORMAL	2 NORMAL	4 NORMAL	Mean
	4.95	4.77	4.62	5.05	4.85

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

Table	STRAW
s.e.d.	0.155

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.219	4.5

GRAIN MEAN DM% 82.8

PLOT AREA HARVESTED 0.00324

87/W/CS/326

GRAIN TONNES/HECTARE

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

STRAW	NONE	NORMAL	2 NORMAL	4 NORMAL	Mean
	2.93	2.88	3.01	2.43	2.81

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

Table	STRAW
s.e.d.	0.209

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.256	9.1

GRAIN MEAN DM% 75.2 PLOT AREA HARVESTED 0.00442

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87/W/CS/328

DEEP-WORKED SOIL AND PCN

Object: To study the effects of deep working of soil, on a site infested with potato cyst-nematode (PCN), on varieties resistant or susceptible to PCN, with and without a nematicide - Stackyard A II.

Sponsor: A.G. Whitehead.

The first year, potatoes.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 3.0 x 8.0.

Treatments: All combinations of:-

1. SOIL TRT	Soil treatment:	
	NONE	None
	SUBSOIL	Subsoiled, with 25 cm wide wings on tines 38 cm deep and 66 cm apart, on 23 Apr, 1987
2. NEMACIDE	Nematicides:	
	NONE	None
	OXAMYL	Oxamyl at 5.5 kg worked into seedbed on 27 Apr
3. VARIETY	Varieties:	
	CARA	Cara
	DESIREE	Desiree

NOTE: The experiment was sited on Series III of W/CS/35 (see 86/W/CS/35). Series II was planted to uniform Desiree potatoes for fresh tests of the above treatments in 1988.

Basal applications: Series II and III: Manures: (10:10:15+4.5Mg) at 2290 kg. Weedkillers: Sodium trichloroacetate at 38 kg in 240 l. EPTC at 4.5 kg in 240 l. Linuron at 1.6 kg in 200 l. Fungicides: Mancozeb at 1.4 kg on four occasions in 200 l, applied with the pirimicarb on the second. Fentin hydroxide at 0.28 kg on two occasions in 200 l. Desiccant: Diquat at 0.80 kg ion in 200 l.

Cultivations, etc.:- Series II and III: Sodium trichloroacetate applied, spring-tine cultivated twice: 13 Nov, 1986. Spring-tine cultivated: 18 Feb, 1987. NPK Mg applied: 21 Apr. EPTC applied, rotary cultivated, potatoes planted: 29 Apr. Rotary ridged: 15 May. Linuron applied: 22 May. Mancozeb applied: 22 June, 26 July and 5 Aug. Mancozeb and pirimicarb applied: 8 July. Fentin hydroxide applied: 18 Aug and 4 Sept. Desiccant applied: 18 Sept. Haulm mechnically destroyed: 1 Oct. Lifted: 14 Oct.

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

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87/W/CS/328

TOTAL TUBERS TONNES/HECTARE

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

NEMACIDE SOIL TRT	NONE	OXAMYL	Mean
NONE	15.7	27.7	21.7
SUBSOIL	16.8	38.8	27.8
Mean	16.2	33.2	24.7

VARIETY SOIL TRT	CARA	DESIREE	Mean
NONE	28.1	15.3	21.7
SUBSOIL	35.7	19.8	27.8
Mean	31.9	17.6	24.7

VARIETY NEMACIDE	CARA	DESIREE	Mean
NONE	27.5	5.0	16.2
OXAMYL	36.3	30.2	33.2
Mean	31.9	17.6	24.7

SOIL TRT	VARIETY NEMACIDE	CARA	DESIREE
NONE	NONE	25.8	5.6
	OXAMYL	30.4	25.0
SUBSOIL	NONE	29.2	4.3
	OXAMYL	42.2	35.4

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

Table	SOIL TRT	NEMACIDE	VARIETY	SOIL TRT NEMACIDE
s.e.d.	1.63	1.63	1.63	2.30

Table	SOIL TRT VARIETY	NEMACIDE VARIETY	SOIL TRT NEMACIDE VARIETY
s.e.d.	2.30	2.30	3.25

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	3.98	16.1

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87/W/CS/328

PERCENTAGE WARE 4CM (1.57 INCH) RIDDLE

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

NEMACIDE	NONE	OXAMYL	Mean
SOIL TRT			
NONE	67.4	76.4	71.9
SUBSOIL	72.8	85.3	79.0
Mean	70.1	80.8	75.5

VARIETY	CARA	DESIREE	Mean
SOIL TRT			
NONE	83.3	60.5	71.9
SUBSOIL	88.9	69.2	79.0
Mean	86.1	64.8	75.5

VARIETY	CARA	DESIREE	Mean
NEMACIDE			
NONE	89.1	51.1	70.1
OXAMYL	83.1	78.6	80.8
Mean	86.1	64.8	75.5

VARIETY	CARA	DESIREE
SOIL TRT NEMACIDE		
NONE NONE	88.0	46.8
NONE OXAMYL	78.7	74.1
SUBSOIL NONE	90.3	55.4
SUBSOIL OXAMYL	87.5	83.0

PLOT AREA HARVESTED 0.00120

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87/R/WW/1

WINTER WHEAT

VARIETIES

Object: To study a selection of newer varieties of w. wheat on land in rotation (pathogen free) and after wheat (pathogen infected) - Great Knott I (pathogen free RH) and Highfield VI (pathogen infected RD).

Sponsors: R. Moffitt, R.J. Gutteridge.

Design: Two randomised blocks of 2 whole plots split into (RH) 11, (RD) 13.

Sub plot dimensions: 3.0 x 12.0.

Treatments: All combinations of:-

Whole plots

1.	INSCTCDE	Insecticide:
	NONE	None
	PIRIMICA	Pirimicarb at 0.14 kg in 200 l on 23 June, 1987

Sub plots

2.	VARIETY	Varieties:
	AVALON	Avalon (on RH only)
	AVALON A	Avalon (grown after Avalon, RD only)
	AVALON N	Avalon (grown after Norman, RD only)
	BRIMSTON	Brimstone
	FORTRESS	Fortress
	GALAHAD	Galahad
	HORNET	Hornet
	MERCIA	Mercia
	MISSION	Mission
	NORMAN	Norman (on RH only)
	NORMAN A	Norman (grown after Avalon, RD only)
	NORMAN N	Norman (grown after Norman, RD only)
	PARADE	Parade
	RAPIER	Rapier
	RENDEZVO	Rendezvous

NOTES: (1) A planned test of urea was not applied.
(2) A further experiment on a pathogen free site at Woburn was not sown because of unsuitable conditions.

Basal applications:
Great Knott I (RH): Manures: 'Nitram' at 380 kg. Weedkillers: Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 200 l. Fungicides: Propiconazole at 0.25 kg with tridemorph at 0.19 kg in 200 l.
Highfield VI (RD): Manures: 'Nitram' at 590 kg. Weedkillers: Isoproturon at 2.5 kg with clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.5 kg in 200 l.

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Seed: Varieties sown at 190 kg on both sites.

Cultivations, etc.:-
Great Knott I (RH): Heavy spring-tine cultivated: 17 Oct, 1986. Rotary harrowed, seed sown: 30 Oct. N applied: 16 Apr, 1987. Weedkillers applied: 6 May. Fungicides applied: 29 June. Combine harvested: 31 Aug. Previous crops: S. beans 1985, potatoes 1986.
Highfield VI (RD): Ploughed: 1 Oct, 1986. Disced twice: 14 Oct. Rotary harrowed, seed sown: 17 Oct. N applied, weedkillers applied: 15 Apr, 1987. Prochloraz and carbendazim applied: 5 May. Propiconazole, carbendazim and maneb applied: 29 June. Combine harvested: 1 Sept. Previous crops: Potatoes 1985, w. wheat 1986.

NOTES: (1) Foot and roots rots were assessed in June on Highfield VI (RD).
(2) One plot with treatment combination BRIMSTON NONE on the Highfield site was treated as missing because of severe lodging. An estimated value was used in the analysis.

87/R/WW/1 GREAT KNOTT I (RH)

GRAIN TONNES/HECTARE

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

INSCTCDE / VARIETY	NONE	PIRIMICA	Mean
AVALON	8.35	7.75	8.05
BRIMSTON	9.44	9.51	9.47
FORTRESS	8.89	9.25	9.07
GALAHAD	9.06	9.29	9.17
HORNET	9.41	9.62	9.52
MERCIA	8.75	9.04	8.89
MISSION	8.20	8.15	8.17
NORMAN	8.27	8.61	8.44
PARADE	8.95	8.98	8.97
RAPIER	9.37	9.64	9.51
RONDEZVO	9.07	9.43	9.25
Mean	8.89	9.02	8.96

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

Table	VARIETY	INSCTCDE* VARIETY
s.e.d.	0.148	0.209

* Within the same level of INSCTCDE only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.209	2.3

GRAIN MEAN DM% 81.8

PLOT AREA HARVESTED 0.00245

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87/R/WW/1 HIGHFIELD (RD)

GRAIN TONNES/HECTARE

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

INSCTCDE VARIETY	NONE	PIRIMICA	Mean
AVALON A	7.82	8.00	7.91
AVALON N	7.87	8.13	8.00
BRIMSTON	5.52	8.34	6.93
FORTRESS	8.49	8.93	8.71
GALAHAD	8.95	8.93	8.94
HORNET	9.05	9.36	9.20
MERCIA	8.37	8.64	8.51
MISSION	7.05	7.07	7.06
NORMAN A	8.52	8.55	8.53
NORMAN N	8.16	8.51	8.34
PARADE	8.42	8.98	8.70
RAPIER	7.89	8.13	8.01
RONDEZVO	7.62	8.53	8.08
Mean	7.98	8.47	8.22

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

Table	VARIETY	INSCTCDE* VARIETY
s.e.d.	0.342	0.483

* Within the same level of INSCTCDE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	23	0.483	5.9

GRAIN MEAN DM% 82.8

PLOT AREA HARVESTED 0.00244

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87/R/WW/3

WINTER WHEAT

FACTORS AFFECTING TILLERING AND YIELD

Object: To study the effects of soil residual nitrogen and applied fertilizer nitrogen on tillering, growth and yield of winter wheat sown early or later - Fosters corner.

Sponsors: R.D. Prew, R.J. Darby, W. Day, D.W. Lawlor, G.F.J. Milford, A. Penny, G.N. Thorne, A.D. Todd.

Design: A single replicate of 2 x 2 x 2 x 2 x 2 + 32 extra plots.

Whole plot dimensions: 3.0 x 16.0.

Treatments: All combinations of the following:-

1. PREVCROP	Previous cropping:	
	RAPE	S. oilseed rape
	OATS	S. oats
2. SOWDATE	Dates of sowing:	
	18 SEPT	Sown on 18 September, 1986
	16 OCT	Sown on 16 October
3. WINTER N	Nitrogen (kg N) in winter (as urea):	
	0	None
	40	40 kg applied on 20 November, 1986
4. SPRING N	Application of 200 kg N in spring (as 'Nitro-Chalk'):	
	SINGLE	Single application at date of 3rd divided application
	DIVIDED	Applied as 4 equal dressings
5. N TIME	Timing of spring nitrogen:	
	N NORM	Normal timing on 12 Feb, 1987, 11 Mar, 6 Apr and 5 May
	N LATE	Late timing on 11 Mar, 6 Apr, 5 May and 27 May

plus all combinations of the following (all sown early, given spring N divided and at normal time):-

1. PRECROPN	Previous cropping:	
	RAPE	S. oilseed rape
	OATS	S. oats
2. WINTR NN	Nitrogen (kg N) in winter (as urea):	
	0	None
	40	40 kg applied on 19 November, 1986

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3. SPRNG NN — Nitrogen (kg N) in spring (as 'Nitro-Chalk'):

0	None
150	150
250	250

plus 3 replicates of all combinations of the following (all following oats, sown on 18 Sept and not given Winter N, Spring N given as divided applications at normal time):-

1. SPRNG NP — Nitrogen (kg N) in spring (as 'Nitro-Chalk'):

0	None
80	80
200	200

2. SUMMR NP — Nitrogen (kg N) in summer, as a foliar spray of urea:

0	None
40	40 kg applied half on 27 May half on 28 May, 1987

Basal applications: Manures: (0:18:36) at 280 kg. Weedkillers: Chlortoluron at 5.6 kg in 200 l. Diclofop-methyl at 1.1 kg in 500 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg applied with the growth regulator in 200 l. Propiconazole at 0.12 kg in 200 l, and on a second occasion with carbendazim at 0.25 kg and maneb at 1.5 kg in 200 l. Growth regulator: Chlormequat chloride at 1.6 kg. Molluscicide: Methiocarb at 0.22 kg.

Seed: Avalon, sown at 190 kg.

Cultivations, etc.:- PK applied: 15 Sept, 1986. Ploughed: 16 Sept. Rotary harrowed, methiocarb applied: 17 Sept. SOWDATE 18 SEPT plots rotary harrowed, seed sown: 18 Sept. SOWDATE 16 OCT plots rotary harrowed, seed sown: 16 Oct. Chlortoluron applied: 17 Oct. Diclofop-methyl applied: 5 Jan, 1987. Prochloraz with carbendazim and the growth regulator applied: 14 Apr. Propiconazole applied: 28 May. Propiconazole with carbendazim and maneb applied: 23 June. Combine harvested: 31 Aug. Previous crops: W. oats 1985, s. oats and s. rape 1986.

NOTE: Soil samples were taken to measure nitrate and ammonia contents in September, 1986, November and February, 1987. Photosynthesis, dry weight, leaf area, shoot numbers, N content of the above-ground crop and stem nitrate contents were measured on several occasions. Foliar diseases were assessed.

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87/R/WW/3

GRAIN TONNES/HECTARE

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

SOWDATE	18 SEPT	16 OCT	Mean
PREVCROP			
RAPE	8.58	8.46	8.52
OATS	8.50	8.23	8.36
Mean	8.54	8.34	8.44

WINTER N	0	40	Mean
PREVCROP			
RAPE	8.57	8.47	8.52
OATS	8.15	8.58	8.36
Mean	8.36	8.52	8.44

WINTER N	0	40	Mean
SOWDATE			
18 SEPT	8.51	8.57	8.54
16 OCT	8.21	8.47	8.34
Mean	8.36	8.52	8.44

SPRING N	SINGLE	DIVIDED	Mean
PREVCROP			
RAPE	8.48	8.56	8.52
OATS	8.15	8.57	8.36
Mean	8.32	8.57	8.44

SPRING N	SINGLE	DIVIDED	Mean
SOWDATE			
18 SEPT	8.39	8.69	8.54
16 OCT	8.24	8.45	8.34
Mean	8.32	8.57	8.44

SPRING N	SINGLE	DIVIDED	Mean
WINTER N			
0	8.16	8.57	8.36
40	8.48	8.57	8.52
Mean	8.32	8.57	8.44

N TIME	N NORM	N LATE	Mean
PREVCROP			
RAPE	8.50	8.54	8.52
OATS	8.48	8.25	8.36
Mean	8.49	8.39	8.44

N TIME	N NORM	N LATE	Mean
SOWDATE			
18 SEPT	8.64	8.44	8.54
16 OCT	8.34	8.34	8.34
Mean	8.49	8.39	8.44

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87/R/WW/3

GRAIN TONNES/HECTARE

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

N TIME WINTER N	N NORM	N LATE	Mean
0	8.44	8.29	8.36
40	8.55	8.50	8.52
Mean	8.49	8.39	8.44

N TIME SPRING N	N NORM	N LATE	Mean
SINGLE	8.49	8.14	8.32
DIVIDED	8.49	8.64	8.57
Mean	8.49	8.39	8.44

PREVCROP	WINTER N SOWDATE	0	40
RAPE	18 SEPT	8.72	8.45
	16 OCT	8.43	8.49
OATS	18 SEPT	8.30	8.70
	16 OCT	8.00	8.46

PREVCROP	SPRING N SOWDATE	SINGLE	DIVIDED
RAPE	18 SEPT	8.55	8.61
	16 OCT	8.41	8.51
OATS	18 SEPT	8.24	8.76
	16 OCT	8.07	8.38

PREVCROP	SPRING N WINTER N	SINGLE	DIVIDED
RAPE	0	8.44	8.70
	40	8.52	8.42
OATS	0	7.87	8.43
	40	8.44	8.71

SOWDATE	SPRING N WINTER N	SINGLE	DIVIDED
18 SEPT	0	8.30	8.72
	40	8.49	8.66
16 OCT	0	8.01	8.41
	40	8.47	8.48

PREVCROP	N TIME SOWDATE	N NORM	N LATE
RAPE	18 SEPT	8.55	8.62
	16 OCT	8.46	8.46
OATS	18 SEPT	8.73	8.27
	16 OCT	8.23	8.23

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87/R/WW/3

GRAIN TONNES/HECTARE

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

	N TIME	N NORM	N LATE
PREVCROP	WINTER N		
RAPE	0	8.59	8.55
	40	8.42	8.52
OATS	0	8.28	8.02
	40	8.68	8.48

	N TIME	N NORM	N LATE
SOWDATE	WINTER N		
18 SEPT	0	8.65	8.37
	40	8.63	8.51
16 OCT	0	8.23	8.20
	40	8.46	8.49

	N TIME	N NORM	N LATE
PREVCROP	SPRING N		
RAPE	SINGLE	8.58	8.38
	DIVIDED	8.43	8.69
OATS	SINGLE	8.41	7.90
	DIVIDED	8.55	8.60

	N TIME	N NORM	N LATE
SOWDATE	SPRING N		
18 SEPT	SINGLE	8.67	8.12
	DIVIDED	8.61	8.77
16 OCT	SINGLE	8.32	8.17
	DIVIDED	8.37	8.52

	N TIME	N NORM	N LATE
WINTER N	SPRING N		
0	SINGLE	8.41	7.90
	DIVIDED	8.46	8.67
40	SINGLE	8.58	8.38
	DIVIDED	8.51	8.62

WINTR NN	0	40	Mean
PRECROPN			
RAPE	7.66	7.90	7.78
OATS	7.07	7.46	7.26
Mean	7.36	7.68	7.52

SPRNG NN	0	150	250	Mean
PRECROPN				
RAPE	5.91	8.60	8.83	7.78
OATS	4.49	8.34	8.96	7.26
Mean	5.20	8.47	8.89	7.52

SPRNG NN	0	150	250	Mean
WINTR NN				
0	4.76	8.43	8.89	7.36
40	5.64	8.51	8.89	7.68
Mean	5.20	8.47	8.89	7.52

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87/R/WW/3

GRAIN TONNES/HECTARE

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

PRECROPN	SPRNG NN / WINTR NN	0	150	250
RAPE	0	5.56	8.61	8.80
	40	6.26	8.59	8.85
OATS	0	3.96	8.26	8.99
	40	5.01	8.42	8.94

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

Table	PREVCROP	SOWDATE	WINTER N	SPRING N
s.e.d.	0.102	0.102	0.102	0.102

Table	N TIME	PREVCROP SOWDATE	PREVCROP WINTER N	SOWDATE WINTER N
s.e.d.	0.102	0.145	0.145	0.145

Table	PREVCROP SPRING N	SOWDATE SPRING N	WINTER N SPRING N	PREVCROP N TIME
s.e.d.	0.145	0.145	0.145	0.145

Table	SOWDATE N TIME	WINTER N N TIME	SPRING N N TIME	PREVCROP SOWDATE WINTER N
s.e.d.	0.145	0.145	0.145	0.205

Table	PREVCROP SOWDATE SPRING N	PREVCROP WINTER N SPRING N	SOWDATE WINTER N SPRING N	PREVCROP SOWDATE N TIME
s.e.d.	0.205	0.205	0.205	0.205

Table	PREVCROP WINTER N N TIME	SOWDATE WINTER N N TIME	PREVCROP SPRING N N TIME	SOWDATE SPRING N N TIME
s.e.d.	0.205	0.205	0.205	0.205

Table	WINTER N SPRING N N TIME
s.e.d.	0.205

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

Stratum	d.f.	s.e.	cv%
WP	6	0.290	3.4

GRAIN MEAN DM% 82.6

PLOT AREA HARVESTED 0.00207

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GRAIN TONNES/HECTARE

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

SUMMR NP / SPRNG NP	0	40	Mean
0	3.51	4.21	3.86
80	6.57	6.94	6.76
200	8.23	8.46	8.34
Mean	6.11	6.54	6.32

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

Table	SPRNG NP	SUMMR NP	SPRNG NP SUMMR NP
s.e.d.	0.223	0.182	0.315

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

Stratum	d.f.	s.e.	cv%
WP	10	0.386	6.1

GRAIN MEAN DM% 80.6

STRAW TONNES/HECTARE

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

SUMMR NP / SPRNG NP	0	40	Mean
0	3.65	3.86	3.76
80	6.39	6.53	6.46
200	7.83	8.33	8.08
Mean	5.95	6.24	6.10

STRAW MEAN DM% 60.7

PLOT AREA HARVESTED 0.00047

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87/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 - Summerdells I.

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

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

Whole plot dimensions: 3.0 x 10.0.

Treatments: All combinations of:-

1. SOWDATE		Dates of sowing:
	25 SEPT	25 September, 1986
	31 OCT	31 October
2. SOILFUNG		Application of fungicide to the seedbed:
	NONE	None
	NUARIMOL	Nuarimol at 1.3 kg in 375 l
3. SEEDRESS		Seed dressings:
	ORGANO M	Organo mercury
	TRIADIME	Triadimenol plus fuberidazole
4. AUTUMN N		N application to the seedbed:
	0	None
	60	60 kg N as 'Nitro-Chalk' on 25 Sept, 1986 or 31 Oct for successive SOWDATES
5. N TIME		Spring application of 200 kg N:
	SINGLE	Single application on 16 Apr, 1987
	DIVIDED	40 kg early, on 13 Feb, 160 kg later, on 16 Apr
6. N FORM		Forms of spring nitrogen:
	SUL AMM	Sulphate of ammonia
	AMM NITR	Ammonium nitrate as 'Nitro-Chalk'

NOTE: Nuarimol was applied at 1.3 kg in error for the intended rate of 1.0 kg.

Basal applications: Manures: Chalk at 5.0 t. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg with clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicides: Carbendazim at 0.15 kg and prochloraz at 0.40 kg in 200 l. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l.

Seed: Avalon, sown at 170 kg.

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Cultivations, etc.:- Heavy spring-tine cultivated, disced: 19 Aug, 1986. Chalk applied: 4 Sept. Paraquat applied: 11 Sept. Spring-tine cultivated: 24 Sept. SOWDATE 25 SEPT plots rotary harrowed, seed sown: 25 Sept. SOWDATE 31 OCT plots rotary harrowed, seed sown: 31 Oct. Remaining weedkillers applied: 16 Apr, 1987. Carbendazim and prochloraz applied: 7 May. Propiconazole, carbendazim and maneb applied: 1 July. Combine harvested: 4 Sept. Previous crops: W. wheat 1985, w. barley 1986.

NOTE: Plant samples were taken in mid-March, end of April and the beginning of July to assess take-all. Eyespot and sharp eyespot were assessed in July. Components of yield were measured and quality assessments were made on the grain.

GRAIN TONNES/HECTARE

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

SOILFUNG	NONE	NUARIMOL	Mean
SOWDATE			
25 SEPT	5.97	6.23	6.10
31 OCT	5.67	6.09	5.88
Mean	5.82	6.16	5.99

SEEDRESS	ORGANO M	TRIADIME	Mean
SOWDATE			
25 SEPT	6.13	6.06	6.10
31 OCT	5.88	5.88	5.88
Mean	6.01	5.97	5.99

SEEDRESS	ORGANO M	TRIADIME	Mean
SOILFUNG			
NONE	5.74	5.90	5.82
NUARIMOL	6.28	6.04	6.16
Mean	6.01	5.97	5.99

AUTUMN N	0	60	Mean
SOWDATE			
25 SEPT	5.85	6.34	6.10
31 OCT	5.71	6.05	5.88
Mean	5.78	6.20	5.99

AUTUMN N	0	60	Mean
SOILFUNG			
NONE	5.65	5.99	5.82
NUARIMOL	5.91	6.40	6.16
Mean	5.78	6.20	5.99

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GRAIN TONNES/HECTARE

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

AUTUMN N	0	60	Mean
SEEDRESS			
ORGANO M	5.79	6.23	6.01
TRIADIME	5.77	6.17	5.97
Mean	5.78	6.20	5.99

N TIME	SINGLE	DIVIDED	Mean
SOWDATE			
25 SEPT	6.03	6.16	6.10
31 OCT	5.87	5.88	5.88
Mean	5.95	6.02	5.99

N TIME	SINGLE	DIVIDED	Mean
SOILFUNG			
NONE	5.80	5.83	5.82
NUARIMOL	6.11	6.21	6.16
Mean	5.95	6.02	5.99

N TIME	SINGLE	DIVIDED	Mean
SEEDRESS			
ORGANO M	6.05	5.96	6.01
TRIADIME	5.85	6.08	5.97
Mean	5.95	6.02	5.99

N TIME	SINGLE	DIVIDED	Mean
AUTUMN N			
0	5.70	5.85	5.78
60	6.20	6.19	6.20
Mean	5.95	6.02	5.99

N FORM	SUL AMM	AMM NITR	Mean
SOWDATE			
25 SEPT	5.90	6.30	6.10
31 OCT	5.90	5.86	5.88
Mean	5.90	6.08	5.99

N FORM	SUL AMM	AMM NITR	Mean
SOILFUNG			
NONE	5.68	5.95	5.82
NUARIMOL	6.11	6.20	6.16
Mean	5.90	6.08	5.99

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GRAIN TONNES/HECTARE

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

N FORM	SUL AMM	AMM NITR	Mean
SEEDRESS			
ORGANO M	5.90	6.11	6.01
TRIADIME	5.89	6.05	5.97
Mean	5.90	6.08	5.99

N FORM	SUL AMM	AMM NITR	Mean
AUTUMN N			
0	5.63	5.93	5.78
60	6.16	6.23	6.20
Mean	5.90	6.08	5.99

N FORM	SUL AMM	AMM NITR	Mean
N TIME			
SINGLE	5.83	6.07	5.95
DIVIDED	5.96	6.08	6.02
Mean	5.90	6.08	5.99

	SOILFUNG	NONE		NUARIMOL	
SOWDATE	SEEDRESS	ORGANO M	TRIADIME	ORGANO M	TRIADIME
25 SEPT		5.95	5.99	6.32	6.13
31 OCT		5.53	5.80	6.23	5.95

	SOILFUNG	NONE		NUARIMOL	
SOWDATE	AUTUMN N	0	60	0	60
25 SEPT		5.70	6.23	6.00	6.45
31 OCT		5.59	5.74	5.82	6.36

	SEEDRESS	ORGANO M		TRIADIME	
SOWDATE	AUTUMN N	0	60	0	60
25 SEPT		5.86	6.40	5.84	6.28
31 OCT		5.71	6.05	5.70	6.05

	SEEDRESS	ORGANO M		TRIADIME	
SOILFUNG	AUTUMN N	0	60	0	60
NONE		5.58	5.90	5.71	6.08
NUARIMOL		6.00	6.56	5.83	6.25

	SOILFUNG	NONE		NUARIMOL	
SOWDATE	N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
25 SEPT		5.92	6.01	6.15	6.31
31 OCT		5.68	5.65	6.07	6.11

	SEEDRESS	ORGANO M		TRIADIME	
SOWDATE	N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
25 SEPT		6.20	6.07	5.87	6.26
31 OCT		5.90	5.86	5.84	5.91

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GRAIN TONNES/HECTARE

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

	SEEDRESS	ORGANO M		TRIADIME	
SOILFUNG	N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
NONE		5.75	5.73	5.85	5.94
NUARIMOL		6.35	6.20	5.86	6.22

	AUTUMN N	0		60	
SOWDATE	N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
25 SEPT		5.69	6.02	6.38	6.31
31 OCT		5.72	5.69	6.02	6.07

	AUTUMN N	0		60	
SOILFUNG	N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
NONE		5.52	5.78	6.08	5.89
NUARIMOL		5.89	5.93	6.32	6.49

	AUTUMN N	0		60	
SEEDRESS	N TIME	SINGLE	DIVIDED	SINGLE	DIVIDED
ORGANO M		5.68	5.90	6.42	6.03
TRIADIME		5.73	5.81	5.98	6.35

	SOILFUNG	NONE		NUARIMOL	
SOWDATE	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
25 SEPT		5.70	6.23	6.09	6.36
31 OCT		5.66	5.67	6.13	6.05

	SEEDRESS	ORGANO M		TRIADIME	
SOWDATE	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
25 SEPT		5.84	6.43	5.96	6.16
31 OCT		5.97	5.79	5.82	5.93

	SEEDRESS	ORGANO M		TRIADIME	
SOILFUNG	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
NONE		5.56	5.92	5.80	5.99
NUARIMOL		6.25	6.30	5.97	6.11

	AUTUMN N	0		60	
SOWDATE	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
25 SEPT		5.49	6.21	6.30	6.39
31 OCT		5.77	5.64	6.02	6.08

	AUTUMN N	0		60	
SOILFUNG	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
NONE		5.40	5.90	5.96	6.01
NUARIMOL		5.87	5.96	6.36	6.45

	AUTUMN N	0		60	
SEEDRESS	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
ORGANO M		5.56	6.02	6.25	6.20
TRIADIME		5.71	5.83	6.07	6.26

	N TIME	SINGLE		DIVIDED	
SOWDATE	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
25 SEPT		5.75	6.31	6.04	6.28
31 OCT		5.91	5.83	5.88	5.89

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GRAIN TONNES/HECTARE

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

	N TIME	SINGLE		DIVIDED	
SOILFUNG	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
NONE		5.53	6.07	5.83	5.84
NUARIMOL		6.13	6.08	6.09	6.33

	N TIME	SINGLE		DIVIDED	
SEEDRESS	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
ORGANO M		5.95	6.15	5.86	6.07
TRIADIME		5.71	6.00	6.06	6.10

	N TIME	SINGLE		DIVIDED	
AUTUMN N	N FORM	SUL AMM	AMM NITR	SUL AMM	AMM NITR
0		5.44	5.97	5.82	5.89
60		6.22	6.18	6.10	6.28

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

Margins of two factor tables	0.173
Two factor tables	0.245
Three factor tables	0.347

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.693	11.6

GRAIN MEAN DM% 72.5

PLOT AREA HARVESTED 0.00272

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87/R/WW/5

WINTER WHEAT

APHICIDE, N AND FUNGICIDE

Object: To determine the economic thresholds for cereal aphids with different levels of inputs - Delafield.

Sponsor: N. Carter.

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 3.0 x 12.0.

Treatments: All combinations of:-

1. APHICIDE — Aphicides (applied in 200 l):

   NONE — None
   PIRIMICA — Pirimicarb applied at 0.14 kg on 23 June, 1987, 3 July and 16 July

2. N RATE — Nitrogen fertilizers (kg N) as 'Nitram' on 14 Apr, 1987:

   80
   120
   160

3. FUNGCIDE — Fungicides:

   NONE — None
   31+39+59 — Fungicide sprays at growth stage 31, 39, 59:
   G.S. 31 - Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 380 l on 6 May, 1987
   G.S. 39 - Propiconazole at 0.12 kg in 200 l on 28 May
   G.S. 59 - Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.5 kg in 200 l on 23 June

Basal applications: Weedkillers: Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 200 l. Glyphosate at 1.4 kg in 200 l. Growth regulator: Chlormequat at 1.6 kg in 200 l.

Seed: Avalon, sown at 200 kg.

Cultivations, etc.:- Rotary harrowed, seed sown: 6 Nov, 1986. Clopyralid, bromoxynil and mecoprop applied: 23 Apr, 1987. Growth regulator applied: 6 May. Glyphosate applied: 17 Aug. Combine harvested: 1 Sept. Previous crops: W. wheat 1985, potatoes 1986.

NOTE: Aphids were counted from early June until late July. Plant samples were taken at anthesis for dry weight measurements. Disease assessments were made in late June and late July. Components of yield were measured.

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87/R/WW/5

GRAIN TONNES/HECTARE

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

N RATE	80	120	160	Mean
APHICIDE				
NONE	6.62	6.96	7.21	6.93
PIRIMICA	6.73	7.27	7.47	7.16
Mean	6.68	7.12	7.34	7.04

FUNGCIDE	NONE	31+39+59	Mean
APHICIDE			
NONE	6.40	7.46	6.93
PIRIMICA	6.66	7.65	7.16
Mean	6.53	7.56	7.04

FUNGCIDE	NONE	31+39+59	Mean
N RATE			
80	6.39	6.96	6.68
120	6.57	7.66	7.12
160	6.64	8.04	7.34
Mean	6.53	7.56	7.04

N RATE	80		120		160	
APHICIDE FUNGCIDE	NONE	31+39+59	NONE	31+39+59	NONE	31+39+59
NONE	6.25	7.00	6.50	7.42	6.46	7.95
PIRIMICA	6.54	6.92	6.65	7.90	6.81	8.13

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

Table	APHICIDE	N RATE	FUNGCIDE	APHICIDE N RATE
s.e.d.	0.124	0.152	0.124	0.215

Table	APHICIDE FUNGCIDE	N RATE FUNGCIDE	APHICIDE N RATE FUNGCIDE
s.e.d.	0.176	0.215	0.304

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	22	0.373	5.3

GRAIN MEAN DM% 83.9

PLOT AREA HARVESTED 0.00258

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87/R/WW/6

WINTER WHEAT

N AND DCD

Object: To study the effects of a nitrification inhibitor in combination with different rates and timings of N on yield - Claycroft.

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

Design: 2 randomised blocks of 30 plots.

Whole plot dimensions: 3.0 x 11.0.

Treatments: All combinations of:-

1. N INHIB	Nitrification inhibitor added to nitrogen fertilizer:
NONE	None
DICYANDI	Dicyandiamide at 16 kg, divided equally between applications
2. N TIME	Time and division of aqueous nitrogen fertilizer:
1 1 1 1	Quarter of N on each of 25 Feb, 1987, 30 Mar, 21 Apr, 19 May
2 2 - -	Half of N on each of 25 Feb, 30 Mar
2 - 2 -	Half of N on each of 25 Feb, 21 Apr
- 2 2 -	Half of N on each of 30 Mar, 21 Apr
4 - - -	All of N on 25 Feb
- - 4 -	All of N on 21 Apr
3. N RATE	Amount of nitrogen fertilizer applied (kg N):
160	160
240	240

plus extra treatments given no nitrification inhibitor all combinations of:-

1. N TIMENC	Time and division of nitrogen fertilizer as 'Nitro-Chalk':
- 2 2 -	Half of N on each of 30 Mar, 1987, 21 Apr
- - 4 -	All of N on 21 Apr
2. N RATENC	Amount of nitrogen fertilizer applied (kg N):
160	160
240	240

plus one extra treatment

EXTRA	
NONE	No nitrogen fertilizer or inhibitor (duplicated)

NOTE: Nitrogen was applied as a mixture of urea and ammonium nitrate (28% N).

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Basal applications: Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg in 200 l. Clopyralid at 0.05 kg and bromoxynil at 0.24 kg with mecoprop at 1.8 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.5 kg in 200 l.

Seed: Avalon, sown at 180 kg.

Cultivations, etc.:- Heavy spring-tine cultivated: 5 Sept, 1986. Paraquat applied: 30 Sept. Disced: 2 Oct. Disced, rotary harrowed: 3 Oct. Seed sown: 4 Oct. Isoproturon applied: 31 Mar, 1987. Clopyralid, bromoxynil, mecoprop, prochloraz and carbendazim applied: 18 Apr. Propiconazole with carbendazim and maneb applied: 23 June. Combine harvested: 31 Aug. Previous crops: S. barley 1985, w. wheat 1986.

NOTE: The crop was sampled in mid-June to measure dry matter, ear numbers and N content. The N content of the grain was determined.

GRAIN TONNES/HECTARE

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

N INHIB / N TIME	NONE	DICYANDI	Mean
1 1 1 1	5.94	6.27	6.10
2 2 - -	5.96	6.03	6.00
2 - 2 -	5.88	5.96	5.92
- 2 2 -	5.91	5.94	5.92
4 - - -	5.75	6.11	5.93
- - 4 -	6.12	5.92	6.02
Mean	5.93	6.04	5.98

N RATE / N TIME	160	240	Mean
1 1 1 1	5.84	6.37	6.10
2 2 - -	5.72	6.27	6.00
2 - 2 -	5.70	6.14	5.92
- 2 2 -	5.80	6.04	5.92
4 - - -	5.75	6.11	5.93
- - 4 -	5.93	6.11	6.02
Mean	5.79	6.17	5.98

N RATE / N INHIB	160	240	Mean
NONE	5.86	5.99	5.93
DICYANDI	5.72	6.35	6.04
Mean	5.79	6.17	5.98

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87/R/WW/6

GRAIN TONNES/HECTARE

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

N INHIB	NONE		DICYANDI	
N RATE	160	240	160	240
N TIME				
1 1 1 1	5.93	5.95	5.76	6.78
2 2 - -	6.02	5.90	5.42	6.63
2 - 2 -	5.80	5.97	5.60	6.32
- 2 2 -	5.67	6.15	5.94	5.94
4 - - -	5.58	5.92	5.92	6.30
- - 4 -	6.17	6.08	5.69	6.15

N RATENC	160	240	Mean
N TIMENC			
- 2 2 -	6.17	6.02	6.09
- - 4 -	5.72	5.62	5.67
Mean	5.95	5.82	5.88

NONE	2.96
Grand mean	5.77

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

Table	N INHIB	N TIME	N RATE	N TIMEC
s.e.d.	0.136	0.236	0.136	0.334

Table	N RATENC	N INHIB N TIME	N INHIB N RATE	N TIME N RATE
s.e.d.	0.334	0.334	0.193	0.334

Table	N TIMENC N RATENC	N INHIB N TIME N RATE
s.e.d.	0.472	0.472

SED of NONE v any item in N TIMEC.N RATENC
table or N INHIB.N TIME.N RATE table is 0.409

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.472	8.2

GRAIN MEAN DM% 81.5

PLOT AREA HARVESTED 0.00253

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87/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 - Summerdells II.

Sponsors: J.F. Jenkyn, R.J.Gutteridge, R.T. Plumb, D.G. Christian, R.J. Darby, S.H.T. Harper, L.A. Mullen, N. Carter, G.J.S. Ross.

Associate sponsors: B.R. Kerry, W.Day.

Design: A single replicate of 2 x 2 x 2 x 2 x 2 x 2 + 24 extra plots.

Whole plot dimensions: 3.0 x 15.2.

Treatments: All combinations of the following, all sown early (18 Sept, 1986) and given cypermethrin at 0.025 kg in 220 l on 31 Oct:

1. PREVCROP	Previous cropping:	
	BARLEY	W. wheat 1984, s. barley 1985, w. barley 1986
	OATS	W. wheat 1984, s. barley 1985, w. oats ploughed out and resown to s. oats 1986
2. WINTER N	Nitrogen fertilizer in winter (kg N) as prilled urea (46% N):	
	0	None
	26+25	26 on 17 Nov, 1986, 25 on 16 Feb, 1987
3. SPRING N	Nitrogen fertilizer in spring (kg N) as 'Nitro-Chalk':	
	105	
	155	
4. N TIME	Timing of spring nitrogen application:	
	16 MARCH	16 March, 1987
	13 APRIL	13 April
5. E FUNG	Early fungicides:	
	NONE	None
	TFSD	Triadimenol and fuberidazole seed dressing
6. L FUNG	Late fungicides:	
	NONE	None
	SPRAYS	Prochloraz at 0.40 kg, carbendazim at 0.15 kg and tridemorph at 0.52 kg in 220 l on 15 Apr, 1987. Propiconazole at 0.12 kg and tridemorph at 0.22 kg in 220 l on 27 May

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plus all combinations of the following all after barley and given late fungicides and 105 kg N in spring, not given cypermethrin in the autumn:

1. SOWDATEV

18 SEPT	18 September, 1986
17 OCT	17 October

2. WINTR NV — Nitrogen fertilizer in winter (kg N) as prilled urea (46 %N):

0	None
26+25	26 on 17 Nov, 1986, 25 on 16 Feb, 1987

3. E FUNGV — Early fungicides:

NONE	None
TFSD	Triadimenol and fuberidazole seed dressing

4. N TIMEV — Timing of spring nitrogen application:

16 MARCH	16 March, 1987
13 APRIL	13 April

plus 2 extra treatments following fallow, sown 18 September and given early and late fungicides, cypermethrin, 105 kg spring nitrogen but not given winter nitrogen:

N TIMEF — Timing of spring nitrogen application:

16 MARCH	16 March, 1987 (duplicated)
13 APRIL	13 April (duplicated)

plus 1 extra treatment following barley, sown 18 September given early and late fungicides, cypermethrin, 155 kg spring nitrogen in April:

WINTER NX — Extra winter nitrogen (kg N):

51+25	51 kg on 17 Nov, 1986, 25 kg on 16 Feb, 1987 (duplicated)

plus 1 extra treatment following barley, sown 18 September, and given early and late fungicides, cypermethrin but no nitrogen:

EXTRA NO

0+0+0	No nitrogen (duplicated)

Basal applications: Weedkillers: Paraquat at 0.60 kg ion in 200 l on two occasions. Isoproturon at 2.5 kg, clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Glyphosate at 1.4 kg in 220 l. Growth regulators: Mepiquat chloride at 0.61 kg and 2-chloroethylphosphonic acid at 0.31 kg with a wetting agent ('Cittowet' at 0.08 l) in 200 l.

Seed: Magie, sown at 300 seeds per square metre.

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Cultivations, etc.:- Paraquat applied: 12 Aug, 1986. Heavy spring-tine cultivated, cultivated by rotary grubber: 18 Aug. Paraquat applied: 10 Sept. SOWDATE 18 SEPT plots spring-tine cultivated, rotary harrowed and seed sown: 18 Sept. SOWDATE 17 OCT plots rotary harrowed and seed sown: 17 Oct. Isoproturon, clopyralid, bromoxynil and mecoprop applied: 16 Apr, 1987. Growth regulators with wetting agent applied: 27 Apr. Glyphosate applied: 30 July. Combine harvested: 6 Aug. Previous crops: S. barley 1985, w. barley, s oats, fallow 1986.

NOTES: (1) Soil samples were taken to measure nitrate and ammonium contents in September, 1986, November and February, 1987. Crop samples were taken to measure nitrate N concentrations from November to April.
(2) Plants were sampled in March, April and June, to measure plant and shoot numbers, dry weights and nitrogen uptakes. After harvest thousand grain weights were measured.
(3) Leaf diseases, take-all, eyespot, barley yellow dwarf virus and aphid incidence were assessed.
(4) A cage was erected over the crop from early June to maturity to prevent damage by birds.

GRAIN TONNES/HECTARE

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

WINTER N	0	26+25	Mean
PREVCROP			
BARLEY	4.83	5.63	5.23
OATS	6.33	7.07	6.70
Mean	5.58	6.35	5.96

E FUNG	NONE	TFSD	Mean
PREVCROP			
BARLEY	5.21	5.25	5.23
OATS	6.74	6.66	6.70
Mean	5.97	5.95	5.96

E FUNG	NONE	TFSD	Mean
WINTER N			
0	5.58	5.58	5.58
26+25	6.36	6.33	6.35
Mean	5.97	5.95	5.96

L FUNG	NONE	SPRAYS	Mean
PREVCROP			
BARLEY	4.89	5.57	5.23
OATS	6.21	7.18	6.70
Mean	5.55	6.38	5.96

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GRAIN TONNES/HECTARE

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

L FUNG	NONE	SPRAYS	Mean
WINTER N			
0	5.18	5.98	5.58
26+25	5.92	6.77	6.35
Mean	5.55	6.38	5.96

L FUNG	NONE	SPRAYS	Mean
E FUNG			
NONE	5.56	6.39	5.97
TFSD	5.55	6.36	5.95
Mean	5.55	6.38	5.96

SPRING N	105	155	Mean
PREVCROP			
BARLEY	5.07	5.39	5.23
OATS	6.47	6.93	6.70
Mean	5.77	6.16	5.96

SPRING N	105	155	Mean
WINTER N			
0	5.30	5.86	5.58
26+25	6.23	6.46	6.35
Mean	5.77	6.16	5.96

SPRING N	105	155	Mean
E FUNG			
NONE	5.81	6.14	5.97
TFSD	5.73	6.18	5.95
Mean	5.77	6.16	5.96

SPRING N	105	155	Mean
L FUNG			
NONE	5.43	5.67	5.55
SPRAYS	6.10	6.65	6.38
Mean	5.77	6.16	5.96

N TIME	16 MARCH	13 APRIL	Mean
PREVCROP			
BARLEY	5.81	4.65	5.23
OATS	6.97	6.43	6.70
Mean	6.39	5.54	5.96

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GRAIN TONNES/HECTARE

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

N TIME	16 MARCH	13 APRIL	Mean
WINTER N			
0	6.16	5.00	5.58
26+25	6.61	6.08	6.35
Mean	6.39	5.54	5.96

N TIME	16 MARCH	13 APRIL	Mean
E FUNG			
NONE	6.38	5.57	5.97
TFSD	6.40	5.51	5.95
Mean	6.39	5.54	5.96

N TIME	16 MARCH	13 APRIL	Mean
L FUNG			
NONE	5.97	5.14	5.55
SPRAYS	6.81	5.95	6.38
Mean	6.39	5.54	5.96

N TIME	16 MARCH	13 APRIL	Mean
SPRING N			
105	6.18	5.36	5.77
155	6.60	5.73	6.16
Mean	6.39	5.54	5.96

E FUNG	NONE	TFSD
PREVCROP WINTER N		
BARLEY 0	4.80	4.86
26+25	5.61	5.65
OATS 0	6.36	6.29
26+25	7.12	7.02

L FUNG	NONE	SPRAYS
PREVCROP WINTER N		
BARLEY 0	4.48	5.18
26+25	5.30	5.95
OATS 0	5.89	6.77
26+25	6.54	7.60

L FUNG	NONE	SPRAYS
PREVCROP E FUNG		
BARLEY NONE	4.90	5.51
TFSD	4.88	5.62
OATS NONE	6.22	7.27
TFSD	6.21	7.10

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GRAIN TONNES/HECTARE

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

		L FUNG	NONE	SPRAYS
WINTER N		E FUNG		
0		NONE	5.19	5.98
		TFSD	5.18	5.97
26+25		NONE	5.93	6.80
		TFSD	5.91	6.75
		SPRING N	105	155
PREVCROP		WINTER N		
BARLEY		0	4.57	5.10
		26+25	5.57	5.69
OATS		0	6.04	6.62
		26+25	6.90	7.24
		SPRING N	105	155
PREVCROP		E FUNG		
BARLEY		NONE	5.10	5.31
		TFSD	5.03	5.47
OATS		NONE	6.52	6.96
		TFSD	6.42	6.89
		SPRING N	105	155
WINTER N		E FUNG		
0		NONE	5.35	5.81
		TFSD	5.25	5.90
26+25		NONE	6.27	6.46
		TFSD	6.20	6.46
		SPRING N	105	155
PREVCROP		L FUNG		
BARLEY		NONE	4.80	4.98
		SPRAYS	5.33	5.81
OATS		NONE	6.06	6.37
		SPRAYS	6.88	7.49
		SPRING N	105	155
WINTER N		L FUNG		
0		NONE	5.03	5.34
		SPRAYS	5.57	6.38
26+25		NONE	5.83	6.01
		SPRAYS	6.63	6.92
		SPRING N	105	155
E FUNG		L FUNG		
NONE		NONE	5.46	5.65
		SPRAYS	6.15	6.62
TFSD		NONE	5.40	5.69
		SPRAYS	6.05	6.67

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GRAIN TONNES/HECTARE

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

	N TIME	16 MARCH	13 APRIL
PREVCROP	WINTER N		
BARLEY	0	5.53	4.13
	26+25	6.08	5.17
OATS	0	6.79	5.87
	26+25	7.15	6.99

	N TIME	16 MARCH	13 APRIL
PREVCROP	E FUNG		
BARLEY	NONE	5.74	4.68
	TFSD	5.88	4.63
OATS	NONE	7.02	6.47
	TFSD	6.92	6.39

	N TIME	16 MARCH	13 APRIL
WINTER N	E FUNG		
0	NONE	6.14	5.02
	TFSD	6.18	4.97
26+25	NONE	6.61	6.12
	TFSD	6.62	6.05

	N TIME	16 MARCH	13 APRIL
PREVCROP	L FUNG		
BARLEY	NONE	5.43	4.36
	SPRAYS	6.19	4.95
OATS	NONE	6.51	5.91
	SPRAYS	7.42	6.94

	N TIME	16 MARCH	13 APRIL
WINTER N	L FUNG		
0	NONE	5.79	4.58
	SPRAYS	6.53	5.42
26+25	NONE	6.15	5.70
	SPRAYS	7.08	6.47

	N TIME	16 MARCH	13 APRIL
E FUNG	L FUNG		
NONE	NONE	5.98	5.14
	SPRAYS	6.78	6.00
TFSD	NONE	5.97	5.13
	SPRAYS	6.83	5.89

	N TIME	16 MARCH	13 APRIL
PREVCROP	SPRING N		
BARLEY	105	5.64	4.50
	155	5.98	4.81
OATS	105	6.73	6.21
	155	7.21	6.64

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GRAIN TONNES/HECTARE

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

WINTER N	N TIME SPRING N	16 MARCH	13 APRIL
0	105	5.85	4.75
	155	6.47	5.24
26+25	105	6.51	5.96
	155	6.72	6.21

E FUNG	N TIME SPRING N	16 MARCH	13 APRIL
NONE	105	6.24	5.38
	155	6.52	5.76
TFSD	105	6.13	5.33
	155	6.67	5.69

L FUNG	N TIME SPRING N	16 MARCH	13 APRIL
NONE	105	5.85	5.02
	155	6.09	5.25
SPRAYS	105	6.51	5.69
	155	7.10	6.20

WINTR NV SOWDATEV	0	26+25	Mean
18 SEPT	4.70	5.90	5.30
17 OCT	5.25	5.60	5.42
Mean	4.97	5.75	5.36

N TIMEV SOWDATEV	16 MARCH	14 APRIL	Mean
18 SEPT	5.90	4.70	5.30
17 OCT	5.85	4.99	5.42
Mean	5.88	4.85	5.36

N TIMEV WINTR NV	16 MARCH	14 APRIL	Mean
0	5.63	4.31	4.97
26+25	6.12	5.38	5.75
Mean	5.88	4.85	5.36

E FUNGV SOWDATEV	NONE	TFSD	Mean
18 SEPT	5.35	5.24	5.30
17 OCT	5.38	5.47	5.42
Mean	5.37	5.36	5.36

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GRAIN TONNES/HECTARE

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

E FUNGV WINTR NV	NONE	TFSD	Mean
0	4.88	5.06	4.97
26+25	5.85	5.65	5.75
Mean	5.37	5.36	5.36

E FUNGV N TIMEV	NONE	TFSD	Mean
16 MARCH	5.88	5.88	5.88
14 APRIL	4.86	4.83	4.85
Mean	5.37	5.36	5.36

SOWDATEV	N TIMEV WINTR NV	16 MARCH	14 APRIL
18 SEPT	0	5.34	4.05
	26+25	6.46	5.34
17 OCT	0	5.92	4.58
	26+25	5.79	5.41

SOWDATEV	E FUNGV WINTR NV	NONE	TFSD
18 SEPT	0	4.42	4.97
	26+25	6.29	5.51
17 OCT	0	5.34	5.16
	26+25	5.42	5.78

SOWDATEV	E FUNGV N TIMEV	NONE	TFSD
18 SEPT	16 MARCH	5.99	5.81
	14 APRIL	4.72	4.67
17 OCT	16 MARCH	5.77	5.94
	14 APRIL	4.99	5.00

WINTR NV	E FUNGV N TIMEV	NONE	TFSD
0	16 MARCH	5.55	5.71
	14 APRIL	4.21	4.42
26+25	16 MARCH	6.20	6.04
	14 APRIL	5.50	5.25

SOWDATEV	WINTR NV	E FUNGV N TIMEV	NONE	TFSD
18 SEPT	0	16 MARCH	4.91	5.77
		14 APRIL	3.93	4.17
	26+25	16 MARCH	7.06	5.86
		14 APRIL	5.51	5.17
17 OCT	0	16 MARCH	6.19	5.65
		14 APRIL	4.49	4.66
	26+25	16 MARCH	5.34	6.23
		14 APRIL	5.49	5.33

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GRAIN TONNES/HECTARE

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

N TIMEF	16 MARCH	14 APRIL	Mean
	7.34	6.79	7.06

WINTR NX	51+25
	6.36

EXTRA NO	0+0+0
	2.45

Grand mean 5.83

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

(not including extra plots)

Margin of two factor tables	0.101
Two factor tables	0.143
Three factor tables	0.202

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

Stratum	d.f.	s.e.	cv%
WP	22	0.404	6.8

GRAIN MEAN DM% 85.3

STRAW TONNES/HECTARE

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

WINTER N	0	26+25	Mean
PREVCROP			
BARLEY	2.36	2.73	2.55
OATS	2.72	2.91	2.81
Mean	2.54	2.82	2.68

E FUNG	NONE	TFSD	Mean
PREVCROP			
BARLEY	2.55	2.55	2.55
OATS	2.83	2.79	2.81
Mean	2.69	2.67	2.68

E FUNG	NONE	TFSD	Mean
WINTER N			
0	2.56	2.52	2.54
26+25	2.83	2.81	2.82
Mean	2.69	2.67	2.68

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STRAW TONNES/HECTARE

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

L FUNG	NONE	SPRAYS	Mean
PREVCROP			
BARLEY	2.31	2.79	2.55
OATS	2.41	3.21	2.81
Mean	2.36	3.00	2.68

L FUNG	NONE	SPRAYS	Mean
WINTER N			
0	2.26	2.82	2.54
26+25	2.46	3.18	2.82
Mean	2.36	3.00	2.68

L FUNG	NONE	SPRAYS	Mean
E FUNG			
NONE	2.36	3.03	2.69
TFSD	2.37	2.97	2.67
Mean	2.36	3.00	2.68

SPRING N	105	155	Mean
PREVCROP			
BARLEY	2.48	2.62	2.55
OATS	2.77	2.85	2.81
Mean	2.63	2.73	2.68

SPRING N	105	155	Mean
WINTER N			
0	2.43	2.65	2.54
26+25	2.82	2.81	2.82
Mean	2.63	2.73	2.68

SPRING N	105	155	Mean
E FUNG			
NONE	2.67	2.71	2.69
TFSD	2.58	2.75	2.67
Mean	2.63	2.73	2.68

SPRING N	105	155	Mean
L FUNG			
NONE	2.34	2.38	2.36
SPRAYS	2.91	3.08	3.00
Mean	2.63	2.73	2.68

N TIME	16 MARCH	13 APRIL	Mean
PREVCROP			
BARLEY	2.62	2.48	2.55
OATS	2.75	2.87	2.81
Mean	2.68	2.68	2.68

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STRAW TONNES/HECTARE

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

N TIME	16 MARCH	13 APRIL	Mean
WINTER N			
0	2.61	2.47	2.54
26+25	2.75	2.88	2.82
Mean	2.68	2.68	2.68

N TIME	16 MARCH	13 APRIL	Mean
E FUNG			
NONE	2.69	2.69	2.69
TFSD	2.67	2.66	2.67
Mean	2.68	2.68	2.68

N TIME	16 MARCH	13 APRIL	Mean
L FUNG			
NONE	2.34	2.39	2.36
SPRAYS	3.03	2.97	3.00
Mean	2.68	2.68	2.68

N TIME	16 MARCH	13 APRIL	Mean
SPRING N			
105	2.68	2.57	2.63
155	2.68	2.78	2.73
Mean	2.68	2.68	2.68

	E FUNG	NONE	TFSD
PREVCROP	WINTER N		
BARLEY	0	2.33	2.40
	26+25	2.77	2.69
OATS	0	2.78	2.65
	26+25	2.88	2.93

	L FUNG	NONE	SPRAYS
PREVCROP	WINTER N		
BARLEY	0	2.14	2.59
	26+25	2.49	2.98
OATS	0	2.39	3.05
	26+25	2.44	3.37

	L FUNG	NONE	SPRAYS
PREVCROP	E FUNG		
BARLEY	NONE	2.27	2.83
	TFSD	2.35	2.74
OATS	NONE	2.44	3.23
	TFSD	2.38	3.19

	L FUNG	NONE	SPRAYS
WINTER N	E FUNG		
0	NONE	2.25	2.86
	TFSD	2.27	2.78
26+25	NONE	2.46	3.20
	TFSD	2.46	3.15

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STRAW TONNES/HECTARE

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

	SPRING N	105	155
PREVCROP	WINTER N		
BARLEY	0	2.21	2.52
	26+25	2.75	2.72
OATS	0	2.64	2.79
	26+25	2.90	2.91

	SPRING N	105	155
PREVCROP	E FUNG		
BARLEY	NONE	2.49	2.61
	TFSD	2.47	2.62
OATS	NONE	2.86	2.81
	TFSD	2.69	2.88

	SPRING N	105	155
WINTER N	E FUNG		
0	NONE	2.44	2.67
	TFSD	2.42	2.63
26+25	NONE	2.91	2.75
	TFSD	2.74	2.88

	SPRING N	105	155
PREVCROP	L FUNG		
BARLEY	NONE	2.27	2.35
	SPRAYS	2.69	2.88
OATS	NONE	2.41	2.41
	SPRAYS	3.13	3.29

	SPRING N	105	155
WINTER N	L FUNG		
0	NONE	2.16	2.36
	SPRAYS	2.69	2.94
26+25	NONE	2.52	2.40
	SPRAYS	3.13	3.23

	SPRING N	105	155
E FUNG	L FUNG		
NONE	NONE	2.36	2.35
	SPRAYS	2.98	3.07
TFSD	NONE	2.32	2.41
	SPRAYS	2.84	3.10

	N TIME	16 MARCH	13 APRIL
PREVCROP	WINTER N		
BARLEY	0	2.48	2.25
	26+25	2.76	2.71
OATS	0	2.74	2.69
	26+25	2.75	3.06

	N TIME	16 MARCH	13 APRIL
PREVCROP	E FUNG		
BARLEY	NONE	2.63	2.48
	TFSD	2.61	2.48
OATS	NONE	2.75	2.91
	TFSD	2.74	2.83

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87/R/B/1

STRAW TONNES/HECTARE

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

	N TIME	16 MARCH	13 APRIL
WINTER N	E FUNG		
0	NONE	2.60	2.51
	TFSD	2.62	2.42
26+25	NONE	2.78	2.88
	TFSD	2.73	2.89

	N TIME	16 MARCH	13 APRIL
PREVCROP	L FUNG		
BARLEY	NONE	2.38	2.24
	SPRAYS	2.85	2.72
OATS	NONE	2.29	2.54
	SPRAYS	3.21	3.21

	N TIME	16 MARCH	13 APRIL
WINTER N	L FUNG		
0	NONE	2.34	2.19
	SPRAYS	2.89	2.75
26+25	NONE	2.34	2.59
	SPRAYS	3.17	3.18

	N TIME	16 MARCH	13 APRIL
E FUNG	L FUNG		
NONE	NONE	2.31	2.40
	SPRAYS	3.07	2.99
TFSD	NONE	2.36	2.37
	SPRAYS	2.99	2.94

	N TIME	16 MARCH	13 APRIL
PREVCROP	SPRING N		
BARLEY	105	2.59	2.37
	155	2.65	2.59
OATS	105	2.78	2.76
	155	2.71	2.98

	N TIME	16 MARCH	13 APRIL
WINTER N	SPRING N		
0	105	2.54	2.32
	155	2.69	2.62
26+25	105	2.83	2.82
	155	2.68	2.95

	N TIME	16 MARCH	13 APRIL
E FUNG	SPRING N		
NONE	105	2.80	2.54
	155	2.58	2.85
TFSD	105	2.56	2.60
	155	2.79	2.72

	N TIME	16 MARCH	13 APRIL
L FUNG	SPRING N		
NONE	105	2.44	2.25
	155	2.23	2.53
SPRAYS	105	2.93	2.89
	155	3.13	3.04

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87/R/B/1

STRAW TONNES/HECTARE

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

WINTR NV	0	26+25	Mean
SOWDATEV			
18 SEPT	2.45	2.95	2.70
17 OCT	3.15	3.29	3.22
Mean	2.80	3.12	2.96

N TIMEV	16 MARCH	14 APRIL	Mean
SOWDATEV			
18 SEPT	2.99	2.41	2.70
17 OCT	3.45	2.99	3.22
Mean	3.22	2.70	2.96

N TIMEV	16 MARCH	14 APRIL	Mean
WINTR NV			
0	3.13	2.47	2.80
26+25	3.31	2.94	3.12
Mean	3.22	2.70	2.96

E FUNGV	NONE	TFSD	Mean
SOWDATEV			
18 SEPT	2.81	2.59	2.70
17 OCT	3.11	3.34	3.22
Mean	2.96	2.96	2.96

E FUNGV	NONE	TFSD	Mean
WINTR NV			
0	2.71	2.89	2.80
26+25	3.21	3.04	3.12
Mean	2.96	2.96	2.96

E FUNGV	NONE	TFSD	Mean
N TIMEV			
16 MARCH	3.29	3.14	3.22
14 APRIL	2.62	2.79	2.70
Mean	2.96	2.96	2.96

	N TIMEV	16 MARCH	14 APRIL
SOWDATEV	WINTR NV		
18 SEPT	0	2.79	2.10
	26+25	3.18	2.73
17 OCT	0	3.46	2.84
	26+25	3.44	3.15

	E FUNGV	NONE	TFSD
SOWDATEV	WINTR NV		
18 SEPT	0	2.36	2.53
	26+25	3.25	2.66
17 OCT	0	3.05	3.25
	26+25	3.16	3.43

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87/R/B/1

STRAW TONNES/HECTARE

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

SOWDATEV	E FUNGV N TIMEV	NONE	TFSD
18 SEPT	16 MARCH	3.21	2.76
	14 APRIL	2.40	2.43
17 OCT	16 MARCH	3.37	3.53
	14 APRIL	2.84	3.14

WINTR NV	E FUNGV N TIMEV	NONE	TFSD
0	16 MARCH	3.10	3.15
	14 APRIL	2.31	2.63
26+25	16 MARCH	3.48	3.14
	14 APRIL	2.93	2.95

SOWDATEV	WINTR NV	E FUNGV N TIMEV	NONE	TFSD
18 SEPT	0	16 MARCH	2.83	2.75
		14 APRIL	1.89	2.31
	26+25	16 MARCH	3.60	2.76
		14 APRIL	2.91	2.55
17 OCT	0	16 MARCH	3.37	3.55
		14 APRIL	2.74	2.94
	26+25	16 MARCH	3.37	3.51
		14 APRIL	2.95	3.34

N TIMEF	16 MARCH	14 APRIL	Mean
	3.37	3.28	3.32

WINTR NX	51+25
	3.45

EXTRA NO	0+0+0
	0.84

Grand mean 2.74

STRAW MEAN DM% 88.0

PLOT AREA HARVESTED 0.00245

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87/R/B/2

WINTER BARLEY

SOWING DATES, APHIDS AND BYDV

Object: To study the relationship of aphid numbers in suction trap samples to crop populations and the incidence of BYDV on winter barley sown on a range of dates - Great Field II.

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

Design: 4 randomised blocks of 10 plots.

Whole plot dimensions: 3.0 x 18.0.

Treatments: All combinations of:-

1. SOWDATE	Dates of sowing:
12 SEPT	12 September, 1986
22 SEPT	22 September
1 OCT	1 October
10 OCT	10 October
24 OCT	24 October
2. APHICIDE	Aphicide:
NONE	None
CYPERMET	Cypermethrin at 0.025 kg in 380 l on 12 Nov, 1986

NOTES: (1) All SOWDATE treatments were rotary harrowed on the day of sowing.
(2) The crop was netted against birds from late June until maturity.

Basal applications: Manures: 'Nitram' at 460 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg with clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Triadimenol at 0.12 kg in 200 l.

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- Cultivated by rotary grubber: 13 Aug, 1986. Heavy spring-tine cultivated: 28 Aug. Paraquat applied: 10 Sept. Heavy spring-tine cultivated, rotary harrowed: 11 Sept. N applied: 21 Mar, 1987. Remaining weedkillers applied: 16 Apr. Prochloraz and carbendazim applied: 21 Apr. Triadimenol applied: 27 May. Combine harvested: 7 Aug. Previous crops: S. barley 1985, w. barley 1986.

NOTE: Aphids were counted from late September to January and again in May. Visual estimates of BYDV were made at the end of April. Components of yield were measured. Take-all was assessed in summer.

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87/R/B/2

GRAIN TONNES/HECTARE

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

APHICIDE SOWDATE	NONE	CYPERMET	Mean
12 SEPT	5.28	5.20	5.24
22 SEPT	5.14	5.46	5.30
1 OCT	5.54	5.63	5.58
10 OCT	5.47	5.39	5.43
24 OCT	5.61	5.64	5.63
Mean	5.41	5.46	5.44

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

Table	SOWDATE	APHICIDE	SOWDATE APHICIDE
s.e.d.	0.159	0.101	0.225

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	27	0.319	5.9

GRAIN MEAN DM% 86.3

PLOT AREA HARVESTED 0.00230

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87/R/B/3

WINTER BARLEY

ANTI-FEEDANTS AND BYDV

Object: To study the effects of insecticides and insect anti-feedants and their interaction with control of autumn volunteers on the incidence of BYDV - Scout N.

Sponsors: D.C. Griffiths, R.T. Plumb.

Design: 3 blocks of 2 whole plots, split into 6 sub-plots.

Whole plot dimensions: 15.0 x 30.0.

Treatments: All combinations of:-

Whole plots

1. VOLNTEER		Control of volunteers prior to sowing:
	KILLED	Control of all green plant matter
	PRESENT	Volunteer germination and survival encouraged

Sub plots

2. SPRY INS		Sprays of insecticides and pheromone derivatives applied electrostatically in 10 l:
	NONE	None
	CYP	Cypermethrin at 25 g on 29 Oct, 1986
	POLYG R1	Polygodial, racemic, one spray on 29 Oct
	POLYG R2	Polygodial, racemic, two sprays, on 15 Oct and 29 Oct
	POLYG R3	Polygodial, racemic, three sprays, on 3 Oct, 15 Oct and 29 Oct
	POLYG N3	Polygodial, normal, three sprays, on 3 Oct, 15 Oct and 29 Oct

NOTE: VOLNTEER KILLED plots were sprayed with paraquat at 0.60 kg ion in 280 l on 9 Sept, 1986.

Basal applications: Manures: (0:18:36) at 690 kg. 'Nitram' at 460 kg. Weedkillers: Isoproturon at 2.5 kg with clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 500 l. Fungicides: Carbendazim at 0.15 kg and prochloraz at 0.40 kg in 200 l. Propiconazole at 0.25 kg in 200 l. Desiccant: Diquat at 0.80 kg ion with a wetting agent ('Agral' at 0.20 l) in 200 l.

Seed: Igri, sown at 150 kg.

Cultivations, etc.:- PK applied, cultivated by rotary grubber: 7 Aug, 1986. Spring-tine cultivated: 11 Sept. Rotary harrowed, seed sown: 12 Sept. N applied: 20 Mar, 1987. Weedkillers applied: 15 Apr. Carbendazim and prochloraz applied: 29 Apr. Propiconazole applied: 27 May. Diquat with wetting agent applied: 31 July. Combine harvested: 7 Aug. Previous crops: W. barley 1985 and 1986.

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87/R/B/3

NOTES: (1) Aphid counts were made in early November 1986, late November and early April, 1987.
(2) VOLNTEER PRESENT plots were severely infested with blackgrass.

GRAIN TONNES/HECTARE

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

SPRY INS / VOLNTEER	NONE	CYP	POLYG R1	POLYG R2	POLYG R3	POLYG N3	Mean
KILLED	6.96	7.35	7.14	7.24	7.27	7.38	7.22
PRESENT	4.75	4.19	4.71	2.43	5.10	4.25	4.24
Mean	5.85	5.77	5.92	4.83	6.19	5.81	5.73

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

Table	SPRY INS	VOLNTEER* SPRY INS
s.e.d.	0.657	0.930

* Within the same level of VOLNTEER only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	20	1.139	19.9

GRAIN MEAN DM% 85.9

SUB PLOT AREA HARVESTED 0.00163

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87/R/B/5

WINTER BARLEY

VARIETIES

Object: To study the yields of some of the newer winter barley varieties - Summerdells II.

Sponsors: R. Moffitt, J.F. Jenkyn.

Design: 4 randomised blocks of 11 plots.

Whole plot dimensions: 3.0 x 10.0.

Treatments:

VARIETY	Varieties:
GERBEL	Gerbel
IGRI	Igri
KASKADE	Kaskade
MAGIE	Magie
MG 26+0	Magie with 26 kg extra N applied on 17 Nov, 1986
MG 0+25	Magie with 25 kg extra N applied on 16 Feb, 1987
MG 26+25	Magie with extra N applied on both the above dates
MG S600	Magie with 'Seamac 600' spray
MARINKA	Marinka
PIRATE	Pirate
PLAISANT	Plaisant

NOTES: (1) The extra N for VARIETY MG was applied as urea.
(2) The 'Seamac 600' was applied at 5.6 l in 220 l on 14 Apr, 1987.

Basal applications: Manures: 'Nitram' at 450 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Isoproturon at 2.5 kg with clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Triadimenol at 0.12 kg in 200 l. Growth regulators: Mepiquat chloride at 0.61 kg and 2-chloroethylphosphonic acid at 0.31 kg with a wetting agent ('Cittowet' at 0.08 l) in 200 l.

Seed: Varieties sown at 150 kg.

Cultivations, etc.:- Heavy spring-tine cultivated, disced: 18 Aug, 1986. Paraquat applied: 10 Sept. Rotary harrowed, seed sown: 22 Sept. N applied: 19 Mar, 1987. Remaining weedkillers applied: 16 Apr. Prochloraz and carbendazim applied, growth regulators with the wetting agent applied: 27 Apr. Triadimenol applied: 27 May. Combine harvested: 7 Aug. Previous crops: S. barley 1985, w. barley 1986.

NOTE: Leaf samples were taken for disease assessment in June.

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87/R/B/5

GRAIN TONNES/HECTARE

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

VARIETY	
GERBEL	8.32
IGRI	7.29
KASKADE	7.42
MAGIE	7.95
MG 26+0	8.28
MG 0+25	7.72
MG 26+25	8.58
MG S600	7.77
MARINKA	8.19
PIRATE	7.87
PLAISANT	7.69
Mean	7.92

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

Table	VARIETY
s.e.d.	0.197

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.279	3.5

GRAIN MEAN DM% 85.2

PLOT AREA HARVESTED 0.00204

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87/R/B/6 and 87/W/B/6

SPRING BARLEY

VARIETIES AND N

Object: To study the yields of some of the newer varieties of s. barley at two rates of nitrogen - Rothamsted (R), Highfield IV and Woburn (W), Lansome II.

Sponsor: R. Moffitt.

Design: 3 randomised blocks of 2 plots split into 10.

Sub-plot dimensions: (R) 3.0 x 10.0. (W) 4.0 x 9.0.

Treatments: All combinations of:-

Whole plots

1. N — Nitrogen fertilizer:

(R)	(W)	
125	80	125 kg N on 20 Mar, 1987 (R), 80 kg N on 5 May (W)
125+46	120	125 kg N on 20 Mar plus 46 kg N on 29 Apr (R), 120 kg N on 5 May (W)

Sub plots

2. VARIETY — Varieties:

BLENHEIM	Blenheim
CAMEO	Cameo
CORNICHE	Corniche
DIGGER	Digger
DOUBLET	Doublet
KLAXON	Klaxon
KLAXON B	Klaxon with 'Baytan' seed dressing
NATASHA	Natasha
REGATTA	Regatta
TRIUMPH	Triumph

NOTE: Nitrogen fertilizer was applied as 'Nitram'.

Basal applications:
Highfield IV (R): Weedkillers: Clopyralid at 0.07 kg, bromoxynil at 0.34 kg with mecoprop at 2.5 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.
Lansome II (W): Fungicides: Tridemorph at 0.19 kg with propiconazole at 0.12 kg in 200 l. Desiccant: Diquat at 0.60 kg ion applied with a wetting agent ('Agral' at 0.10 l) in 200 l.

Seed: Highfield IV (R), and Lansome II (W): Sown at 160 kg.

Cultivations, etc.:-
Highfield IV (R): Ploughed: 5 Nov, 1986. Spring-tine cultivated, rotary harrowed, seed sown, harrowed: 20 Mar, 1987. Rolled: 21 Mar. Weedkillers applied: 6 May. Fungicide applied: 23 June. Combine harvested: 20 Aug. Previous crops: Potatoes 1985, w. wheat 1986.

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87/R/B/6 and 87/W/B/6

Cultivations, etc.:-
Lansome II (W): Deep-tine cultivated: 30 Jan, 1987. Spike harrowed with crumbler attached, seed sown: 30 Mar. Fungicides applied: 3 July. Desiccant applied: 21 Aug. Combine harvested: 10 Sept. Previous crops: W. oats 1985, potatoes 1986.

87/R/B/6 HIGHFIELD IV (R)

GRAIN TONNES/HECTARE

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

N VARIETY	125	125+46	Mean
BLENHEIM	6.20	6.59	6.39
CAMEO	6.99	7.63	7.31
CORNICHE	6.61	6.62	6.62
DIGGER	5.99	7.96	6.97
DOUBLET	6.81	7.52	7.17
KLAXON	6.24	6.55	6.39
KLAXON B	6.10	7.19	6.64
NATASHA	6.67	6.85	6.76
REGATTA	7.55	7.58	7.57
TRIUMPH	5.67	6.67	6.17
Mean	6.48	7.12	6.80

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

Table	VARIETY	N* VARIETY
s.e.d.	0.270	0.382

* Within the same level of N only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	36	0.467	6.9

GRAIN MEAN DM% 86.7

SUB PLOT AREA HARVESTED 0.00204

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87/W/B/6 LANSOME II (W)

GRAIN TONNES/HECTARE

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

N	80	120	Mean
VARIETY			
BLENHEIM	4.92	4.78	4.85
CAMEO	5.00	4.22	4.61
CORNICHE	5.17	4.63	4.90
DIGGER	5.94	6.68	6.31
DOUBLET	4.85	5.23	5.04
KLAXON	5.39	4.44	4.91
KLAXON B	5.02	4.86	4.94
NATASHA	4.57	4.22	4.39
REGATTA	5.43	5.17	5.30
TRIUMPH	5.26	4.03	4.64
Mean	5.15	4.83	4.99

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

Table	VARIETY	N* VARIETY
s.e.d.	0.236	0.334

* Within the same level of N only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	36	0.409	8.2

GRAIN MEAN DM% 85.5

SUB PLOT AREA HARVESTED 0.00247

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87/R/BE/1

WINTER BEANS

CONTROL OF CHOCOLATE SPOT AND RUST

Object: To compare maneb plus mancozeb with benomyl plus chlorothalonil for the control of chocolate spot (Botrytis spp.) and rust (Uromyces viciae-fabae) on w. beans sown at two densities - Great Harpenden I.

Sponsors: J. McEwen, D.P. Yeoman.

Design: 2 randomised blocks of 18 plots.

Whole plot dimensions: 6.0 x 10.0.

Treatments: All combinations of:-

1. SEEDRATE — Seeds sown per square metre:

   12
   36

2. CS FUNG — Fungicides applied to control chocolate spot until first rust pustules seen:

   NONE — None
   BEN+CHL — Benomyl at 0.50 kg plus chlorothalonil at 1.0 kg on 18 June, 1987
   MAN+MANC — Maneb plus mancozeb each at 0.80 kg on 18 June

3. RUSTFUNG — Fungicides applied to control rust first applied as soon as rust pustules seen:

   NONE — None
   BEN+CHL — Benomyl at 0.50 kg plus chlorothalonil at 1.0 kg on 9 July, 5 Aug
   MAN+MANC — Maneb plus mancozeb each at 0.80 kg on 9 July, 5 Aug

NOTES: (1) All spray treatments were applied in 200 l.
(2) All benomyl plus chlorothalonil treatments had a wetting agent ('Agral' at 0.06 l) added.

Basal applications: Manures: Chalk at 5.0 t. Weedkillers: Paraquat at 0.80 kg ion in 500 l. Simazine at 1.2 kg with propyzamide at 0.85 kg in 500 l. Insecticide: Deltamethrin at 0.0079 kg in 200 l on two occasions. Desiccant: Diquat at 0.60 kg ion and a wetting agent ('Agral' at 0.3 l) in 300 l.

Seed: Bourdon, dressed with thiram and thiabendazole.

Cultivations, etc.:- Heavy spring-tine cultivated: 10 Sept, 1986. Chalk applied: 24 Sept. Paraquat applied: 6 Nov. Seed broadcast and ploughed in: 12 Nov. Simazine and propyzamide applied: 5 Jan, 1987. Insecticide applied: 22 Apr, 27 May. Desiccant with wetting agent applied: 21 Sept. Combine harvested: 25 Sept. Previous crops: W. wheat 1985 and 1986.

NOTE: Establishment counts were made in autumn, disease assessments were made in July and August and components of yield were measured at maturity.

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87/R/BE/1

GRAIN TONNES/HECTARE

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

CS FUNG / SEEDRATE	NONE	BEN+CHL	MAN+MANC	Mean
12	3.12	2.78	3.40	3.10
36	5.19	5.27	5.11	5.19
Mean	4.15	4.02	4.25	4.14

RUSTFUNG / SEEDRATE	NONE	BEN+CHL	MAN+MANC	Mean
12	2.88	3.21	3.20	3.10
36	4.63	5.25	5.68	5.19
Mean	3.76	4.23	4.44	4.14

RUSTFUNG / CS FUNG	NONE	BEN+CHL	MAN+MANC	Mean
NONE	3.76	4.25	4.45	4.15
BEN+CHL	3.68	3.90	4.48	4.02
MAN+MANC	3.83	4.54	4.39	4.25
Mean	3.76	4.23	4.44	4.14

SEEDRATE	CS FUNG	RUSTFUNG	NONE	BEN+CHL	MAN+MANC
12	NONE		2.89	3.17	3.29
	BEN+CHL		2.78	2.76	2.80
	MAN+MANC		2.96	3.72	3.51
36	NONE		4.62	5.33	5.61
	BEN+CHL		4.59	5.05	6.17
	MAN+MANC		4.69	5.37	5.26

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

Table	SEEDRATE	CS FUNG	RUSTFUNG	SEEDRATE CS FUNG
s.e.d.	0.156	0.191	0.191	0.269

Table	SEEDRATE RUSTFUNG	CS FUNG RUSTFUNG	SEEDRATE CS FUNG RUSTFUNG
s.e.d.	0.269	0.330	0.467

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	17	0.467	11.3

GRAIN MEAN DM% 78.0

PLOT AREA HARVESTED 0.00310

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87/R/BE/4

SPRING BEANS

VARIETIES, ROW SPACING AND PLANT HEALTH

Object: To compare four varieties of spring-sown field beans at two row spacings and two amounts of pest and disease control - Pastures.

Sponsors: J. McEwen, D.P. Yeoman.

Design: 3 randomised blocks of 16 plots.

Whole plot dimensions: 6.0 x 10.0.

Treatments: All combinations of:-

1. VARIETY	Varieties sown at 60 seeds per square metre:	
	ALFRED	
	MINDEN	
	TICOL	
	TROY	
2. ROW SPAC	Spacing between rows (cm):	
	12	
	48	
3. PATHCONT	Pest and pathogen control:	
	STANDARD	None
	ENHANCED	Deltamethrin at 0.0079 kg in 500 l on 22 Apr, 1987, and in 200 l on 27 May
		Chlorothalonil at 1.0 kg with benomyl at 0.50 kg and a wetting agent ('Agral' at 0.06 l) in 200 l on 18 June
		Maneb at 0.80 kg and mancozeb at 0.80 kg in 200 l on 9 July

Basal applications: Weedkillers: Trietazine at 1.2 kg and simazine at 0.17 kg in 500 l.

Cultivations, etc.:- Ploughed: 27 Oct, 1986. Spring-tine cultivated, rotary harrowed, seed sown: 17 Mar, 1987. Weedkillers applied: 30 Mar. Combine harvested: 21 Sept. Previous crops: W. wheat 1985 and 1986.

NOTE: Establishment counts were made. Disease assessments were made in July and August. At maturity, plant heights, lodging and components of yield were assessed.

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87/R/BE/4

GRAIN TONNES/HECTARE

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

ROWSPACE	12	48	Mean
VARIETY			
ALFRED	4.88	4.87	4.88
MINDEN	4.47	4.36	4.42
TICOL	3.79	3.68	3.73
TROY	3.95	3.71	3.83
Mean	4.28	4.16	4.22

PATHCONT	STANDARD	ENHANCED	Mean
VARIETY			
ALFRED	3.82	5.94	4.88
MINDEN	3.88	4.95	4.42
TICOL	2.90	4.57	3.73
TROY	3.47	4.20	3.83
Mean	3.52	4.91	4.22

PATHCONT	STANDARD	ENHANCED	Mean
ROWSPACE			
12	3.53	5.03	4.28
48	3.51	4.80	4.16
Mean	3.52	4.91	4.22

ROWSPACE	12		48	
VARIETY PATHCONT	STANDARD	ENHANCED	STANDARD	ENHANCED
ALFRED	3.86	5.91	3.78	5.96
MINDEN	3.98	4.96	3.78	4.93
TICOL	2.87	4.72	2.94	4.42
TROY	3.39	4.51	3.54	3.88

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

Table	VARIETY	ROWSPACE	PATHCONT	VARIETY ROWSPACE
s.e.d.	0.123	0.087	0.087	0.174

Table	VARIETY PATHCONT	ROWSPACE PATHCONT	VARIETY ROWSPACE PATHCONT
s.e.d.	0.174	0.123	0.246

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.302	7.2

GRAIN MEAN DM% 76.4

PLOT AREA HARVESTED 0.00315

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87/R/LP/2 and 87/W/LP/2

LUPINS

VARIETIES, SOWING DATES AND PLANT HEALTH

Object: To study the effects of sowing dates and pest and pathogen control on the growth and yield of two varieties of lupin (Lupinus albus) - Rothamsted (R) Sawyers I East and Woburn (W) Butt Close IV.

Sponsors: J. McEwen, D.P. Yeoman, A.W. Ferguson, J.F. Jenkyn.

Design: 3 randomised blocks of 16 plots.

Whole plot dimensions: 2.4 x 6.0 (R), 3.0 x 6.0 (W).

Treatments: All combinations of:-

1. SOW DATE — Dates of sowing:

R	W	R	W
4 FEB	4 FEB	4 February, 1987	4 February
24 FEB	23 FEB	24 February	23 February
18 MAR	16 MAR	18 March	16 March
14 APR	6 APR	14 April	6 April

2. VARIETY — Varieties:

   KALINA
   VLADIMIR

3. PATHCON — Pest and pathogen control:

   NONE — None
   FULL — (R) Insecticides: Cypermethrin at 0.025 kg in 220 l: 8 May, 1987, 12 June. Pirimicarb at 0.14 kg with a wetting agent ('Citowett' at 0.14 l) in 220 l: 10 July. Fungicide: Benomyl at 0.55 kg in 220 l: 30 July. Seed dressing: Bendiocarb, thiabendazole and thiram.
   (W) Insecticides: Deltamethrin at 0.038 kg in 250 l: 8 May, 29 May. Pirimicarb at 0.077 kg with a wetting agent ('Enhance' at 0.015 l) in 200 l: 13 July. Fungicide: Benomyl at 0.50 kg applied with the pirimicarb.

NOTES: (1) At Rothamsted plots were netted from sowing to mid-June.
(2) At Woburn netting was available only from April to May and as a result yields were obtained only from SOW DATE 6 APR.

Basal applications:
Sawyers I East (R): Manures: Chalk at 5.0 t. Weedkillers: Monolinuron at 0.46 kg with paraquat at 0.33 kg ion in 220 l. Metamitron at 2.8 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 220 l.
Butt Close IV (W). Weedkillers: Terbutryne at 0.56 kg with terbuthylazine at 0.24 kg in 240 l.

Seed: Sown at 210 kg (R), 250 kg (W).

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87/R/LP/2 and 87/W/LP/2

Cultivations, etc.:-
Sawyers I East (R): Chalk applied: 24 Sept, 1986. Ploughed: 22 Oct. Monolinuron and paraquat applied after each sowing: 4 Feb, 1987, 24 Feb, 18 Mar, 14 Apr. Metamitron applied: 18 June. Diquat applied: 15 Sept, 25 Sept, 3 Nov. Combine harvested: 25 Sept, 22 Oct, 4, 18 Nov. Previous crops: W. wheat 1985 and 1986.
Butt Close IV (W): Ploughed: 10 Nov, 1986. Terbutryne and terbuthylazine applied after each sowing: 11 Feb, 1987, 23 Feb, 16 Mar, 9 Apr. Combine harvested: 18 Nov. Previous crops: Potatoes 1985, w. wheat 1986.

NOTE: Establishment counts were made at the four-leaf stage. Pests and diseases were observed and dates of flowering and maturity recorded.

87/R/LP/2 SAWYERS I E (R)

GRAIN TONNES/HECTARE

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

VARIETY	KALINA	VLADIMIR	Mean
SOW DATE			
4 FEB	0.24	0.29	0.27
24 FEB	0.34	0.27	0.31
18 MAR	2.66	2.20	2.43
14 APR	2.90	3.44	3.17
Mean	1.54	1.55	1.55

PATHCON	NONE	FULL	Mean
SOW DATE			
4 FEB	0.43	0.11	0.27
24 FEB	0.42	0.20	0.31
18 MAR	2.73	2.13	2.43
14 APR	3.19	3.16	3.17
Mean	1.69	1.40	1.55

PATHCON	NONE	FULL	Mean
VARIETY			
KALINA	1.73	1.35	1.54
VLADIMIR	1.66	1.45	1.55
Mean	1.69	1.40	1.55

VARIETY	KALINA		VLADIMIR	
SOW DATE PATHCON	NONE	FULL	NONE	FULL
4 FEB	0.40	0.08	0.45	0.14
24 FEB	0.50	0.18	0.33	0.22
18 MAR	3.02	2.30	2.45	1.96
14 APR	2.98	2.82	3.40	3.49

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87/R/LP/2 SAWYERS I E (R)

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

Table	SOW DATE	VARIETY	PATHCON	SOW DATE VARIETY
s.e.d.	0.108	0.077	0.077	0.153

Table	SOW DATE PATHCON	VARIETY PATHCON	SOW DATE VARIETY PATHCON
s.e.d.	0.153	0.108	0.216

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.265	17.2

GRAIN MEAN DM% 58.6

PLOT AREA HARVESTED 0.00086

87/W/LP/2 BUTT CLOSE IV (W)

GRAIN TONNES/HECTARE

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

PATHCON VARIETY	NONE	FULL	Mean
KALINA	0.71	0.73	0.72
VLADIMIR	0.47	0.64	0.56
Mean	0.59	0.69	0.64

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

Table	VARIETY	PATHCON	VARIETY PATHCON
s.e.d.	0.193	0.193	0.273

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.335	52.4

GRAIN MEAN DM% 58.7

PLOT AREA HARVESTED 0.00133

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87/R/LP/4

LUPINS

DESICCANTS AND FUNGICIDES

Object: To study the effects of times of applying desiccants and fungicides on senescence, grain quality and yield of lupins (Lupinus albus) - Long Hoos III 1.

Sponsors: H.L. Jones, J. Lacey.

Design: 2 randomised blocks of 30 plots.

Whole plot dimensions: 2.4 x 5.0.

Treatments: All combinations of:-

1. DESICCNT	Desiccants:
DIQUAT	Diquat at 0.15 kg ion
MET+FEN	Metoxuron at 2.0 kg plus fentin hydroxide at 0.20 kg
GLYPHOS	Glyphosate at 1.08 kg
NACL	Sodium chloride at 6.25 kg
2. FUNGCIDE	Fungicide:
NONE	None
PROPICON	Propiconazole at 0.125 kg
3. APP TIME	Times of applying desiccants and fungicide:
EARLY	Fungicide on 25 Sept 1987, desiccants 12 Oct
MIDDLE	Fungicide on 25 Sept, desiccants 19 Oct
LATE	Fungicide on 25 Sept, desiccants 28 Oct

plus five extra treatments not given desiccants:

FUNGIC X	Fungicides applied on 12 Oct:
NONE	None (duplicated)
IPRODION	Iprodione at 1.0 kg
PROPICON	Propiconazole at 0.125 kg
PROP+DIQ	Propiconazole at 0.125 kg + diquat at 0.60 kg ion
VINCLOZ	Vinclozalin at 0.375 kg

NOTES: (1) APP TIME for desiccants was chosen for the three stages EARLY-all leaves below pods fallen, MIDDLE-pods fully developed, LATE-no leaves remaining on plant.
(2) All spray treatments were applied in 220 l.
(3) The crop was netted from early Apr to early June.

Basal applications: Weedkillers: Glyphosate at 1.44 kg in 220 l. Monolinuron at 0.46 kg with paraquat at 0.33 kg ion in 220 l. Metamitron at 2.8 kg in 220 l. Insecticides: Cypermethrin at 0.025 kg in 220 l. Pirimicarb at 0.14 kg in 220 l applied with the fungicide. Fungicide: Benomyl at 0.55 kg.

Seed: Vladimir, dressed with thiram, inoculated with Rhizobium, sown at 240 kg.

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87/R/LP/4

Cultivations, etc.:- Glyphosate applied: 1 Oct, 1986. Ploughed: 17-29 Oct. Seed sown, harrowed, rolled: 31 Mar, 1987. Monolinuron and paraquat applied: 2 Apr. Cypermethrin applied: 8 May. Metamitron applied: 18 June. Benomyl and pirimicarb applied: 13 July. Combine harvested: 17 Nov. Previous crops: S. beans 1985, fallow 1986.

NOTE: Plant populations were measured and disease assessments made during the season. After desiccation, changes in dry matter were measured and fungal development on the pods assessed. Components of yield were measured. Seed microflora, germinability and discolouration of the seed coat were also assessed.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE / DESICCNT	NONE	PROPICON	Mean
DIQUAT	1.63	1.89	1.76
MET+FEN	1.79	1.46	1.62
GLYPHOS	1.59	1.71	1.65
NACL	1.81	1.80	1.80
Mean	1.71	1.71	1.71

APP TIME / DESICCNT	EARLY	MIDDLE	LATE	Mean
DIQUAT	1.59	1.92	1.77	1.76
MET+FEN	1.34	1.81	1.73	1.62
GLYPHOS	1.93	1.68	1.35	1.65
NACL	1.86	2.01	1.55	1.80
Mean	1.68	1.85	1.60	1.71

APP TIME / FUNGCIDE	EARLY	MIDDLE	LATE	Mean
NONE	1.73	1.90	1.49	1.71
PROPICON	1.63	1.80	1.71	1.71
Mean	1.68	1.85	1.60	1.71

DESICCNT	APP TIME / FUNGCIDE	EARLY	MIDDLE	LATE
DIQUAT	NONE	1.60	1.78	1.52
	PROPICON	1.57	2.07	2.03
MET+FEN	NONE	1.61	2.08	1.69
	PROPICON	1.07	1.53	1.76
GLYPHOS	NONE	1.91	1.59	1.28
	PROPICON	1.94	1.77	1.43
NACL	NONE	1.79	2.17	1.47
	PROPICON	1.93	1.84	1.62

FUNGIC X	NONE	IPRODION	PROPICON	PROP+DIQ	VINCLOZ	Mean
	1.78	1.54	1.71	1.41	1.84	1.68

Grand mean 1.70

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87/R/LP/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

Table	DESICCNT	FUNGCIDE	APP TIME	DESICCNT FUNGCIDE
s.e.d.	0.162	0.114	0.140	0.228

Table	DESICCNT APP TIME	FUNGCIDE APP TIME	DESICCNT FUNGCIDE APP TIME	FUNGIC X
s.e.d.	0.280	0.198	0.396	0.396

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.396	23.2

GRAIN MEAN DM% 63.3

PLOT AREA HARVESTED 0.00072

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87/R/PE/1

PEAS

EFFECTS OF PEA SEED-BORNE MOSAIC VIRUS

Object: To study the transmission, symptoms and effects on yield of pea seed-borne mosaic virus in two varieties of peas with and without insecticide - Long Hoos III 2.

Sponsor: A.J. Cockbain.

Design: 4 randomised blocks of 2 whole plots split into 3.

Whole plot dimensions: 9.2 x 5.0.

Treatments: All combinations of:-

Whole plots

1. INSCTCDE	Insecticide:	
NONE	None	
PP 321	'PP 321' applied at 0.20 l and pirimicarb at 0.14 kg in 220 l on 1 July, 1986, 10 July and 24 July	

Sub plots

2. VARIETY	Varieties:	
PROGR H	Progreta, healthy stock, sown at 200 kg	
WAVER H	Waverex, healthy stock, sown at 200 kg	
WAVER I	Waverex, seed infected pea seed-borne mosaic virus, sown at 140 kg	

NOTE: Plots were netted against bird damage from the end of May until harvest.

Basal applications: Manure: Muriate of potash at 520 kg. Weedkillers: Glyphosate at 1.4 kg. Simazine at 0.17 kg and trietazine at 1.2 kg in 220 l. Desiccant: Diquat at 0.84 kg ion in 220 l.

Cultivations, etc.:- K applied: 16 Sept, 1986. Glyphosate applied: 1 Oct. Ploughed: 28 Nov. Deep-tine cultivated twice: 28 Apr, 1987. Spring-tine cultivated, seed sown, rolled: 29 Apr. Simazine and trietazine applied: 5 May. Desiccant applied: 15 Sept. Combine harvested: 22 Sept. Previous crops: Potatoes 1985, s. barley 1986.

NOTES: (1) Aphid numbers were assessed during the growing season. Virus incidence was assessed in the plants during the season and in the seed from all plots after harvest.
(2) Because of weather conditions there was a long period between crop maturity and combine harvesting during which much grain was shed.

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87/R/PE/1

GRAIN TONNES/HECTARE

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

VARIETY INSCTCDE	PROGR H	WAVER H	WAVER I	Mean
NONE	1.10	0.33	0.20	0.54
PP 321	1.23	0.60	0.28	0.70
Mean	1.16	0.46	0.24	0.62

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

Table	VARIETY	INSCTCDE* VARIETY
s.e.d.	0.070	0.099

* Within the same level of INSCTCDE only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	12	0.141	22.6

GRAIN MEAN DM% 73.6

SUB PLOT AREA HARVESTED 0.00072

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87/R/RA/1

WINTER OILSEED RAPE

FACTORS LIMITING YIELD

Object: To study the effects of a range of factors on the incidence of pests and diseases and on the growth and yield of w. oilseed rape - Black Horse I.

Sponsors: C.J. Rawlinson, R.J. Darby, P.G.N. Digby, K. Evans, J.E. Leach, I.H. Williams, D.P. Yeoman.

Associate sponsors: P.B. Barraclough, D.S. Jenkinson, J. Lacey, S.P. McGrath, D.S. Powlson, A.J. Thomasson, A.H. Weir.

Design: A half replicate of 2 x 2 x 2 x 2 x 2 x 2 x 2 + a replicate of 2 x 2 x 4 + half replicates of 2 x 2 x 2 x 2 and 2 x 2 x 2 + 14 extra plots

Whole plot dimensions: 3.0 x 21.0.

Treatments: Combinations of:-

1. VARIETY	Varieties:	
	ARIANA	
	BIENVENU	
2. SOW DATE	Dates of sowing:	
	14 AUG	14 August, 1986
	4 SEP	4 September
3. N RATE	Amounts of N fertilizer (kg N), as 'Nitro-Chalk', in addition to a basal application of 50 kg N as 'Nitram' to the seedbed:	
	150	
	250	
4. N DIVIS	Division of N fertilizer application:	
	SINGLE	All on 16 Feb, 1987
	DIVIDED	50 kg on 16 Feb, remainder on 16 Mar
5. GROWREG	Growth regulator:	
	NONE	None
	TRIAPEN	Triapenthenol at 0.70 kg in 220 l on 10 Apr, 1987
6. INSCTCDE	Insecticides:	
	NONE	None
	DE+TR	Deltamethrin at 7.5 g in 220 l on 3 Oct, 1986 and 20 Nov and triazophos at 0.42 g in 220 l on 15 June, 1987

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7. FUNGCIDE		Fungicide in autumn, spring and summer:
	NONE	None
	PR+IP	Prochloraz in autumn and in spring at 0.50 kg in 200 l on 17 Nov, 1986 and 10 Apr, 1987, iprodione in summer at 0.50 kg in 200 l on 15 June

plus combinations of the following (all given growth regulator, insecticides and fungicides as above):

1. VARIETYN		Varieties:
	ARIANA	
	BIENVENU	
2. SOWDAT N		Dates of sowing:
	14 AUG	14 August, 1986
	4 SEP	4 September
3. N RATE N		Amounts of N fertilizer (kg N), as 'Nitro-Chalk', in addition to a basal application of 50 kg N as 'Nitram' to the seedbed. Applied as a single dressing on 16 Feb, 1987:
	0	
	100	
	200	
	300	

plus combinations of the following (all given insecticides and fungicides as above, combinations chosen are those not provided by the main factorial):

1. VARIETYP		Varieties:
	ARIANA	
	BIENVENU	
2. SOWDAT P		Dates of sowing:
	14 AUG	14 August, 1986
	4 SEP	4 September
3. N RATE P		Amounts of N fertilizer (kg N), as 'Nitro-Chalk', in addition to a basal application of 50 kg N as 'Nitram' to the seedbed. Applied as a single dressing on 16 Feb, 1987:
	150	
	250	
4. GROREG P		Growth regulator:
	NONE	None
	TRIAPEN	Triapenthenol at 0.70 kg in 220 l on 10 Apr, 1987

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plus combinations of the following (all Ariana given N as N RATE 150, SINGLE, fungicides as above and oxamyl at 5 kg to the seedbed):

1. SODATE OX	Dates of sowing:
14 AUG	14 August, 1986
4 SEP	4 September
2. GRORG OX	Growth regulator:
NONE	None
TRIAPEN	Triapenthenol at 0.70 kg in 220 l on 10 Apr, 1987
3. INSCT OX	Insecticides:
NONE	None
DE+TR	Deltamethrin at 7.5 g in 220 l on 3 Oct, 1986 and 20 Nov, triazophos at 0.42 l in 220 l on 15 June, 1987

plus two replicates (all sown 4 SEP and given N as N RATE 250, DIVIDED and insecticides and fungicides as above) of all combinations of:

1. VAR NUT	Varieties:
ARIANA	
BIENVENU	
2. FOL NUT	Foliar nutrients:
N	N at 3.2 kg (1.0 kg as ammonium nitrate, 2.2 kg as urea; solution applied at 12 l in 220 l on 16 Apr, 1987, 12 June and 23 June)
N+MIC+S	N (as above) plus micronutrients: Mg at 480 g, Mn at 162 g, Cu at 32.4 g, Fe at 3.6 g, B at 3.6 g, Zn at 1.68 g and Mo at 0.84 g (as 'BASF Foliar 36' at 12 l), plus sulphur at 8.0 kg (as 'Thiovit') applied in 220 l on 16 Apr, 1987, 12 June and 23 June

plus all combinations of (all given no other inputs):

1. VAR NIL	Varieties:
ARIANA	Ariana (duplicated)
BIENVENU	Bienvenu
2. SDAT NIL	Dates of sowing:
14 AUG	14 August, 1986
4 SEP	4 September

plus 4 plots for N15 studies and 2 plots for root studies not taken for yield.

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87/R/RA/1

Basal applications: Manures: (0:18:36) at 700 kg. 'Nitram' at 140 kg. Weedkillers: Sodium trichloroacetate at 16 kg in 200 l. Metazachlor at 0.75 kg in 280 l. Metazachlor at 0.50 kg with fluazifop-P-butyl at 0.19 kg and a wetting agent ('Agral' at 0.20 l) in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.50 l) in 500 l.

Seed: Varieties, dressed gamma HCH, thiram and fenpropimorph, sown at 8.0 kg.

Cultivations, etc.:- Spring-tine cultivated: 8 Aug, 1986. PK applied: 11 Aug. Sodium trichloroacetate applied, basal N applied, oxamyl treatments to SOWDATE 14 AUG applied, harrowed: 13 Aug. Seed sown for SOWDATE 14 AUG: 14 Aug. Metazachlor applied to SOWDATE 14 AUG: 15 Aug. Oxamyl treatments applied and seed sown to SOWDATE 4 SEPT, harrowed in, metazachlor applied to these plots: 4 Sept. Metazachlor with fluazifop-P-butyl and the wetting agent applied: 4 Oct. Desiccant with wetting agent applied: 30 July, 1987. Combine harvested: 4 Aug. Previous crops: W. wheat 1985, w. barley 1986.

NOTE: Detailed observations were made during the season on diseases, pests, N in plants and soil, dry matter accumulation, leaf areas, root growth, light interception and lodging. Measurements were taken of N15 uptake and the fate of N in crop residues. Microflora of leaf and pods were assessed up to harvest and some seed analysed for mineral composition and glucosinolate contents. Percentage of oil in grain was measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOW DATE	14 AUG	4 SEP	Mean
VARIETY			
ARIANA	3.66	3.78	3.72
BIENVENU	3.91	4.10	4.00
Mean	3.78	3.94	3.86

N RATE	150	250	Mean
VARIETY			
ARIANA	3.65	3.78	3.72
BIENVENU	3.90	4.11	4.00
Mean	3.77	3.95	3.86

N RATE	150	250	Mean
SOW DATE			
14 AUG	3.58	3.98	3.78
4 SEP	3.96	3.91	3.94
Mean	3.77	3.95	3.86

N DIVIS	SINGLE	DIVIDED	Mean
VARIETY			
ARIANA	3.67	3.77	3.72
BIENVENU	4.07	3.94	4.00
Mean	3.87	3.85	3.86

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87/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N DIVIS	SINGLE	DIVIDED	Mean
SOW DATE			
14 AUG	3.75	3.82	3.78
4 SEP	3.99	3.89	3.94
Mean	3.87	3.85	3.86

N DIVIS	SINGLE	DIVIDED	Mean
N RATE			
150	3.74	3.80	3.77
250	3.99	3.91	3.95
Mean	3.87	3.85	3.86

GROWREG	NONE	TRIAPEN	Mean
VARIETY			
ARIANA	3.49	3.94	3.72
BIENVENU	3.60	4.40	4.00
Mean	3.55	4.17	3.86

GROWREG	NONE	TRIAPEN	Mean
SOW DATE			
14 AUG	3.31	4.26	3.78
4 SEP	3.79	4.09	3.94
Mean	3.55	4.17	3.86

GROWREG	NONE	TRIAPEN	Mean
N RATE			
150	3.48	4.06	3.77
250	3.61	4.29	3.95
Mean	3.55	4.17	3.86

GROWREG	NONE	TRIAPEN	Mean
N DIVIS			
SINGLE	3.60	4.14	3.87
DIVIDED	3.50	4.21	3.85
Mean	3.55	4.17	3.86

INSCTCDE	NONE	DE+TR	Mean
VARIETY			
ARIANA	3.64	3.80	3.72
BIENVENU	4.04	3.97	4.00
Mean	3.84	3.88	3.86

INSCTCDE	NONE	DE+TR	Mean
SOW DATE			
14 AUG	3.80	3.76	3.78
4 SEP	3.87	4.01	3.94
Mean	3.84	3.88	3.86

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87/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

INSCTCDE N RATE	NONE	DE+TR	Mean
150	3.72	3.82	3.77
250	3.95	3.95	3.95
Mean	3.84	3.88	3.86

INSCTCDE N DIVIS	NONE	DE+TR	Mean
SINGLE	3.78	3.96	3.87
DIVIDED	3.89	3.81	3.85
Mean	3.84	3.88	3.86

INSCTCDE GROWREG	NONE	DE+TR	Mean
NONE	3.57	3.53	3.55
TRIAPEN	4.11	4.24	4.17
Mean	3.84	3.88	3.86

FUNGCIDE VARIETY	NONE	PR+IP	Mean
ARIANA	3.53	3.90	3.72
BIENVENU	3.82	4.19	4.00
Mean	3.68	4.04	3.86

FUNGCIDE SOW DATE	NONE	PR+IP	Mean
14 AUG	3.65	3.91	3.78
4 SEP	3.70	4.17	3.94
Mean	3.68	4.04	3.86

FUNGCIDE N RATE	NONE	PR+IP	Mean
150	3.55	3.99	3.77
250	3.80	4.09	3.95
Mean	3.68	4.04	3.86

FUNGCIDE N DIVIS	NONE	PR+IP	Mean
SINGLE	3.70	4.04	3.87
DIVIDED	3.66	4.05	3.85
Mean	3.68	4.04	3.86

FUNGCIDE GROWREG	NONE	PR+IP	Mean
NONE	3.33	3.77	3.55
TRIAPEN	4.03	4.32	4.17
Mean	3.68	4.04	3.86

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87/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

FUNGCIDE INSCTCDE	NONE	PR+IP	Mean
NONE	3.63	4.04	3.84
DE+TR	3.72	4.04	3.88
Mean	3.68	4.04	3.86

SOWDAT N VARIETYN	14 AUG	4 SEP	Mean
ARIANA	3.70	3.47	3.59
BIENVENU	4.18	4.05	4.11
Mean	3.94	3.76	3.85

N RATE N VARIETYN	0	100	200	300	Mean
ARIANA	2.39	3.58	4.19	4.19	3.59
BIENVENU	2.84	4.20	4.60	4.81	4.11
Mean	2.61	3.89	4.40	4.50	3.85

N RATE N SOWDAT N	0	100	200	300	Mean
14 AUG	2.93	3.94	4.43	4.45	3.94
4 SEP	2.30	3.84	4.36	4.55	3.76
Mean	2.61	3.89	4.40	4.50	3.85

SOWDAT P VARIETYP	14 AUG	4 SEP	Mean
ARIANA	4.14	3.86	4.00
BIENVENU	4.25	4.56	4.41
Mean	4.19	4.21	4.20

N RATE P VARIETYP	150	250	Mean
ARIANA	3.85	4.15	4.00
BIENVENU	3.89	4.92	4.41
Mean	3.87	4.53	4.20

N RATE P SOWDAT P	150	250	Mean
14 AUG	3.75	4.64	4.19
4 SEP	3.99	4.43	4.21
Mean	3.87	4.53	4.20

GROREG P VARIETYP	NONE	TRIAPEN	Mean
ARIANA	3.87	4.13	4.00
BIENVENU	4.27	4.54	4.41
Mean	4.07	4.34	4.20

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87/R/RA/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

GROREG P	NONE	TRIAPEN	Mean
SOWDAT P			
14 AUG	4.06	4.33	4.19
4 SEP	4.08	4.34	4.21
Mean	4.07	4.34	4.20

GROREG P	NONE	TRIAPEN	Mean
N RATE P			
150	3.74	4.00	3.87
250	4.40	4.67	4.53
Mean	4.07	4.34	4.20

GRORG OX	NONE	TRIAPEN	Mean
SODATE O			
14 AUG	2.97	4.32	3.65
4 SEP	3.89	4.00	3.95
Mean	3.43	4.16	3.80

INSCT OX	NONE	DE+TR	Mean
SODATE O			
14 AUG	2.97	4.32	3.65
4 SEP	4.00	3.89	3.95
Mean	3.49	4.11	3.80

INSCT OX	NONE	DE+TR	Mean
GRORG OX			
NONE	2.97	3.89	3.43
TRIAPEN	4.00	4.32	4.16
Mean	3.49	4.11	3.80

FOL NUT	N	N+MIC+S	Mean
VAR NUT			
ARIANA	3.95	4.15	4.05
BIENVENU	4.70	4.24	4.47
Mean	4.32	4.19	4.26

SDAT NIL	14 AUG	4 SEP	Mean
VAR NIL			
ARIANA	2.31	2.25	2.28
BIENVENU	2.59	2.44	2.52
Mean	2.41	2.31	2.36

GRAIN MEAN 3.83

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

Table	VARIETY	SOW DATE	N RATE	N DIVIS
s.e.d.	0.094	0.094	0.090	0.090

Table	GROWREG	INSCTCDE	FUNGCIDE	VARIETY SOW DATE
s.e.d.	0.090	0.090	0.090	0.133

Table	VARIETY N RATE	SOW DATE N RATE	VARIETY N DIVIS	SOW DATE N DIVIS
s.e.d.	0.131	0.131	0.131	0.131
Except when comparing means with the same level(s) of				
VARIETY	0.128		0.128	
SOW DATE		0.128		0.128

Table	N RATE N DIVIS	VARIETY GROWREG	SOW DATE GROWREG	N RATE GROWREG
s.e.d.	0.128	0.131	0.131	0.128
Except when comparing means with the same level(s) of				
VARIETY		0.128		
SOW DATE			0.128	
N RATE				0.131
GROWREG				0.131

Table	N DIVIS GROWREG	VARIETY INSCTCDE	SOW DATE INSCTCDE	N RATE INSCTCDE
s.e.d.	0.128	0.131	0.131	0.128
Except when comparing means with the same level(s) of				
VARIETY		0.128		
SOW DATE			0.128	

Table	N DIVIS INSCTCDE	GROWREG INSCTCDE	VARIETY FUNGCIDE	SOW DATE FUNGCIDE
s.e.d.	0.128	0.128	0.131	0.131
Except when comparing means with the same level(s) of				
VARIETY			0.128	
SOW DATE				0.128

Table	N RATE FUNGCIDE	N DIVIS FUNGCIDE	GROWREG FUNGCIDE	INSCTCDE FUNGCIDE
s.e.d.	0.128	0.128	0.128	0.128
Except when comparing means with the same level(s) of				
N RATE	0.131			
GROWREG			0.131	
FUNGCIDE	0.131		0.131	

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.189	4.9
BLOCK.WP.SP	26	0.361	9.4

GRAIN MEAN DM% 87.1

PLOT AREA HARVESTED 0.00299

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87/R/RA/2

WINTER OILSEED RAPE

SEED RATES AND ROW SPACINGS

Object: To compare c.v. Ariana on a range of row-widths and seed rates - Great Knott II.

Sponsor: D.P. Yeoman.

Design: 3 randomised blocks of 11 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

1. SEEDRATE Seed rates:

   4 KG
   6 KG
   8 KG

2. ROWSPACE Row spacings:

   17.5 CM
   35 CM
   52.5 CM

plus two extra treatments, sown at 2 kg seed rate:-

EXTRA	Row spacings:
2 KG 35	35 cm
2 KG 52.5	52.5 cm

Basal applications: Manures: 'Nitram' at 140 kg and later at 720 kg. Weedkillers: Sodium trichloroacetate at 16 kg in 200 l. Clopyralid and propyzamide (as 'Matrikerb' at 1.6 kg) in 500 l. Fungicides: Prochloraz at 0.50 kg in 200 l. Iprodione at 0.50 kg in 200 l. Insecticides: Azinphos methyl at 0.40 kg and demeton-S-methyl sulphone at 0.12 kg in 300 l. Triazophos at 0.42 l in 200 l. Bird repellent: 'Hoppit' at 3.0 l in 220 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 500 l.

Seed: Ariana, dressed iprodione, gamma HCH and captan.

Cultivations, etc.:- Heavy spring-tine cultivated, cultivated with rotary grubber: 12 Aug, 1986. First N applied: 15 Aug. Rotary harrowed: 31 Aug. Sodium trichloroacetate applied, harrowed: 1 Sept. Seed sown: 3 Sept. Remaining weedkillers applied: 20 Nov. Bird repellent applied: 12 Dec. Second N applied: 18 Feb, 1987. Prochloraz applied: 22 Apr. Azinphos methyl and demeton-S-methyl sulphone applied: 29 Apr. Iprodione and triazophos applied: 15 June. Desiccant with wetting agent applied: 28 July. Combine harvested: 5 Aug. Previous crops: S. wheat 1985, w. barley 1986.

NOTE: Plant counts were made at establishment and again in spring.

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87/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	3.45	3.36	3.48	3.43
6 KG	3.17	3.13	2.90	3.07
8 KG	3.02	3.02	2.94	2.99
Mean	3.21	3.17	3.11	3.16

EXTRA	2 KG 35	2 KG 52.5	Mean
	3.61	3.39	3.50

GRAND MEAN 3.22

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

Table	EXTRA	SEEDRATE	ROWSPACE	SEEDRATE ROWSPACE
s.e.d.	0.229	0.132	0.132	0.229

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	20	0.280	8.7

GRAIN MEAN DM% 71.3

PLOT AREA HARVESTED 0.00345

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87/R/RA/3

WINTER OILSEED RAPE

VARIETIES AND FUNGICIDES

Object: To study the effects of times of applying fungicides on the incidence of diseases and on the yield of six varieties of w. oilseed rape - Black Horse I.

Sponsor: C.J. Rawlinson.

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

Whole plot dimensions: 21.0 x 15.0.

Treatments: All combinations of:-

Whole plots

1. AUT FUNG		Fungicide in autumn:
	NONE	None
	PROCHLOR	Prochloraz at 0.50 kg in 500 l on 12 Nov, 1986
2. SPR FUNG		Fungicide in spring:
	NONE	None
	PROCHLOR	Prochloraz at 0.50 kg in 200 l on 21 Apr, 1987
3. SUM FUNG		Fungicidein summer:
	NONE	None
	IPRODION	Iprodione at 0.50 kg in 200 l on 15 June, 1987

Sub plots

4. VARIETY		Varieties:
	ARIANA	Ariana
	BIENVENU	Bienvenu
	JET NEUF	Jet Neuf
	LIRADONN	Liradonna
	MIKADO	Mikado
	RAFAL	Rafal

Basal applications: Manures: (0:18:36) at 690 kg. 'Nitram' at 140 kg and later at 800 kg. Weedkillers: Sodium trichloroacetate at 16 kg in 200 l. Metazachlor at 1.2 kg with fluazifop-P-butyl at 0.19 kg and a wetting agent ('Agral' at 0.20 l) in 200 l. Insecticides: Deltamethrin at 0.0062 kg in 200 l. Azinphos methyl at 0.40 kg and demeton-S-methyl sulphone at 0.12 kg in 300 l. Bird repellent: 'Hoppit' at 3.0 l in 220 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 500 l.

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87/R/RA/3

Seed : Varieties, sown at 8.0 kg.

Cultivations, etc.:- Spring-tine cultivated: 8 Aug, 1986. PK applied: 11 Aug. Sodium trichloroacetate applied, N applied: 13 Aug. Seed sown: 2 Sept. Remaining weedkillers applied: 4 Oct. Deltamethrin applied: 11 Oct. Bird repellent applied: 12 Dec. Second N applied: 17 Feb, 1987. Remaining insecticides applied: 28 Apr. Desiccant with wetting agent applied: 28 July. Combine harvested: 3 Aug. Previous crops: W. wheat 1985, w. barley 1986.

NOTE: Diseases were assessed between November and July. Growth stage, height and plant development were recorded from May to harvest. Ripening and lodging were assessed before harvest and stubble stem population counts made immediately after harvest.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SPR FUNG / AUT FUNG	NONE	PROCHLOR	Mean
NONE	3.16	3.43	3.29
PROCHLOR	3.53	3.32	3.43
Mean	3.35	3.38	3.36

SUM FUNG / AUT FUNG	NONE	IPRODION	Mean
NONE	3.18	3.41	3.29
PROCHLOR	3.28	3.58	3.43
Mean	3.23	3.49	3.36

SUM FUNG / SPR FUNG	NONE	IPRODION	Mean
NONE	3.22	3.48	3.35
PROCHLOR	3.24	3.51	3.38
Mean	3.23	3.49	3.36

VARIETY / AUT FUNG	ARIANA	BIENVENU	JET	NEUF	LIRADONN	MIKADO	RAFAL	Mean
NONE	3.28	3.88	2.56	2.89	3.91	3.23	3.29	
PROCHLOR	3.25	3.83	2.73	3.16	4.27	3.32	3.43	
Mean	3.27	3.86	2.65	3.03	4.09	3.27	3.36	

VARIETY / SPR FUNG	ARIANA	BIENVENU	JET	NEUF	LIRADONN	MIKADO	RAFAL	Mean
NONE	3.23	3.79	2.70	2.96	4.03	3.37	3.35	
PROCHLOR	3.31	3.93	2.59	3.10	4.14	3.18	3.38	
Mean	3.27	3.86	2.65	3.03	4.09	3.27	3.36	

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87/R/RA/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VARIETY	ARIANA	BIENVENU	JET	NEUF	LIRADONN	MIKADO	RAFAL	Mean
SUM FUNG								
NONE	3.14	3.76	2.54	2.88	3.93	3.14	3.23	
IPRODION	3.40	3.96	2.76	3.17	4.25	3.41	3.49	
Mean	3.27	3.86	2.65	3.03	4.09	3.27	3.36	

	SUM FUNG	NONE	IPRODION
AUT FUNG	SPR FUNG		
NONE	NONE	3.00	3.32
	PROCHLOR	3.36	3.49
PROCHLOR	NONE	3.44	3.63
	PROCHLOR	3.12	3.53

	VARIETY	ARIANA	BIENVENU	JET	NEUF	LIRADONN	MIKADO	RAFAL
AUT FUNG	SPR FUNG							
NONE	NONE	3.15	3.66	2.43	2.83	3.79	3.11	
	PROCHLOR	3.41	4.10	2.70	2.96	4.03	3.36	
PROCHLOR	NONE	3.31	3.91	2.98	3.08	4.28	3.62	
	PROCHLOR	3.20	3.76	2.49	3.23	4.25	3.01	

	VARIETY	ARIANA	BIENVENU	JET	NEUF	LIRADONN	MIKADO	RAFAL
AUT FUNG	SUM FUNG							
NONE	NONE	3.02	3.79	2.56	2.68	3.78	3.26	
	IPRODION	3.54	3.98	2.57	3.11	4.04	3.20	
PROCHLOR	NONE	3.25	3.73	2.51	3.09	4.08	3.01	
	IPRODION	3.26	3.94	2.95	3.23	4.45	3.62	

	VARIETY	ARIANA	BIENVENU	JET	NEUF	LIRADONN	MIKADO	RAFAL
SPR FUNG	SUM FUNG							
NONE	NONE	3.12	3.64	2.62	2.76	3.86	3.30	
	IPRODION	3.33	3.94	2.79	3.15	4.21	3.43	
PROCHLOR	NONE	3.15	3.88	2.45	3.01	4.00	2.97	
	IPRODION	3.46	3.98	2.73	3.18	4.29	3.40	

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87/R/RA/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VARIETY	AUT FUNG	SUM FUNG SPR FUNG	NONE	IPRODION
ARIANA	NONE	NONE	2.86	3.44
		PROCHLOR	3.19	3.64
	PROCHLOR	NONE	3.39	3.23
		PROCHLOR	3.11	3.29
BIENVENU	NONE	NONE	3.57	3.75
		PROCHLOR	4.00	4.21
	PROCHLOR	NONE	3.70	4.12
		PROCHLOR	3.76	3.76
JET NEUF	NONE	NONE	2.33	2.52
		PROCHLOR	2.78	2.61
	PROCHLOR	NONE	2.91	3.05
		PROCHLOR	2.12	2.85
LIRADONN	NONE	NONE	2.55	3.10
		PROCHLOR	2.80	3.11
	PROCHLOR	NONE	2.96	3.21
		PROCHLOR	3.21	3.26
MIKADO	NONE	NONE	3.56	4.02
		PROCHLOR	4.00	4.07
	PROCHLOR	NONE	4.17	4.39
		PROCHLOR	3.99	4.51
RAFAL	NONE	NONE	3.10	3.11
		PROCHLOR	3.42	3.30
	PROCHLOR	NONE	3.50	3.75
		PROCHLOR	2.53	3.50

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

Table	AUT FUNG	SPR FUNG	SUM FUNG	VARIETY
s.e.d.	0.136	0.136	0.136	0.104

Table	AUT FUNG SPR FUNG	AUT FUNG SUM FUNG	SPR FUNG SUM FUNG	AUT FUNG VARIETY
s.e.d.	0.193	0.193	0.193	0.191
Except when comparing means with the same level(s) of				
AUT FUNG				0.147

Table	SPR FUNG VARIETY	SUM FUNG VARIETY	AUT FUNG SPR FUNG SUM FUNG	AUT FUNG SPR FUNG VARIETY
s.e.d.	0.191	0.191	0.273	0.271
Except when comparing means with the same level(s) of				
SPR FUNG	0.147			
SUM FUNG		0.147		
AUT FUNG.SPR FUNG				0.208

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

Table	AUT FUNG SUM FUNG VARIETY	SPR FUNG SUM FUNG VARIETY	AUT FUNG SPR FUNG SUM FUNG VARIETY
s.e.d.	0.271	0.271	0.383

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

AUT FUNG.SUM FUNG	0.208
SPR FUNG.SUM FUNG	0.208
AUT FUNG.SPR FUNG.SUM FUNG	0.294

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	7	0.273	8.1
BLOCK.WP.SP	40	0.294	8.7

GRAIN MEAN DM% 83.9

SUB PLOT AREA HARVESTED 0.00345

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87/R/RA/4

WINTER OILSEED RAPE

GROWTH REGULATORS AND FUNGICIDES

Object: To study the effects of a range of materials on the control of fungi and on the growth and the yield of w. oilseed rape - Black Horse I.

Sponsor: C.J. Rawlinson.

Design: Single replicate of 3 x 4 x 2 x 2.

Whole plot dimensions: 3.0 x 20.0.

Treatments: All combinations of:-

Whole plots

1. FUNGCIDE		Fungicides:
	NONE	None
	PROCHLOR	Prochloraz at 0.50 kg
	PROPICON	Propiconazole at 0.12 kg
2. GRTH REG		Growth regulators:
	NONE	None
	MEPIQUAT	Mepiquat chloride at 0.915 kg + 2-chlorethyl-phosphonic acid at 0.465 kg
	TRIAPENT	Triapenthenol (as 'U.K.244a' at 0.70 kg) with a wetting agent ('Cittowett' at 0.10 l)
	BAS11100	'BAS 11100W' at 3.0 l
3. VARIETY		Varieties:
	ARIANA	
	PRIMOR	
4. APP TIME		Times of application:
	AUTUMN	Autumn, on 27 Nov, 1986
	SPRING	Spring, on 15 Apr, 1987

NOTE: Treatment sprays were applied in 220 l.

Basal applications: Manures: (0:18:36) at 690 kg. 'Nitram' at 140 kg, and later at 800 kg. Weedkillers: Sodium trichloroacetate at 16 kg in 200 l. Metazachlor at 1.2 kg with fluazifop-P-butyl at 0.19 kg and a wetting agent ('Agral' at 0.20 l) in 200 l. Insecticides: Deltamethrin at 0.0062 kg in 200 l. Azinphos methyl at 0.40 kg and demeton-S-methyl sulphone at 0.12 kg in 300 l. Bird repellent: 'Hoppit' at 3.0 l in 220 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 500 l.

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87/R/RA/4

Seed: Varieties, sown at 8.0 kg.

Cultivations, etc.:- Spring-tine cultivated: 8 Aug, 1986. PK applied: 11 Aug. Sodium trichloroacetate applied, N applied: 13 Aug. Seed sown: 2 Sept. Remaining weedkillers applied: 4 Oct. Deltamethrin applied: 11 Oct. Bird repellent applied: 12 Dec. Second N applied: 17 Feb, 1987. Remaining insecticides applied: 28 Apr. Desiccant with wetting agent applied: 28 July. Combine harvested: 3 Aug. Previous crops: W. wheat 1985, w. barley 1986.

NOTE: Plant heights and diseases were assessed throughout the season. Flowering dates were noted and plant population counts made at harvest. Growth analysis and plant structure measurements were made just before harvest, stubble stem population counts were made immediately after harvest. Components of yield were measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

GRTH REG / FUNGCIDE	NONE	MEPIQUAT	TRIAPENT	BAS11100	Mean
NONE	2.71	2.84	3.10	2.75	2.85
PROCHLOR	3.19	2.98	3.24	3.20	3.15
PROPICON	2.82	2.78	3.17	3.04	2.95
Mean	2.90	2.86	3.17	2.99	2.98

VARIETY / FUNGCIDE	ARIANA	PRIMOR	Mean
NONE	3.24	2.45	2.85
PROCHLOR	3.54	2.76	3.15
PROPICON	3.25	2.66	2.95
Mean	3.34	2.62	2.98

VARIETY / GRTH REG	ARIANA	PRIMOR	Mean
NONE	3.36	2.45	2.90
MEPIQUAT	3.30	2.43	2.86
TRIAPENT	3.41	2.93	3.17
BAS11100	3.30	2.69	2.99
Mean	3.34	2.62	2.98

APP TIME / FUNGCIDE	AUTUMN	SPRING	Mean
NONE	2.83	2.86	2.85
PROCHLOR	3.19	3.11	3.15
PROPICON	2.96	2.95	2.95
Mean	2.99	2.97	2.98

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87/R/RA/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

APP TIME GRTH REG	AUTUMN	SPRING	Mean
NONE	2.88	2.93	2.90
MEPIQUAT	2.95	2.78	2.86
TRIAPENT	3.12	3.22	3.17
BAS11100	3.02	2.97	2.99
Mean	2.99	2.97	2.98

APP TIME VARIETY	AUTUMN	SPRING	Mean
ARIANA	3.39	3.29	3.34
PRIMOR	2.60	2.65	2.62
Mean	2.99	2.97	2.98

FUNGCIDE	VARIETY GRTH REG	ARIANA	PRIMOR
NONE	NONE	3.30	2.12
	MEPIQUAT	3.24	2.44
	TRIAPENT	3.41	2.78
	BAS11100	3.01	2.48
PROCHLOR	NONE	3.59	2.79
	MEPIQUAT	3.47	2.49
	TRIAPENT	3.55	2.93
	BAS11100	3.54	2.85
PROPICON	NONE	3.18	2.45
	MEPIQUAT	3.19	2.37
	TRIAPENT	3.28	3.07
	BAS11100	3.34	2.74

FUNGCIDE	APP TIME GRTH REG	AUTUMN	SPRING
NONE	NONE	2.68	2.74
	MEPIQUAT	2.81	2.86
	TRIAPENT	3.04	3.15
	BAS11100	2.79	2.70
PROCHLOR	NONE	3.28	3.10
	MEPIQUAT	3.23	2.72
	TRIAPENT	3.13	3.35
	BAS11100	3.14	3.26
PROPICON	NONE	2.69	2.94
	MEPIQUAT	2.81	2.75
	TRIAPENT	3.19	3.16
	BAS11100	3.13	2.94

VARIETY	ARIANA		PRIMOR	
FUNGCIDE APP TIME	AUTUMN	SPRING	AUTUMN	SPRING
NONE	3.21	3.27	2.45	2.46
PROCHLOR	3.56	3.51	2.82	2.70
PROPICON	3.39	3.11	2.52	2.79

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87/R/RA/4

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

VARIETY	ARIANA		PRIMOR	
GRTH REG APP TIME	AUTUMN	SPRING	AUTUMN	SPRING
NONE	3.24	3.47	2.52	2.38
MEPIQUAT	3.38	3.22	2.53	2.33
TRIAPENT	3.43	3.39	2.81	3.04
BAS11100	3.50	3.09	2.54	2.84

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

Table	FUNGCIDE	GRTH REG	VARIETY	APP TIME
s.e.d.	0.103	0.119	0.084	0.084

Table	FUNGCIDE GRTH REG	FUNGCIDE VARIETY	GRTH REG VARIETY	FUNGCIDE APP TIME
s.e.d.	0.206	0.145	0.168	0.145

Table	GRTH REG APP TIME	VARIETY APP TIME	FUNGCIDE GRTH REG VARIETY	FUNGCIDE GRTH REG APP TIME
s.e.d.	0.168	0.119	0.291	0.291

Table	FUNGCIDE VARIETY APP TIME	GRTH REG VARIETY APP TIME
s.e.d.	0.206	0.237

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

Stratum	d.f.	s.e.	cv%
WP	6	0.291	9.7

GRAIN MEAN DM% 83.6

PLOT AREA HARVESTED 0.00460

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87/R/RA/5

WINTER OILSEED RAPE

PRECISION SOWING

Object: To compare four drills at two seed rates on two sowing dates with and without an insecticide - Great Knott II.

Sponsor: D.P. Yeoman.

Design: 2 replicates of 4 x 2 x 2 x 2 arranged in 4 blocks of 16 plots.

Whole plot dimensions: 3.0 x 15.0.

Treatments: All combinations of:-

1. DRILL		Drills used to sow seed:
	ALPHA AC	Alpha Accord sown in rows 12.5 cm apart, seeds randomly spaced
	CNVNTIAL	Conventional, sown in rows 17.6 cm apart, seeds randomly spaced
	MONOCENT	Monocentra, sown in rows 25 cm apart, seeds precisely spaced
	STANHAY	Stanhay, sown in rows 25 cm apart, seeds precisely spaced
2. SOW DATE		Dates of sowing:
	18 AUG	18 August, 1986
	5 SEP	5 September
3. SEEDRATE		Seed rates:
	4 KG	
	8 KG	
4.INSCTCDE		Insecticide:
	NONE	None
	DELTAMET	Deltamethrin at 0.0075 kg in 220 l on 3 Oct, 1986

NOTES: (1) For the Monocentra drill the seed within the row was spaced at 5.5 cm for the 4 kg seed rate and 2.7 cm for the 8 kg seed rate.
(2) For the Stanhay drill the seed within the row was spaced at 4.8 cm for the 4 kg seed rate and 2.8 cm for the 8 kg seed rate.

Basal applications: Manures: 'Nitram' at 140 kg and later at 720 kg. Weedkillers: Sodium trichloroacetate at 16 kg in 200 l. Clopyralid and propyzamide (as 'Matrikerb' at 1.6 kg) in 500 l. Fungicides: Prochloraz at 0.50 kg in 200 l. Iprodione at 0.50 kg in 200 l. Insecticides: Azinphos methyl at 0.40 kg and demeton-S-methyl sulphone at 0.12 kg in 300 l. Bird repellent: 'Hoppit' at 3.0 l in 500 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 500 l.

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Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

Cultivations, etc.:- Heavy spring-tine cultivated, cultivated with rotary grubber: 12 Aug, 1986. First N applied, sodium trichloroacetate applied, harrowed: 15 Aug. SOWDATE 18 AUG seed sown: 18 Aug. SOWDATE 5 SEPT seed sown: 5 Sept. 'Matrikerb' applied: 20 Nov. Bird repellent applied: 24 Dec. Second N applied: 18 Feb, 1987. Prochloraz applied: 22 Apr. Insecticides applied: 29 Apr. Iprodione applied: 15 June. Desiccant with wetting agent applied: 28 July. Combine harvested: 6 Aug. Previous crops: S. wheat 1985, w. barley 1986.

NOTE: Plant counts were made at establishment and in spring.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOW DATE / DRILL	18 AUG	5 SEP	Mean
ALPHA AC	3.88	3.44	3.66
CNVNTIAL	3.85	3.27	3.56
MONOCENT	3.84	3.40	3.62
STANHAY	3.92	3.69	3.81
Mean	3.87	3.45	3.66

SEEDRATE / DRILL	4 KG	8 KG	Mean
ALPHA AC	3.84	3.48	3.66
CNVNTIAL	3.87	3.25	3.56
MONOCENT	3.83	3.41	3.62
STANHAY	3.93	3.68	3.81
Mean	3.87	3.46	3.66

SEEDRATE / SOW DATE	4 KG	8 KG	Mean
18 AUG	4.02	3.72	3.87
5 SEP	3.71	3.19	3.45
Mean	3.87	3.46	3.66

INSCTCDE / DRILL	NONE	DELTAMET	Mean
ALPHA AC	3.51	3.81	3.66
CNVNTIAL	3.52	3.60	3.56
MONOCENT	3.60	3.65	3.62
STANHAY	3.91	3.70	3.81
Mean	3.63	3.69	3.66

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

INSCTCDE	NONE	DELTAMET	Mean
SOW DATE			
18 AUG	3.84	3.91	3.87
5 SEP	3.43	3.47	3.45
Mean	3.63	3.69	3.66

INSCTCDE	NONE	DELTAMET	Mean
SEEDRATE			
4 KG	3.85	3.88	3.87
8 KG	3.41	3.50	3.46
Mean	3.63	3.69	3.66

	SOW DATE	18 AUG		5 SEP	
DRILL	SEEDRATE	4 KG	8 KG	4 KG	8 KG
ALPHA AC		3.96	3.80	3.72	3.16
CNVNTIAL		4.08	3.62	3.65	2.89
MONOCENT		3.99	3.69	3.67	3.13
STANHAY		4.06	3.79	3.81	3.57

	SOW DATE	18 AUG		5 SEP	
DRILL	INSCTCDE	NONE	DELTAMET	NONE	DELTAMET
ALPHA AC		3.82	3.94	3.20	3.68
CNVNTIAL		3.73	3.97	3.30	3.24
MONOCENT		3.82	3.87	3.37	3.43
STANHAY		3.98	3.87	3.84	3.53

	SEEDRATE	4 KG		8 KG	
DRILL	INSCTCDE	NONE	DELTAMET	NONE	DELTAMET
ALPHA AC		3.63	4.05	3.39	3.57
CNVNTIAL		3.90	3.84	3.13	3.37
MONOCENT		3.90	3.77	3.29	3.53
STANHAY		3.98	3.88	3.84	3.52

	SEEDRATE	4 KG		8 KG	
SOW DATE	INSCTCDE	NONE	DELTAMET	NONE	DELTAMET
18 AUG		3.95	4.10	3.73	3.72
5 SEP		3.76	3.67	3.10	3.27

		SEEDRATE	4 KG		8 KG	
DRILL	SOW DATE	INSCTCDE	NONE	DELTAMET	NONE	DELTAMET
ALPHA AC	18 AUG		3.81	4.12	3.83	3.77
	5 SEP		3.46	3.98	2.95	3.37
CNVNTIAL	18 AUG		4.00	4.17	3.47	3.77
	5 SEP		3.81	3.50	2.80	2.97
MONOCENT	18 AUG		3.94	4.05	3.70	3.69
	5 SEP		3.85	3.50	2.89	3.37
STANHAY	18 AUG		4.04	4.07	3.92	3.66
	5 SEP		3.93	3.69	3.76	3.38

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87/R/RA/5

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

Table	DRILL	SOW DATE	SEEDRATE	INSCTCDE
s.e.d.	0.072	0.051	0.051	0.051

Table	DRILL SOW DATE	DRILL SEEDRATE	SOW DATE SEEDRATE	DRILL INSCTCDE
s.e.d.	0.101	0.101	0.072	0.101

Table	SOW DATE INSCTCDE	SEEDRATE INSCTCDE	DRILL SOW DATE SEEDRATE	DRILL SOW DATE INSCTCDE
s.e.d.	0.072	0.072	0.143	0.143

Table	DRILL SEEDRATE INSCTCDE	DRILL* SOW DATE SEEDRATE INSCTCDE
s.e.d.	0.143	0.203

* Within the same level of SOW DATE.SEEDRATE.INSCTCDE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	0.203	5.5

GRAIN MEAN DM% 79.1

PLOT AREA HARVESTED 0.00345

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87/R/RA/6

WINTER OILSEED RAPE

STRAW TREATMENTS BEFORE SOWING

Object: To study the effects of a range of methods of treating cereal straw on the establishment and yield of w. oilseed rape sown on two dates, with and without seedbed N - Great Knott II.

Sponsors: R.J. Darby, D.P Yeoman.

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

Whole plot dimensions: 6.0 x 33.0.

Treatments: All combinations of:-

Whole plots

1. STR DISP		Disposal of straw:
	BURN	Burnt on 13 Aug, 1986
	CHOP	Chopped on 8 Aug
	BALE	Baled on 7 Aug
2. CULTIVTN		Method of primary cultivation:
	TINE CULT	Tine cultivated, without inversion
	PLOUGH	Ploughed on 15 Aug, 1986

Sub plots

3. SOW DATE		Dates of sowing:
	20 AUG	20 Aug, 1986
	5 SEPT	5 Sept

Sub sub plots

4. SDBED N		Seedbed nitrogen (kg N) as 'Nitram' on 18 Aug, 1986:
	0	
	50	

NOTES: (1) All plots were disced and rotary harrowed on 18 Aug, 1986.
(2) STR DISP BURN plots were spring-tine cultivated on 14 Aug.
(3) CULTIVTN TINE CULT plots were heavy spring-tine cultivated on 18 Aug, and except for STR DISP BURN plots were also rotary cultivated the same day.
(4) CULTIVTN PLOUGH plots were rolled immediately after ploughing.
(5) All plots were harrowed immediately after sowing. All SOW DATE 5 SEPT plots were rolled immediately after harrowing.

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Basal applications: Manures: 'Nitram' at 580 kg. Weedkillers: Clopyralid and propyzamide (as 'Matrikerb' at 1.6 kg) in 500 l. Metazochlor at 0.75 kg in 280 l. Molluscicide: Methiocarb at 0.22 kg. Bird repellent: 'Hoppit' at 3.0 l in 500 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.50 l) in 500 l.

Seed: Bienvenu, dressed gamma HCH, thiram and fenpropimorph, sown at 8.0 kg.

Cultivations, etc.:- Molluscicide applied to all plots, metazachlor applied to SOWDATE 20 AUG only: 20 Aug, 1986. Metazachlor applied to SOWDATE 5 SEPT: 6 Sept. Remaining weedkillers applied: 20 Nov. Bird repellent applied: 24 Dec. N applied: 18 Feb, 1987. Desiccant with wetting agent applied: 30 July. Combine harvested: 5 Aug. Previous crops: S. wheat 1985, w. barley 1986.

NOTE: Emergence counts were made in autumn and plant counts in mid-March.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

CULTIVTN	TINE CLT	PLOUGH	Mean
STR DISP			
BURN	3.84	3.78	3.81
CHOP	3.48	3.74	3.61
BALED	3.67	3.63	3.65
Mean	3.66	3.72	3.69

SOW DATE	20 AUG	5 SEPT	Mean
STR DISP			
BURN	3.83	3.79	3.81
CHOP	3.79	3.43	3.61
BALED	3.86	3.44	3.65
Mean	3.82	3.55	3.69

SOW DATE	20 AUG	5 SEPT	Mean
CULTIVTN			
TINE CLT	3.82	3.51	3.66
PLOUGH	3.83	3.60	3.72
Mean	3.82	3.55	3.69

SDBED N	0	50	Mean
STR DISP			
BURN	3.67	3.95	3.81
CHOP	3.56	3.66	3.61
BALED	3.52	3.77	3.65
Mean	3.58	3.79	3.69

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SDBED N	0	50	Mean
CULTIVTN			
TINE CLT	3.52	3.81	3.66
PLOUGH	3.65	3.78	3.72
Mean	3.58	3.79	3.69

SDBED N	0	50	Mean
SOW DATE			
20 AUG	3.72	3.93	3.82
5 SEPT	3.45	3.66	3.55
Mean	3.58	3.79	3.69

	SOW DATE	20 AUG	5 SEPT
STR DISP	CULTIVTN		
BURN	TINE CLT	3.84	3.84
	PLOUGH	3.82	3.74
CHOP	TINE CLT	3.66	3.30
	PLOUGH	3.92	3.56
BALED	TINE CLT	3.95	3.38
	PLOUGH	3.76	3.50

	SDBED N	0	50
STR DISP	CULTIVTN		
BURN	TINE CLT	3.66	4.02
	PLOUGH	3.68	3.88
CHOP	TINE CLT	3.43	3.53
	PLOUGH	3.69	3.79
BALED	TINE CLT	3.46	3.87
	PLOUGH	3.59	3.67

	SDBED N	0	50
STR DISP	SOW DATE		
BURN	20 AUG	3.61	4.04
	5 SEPT	3.73	3.86
CHOP	20 AUG	3.83	3.75
	5 SEPT	3.29	3.57
BALED	20 AUG	3.73	3.99
	5 SEPT	3.32	3.56

	SDBED N	0	50
CULTIVTN	SOW DATE		
TINE CLT	20 AUG	3.66	3.97
	5 SEPT	3.37	3.64
PLOUGH	20 AUG	3.78	3.88
	5 SEPT	3.52	3.68

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	SOW DATE	20 AUG		5 SEPT	
STR DISP	CULTIVTN SDBED N	0	50	0	50
BURN	TINE CLT	3.55	4.12	3.76	3.92
	PLOUGH	3.66	3.97	3.69	3.79
CHOP	TINE CLT	3.69	3.64	3.17	3.43
	PLOUGH	3.96	3.87	3.42	3.71
BALED	TINE CLT	3.74	4.17	3.19	3.58
	PLOUGH	3.72	3.81	3.46	3.54

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

Table	STR DISP	CULTIVTN	SOW DATE	SDBED N
s.e.d.	0.158	0.129	0.043	0.055

Table	STR DISP CULTIVTN	STR DISP SOW DATE	CULTIVTN SOW DATE	STR DISP SDBED N
s.e.d.	0.223	0.166	0.136	0.172
Except when comparing means with the same level(s) of				
STR DISP		0.075		0.096
CULTIVTN			0.061	

Table	CULTIVTN SDBED N	SOW DATE SDBED N	STR DISP CULTIVTN SOW DATE	STR DISP CULTIVTN SDBED N
s.e.d.	0.140	0.070	0.235	0.243
Except when comparing means with the same level(s) of				
CULTIVTN	0.078			
SOW DATE		0.078		
STR DISP.CULTIVTN			0.106	0.135

Table	STR DISP SOW DATE SDBED N	CULTIVTN SOW DATE SDBED N	STR DISP CULTIVTN SOW DATE SDBED N
s.e.d.	0.192	0.157	0.271
Except when comparing means with the same level(s) of			
STR DISP	0.122		
CULTIVTN		0.099	
STR DISP.CULTIVTN			0.172
STR DISP.SOW DATE	0.135		
CULTIVTN.SOW DATE		0.111	
STR DISP.SDBED N	0.122		
CULTIVTN.SDBED N		0.099	
STR DISP.CULTIVTN.SOW DATE			0.192
STR DISP.CULTIVTN.SDBED N			0.172

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	5	0.223	6.0
BLOCK.WP.SP	6	0.106	2.9
BLOCK.WP.SP.SSP	12	0.192	5.2

GRAIN MEAN DM% 86.7 SUB PLOT AREA HARVESTED 0.00368

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87/R/RA/7

WINTER OILSEED RAPE

FORMS AND TIMES OF N

Object: To compare the effects of single and divided dressings of urea and 'Nitro-Chalk' on the yield of w. oilseed rape - Great Knott II.

Sponsor: R.J. Darby.

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

Whole plot dimensions: 30.0 x 27.0.

Treatments: All combinations of:-

Whole plots

1. VARIETY — Variety:

   ARIANA
   MIKADO

Sub plots

2. N FORM — Forms of nitrogen fertilizer:

   AMM NIT — Ammonium nitrate (as 'Nitro-Chalk')
   UREA — Prilled urea

3. N TIME — Times of applying a total dressing of 200 kg N:

   4 - - - — All on 23 Feb, 1987
   3 1 - - — Three quarters on 23 Feb, one quarter on 16 Mar
   3 - 1 - — Three quarters on 23 Feb, one quarter on 9 Apr
   2 2 - - — Half on 23 Feb, half on 16 Mar
   2 - 2 - — Half on 23 Feb, half on 9 Apr
   2 1 1 - — Half on 23 Feb, quarter on 16 Mar, quarter on 9 Apr
   1 1 1 1 — One quarter on 23 Feb and 16 Mar and 9 Apr and 27 Apr

plus two extra treatments

   EXTRA

   NONE AR — No nitrogen fertilizer ARIANA
   NONE MI — No nitrogen fertilizer MIKADO

NOTE: Seed was dressed with gamma HCH, thiram and fenpropimorph and sown at 8 kg on 3 Sept, 1986.

Basal applications: Weedkillers: Sodium trichloroacetate at 16 kg in 200 l. Clopyralid and propyzamide (as 'Matrikerb' at 1.6 kg) in 500 l. Bird repellent: 'Hoppit' at 3.0 l in 500 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.50 l) in 500 l.

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Cultivations, etc.:- Heavy spring-tine cultivated, cultivated with rotary grubber: 12 Aug, 1986. Rotary harrowed: 31 Aug. Sodium trichloroacetate applied, harrowed: 1 Sept. Clopyralid and propyzamide applied: 20 Nov. Bird repellent applied: 24 Dec. Desiccant with wetting agent applied: 30 July, 1987. Combine harvested: 5 Aug. Previous crops: S. wheat 1985, w. barley 1986.

NOTE: Alternaria infection was assessed in July. Percentage of oil in grain was measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N FORM / N TIME	AMM NIT	UREA	Mean
4 - - -	2.65	2.79	2.72
3 1 - -	2.77	2.74	2.76
3 - 1 -	2.61	2.76	2.68
2 2 - -	2.76	2.73	2.74
2 - 2 -	2.64	2.62	2.63
2 1 1 -	2.67	2.83	2.75
1 1 1 1	2.78	2.78	2.78
Mean	2.70	2.75	2.72

VARIETY / N TIME	ARIANA	MIKADO	Mean
4 - - -	2.73	2.71	2.72
3 1 - -	2.81	2.71	2.76
3 - 1 -	2.63	2.74	2.68
2 2 - -	2.63	2.86	2.74
2 - 2 -	2.60	2.67	2.63
2 1 1 -	2.75	2.74	2.75
1 1 1 1	2.64	2.92	2.78
Mean	2.68	2.76	2.72

VARIETY / N FORM	ARIANA	MIKADO	Mean
AMM NIT	2.68	2.72	2.70
UREA	2.69	2.81	2.75
Mean	2.68	2.76	2.72

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N FORM	AMM NIT		UREA	
VARIETY	ARIANA	MIKADO	ARIANA	MIKADO
N TIME				
4 - - -	2.69	2.62	2.78	2.80
3 1 - -	2.84	2.71	2.77	2.71
3 - 1 -	2.55	2.67	2.70	2.81
2 2 - -	2.66	2.85	2.59	2.87
2 - 2 -	2.60	2.68	2.59	2.66
2 1 1 -	2.83	2.52	2.68	2.97
1 1 1 1	2.59	2.96	2.68	2.88

EXTRA	NONE AR	NONE MI	Mean
	1.13	1.13	1.13

Grand mean 2.62

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

Table	EXTRA	N TIME	N FORM
s.e.d.	0.190	0.095	0.051

Table	N TIME N FORM	N TIME* VARIETY	N FORM* VARIETY	N TIME* N FORM VARIETY*
s.e.d.	0.134	0.134	0.072	0.190

* Within the same level of VARIETY only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	28	0.190	7.3

MEAN DM% 84.4

SUB PLOT AREA HARVESTED 0.00299

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87/R/RA/11

WINTER OILSEED RAPE

OVERSOWING IN WHEAT

Object: To study the establishment of rape after wheat by oversowing into the wheat - Great Knott III.

Sponsors: R.J. Darby, D.P. Yeoman.

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

Whole plot dimensions: 15.0 x 16.0.

Treatments: All combinations of:-

Whole plots

1. SOWING		Methods of sowing and straw disposal:
	OVERS BA	Oversown on 20 Aug, 1986, straw baled on 21 Aug
	OVERS CH	Oversown on 20 Aug, 1986, straw chopped and spread on 21 Aug
	CONVEN S	Straw baled on 21 Aug, conventionally sown into conventionally prepared seedbed

Sub plots

2. N TIME		Timing of nitrogen as 'Nitram'. (Total spring N same for all treatments):
	SN FN MN	50 kg N to seedbed, 50 kg N on 19 Feb, 1987 and 150 kg N on 19 Mar
	- FN -	200 kg N on 19 Feb
	- FN MN	50 kg N on 19 Feb and 150 kg N on 19 Mar

NOTES: (1) Oversowing was done into standing wheat. The wheat was harvested later that day.
(2) SOWING CONVEN S plots were ploughed and rolled on 22 Aug, rotary harrowed on 31 Aug.
(3) SOWING OVERS BA and OVERS CH plots were sprayed with fluazifop-P-butyl at 0.19 kg with a wetting agent ('Agral' at 0.38 l) in 380 l on 26 Sept.
(4) One whole plot CONVEN S was missing. An estimated value was used in the analysis.

Basal applications: Weedkillers: Clopyralid and propyzamide (as 'Matrikerb' at 1.6 kg) in 500 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.

Cultivations, etc.:- Weedkillers applied: 20 Nov, 1986. Desiccant with wetting agent applied: 31 July, 1987. Combine harvested: 6 Aug. Previous crops: W. wheat 1985 and 1986.

NOTE: Plant counts were made in autumn and again in mid-March.

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87/R/RA/11

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N TIME SOWING	SN FN MN	- FN -	- FN MN	Mean
OVERS BA	3.61	3.51	3.38	3.50
OVERS CH	3.47	2.86	2.66	3.00
CONVEN S	3.51	3.28	3.22	3.34
Mean	3.53	3.22	3.09	3.28

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

Table	N TIME	SOWING* N TIME
s.e.d.	0.184	0.319

* Within same level of SOWING only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	10	0.391	11.9

GRAIN MEAN DM% 75.2

SUB PLOT AREA HARVESTED 0.00368

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87/R/RA/13

WINTER OILSEED RAPE

TIMES AND METHODS OF HARVEST

Object: To investigate the effects of times and methods of harvest on the yield and glucosinolate content of the seed - Webbs and Drapers.

Sponsor: C.J. Rawlinson.

Design: 4 blocks of 2 whole plots each split into 3 sub-plots each split into 3 sub-sub plots.

Whole plot dimensions: Webbs (2 blocks): 78 x 14.
Drapers (2 blocks): 24 x 64.

Treatments: All combinations of:-

Whole plots

1. FUNGCIDE		Fungicide at stem extension:
	NONE	None
	PROCHLOR	Prochloraz at 0.50 kg in 500 l on 23 Apr, 1987

Sub plots

2. HAR METH		Method of harvest:
	COMBINE	Combined direct, without prior treatment
	DESICATE	Desiccated with diquat
	SWATHE	Swathed before combining

Sub sub plots

3. HAR TIME		Time of harvest:
	EARLY	Early (seed above 20% moisture)
	NORMAL	Normal (seed 10 - 15% moisture)
	LATE	Late (7 - 10 days after NORMAL)

NOTES: (1) The HAR METH DESICATE plots were desiccated on 9 July, 1987 24 July and 5 Aug respectively for early, normal and late HAR TIME using diquat at 0.60 kg ion with a wetting agent in 500 l. The wetting agent was 'Enhance' at 0.50 l on the first two occasions, 'Agral' at 0.50 l on the third.
(2) The HAR METH SWATHE plots were swathed on 9 July, 1987, 23 July and 5 Aug respectively for early, normal and late HAR TIME.
(3) All HAR METH plots for early and normal HAR TIME were combine harvested on 5 Aug, 1987 and for late HAR TIME on 12 Aug.

Basal applications: Manures: 'Nitram' at 720 kg. Weedkillers: Fluazifop-P-butyl at 0.19 kg with metazachlor at 1.2 kg and a wetting agent ('Agral' at 0.20 l) in 200 l. Insecticides: Azinphos methyl at 0.40 kg and demeton-S-methyl sulphone at 0.12 kg in 300 l. Bird repellent: 'Hoppit' at 3.0 l in 500 l.

Seed: Ariana, dressed iprodione, sown at 6.0 kg.

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Cultivations, etc.:- Heavy spring-tine cultivated: 5 Sept, 1986. Rotary harrowed: 6 Sept. Seed sown: 7 Sept. Weedkillers applied: 4 Oct (Webbs) and 17 Oct (Drapers). Bird repellent applied: 23 Dec. N applied: 20 Feb, 1987. Insecticides applied: 28 Apr. Previous crops: W. wheat 1985 and 1986 on both sites.

NOTE: Seed samples were taken frequently from early July until harvest for glucosinolate analysis.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

HAR METH	COMBINE	DESICATE	SWATHE	Mean
FUNGCIDE				
NONE	3.07	2.63	2.27	2.65
PROCHLOR	3.52	2.71	2.62	2.95
Mean	3.29	2.67	2.44	2.80

HAR TIME	EARLY	NORMAL	LATE	Mean
FUNGCIDE				
NONE	1.99	3.00	2.97	2.65
PROCHLOR	2.18	3.33	3.33	2.95
Mean	2.09	3.17	3.15	2.80

HAR TIME	EARLY	NORMAL	LATE	Mean
HAR METH				
COMBINE	3.26	3.21	3.41	3.29
DESICATE	1.46	3.06	3.48	2.67
SWATHE	1.54	3.22	2.56	2.44
Mean	2.09	3.17	3.15	2.80

	HAR TIME	EARLY	NORMAL	LATE
FUNGCIDE	HAR METH			
NONE	COMBINE	3.04	3.02	3.14
	DESICATE	1.41	2.98	3.49
	SWATHE	1.52	3.01	2.27
PROCHLOR	COMBINE	3.47	3.41	3.67
	DESICATE	1.51	3.14	3.47
	SWATHE	1.57	3.44	2.86

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

Table	HAR METH	HAR TIME	FUNGCIDE* HAR METH
s.e.d.	0.058	0.063	0.082

Table	FUNGCIDE* HAR TIME	HAR METH HAR TIME	FUNGCIDE* HAR METH HAR TIME
s.e.d.	0.090	0.107	0.151

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

HAR METH	0.110	
FUNGCIDE.HAR METH		0.155

* Within the same level of FUNGCIDE only

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	12	0.116	4.1
BLOCK.WP.SP.SSP	36	0.219	7.8

GRAIN MEAN DM% 79.8

PLOT AREA HARVESTED

HAR METH SWATHE	0.00519
HAR METH COMBINE OR DESICATE	0.00322

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87/R/SU/1

SUNFLOWERS

EARLY VARIETIES AND PLANT HEALTH

Object: To compare six varieties of sunflower with and without sprays to control pathogens - Hoosfield.

Sponsor: C.J. Rawlinson.

Design: 3 randomised blocks of 12 plots.

Whole plot dimensions: 4.5 x 10.0.

Treatments: All combinations of:-

1. VARIETY		Varieties:
	SUNBRED	Sunbred 246
	EX 10	Ex 10
	EX 34	Ex 34
	S 2004	S 2004
	CERFLOR	Cerflor
	SUNWHEAT	Sunwheat
2. PATHCONT		Pathogen control:
	NONE	None
	FULL	Full: Carbendazim at 0.25 kg with vinclozolin at 0.50 kg in 220 l on 25 July, 1987, 5 Aug, 19 Aug, 2 Sept and 16 Sept

NOTES: (1) Varieties SUNBRED and CERFLOR were desiccated with diquat at 0.60 kg ion in 220 l on 12 Oct, 1987 but were not harvested for yield because of subsequent storm and bird damage.
(2) The remaining varieties were desiccated with diquat at 0.60 kg ion in 220 l on 18 Sept and combine harvested on 25 Sept.

Basal applications: Manures: 'Nitram' at 200 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Trifluralin at 0.84 kg in 200 l. Linuron at 0.75 kg in 500 l.

Seed: Varieties, sown at 80,000 seeds per hectare.

Cultivations, etc.:- Glyphosate applied: 6 Nov, 1986. Ploughed: 1 Dec. Spring-tine cultivated: 14 Apr, 1987. N applied, trifluralin applied, rotary harrowed twice: 15 Apr. Seed sown: 17 Apr. Linuron applied: 21 Apr. Previous crops: Sugar beet 1985, s. barley 1986.

NOTE: Disease assessments were made on five occasions from June until September. Growth stages and plant height were assessed on ten occasions thoughout the season. Oil contents of the grain were measured.

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87/R/SU/1

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PATHCONT VARIETY	NONE	FULL	Mean
EX 10	1.79	1.71	1.75
EX 34	0.52	0.78	0.65
S 2004	2.71	2.38	2.55
SUNWHEAT	1.50	1.88	1.69
Mean	1.63	1.69	1.66

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

Table	VARIETY	PATHCONT	VARIETY PATHCONT
s.e.d.	0.168	0.119	0.238

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	0.291	17.6

GRAIN MEAN DM% 61.9

PLOT AREA HARVESTED 0.00200

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87/R/SU/3

SUNFLOWERS

PESTS AND PATHOGENS

Object: To study the separate and combined effects of pest and pathogen control on sunflowers - Garden Plot 2.

Sponsors: A.W. Ferguson, C.J. Rawlinson.

Design: 4 randomised blocks of 4 plots.

Whole plot dimensions: 2.13 x 10.1.

Treatments: All combinations of:-

1. PESTCONT — Sprays to control pests:

NONE	None
FULL	Full: Pirimicarb at 0.14 kg on 25 July, 1987, 5, 19 Aug, 3, 17 Sept. Malathion at 1.3 l on 4, 11, 19 Aug

2. PATHCONT — Sprays to control pathogens:

NONE	None
FULL	Full: Carbendazim at 0.25 kg with vinclozolin at 0.50 kg on 25 July, 5, 19 Aug, 3, 17 Sept, 1 Oct

NOTES: (1) Pesticides were applied in the same 220 l when applied on the same day otherwise in 220 l each. Fungicides were always applied together in 220 l.
(2) The crop was netted against bird damage from late Aug to harvest.
(3) A planned test of varieties was thwarted by bird damage.

Basal applications : Manures: 'Nitro-Chalk' at 225 kg. Weedkillers: Glyphosate at 1.4 kg in 220 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: Asmer 9, sown at 90,000 seeds per hectare.

Cultivations, etc.:- Glyphosate applied: 1 Oct, 1986. Ploughed: 15 Oct. N applied: 21 Apr, 1987. Trifluralin applied, rotary cultivated: 23 Apr. Seed sown, rolled: 24 Apr. Linuron applied: 29 Apr. Diquat applied: 19 Oct. Harvested by hand: 23 Oct (threshed by stationary combine harvester). Previous crops: Mixed legumes 1985, s. barley 1986.

NOTES: (1) Aphids and pollen beetles were counted weekly in late summer.
(2) Growth stages and diseases were observed on six occasions during the season.

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87/R/SU/3

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PATHCONT PESTCONT	NONE	FULL	Mean
NONE	1.98	2.06	2.02
FULL	1.84	2.05	1.95
Mean	1.91	2.05	1.98

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

Table	PESTCONT	PATHCONT	PESTCONT PATHCONT
s.e.d.	0.110	0.110	0.156

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.221	11.1

GRAIN MEAN DM% 60.0

PLOT AREA HARVESTED 0.00215

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87/R/SU/4

SUNFLOWERS

FUNGICIDE AND BOTRYTIS

Object: To study the effects of five times and two methods of applying a mixture of fungicides on the control of Botrytis head infection and on the yield of sunflowers - Annables and Long Hoos III 3.

Sponsor: C.J. Rawlinson.

Design: 3 randomised blocks of 12 plots on each site.

Whole plot dimensions: Annables: 4.2 x 7.0. Long Hoos: 2.7 x 8.0.

Treatments: All combinations of:-

1. SPRAYDTE — Dates of applying vinclozolin at 0.50 kg and carbendazim at 0.25 kg:

	Annables	Long Hoos
1	25 July, 1987	21 Aug
2	25 July and 5 Aug	21 Aug and 4 Sept
3	25 July, 5 and 19 Aug	21 Aug, 4 and 17 Sept
4	25 July, 5, 19 Aug and 3 Sept	21 Aug, 4, 17 Sept and 1 Oct (duplicated)
5	25 July, 5, 19 Aug, 3 and 16 Sept	

2. SPRAYMET — Method of spraying:

ELECTRO	Electrostatic sprayer in 5.3 l (Annables only)
CNVNTIAL	Conventional hydraulic sprayer in 220 l (duplicated on Long Hoos)

plus one extra treatment

EXTRA

NONE	None (duplicated)

NOTE: On Long Hoos the crop was netted from early June to harvest.

Basal applications:
Annables: Manures: 'Nitram' at 170 kg. Weedkiller: Trifluralin at 1.1 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 220 l.
Long Hoos: Manures: 'Nitro-Chalk' at 255 kg. Weedkillers: 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: Annables: Asmer 3 sown at 90,000 seeds per hectare.
Long Hoos: Asmer 3 failed and site was resown with EX10, both at 90,000 seeds per hectare.

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87/R/SU/4

Cultivations, etc.:-
Annables: Ploughed: Autumn 1986, date not recorded. Rotary cultivated, 'Nitram' applied, trifluralin applied, rotary cultivated, seed sown: 15 Apr, 1987. Desiccant applied: 23 Sept. Combine harvested: 29 Sept. Previous crops: W. wheat 1985 and 1986.
Long Hoos: Ploughed: 29 Dec, 1986. 'Nitro-Chalk' applied: 21 Apr, 1987. Spring-tine cultivated, trifluralin applied, rotary cultivated, Asmer 3 sown and rolled: 24 Apr. Linuron applied: 29 Apr. EX10 sown: 28 May. Desiccant applied: 15 Oct. Harvested by hand: 23 Oct (threshed by stationary combine harvester). Previous crops: Fallow 1985, lupins 1986.

NOTE: Botrytis in heads and stems and growth stages were assessed on both sites. More detailed observations on crop growth were made on Annables.

ANNABLES

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SPRAYMET SPRAYDTE	ELECTRO	CNVNTIAL	Mean
1	0.73	0.74	0.73
2	0.85	0.79	0.82
3	0.77	0.76	0.77
4	0.77	0.79	0.78
5	0.72	0.72	0.72
Mean	0.77	0.76	0.76

EXTRA NONE 0.84

Grand mean 0.78

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

Table	SPRAYDTE	SPRAYMET	SPRAYDTE SPRAYMET
s.e.d.	0.128	0.081	0.181

SED for comparing NONE with any item in SPRAYMET.SPRAYDTE table is 0.156

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	23	0.221	28.5

GRAIN MEAN DM% 69.2

PLOT AREA HARVESTED 0.00223

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87/R/SU/4

LONG HOOS III

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SPRAYDTE	NONE	1	2	3	4	5	Mean
	1.02	0.99	1.11	1.10	1.04	0.91	1.03

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

Table	SPRAYDTE
s.e.d.	0.093

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	27	0.161	15.6

GRAIN MEAN DM% 48.2

PLOT AREA HARVESTED 0.00216

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87/R/SU/7

SUNFLOWERS

SOWING DATES

Object: To study the effects of sowing dates on the rates of vegetative and floral devolpment, seed growth, dates of maturity and yield of sunflowers - Garden Plot X.

Sponsor: G.F.J. Milford.

Design: 2 randomised blocks of 6 plots.

Whole plot dimensions: 2.5 x 3.0.

Treatments:

SOWDATE	Sowing dates:
18 MAR	18 March, 1987
2 APR	2 April
15 APR	15 April
6 MAY	6 May
19 MAY	19 May
3 JUNE	3 June

NOTE: Yields were not taken for SOWDATE 3 JUNE.

Basal applications: Manures: 'Nitro-Chalk' at 255 kg. Weedkillers: Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg in 220 l.

Seed: Asmer 3 sown at 260,000 seeds per hectare and thinned to 86,000 plants per hectare.

Cultivations, etc.:- Ploughed: 16 Dec, 1986. N and trifluralin applied, rotary cultivated: 16 Mar, 1987. Linuron applied to each successive sowing date: 19 Mar, 6 Apr, 15 Apr, 6 May, 19 May, 3 June. First two sowings harvested by hand: 7 Oct. Remaining sowings harvested by hand: 13 Oct. Previous crops: Lupins 1985, s. barley 1986.

NOTES: (1) Phenological development was monitored during the season.
(2) Dry matters of stems and heads, heights, head diameter and oil content were measured at harvest.

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87/R/SU/7

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOWDATE	18 MAR	2 APR	15 APR	6 MAY	19 MAY	Mean
	1.45	1.70	1.26	2.39	2.26	1.81

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

Table	SOWDATE
s.e.d.	0.277

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	4	0.277	15.2

GRAIN MEAN DM% NOT RECORDED

PLOT AREA HARVESTED 0.00030

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87/R/MA/2

MAIZE

DAZOMET AND N

Object: To study the effects of dazomet, nitrogen rates, sowing dates and polythene covers on the growth, pathogens and yield of maize grown for forage - Long Hoos V 2.

Sponsor: D. Hornby.

Design: 3 randomised blocks of 16 plots.

Whole plot dimensions: 1.6 x 5.2.

Treatments: All combinations of:-

1. DAZOMET — Dazomet (kg):

   0
   450

2. N — Nitrogen fertilizer (kg N) as 'Nitro-Chalk':

   60
   140

3. SOWDATE — Dates of sowing:

   21 APR — 21 April, 1987
   13 MAY — 13 May

4. COVERS — Covers to seedbed after sowing:

   NONE — None
   POLYTHNE — Polythene sheet

NOTES: (1) Dazomet was applied by hand on 17 Mar, 1987 for the earlier-sown plots, 31 Mar for the later-sown.
(2) The covers were photo-degradable and were laid by hand, on 23 Apr for the earlier-sown plots, 20 May for the later-sown. They were perforated at about 10 cm intervals over the drill rows to allow seedling emergence.

Basal applications: Weedkiller: Atrazine at 1.7 kg in 220 l.

Seed: Bastille, sown at 100,000 seeds per hectare.

Cultivations, etc.:- Ploughed: 27 Nov, 1986. Spring-tine cultivated: 20 Feb, 1987. Earlier-sown plots disc harrowed, seed sown, atrazine applied: 21 Apr. N applied: 22 Apr. Later-sown plots spring-tine cultivated, seed sown: 13 May. Atrazine applied to later-sown plots: 19 May. Harvested by hand: 19 Oct. Previous crops: Potatoes 1985, sunflowers 1986.

NOTE: Germination counts were made. Growth stages, leaf numbers and heights were measured fortnightly. Cob measurments were made in late summer.

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87/R/MA/2

FORAGE TONNES/HECTARE

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

N	60	140	Mean
DAZOMET			
0	12.50	12.92	12.71
450	13.86	14.09	13.98
Mean	13.18	13.50	13.34

SOWDATE	21 APR	13 MAY	Mean
DAZOMET			
0	11.49	13.93	12.71
450	13.16	14.79	13.98
Mean	12.32	14.36	13.34

SOWDATE	21 APR	13 MAY	Mean
N			
60	11.82	14.53	13.18
140	12.82	14.18	13.50
Mean	12.32	14.36	13.34

COVERS	NONE	POLYTHNE	Mean
DAZOMET			
0	12.39	13.03	12.71
450	14.36	13.59	13.98
Mean	13.37	13.31	13.34

COVERS	NONE	POLYTHNE	Mean
N			
60	13.35	13.01	13.18
140	13.40	13.61	13.50
Mean	13.37	13.31	13.34

COVERS	NONE	POLYTHNE	Mean
SOWDATE			
21 APR	13.60	11.05	12.32
13 MAY	13.15	15.57	14.36
Mean	13.37	13.31	13.34

N	60		140	
DAZOMET SOWDATE	21 APR	13 MAY	21 APR	13 MAY
0	10.87	14.13	12.11	13.73
450	12.78	14.94	13.54	14.64

N	60		140	
DAZOMET COVERS	NONE	POLYTHNE	NONE	POLYTHNE
0	12.08	12.92	12.69	13.14
450	14.63	13.10	14.10	14.08

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87/R/MA/2

FORAGE TONNES/HECTARE

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

	SOWDATE	21 APR		13 MAY	
DAZOMET	COVERS	NONE	POLYTHNE	NONE	POLYTHNE
0		12.44	10.54	12.33	15.52
450		14.76	11.56	13.97	15.62

	SOWDATE	21 APR		13 MAY	
N	COVERS	NONE	POLYTHNE	NONE	POLYTHNE
60		13.63	10.02	13.08	15.99
140		13.57	12.07	13.22	15.15

		SOWDATE	21 APR		13 MAY	
DAZOMET	N	COVERS	NONE	POLYTHNE	NONE	POLYTHNE
0	60		11.67	10.07	12.48	15.77
	140		13.21	11.01	12.18	15.27
450	60		15.58	9.98	13.67	16.22
	140		13.93	13.14	14.27	15.02

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

Margins of two factor tables	0.451
Two factor tables	0.638
Three factor tables	0.902
Four factor table	1.276

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	30	1.562	11.7

FORAGE MEAN DM% 25.3

PLOT AREA HARVESTED 0.00028

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87/R/BR/1

BROCCOLI

ANTI-FEEDANTS

Object: To study the effects of anti-feedants on insect pests and on the yield of broccoli - Garden Plot 7.

Sponsors: D.C. Griffiths, L.E. Smart.

Design: 5 randomised blocks of 4 plots.

Whole plot dimensions: 2.4 x 5.0.

Treatments:

CHEMICAL	Chemical foliar sprays:
NONE	None
AJUGA EX	Ajuga extract at 0.15 kg
DELTAMET	Deltamethrin at 0.01 kg
PIPERINE	Piperine at 0.20 kg

NOTES: (1) Treatments were applied on 7 July, 1987, 24 July, 30 July, 11 Aug, 20 Aug, 4 Sept, 11 Sept, 21 Sept and 1 Oct.
(2) They were applied by elecrostatic sprayer in 10 l.

Basal applications: Manures: Chalk at 2.9 t. 'Nitro-Chalk' at 390 kg. Weedkillers: Glyphosate at 1.4 kg in 220 l, bentazone at 0.80 kg, dichlorprop at 1.1 kg, MCPA at 0.64 kg in 220 l applied with the fungicide. Trifluralin at 1.1 kg in 220 l. Tebutam at 2.9 kg in 220 l. Fungicide: Tridemorph at 0.52 kg.

Seed: Sown at 140,000 seeds per hectare.

Cultivations, etc.:- Chalk applied: 29 Sept, 1986. Glyphosate applied: 1 Oct. Ploughed: 22 Dec. Bentazone, dichlorprop, MCPA and tridemorph applied: 6 May, 1987. Deep-tine cultivated twice, trifluralin applied, rotary cultivated, seed sown, rolled, tebutam applied: 7 May. 'Nitro-Chalk' applied: 11 May. Seed resown: 22 June. Harvested by hand: 4 Nov. Previous crops: Potatoes 1985, fallow 1986.

NOTES: (1) The first sowing failed and was resown.
(2) Flea beetle, aphid and caterpillar damage were assessed at intervals during the season.

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87/R/BR/1

FRESH WEIGHT TONNES/HECTARE

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

CHEMICAL	NONE	AJUGA EX	DELTAMET	PIPERINE	Mean
	33.8	31.0	34.0	27.8	31.7

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

Table	CHEMICAL
s.e.d.	2.63

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	12	4.16	13.2
PLOT AREA HARVESTED	0.00048		

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87/R/P/1 and 87/W/P/1

POTATOES

VARIETIES

Object: To compare the quality and yield of some of the newer varieties of potato with current standards on two soil types - Rothamsted Little Hoos (R), Woburn Horsepool Lane Close West (W).

Sponsor: R. Moffitt.

Design: 4 randomised blocks of 7 plots.

Whole plot dimensions: 3.0 x 6.1.

Treatments:

VARIETY	Varieties:
CARA	Cara
CROWN	Pentland Crown
DESIREE	Desiree
ESTIMA	Estima
KINGSTON	Kingston
ROMANO	Romano
WILJA	Wilja

Basal applications:

Little Hoos (R): Manures: (0:18:36) at 690 kg. Chalk at 5 t. FYM at 35 t. (10:10:15+4.5 Mg) at 1960 kg. Weedkillers: Linuron at 1.7 kg with paraquat at 0.50 kg ion in 500 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions applied with the insecticide on the second occasion. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 300 l.

Horsepool Lane Close West (W): Manures: (0:18:36) at 690 kg. (10:10:15+4.5 Mg) at 2290 kg. Weedkillers: Glyphosate at 1.4 kg in 200 l. Linuron at 1.7 kg in 200 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions applied with the insecticide on the second occasion. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.

Cultivations, etc.:-

Little Hoos (R): PK applied: 17 Sept, 1986. Chalk applied: 24 Sept. FYM applied: 12 Nov. Ploughed: 17 Nov. NPK Mg applied: 14 Apr, 1987. Rotary harrowed and ridged: 21 Apr. Potatoes hand planted, split back: 22 Apr. Ridged: 29 Apr. Weedkillers applied: 8 May. Mancozeb applied: 24 June, 8 July, 28 July, 10 Aug. Fentin hydroxide applied: 28 Aug, 9 Sept. Insecticide applied: 8 July. Desiccant applied: 21 Sept. Haulm mechanically destroyed: 26 Sept. Lifted: 25 Nov. Previous crops: W. barley 1985, oilseed rape 1986.

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87/R/P/1 and 87/W/P/1

Cultivations, etc.:-
Horsepool Lane Close West (W): PK applied: 16 Sept, 1986. Glyphosate applied: 19 Sept. Ploughed: 12 Nov. NPK Mg applied: 22 Apr, 1987. Rotary cultivated, ridged, potatoes hand planted, split back: 28 Apr. Rotary ridged: 15 May. Linuron applied: 25 May. Mancozeb applied: 29 June, 8 July, 26 July, 5 Aug. Fentin hydroxide applied: 18 Aug, 4 Sept. Insecticide applied: 8 July. Desiccant applied: 18 Sept. Haulm mechanically destroyed: 1 Oct. Lifted: 6 Nov. Previous crops: W. wheat 1985, w. oats 1986.

87/R/P/1

TOTAL TUBERS TONNES/HECTARE

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

VARIETY	
CARA	45.8
CROWN	37.6
DESIREE	37.9
ESTIMA	43.4
KINGSTON	33.3
ROMANO	31.5
WILJA	37.8
Mean	38.2

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

Table	VARIETY
s.e.d.	3.69

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	5.22	13.7

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

VARIETY	
CARA	92.7
CROWN	96.2
DESIREE	95.5
ESTIMA	92.9
KINGSTON	93.0
ROMANO	95.6
WILJA	90.2
Mean	93.7

PLOT AREA HARVESTED 0.00091

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87/W/P/1

TOTAL TUBERS TONNES/HECTARE

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

VARIETY	
CARA	42.0
CROWN	40.8
DESIREE	26.0
ESTIMA	37.0
KINGSTON	39.1
ROMANO	34.0
WILJA	32.9
Mean	35.9

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

Table	VARIETY
s.e.d.	5.04

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	7.13	19.8

PERCENTAGE WARE 4.44CM (1.75 INCH) RIDDLE

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

VARIETY	
CARA	83.4
CROWN	85.9
DESIREE	82.5
ESTIMA	85.5
KINGSTON	86.1
ROMANO	86.8
WILJA	79.0
Mean	84.2

PLOT AREA HARVESTED 0.00091

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87/R/P/2

POTATOES

SEED HEALTH PROGENY

Object: To compare the health and yield of two varieties of potatoes grown once or twice for seed at Rothamsted under three sets of treatments with the same varieties grown to AA standard in Scotland in 1986 - Bones Close.

Sponsors: R.W. Gibson, G.A. Hide, R. Harrington.

Design: 4 randomised blocks of 28 plots.

Whole plot dimensions: 1.5 x 19.0.

Treatments: All combinations of:-

1. VARIETY	Varieties:
EDWARD	King Edward
PIPER	Maris Piper
2. ROTHGROW	Frequency of cropping at Rothamsted:
ONCE	In 1986 only from Scottish FS seed
TWICE	In 1985 and 1986, from Scottish FS seed in 1985
3. PATHCONT[86]	Pest and pathogen control in 1985, to ROTHGROW TWICE only, and in 1986 to ROTHGROW ONCE and TWICE (in addition to basals):
STANDARD	1985 and 1986: Plants with virus symptoms were removed in June.
ENHANCED	1985 and 1986: Seed treatment with tolclofos methyl at 0.24 kg and imazalil at 0.01 kg per tonne of tubers, applied by hydraulic and uncharged electrostatic sprayers respectively. Cypermethrin at 0.04 kg with 7.0 l oil in 500 l applied by hydraulic sprayer on 14 June, 1985, and on 13 and 19 June, 1986. Plants with virus symptoms were removed in June 1985 and 1986.
FULL	1985: As for ENHANCED 1985, plus:- The imazalil was applied by charged electrostatic sprayer. Cypermethrin at 0.04 kg with 7.0 l oil in 500 l was also applied on 28 June, 11 July, 26 July and (to HAULM D LATER plots only) 14 Aug. 1986: As for ENHANCED 1986, plus:- The imazalil was applied by charged electrostatic sprayer. Cypermethrin at 0.04 kg with oil at 7.0 l in 500 l was also applied on 3 July, 18 July, 1 Aug, 19 Aug and (to HAULM D LATER plots only) 4 Sept.

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4. HAULM D[86] Dates of destroying haulm and of lifting in 1985 to ROTHGROW TWICE only and in 1986 to ROTHGROW ONCE and TWICE:

EARLY	1985: Haulm mechanically destroyed, 12 Aug. Haulm desiccant applied 14 Aug and potatoes lifted 18 Sept.
	1986: Haulm desiccant applied 29 Aug. Haulm mechanically destroyed 16 Sept and potatoes lifted 23 Sept.
LATER	1985: Haulm mechanically destroyed 4 Sept. Haulm desiccant applied 5 Sept and potatoes lifted 11 Oct.
	1986: Haulm mechanically destroyed 25 Sept. Haulm desiccant applied 27 Sept and potatoes lifted 13 Oct.

plus two extra treatments:

SCOTS AA	
KE SAA	King Edward Scottish AA seed bought in 1987 (duplicated)
MP SAA	Maris Piper Scottish AA seed bought in 1987 (duplicated)

NOTES: (1) Basal pest and pathogen control in 1985 (to ROTHGROW TWICE only) was phorate at 1.7 kg with the seed and mancozeb at 1.4 kg in 200 l on five occasions applied with pirimicarb at 0.14 kg on all but the first occasion.

(2) Basal pest and pathogen control in 1986 was phorate at 1.7 kg with the seed, mancozeb at 1.4 kg in 200 l on four occasions with pirimicarb at 0.14 kg on each occasion and (to HAULM D LATER plots only) fentin hydroxide at 0.28 kg in 200 l on two occasions applied with pirimicarb at 0.14 kg on the first.

Basal applications: Manures: FYM at 35 t. (0:18:36) at 690 kg. (10:10:15+4.5 Mg) at 1960 kg. Weedkillers: Linuron at 1.6 kg and paraquat at 0.50 kg ion in 500 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions, applied with the pirimicarb on the second occasion. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Haulm desiccant: Diquat at 0.80 kg ion in 300 l.

Cultivations, etc.:- (0:18:36) applied: 28 Oct, 1986. FYM applied: 11 Nov. Ploughed: 21 Nov. (10:10:15+4.5 Mg) applied: 13 Apr, 1987. Rotary harrowed: 20 Apr. Potatoes planted by hand: 21 Apr. Rotary ridged: 27 Apr. Weedkillers applied: 8 May. Mancozeb applied: 24 June, 8 July, 28 July and 10 Aug. Pirimicarb applied: 8 July. Fentin hydroxide applied: 28 Aug, 9 Sept. Haulm desiccant applied: 21 Sept. Haulm mechanically destroyed: 26 Sept. Lifted: 29 Oct. Previous crops: S. barley 1985, w. beans 1986.

NOTE: Viruses were assessed during the season. Tuber samples were taken at harvest to assess storage diseases.

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87/R/P/2

TOTAL TUBERS TONNES/HECTARE

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

ROTHGROW	ONCE	TWICE	Mean
VARIETY			
EDWARD	76.4	77.9	77.1
PIPER	84.6	81.2	82.9
Mean	80.5	79.5	80.0

PATHCONT[86]	STANDARD	ENHANCED	FULL	Mean
VARIETY				
EDWARD	76.9	76.9	77.7	77.1
PIPER	83.3	82.2	83.0	82.9
Mean	80.1	79.5	80.4	80.0

PATHCONT[86]	STANDARD	ENHANCED	FULL	Mean
ROTHGROW				
ONCE	80.8	80.4	80.2	80.5
TWICE	79.4	78.7	80.5	79.5
Mean	80.1	79.5	80.4	80.0

HAULM D[86]	EARLY	LATER	Mean
VARIETY			
EDWARD	78.5	75.8	77.1
PIPER	83.3	82.4	82.9
Mean	80.9	79.1	80.0

HAULM D[86]	EARLY	LATER	Mean
ROTHGROW			
ONCE	81.4	79.5	80.5
TWICE	80.4	78.6	79.5
Mean	80.9	79.1	80.0

HAULM D[86]	EARLY	LATER	Mean
PATHCONT[86]			
STANDARD	81.3	78.9	80.1
ENHANCED	80.0	79.0	79.5
FULL	81.4	79.3	80.4
Mean	80.9	79.1	80.0

	PATHCONT[86]	STANDARD	ENHANCED	FULL
VARIETY	ROTHGROW			
EDWARD	ONCE	76.5	76.8	75.9
	TWICE	77.2	77.0	79.5
PIPER	ONCE	85.2	84.0	84.5
	TWICE	81.5	80.4	81.5

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87/R/P/2

TOTAL TUBERS TONNES/HECTARE

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

VARIETY	HAULM D[86] ROTHGROW	EARLY	LATER
EDWARD	ONCE	77.3	75.5
	TWICE	79.7	76.1
PIPER	ONCE	85.6	83.5
	TWICE	81.1	81.2

VARIETY	HAULM D[86] PATHCONT[86]	EARLY	LATER
EDWARD	STANDARD	80.2	73.5
	ENHANCED	77.1	76.7
	FULL	78.2	77.1
PIPER	STANDARD	82.3	84.3
	ENHANCED	83.0	81.3
	FULL	84.6	81.5

ROTHGROW	HAULM D[86] PATHCONT[86]	EARLY	LATER
ONCE	STANDARD	82.4	79.3
	ENHANCED	80.8	80.0
	FULL	81.1	79.3
TWICE	STANDARD	80.2	78.5
	ENHANCED	79.3	78.1
	FULL	81.7	79.3

VARIETY	ROTHGROW	HAULM D[86] PATHCONT[86]	EARLY	LATER
EDWARD	ONCE	STANDARD	80.1	72.9
		ENHANCED	75.9	77.7
		FULL	75.9	75.9
	TWICE	STANDARD	80.4	74.1
		ENHANCED	78.2	75.8
		FULL	80.6	78.4
PIPER	ONCE	STANDARD	84.6	85.7
		ENHANCED	85.7	82.3
		FULL	86.4	82.6
	TWICE	STANDARD	80.0	83.0
		ENHANCED	80.4	80.4
		FULL	82.8	80.3

SCOTS AA	KE SAA	MP SAA	Mean
	67.5	78.3	72.9

Grand mean 79.0

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TOTAL TUBERS TONNES/HECTARE

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

Table	VARIETY	ROTHGROW	PATHCONT[86]	HAULM D[86]
s.e.d.	0.71	0.71	0.87	0.71

Table	VARIETY ROTHGROW	VARIETY PATHCONT[86]	ROTHGROW PATHCONT[86]	VARIETY HAULM D[86]
s.e.d.	1.01	1.23	1.23	1.01

Table	ROTHGROW HAULM D[86]	PATHCONT[86] HAULM D[86]	VARIETY ROTHGROW PATHCONT[86]	VARIETY ROTHGROW HAULM D[86]
s.e.d.	1.01	1.23	1.74	1.42

Table	VARIETY PATHCONT[86] HAULM D[86]	ROTHGROW PATHCONT[86] HAULM D[86]	VARIETY ROTHGROW PATHCONT[86] HAULM D[86]	SCOTS AA
s.e.d.	1.74	1.74	2.46	1.74

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	83	3.48	4.4

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87/R/P/2

PERCENTAGE WARE 4.44 CM (1.75 INCH) RIDDLE

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

ROTHGROW VARIETY	ONCE	TWICE	Mean
EDWARD	81.9	81.3	81.6
PIPER	83.7	83.5	83.6
Mean	82.8	82.4	82.6

PATHCONT[86] VARIETY	STANDARD	ENHANCED	FULL	Mean
EDWARD	82.1	80.1	82.7	81.6
PIPER	83.6	82.5	84.6	83.6
Mean	82.8	81.3	83.6	82.6

PATHCONT[86] ROTHGROW	STANDARD	ENHANCED	FULL	Mean
ONCE	82.7	81.9	83.8	82.8
TWICE	83.0	80.7	83.4	82.4
Mean	82.8	81.3	83.6	82.6

HAULM D[86] VARIETY	EARLY	LATER	Mean
EDWARD	82.3	81.0	81.6
PIPER	83.5	83.7	83.6
Mean	82.9	82.3	82.6

HAULM D[86] ROTHGROW	EARLY	LATER	Mean
ONCE	83.5	82.1	82.8
TWICE	82.2	82.6	82.4
Mean	82.9	82.3	82.6

HAULM D[86] PATHCONT[86]	EARLY	LATER	Mean
STANDARD	83.8	81.9	82.8
ENHANCED	81.1	81.5	81.3
FULL	83.7	83.5	83.6
Mean	82.9	82.3	82.6

VARIETY	PATHCONT[86] ROTHGROW	STANDARD	ENHANCED	FULL
EDWARD	ONCE	82.3	81.1	82.3
	TWICE	81.8	79.1	83.1
PIPER	ONCE	83.0	82.6	85.4
	TWICE	84.2	82.4	83.8

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87/R/P/2

PERCENTAGE WARE 4.44 CM (1.75 INCH) RIDDLE

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

VARIETY	HAULM D[86] ROTHGROW	EARLY	LATER
EDWARD	ONCE	82.9	80.9
	TWICE	81.6	81.0
PIPER	ONCE	84.2	83.2
	TWICE	82.8	84.2

VARIETY	HAULM D[86] PATHCONT[86]	EARLY	LATER
EDWARD	STANDARD	84.0	80.1
	ENHANCED	79.9	80.3
	FULL	82.9	82.5
PIPER	STANDARD	83.5	83.7
	ENHANCED	82.3	82.8
	FULL	84.6	84.6

ROTHGROW	HAULM D[86] PATHCONT[86]	EARLY	LATER
ONCE	STANDARD	84.1	81.3
	ENHANCED	82.9	80.8
	FULL	83.5	84.1
TWICE	STANDARD	83.4	82.5
	ENHANCED	79.3	82.2
	FULL	83.9	83.0

VARIETY	ROTHGROW	HAULM D[86] PATHCONT[86]	EARLY	LATER
EDWARD	ONCE	STANDARD	84.2	80.5
		ENHANCED	82.1	80.2
		FULL	82.4	82.1
	TWICE	STANDARD	83.9	79.7
		ENHANCED	77.7	80.4
		FULL	83.3	82.8
PIPER	ONCE	STANDARD	84.1	82.0
		ENHANCED	83.8	81.5
		FULL	84.7	86.1
	TWICE	STANDARD	83.0	85.4
		ENHANCED	80.8	84.0
		FULL	84.5	83.1

SCOTS AA	KE SAA	MP SAA	Mean
	84.8	85.1	84.9

Grand mean 82.9

PLOT AREA HARVESTED 0.00286

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87/W/P/2

POTATOES

VARIETIES AND CONTROL OF GLOBODERA PALLIDA

Object: To study the effects of rates of nematicide on seven varieties of potato differing in their resistance to the pale cyst nematode (Globodera pallida) - Woburn Far Field II.

Sponsor: A.G. Whitehead.

Design: 3 randomised blocks of 21 plots.

Whole plot dimensions: 3.0 x 4.6.

Treatments: All combinations of:-

1. VARIETY — Varieties:

   CAXTON
   DESIREE
   FINGAL
   GLENNA
   MORAG
   ROMANO
   SANTE

2. OXAMYL — Rates of oxamyl (kg):

   0.0
   2.8
   5.6

Basal applications: Manures: (10:10:15+4.5 Mg) at 2290 kg. Weedkiller: Linuron at 1.6 kg in 200 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions applied with the insecticide on the second. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 200 l.

Cultivations, etc.:- Spring-tine cultivated: 30 Jan, 1987 and 16 Feb. NPK Mg applied: 22 Apr. Oxamyl applied, rotary cultivated and potatoes planted: 28 Apr. Rotary ridged: 15 May. Weedkiller applied: 25 May. Mancozeb applied: 24 June, 26 July, 5 Aug. Mancozeb and pirimicarb applied: 8 July. Fentin hydroxide applied: 18 Aug, 4 Sept. Desiccant applied: 18 Sept. Haulm mechanically destroyed: 1 Oct. Lifted: 5 Oct. Previous crops: Potatoes 1985 and 1986.

NOTE: Soil samples were taken before applying nematicide and after harvest for cyst and egg counts of G. pallida.

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87/W/P/2

TOTAL TUBERS TONNES/HECTARE

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

OXAMYL VARIETY	0.0	2.8	5.6	Mean
CAXTON	42.2	52.4	49.7	48.1
DESIREE	29.4	50.1	51.7	43.7
FINGAL	45.9	65.7	64.6	58.7
GLENNA	47.9	59.3	58.8	55.3
MORAG	46.2	56.1	58.7	53.7
ROMANO	18.4	40.9	44.4	34.6
SANTE	31.1	53.9	48.7	44.5
Mean	37.3	54.1	53.8	48.4

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

Table	VARIETY	OXAMYL	VARIETY OXAMYL
s.e.d.	3.36	2.20	5.81

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	40	7.12	14.7

PERCENTAGE WARE 4.44CM (1.75 INCH) RIDDLE

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

OXAMYL VARIETY	0.0	2.8	5.6	Mean
CAXTON	93.7	87.5	87.7	89.6
DESIREE	85.3	95.2	92.0	90.8
FINGAL	91.1	95.5	93.2	93.3
GLENNA	97.1	96.7	95.9	96.5
MORAG	91.3	92.5	92.8	92.2
ROMANO	86.7	93.7	94.1	91.5
SANTE	91.1	94.8	93.0	93.0
Mean	90.9	93.7	92.7	92.4

PLOT AREA HARVESTED 0.00070

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87/R/P/4

POTATOES

EFFECTS OF SEED TUBER TREATMENTS

Object: To study the effects of seed tuber health, size and fungicide treatment on crop growth, yield and quality of potatoes after storage - Little Hoos.

Sponsor: K.J. Boorer.

Design: 3 randomised blocks of 8 plots.

Whole plot dimensions: 6.0 x 12.2.

Treatments: All combinations of:-

1.	SEED STK	Seed stock:
	STOCK A	
	STOCK B	
2.	SIZE	Size of seed tubers:
	SMALL	25 - 55 g
	LARGE	100 - 160 g
3.	FUNGCIDE	Fungicide to seed tubers:
	NONE	None
	TOL+IMAZ	Tolclofos methyl plus imazalil

NOTES: (1) The fungicide treatments were applied as a dip in a mixture containing 0.5 % tolclofos methyl and 0.05 % imazalil.
(2) It was intended that on STOCK A there would be few tuber borne diseases at planting and on STOCK B many. In practice the differences were slight and varied with particular pathogens.

Basal applications: Manures: Chalk at 5.0 t. FYM at 35 t. (0:18:36) at 690 kg. (10:10:15+4.5 Mg) at 1960 kg. Weedkillers: Linuron at 1.6 kg with paraquat at 0.50 kg ion in 500 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions, applied with the pirimicarb on the second occasion. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 300 l.

Seed: Estima.

Cultivations, etc.:- (0:18:36) applied: 17 Sept, 1986. Chalk applied: 24 Sept. FYM applied: 12 Nov. Ploughed: 17 Nov. (10:10:15+4.5 Mg) applied: 14 Apr, 1987. Rotary harrowed: 21 Apr. Potatoes planted: 22 Apr. Rotary ridged: 29 Apr. Weedkillers applied: 8 May. Mancozeb applied: 24 June, 28 July and 10 Aug. Mancozeb and pirimicarb applied: 8 July. Fentin hydroxide applied: 28 Aug, 9 Sept. Desiccant applied: 21 Sept. Haulm mechanically destroyed: 26 Sept. Lifted: 28 Sept and 10 Nov. Previous crops: W. barley 1985, w. oilseed rape 1986.

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87/R/P/4

NOTE: Emergence and ground cover percentages were recorded. Samples were taken on six occasions, from late June to early September, for measurements of haulm weight, leaf area, weight and disease assessments of stem bases and tubers.

TOTAL TUBERS TONNES/HECTARE

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

SIZE	SMALL	LARGE	Mean
SEED STK			
STOCK A	65.3	57.9	61.6
STOCK B	58.1	57.4	57.7
Mean	61.7	57.6	59.7

FUNGCIDE	NONE	TOL+IMAZ	Mean
SEED STK			
STOCK A	60.8	62.4	61.6
STOCK B	56.7	58.8	57.7
Mean	58.7	60.6	59.7

FUNGCIDE	NONE	TOL+IMAZ	Mean
SIZE			
SMALL	62.9	60.5	61.7
LARGE	54.6	60.7	57.6
Mean	58.7	60.6	59.7

FUNGCIDE	NONE	TOL+IMAZ
SEED STK SIZE		
STOCK A SMALL	66.0	64.6
STOCK A LARGE	55.6	60.2
STOCK B SMALL	59.7	56.4
STOCK B LARGE	53.6	61.2

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

Table	SEED STK	SIZE	FUNGCIDE	SEED STK SIZE
s.e.d.	2.56	2.56	2.56	3.63

Table	SEED STK FUNGCIDE	SIZE FUNGCIDE	SEED STK SIZE FUNGCIDE
s.e.d.	3.63	3.63	5.13

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	6.28	10.5

PLOT AREA HARVESTED SIZE SMALL 0.00018
PLOT AREA HARVESTED SIZE LARGE 0.00030
PERCENTAGE WARE NOT RECORDED

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87/R/M/1 and 87/W/M/1

MIXED 1

INPUTS FOR WINTER CEREALS

Object: To compare amounts of disease and the yield of triticale with those of w. wheat, w. barley and w. rye on two contrasted sites each given contrasted amounts of agrochemicals - Rothamsted Summerdells I (R), Woburn Great Hill II (W).

Sponsors: R.J. Gutteridge, D. Hornby, R.D. Prew (R), P.R. Scott, W. Hollins, R.L. Gregory (P.B.I., Cambridge).

Design: 3 randomised blocks of 10 plots.

Whole plot dimensions: 3.0 x 10.0 (R), 4.0 x 10.0 (W).

Treatments: All combinations of :-

1. CROP VAR	Crop and variety:	(R)	(W)
B PANDA	W. barley, Panda sown at	230 kg,	230 kg
R DOMINT	W. rye, Dominant sown at	170 kg,	170 kg
T LASKO	W. triticale, Lasko sown at	170 kg,	160 kg
T CWT	W. triticale, CWT/1977/290 sown at	180 kg,	170 kg
W AVALON	W. wheat, Avalon sown at	190 kg,	190 kg

2. INPUT — Inputs of agrochemicals, in addition to basals:

LARGE

(R): Manures: N at 40 kg: 11 Feb, 1987, and at 160 kg: 2 Apr, both as 'Nitro-Chalk'. Fungicides: Prochloraz at 0.40 kg, carbendazim at 0.15 kg, tridemorph at 0.52 kg in 220 l: 8 May. Carbendazim at 0.25 kg, maneb at 1.6 kg with propiconazole at 0.12 kg in 220 l: 2 July. Growth regulators: Mepiquat chloride at 0.61 kg with 2-chloroethylphosphonic acid at 0.31 kg in 220 l to barley, chlormequat at 1.1 kg in 220 l to wheat and triticale: 8 May.

(W): Manures: N at 40 kg: 13 Feb, 1987 and at 160 kg: 31 Mar, both as 'Nitram'. Fungicides: Prochloraz at 0.40 kg, carbendazim at 0.15 kg, tridemorph at 0.52 kg in 240 l: 21 Apr. Propiconazole at 0.12 kg, tridemorph at 0.52 kg in 200 l: 27 May. Propiconazole at 0.12 kg, carbendazim at 0.25 kg in 200 l: 29 June. Growth regulators: Mepiquat chloride at 0.53 kg with 2-chloroethylphosphonic acid at 0.27 kg in 200 l, to barley and triticale: 7 May.

SMALL

(R) Manures: 120 kg N as 'Nitro-Chalk': 2 Apr, 1987.
(W) Manures: 160 kg N as 'Nitram': 31 Mar.

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87/R/M/1 and 87/W/M/1

Basal applications:
Summerdells (R): Manures: Chalk at 5.0 t. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Methabenzthiazuron at 1.6 kg in 200 l. Isoproturon at 2.5 kg with bromoxynil and ioxynil (as 'Deloxil' at 2.0 l) in 380 l to barley only. Diclofop-methyl at 1.1 kg with bromoxynil and ioxynil (as 'Deloxil' at 2.0 l) in 380 l to rye, triticale and wheat.
Great Hill II (W): Weedkillers: Bromoxynil and ioxynil (as 'Deloxil' at 2.0 l) in 240 l. Fluroxypyr at 0.20 kg in 400 l to barley and wheat.

Cultivations, etc.:-
Summerdells (R): Heavy spring-tine cultivated and disced: 19 Aug, 1986. Chalk applied: 4 Sept. Paraquat applied: 11 Sept. Spring-tine cultivated, rotary harrowed, seed sown, harrowed: 24 Sept. Rolled: 27 Sept. Methabenzthiazuron applied: 30 Sept. Isoproturon, bromoxynil and ioxynil applied to barley, diclofop-methyl, bromoxynil and ioxynil applied to rye, triticale and wheat: 17 Apr, 1987. Combine harvested barley: 7 Aug, rye, triticale and wheat: 1 Sept. Previous crops: W. wheat 1985, w. barley 1986.
Great Hill II (W): Ploughed, rolled: 20 Sept, 1986. Rotary harrowed with crumbler attached, seed sown: 25 Sept. Bromoxynil and ioxynil applied: 17 Apr, 1987. Fluroxypyr applied to barley and wheat: 23 Apr. Combine harvested barley: 5 Aug, rye, triticale and wheat: 18 Aug. Previous crops: Lucerne 1985, w. wheat 1986.

NOTES: (1) Soil samples were taken for take-all bioassay before sowing and after harvest.
(2) Assessments were made of foot and root rots and foliar diseases during the season.

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87/R/M/1

GRAIN TONNES/HECTARE

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

INPUT CROP VAR	LARGE	SMALL	Mean
B PANDA	6.59	6.46	6.53
R DOMINT	6.54	6.04	6.29
T LASKO	5.74	4.62	5.18
T CWT	6.02	5.81	5.91
W AVALON	6.66	6.17	6.42
Mean	6.31	5.82	6.06

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

Table	CROP VAR	INPUT	CROP VAR INPUT
s.e.d.	0.270	0.170	0.381

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.467	7.7

GRAIN MEAN DM% 85.0

PLOT AREA HARVESTED 0.00274

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87/W/M/1

GRAIN TONNES/HECTARE

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

INPUT / CROP VAR	LARGE	SMALL	Mean
B PANDA	6.56	6.16	6.36
R DOMINT	6.39	5.66	6.02
T LASKO	4.42	3.79	4.11
T CWT	4.57	4.70	4.64
W AVALON	4.72	3.70	4.21
Mean	5.33	4.80	5.07

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

Table	CROP VAR	INPUT	CROP VAR INPUT
s.e.d.	0.396	0.251	0.560

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.686	13.5

GRAIN MEAN DM% 80.1

PLOT AREA HARVESTED 0.00275

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87/R/M/2

MIXED 2

FACTORS AFFECTING EYESPOT

Object: To study eyespot (Pseudocercosporella herpotrichoides) development after inoculation with different pathotypes in relation to host crop and seed rate - White Horse II.

Sponsor: A. Goulds.

Design: 2 blocks of 12 plots split into 3.

Whole plot dimensions: 3.0 x 37.0.

Treatments: All combinations of:-

Whole plots

1. W CEREAL		Winter cereals sown on 30 September, 1986:
	BARLEY	Winter barley cv. Opera
	WHEAT	Winter wheat cv. Avalon
2. SEEDRATE		Seed rates (seeds per square metre):
	NORMAL	Normal - 300 barley, 400 wheat
	HALF N	Half normal - 150 barley, 200 wheat
3. INOCULUM		Inoculation with different eyespot pathogen types:
	NONE	None
	RYE INOC	Rye type
	WHE INOC	Wheat type

Sub plots

4. FUNGTIME		Times of applying prochloraz at 0.40 kg and carbendazim at 0.15 kg in 220 l:
	NONE	None
	EARLY	Sprayed at growth stage 30/31 on 23 Apr, 1987
	LATE	Sprayed at growth stage, 33/37 wheat, 41/49 barley on 19 May

NOTES: (1) One additional sub-plot in each whole plot was systematically arranged for sampling, yields not taken.
(2) Strains of wheat and rye type inoculum were colonised on oat seed and broadcast within two weeks of emergence.

Basal applications: Manures: 'Nitram' at 350 kg. Weedkillers: Isoproturon at 2.5 kg with clopyralid at 0.07 kg and bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicides: Propiconazole at 0.25 kg with tridemorph at 0.19 kg in 200 l.

Cultivations, etc.:- Heavy spring-tine cultivated twice, disced: 29 Sept, 1986. Rotary harrowed, seed sown: 30 Sept. Weedkillers applied: 15 Apr, 1987. N applied: 17 Apr. Basal fungicides applied: 29 June. Combine harvested: 7 Aug (barley), 1 Sept (wheat). Previous crops: W oats 1985, potatoes 1986.

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87/R/M/2

NOTE: Eyespot was assessed on plants at fortnightly intervals from December to G.S. 30 and weekly thereafter.

GRAIN TONNES/HECTARE

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

SEEDRATE	NORMAL	HALF N	Mean
W CEREAL			
BARLEY	7.74	7.67	7.71
WHEAT	7.98	7.85	7.92
Mean	7.86	7.76	7.81

INOCULUM	NONE	RYE INOC	WHE INOC	Mean
W CEREAL				
BARLEY	7.97	7.74	7.41	7.71
WHEAT	7.94	8.03	7.77	7.92
Mean	7.95	7.89	7.59	7.81

INOCULUM	NONE	RYE INOC	WHE INOC	Mean
SEEDRATE				
NORMAL	8.09	7.91	7.57	7.86
HALF N	7.81	7.87	7.61	7.76
Mean	7.95	7.89	7.59	7.81

FUNGTIME	NONE	EARLY	LATE	Mean
W CEREAL				
BARLEY	7.18	8.06	7.88	7.71
WHEAT	7.56	7.95	8.23	7.92
Mean	7.37	8.00	8.05	7.81

FUNGTIME	NONE	EARLY	LATE	Mean
SEEDRATE				
NORMAL	7.32	8.08	8.18	7.86
HALF N	7.43	7.93	7.92	7.76
Mean	7.37	8.00	8.05	7.81

FUNGTIME	NONE	EARLY	LATE	Mean
INOCULUM				
NONE	7.47	8.22	8.17	7.95
RYE INOC	7.72	7.78	8.16	7.89
WHE INOC	6.92	8.02	7.82	7.59
Mean	7.37	8.00	8.05	7.81

	INOCULUM	NONE	RYE INOC	WHE INOC
W CEREAL	SEEDRATE			
BARLEY	NORMAL	8.15	7.83	7.24
	HALF N	7.78	7.65	7.58
WHEAT	NORMAL	8.04	7.98	7.91
	HALF N	7.85	8.08	7.63

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87/R/M/2

GRAIN TONNES/HECTARE

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

W CEREAL	FUNGTIME / SEEDRATE	NONE	EARLY	LATE
BARLEY	NORMAL	7.03	8.17	8.02
	HALF N	7.33	7.95	7.73
WHEAT	NORMAL	7.60	7.98	8.35
	HALF N	7.53	7.92	8.12

W CEREAL	FUNGTIME / INOCULUM	NONE	EARLY	LATE
BARLEY	NONE	7.54	8.18	8.17
	RYE INOC	7.45	7.99	7.79
	WHE INOC	6.55	8.02	7.66
WHEAT	NONE	7.40	8.25	8.18
	RYE INOC	8.00	7.57	8.53
	WHE INOC	7.29	8.03	7.99

SEEDRATE	FUNGTIME / INOCULUM	NONE	EARLY	LATE
NORMAL	NONE	7.56	8.36	8.36
	RYE INOC	7.77	7.74	8.22
	WHE INOC	6.62	8.13	7.97
HALF N	NONE	7.39	8.07	7.99
	RYE INOC	7.68	7.82	8.10
	WHE INOC	7.23	7.91	7.68

W CEREAL	SEEDRATE	FUNGTIME / INOCULUM	NONE	EARLY	LATE
BARLEY	NORMAL	NONE	7.74	8.39	8.33
		RYE INOC	7.52	8.03	7.96
		WHE INOC	5.84	8.11	7.78
	HALF N	NONE	7.34	7.97	8.02
		RYE INOC	7.39	7.95	7.63
		WHE INOC	7.27	7.93	7.54
WHEAT	NORMAL	NONE	7.38	8.34	8.39
		RYE INOC	8.02	7.45	8.49
		WHE INOC	7.40	8.16	8.17
	HALF N	NONE	7.43	8.17	7.96
		RYE INOC	7.98	7.69	8.58
		WHE INOC	7.19	7.89	7.81

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87/R/M/2

GRAIN TONNES/HECTARE

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

Table	W CEREAL	SEEDRATE	INOCULUM	FUNGTIME
s.e.d.	0.093	0.093	0.114	0.114

Table	W CEREAL SEEDRATE	W CEREAL INOCULUM	SEEDRATE INOCULUM	W CEREAL FUNGTIME
s.e.d.	0.132	0.162	0.162	0.162

Table	SEEDRATE FUNGTIME	INOCULUM FUNGTIME	W CEREAL SEEDRATE INOCULUM	W CEREAL SEEDRATE FUNGTIME
s.e.d.	0.162	0.198	0.229	0.228

Table	W CEREAL INOCULUM FUNGTIME	SEEDRATE INOCULUM FUNGTIME	W CEREAL SEEDRATE INOCULUM FUNGTIME
s.e.d.	0.280	0.280	0.396

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.229	2.9
BLOCK.WP.SP	24	0.396	5.1

GRAIN MEAN DM% 84.3

SUB PLOT AREA HARVESTED 0.00235

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87/W/M/2

MIXED 2

COMPARISON OF COMBINES

Object: To evaluate the suitability of two combines for plot work in respect of purity of sample and accuracy when working on slopes - Great Hill III.

Sponsor: R. Moffitt.

Design: A systematic split-plot design, 56 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	
R*	W	R	W	R	W	R	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 two 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: 8.0 x 11.0.

Treatments:

Whole plots

1. CROP		Crop and variety:
	WHEAT	W. wheat, Avalon
	RYE	W. rye, Dominant
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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87/W/M/2

Sub plots

4. COMBINE Combine type:

CLAYSON	Clayson 1530
DEUTZ-F	Deutz-Fahr 660

Basal applications: Manures: FYM at 100 t. (0:18:36) at 700 kg, 'Nitram' at 470 kg. Weedkillers: Bromoxynil and ioxynil (as 'Deloxil' at 2.0 l) in 240 l. Fungicide: Triadimenol at 0.062 kg in 200 l.

Seed: W. rye: Dominant, sown at 170 kg.
W. wheat: Avalon, sown at 160 kg.

Cultivations, etc.:- FYM applied: 3 July, 1986. Ploughed: 9-11, July. Rolled: 22 July. PK applied: 16 Sept. Rotary harrowed with crumbler attached, sown: 7 Oct. Rolled: 8 Oct. N applied: 15 Apr, 1987. Weedkillers applied: 17 June. Fungicide applied: 1 July. Combine harvested: 15 Sept. Previous crops: Lucerne 1985 and 1986.

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87/W/M/2

GRAIN TONNES/HECTARE

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

COMBINE	CLAYSON	DEUTZ-F
	5.63	5.78

	DIRECTN	UP			DOWN		
CROP	ORDER	BEGIN	STRAIGHT	END	BEGIN	STRAIGHT	END
WHEAT			6.40		5.49	6.58	6.67
RYE		3.94	3.65	4.25		3.93	

CROP	DIRECTN	ORDER	COMBINE	CLAYSON	DEUTZ-F
WHEAT	UP	STRAIGHT		6.24	6.55
	DOWN	BEGIN		5.57	5.41
		STRAIGHT		6.46	6.70
		END		6.55	6.78
RYE	UP	BEGIN		4.49	3.39
		STRAIGHT		3.76	3.54
		END		3.80	4.70
	DOWN	STRAIGHT		3.78	4.09

Grand mean 5.70

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

Table	COMBINE	CROP DIRECTN ORDER	CROP DIRECTN ORDER COMBINE	
s.e.d.	0.066	0.242	0.299	min.rep
		0.191	0.236	max-min
		0.121	0.149	max.rep
Except when comparing means with the same level(s) of CROP.DIRECTN.ORDER			0.249	min.rep
			0.197	max-min
			0.124	max.rep

max.rep CROP WHEAT and ORDER STRAIGHT
min.rep any of the remainder
max-min CROP WHEAT and ORDER STRAIGHT v any of the remainder

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

Stratum	d.f.	s.e.	cv%
WP	48	0.342	6.0
WP.SP	48	0.352	6.2

GRAIN MEAN DM% 82.0

PLOT AREA HARVESTED	CLAYSON	0.00302
	DEUTZ-F	0.00220

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METEOROLOGICAL RECORDS 1987 - ROTHAMSTED

(Departure from long-period means in brackets)

MONTH	Total sunshine: hours	Mean temperature: C Air(1)	Dew point	In ground under grass 30cm	100cm
JAN	61 (+1)	0.0 (-2.8)	-2.1	3.4	6.1
FEB	58 (-4)	3.1 (0.0)	1.5	3.7	5.1
MAR	96 (-13)	3.5 (-1.7)	1.1	4.5	5.2
APR	147 (+8)	10.0 (+2.3)	7.1	8.6	6.9
MAY	195 (+6)	9.6 (-1.5)	6.2	11.0	9.4
JUNE	120 (-77)	12.7 (-1.3)	10.2	13.8	11.4
JULY	174 (-7)	15.4 (-0.3)	12.3	16.4	13.9
AUG	149 (-18)	15.4 (-0.3)	12.6	16.2	14.5
SEPT	142 (+2)	13.4 (-0.2)	10.8	15.3	14.5
OCT	124 (24)	9.7 (-0.5)	8.0	11.7	12.7
NOV	44 (-18)	5.8 (-0.1)	4.6	8.7	10.4
DEC	29 (-17)	5.3 (+1.2)	3.9	6.4	8.0
YEAR*	1338 (-103)	8.7 (-0.5)	6.3	10.0	9.8

MONTH	Ground frosts (2)	Total rainfall:mm 0.000405 ha (1/1000 acre) gauge	Rain days (3)	Drainage through 50.8cm (20 in) soil:mm	Wind km per hour (4)
JAN	25	15 (-48)	11	16	7.9
FEB	18	28 (-24)	13	15	7.9
MAR	23	56 (+4)	20	34	10.4
APR	14	47 (0)	9	32	7.8
MAY	11	64 (+12)	15	6	7.9
JUNE	4	90 (+32)	21	38	5.3
JULY	0	62 (+10)	16	21	5.4
AUG	1	60 (-1)	12	18	4.7
SEPT	4	40 (-19)	15	6	5.4
OCT	14	199 (+139)	23	157	6.4
NOV	14	59 (-10)	18	50	7.5
DEC	15	30 (-39)	12	23	9.4
YEAR*	143	749 (+56)	185	416	7.2

(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 1987 - WOBURN

(Departure from long-period means in brackets)

Mean temperature: C

MONTH	Total sunshine: hours	Air(1)	Dew point	In ground under grass 30 cm	In ground under grass 100 cm	Ground frosts (2)	Total rainfall: mm 12.7 cm (5in) gauge	Rain days (3)	Wind km per hour (4)
JAN	47 (-4)	0.0 (-3.3)	-1.0	3.3	6.4	23	18 (-35)	12	4.8
FEB	46 (-15)	4.3 (+1.0)	2.5	3.7	5.4	18	29 (-13)	14	7.2
MAR	90 (-17)	3.9 (-1.4)	1.9	4.7	5.4	21	48 (-1)	18	9.3
APR	150 (+18)	10.3 (+2.6)	7.4	9.3	7.2	9	56 (+11)	12	7.2
MAY	157 (-26)	10.2 (-0.9)	6.6	11.8	9.9	12	48 (-3)	14	7.0
JUNE	129 (-64)	12.9 (-1.1)	10.5	14.4	11.6	1	109 (+53)	22	6.4
JULY	168 (-8)	15.6 (-0.2)	12.2	17.7	14.7	0	72 (+21)	14	5.5
AUG	156 (-7)	15.5 (-0.1)	12.6	17.1	15.2	1	48 (-19)	13	5.5
SEPT	137 (+2)	13.8 (+0.3)	11.2	15.6	15.1	4	38 (-17)	16	6.7
OCT	119 (+19)	9.6 (-0.7)	7.6	11.4	13.0	7	152 (+100)	20	6.5
NOV	36 (-26)	6.1 (-0.1)	4.3	8.4	10.5	12	57 (-3)	14	7.4
DEC	21 (-25)	5.3 (+1.0)	3.7	5.9	8.1	14	25 (-34)	10	9.4
YEAR*	1255 (-154)	8.9 (-0.2)	6.6	10.3	10.2	122	698 (+61)	179	6.9

(1)Mean of maximum and minimum
(2)Number of nights grass min. was below 0.0 C
(3)Number of days rainfall was 0.2 mm or more
(4)At 2 metres above ground level
*Mean or total

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CONVERSION FACTORS

Factors for the Conversion of Imperial to Metric Units

1 inch (in.)	= 2·540 centimetres (cm)
1 foot (ft) (=12 in.)	= 30·48 cm
1 yard (yd) (=3 ft)	= 0·9144 metre (m)
1 square yard (yd²)	= 0·8361 m²
1 acre (ac) (=4840 yd²)	= 0·4047 hectare (ha)
1 ounce (oz)	= 28·35 grams (g)
1 pound (lb)	= 0·4536 kilogram (kg)
1 hundredweight (cwt) (=112 lb)	= 50·80 kg
1 ton (=2240 lb)	= 1016 kg = 1·016 metric tons (tonnes) (t)
1 pint	= 0·5682 litre (l)
1 gallon (gal) (=8 pints)	= 4·546 litres
1 fluid ounce = 1/20 pint	= 0·02841 litre = 28·41 ml
1 cubic foot	= 28·32 litres

To convert	*Multiply by*
oz ac^{-1} to g ha^{-1}	70·06
lb ac^{-1} to kg ha^{-1}	1·121
cwt ac^{-1} to kg ha^{-1}	125·5
cwt ac^{-1} to t ha^{-1}	0·1255
ton ac^{-1} to kg ha^{-1}	2511
ton ac^{-1} to t ha^{-1}	2·511
gal ac^{-1} to l ha^{-1}	11·233

The following factors are accurate to about 2 parts in 100:

1 lb ac^{-1} = 1·1 kg ha^{-1}
1 gal ac^{-1} = 11 litres ha^{-1}
1 ton ac^{-1} = 2·5 t ha^{-1}

In general reading of the text there will be no great inaccuracy in regarding:

1 lb = 0·5 kg
1 lb ac^{-1} = 1 kg ha^{-1}

Temperatures

To convert °F into °C subtract 32 and multiply by $\frac{5}{9}$ (0.556)
To convert °C into °F multiply by $\frac{9}{5}$ (1·8) and add 32

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CONVERSION FACTORS

Factors for the Conversion of Metric to Imperial Units

1 centimetre (cm)	=	0·3937 inch (in.) = 0·03281 ft
1 metre (m)	=	1·094 yards (yd)
1 square metre (m^2)	=	1·196 square yards (yd^2)
1 hectare (ha)	=	2·471 acres (ac)
1 gram (g)	=	0·03527 ounce (oz)
1 kilogram (kg)	=	2·205 pounds (lb)
1 kg	=	0·01968 hundredweight (cwt) = 0·0009842 ton
1 metric ton (tonne) (t)	=	0·9842 ton
1 litre	=	1·760 pints = 0·2200 gallon (gal)

1 litre = 1000 millilitres (ml) = 35·20 fluid ounces = 0·03531 cubic foot (ft^3)

To convert	*Multiply by*
g ha^{-1} to oz ac^{-1}	0·01427
kg ha^{-1} to lb ac^{-1}	0·8921
kg ha^{-1} to cwt ac^{-1}	0·007966
t ha^{-1} to cwt ac^{-1}	7·966
kg ha^{-1} to tons ac^{-1}	0·0003983
t ha^{-1} to tons ac^{-1}	0·3983
l ha^{-1} to gal ac^{-1}	0·08902

Plant nutrients

Plant nutrients are best stated in terms of amounts of the elements (P, K, Na, Ca, Mg, S); the old 'oxide' terminology (P_2O_5, K_2O, Na_2O, CaO, MgO, SO_3) is still used in work involving fertilisers and liming since Regulations require statements of P_2O_5, K_2O, etc.

For quick conversions

(accurate to within 2%) the following factors may be used:

$2\frac{1}{3} \times P = P_2O_5$	$\frac{3}{7} \times P_2O_5 = P$
$1\frac{1}{5} \times K = K_2O$	$\frac{5}{6} \times K_2O = K$
$1\frac{2}{5} \times Ca = CaO$	$\frac{7}{10} \times CaO = Ca$
$1\frac{2}{3} \times Mg = MgO$	$\frac{3}{5} \times MgO = Mg$

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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