

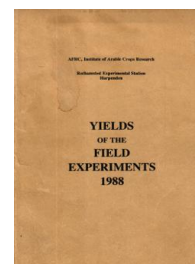
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# Yields of the Field Experiments 1988

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## Crop Sequences

### Rothamsted Research

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

### LONG TERM LIMING

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

**Sponsor:** S.P. McGrath.

The 27th year, linseed.

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

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

**Whole plot dimensions:** 6.40 x 18.3.

**Treatments:** All combinations of:-

Whole plots

1. **CHALK** Residual effects of ground chalk (tonnes CaCO<sub>3</sub>) (total applied 1962-87):

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

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

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

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

Sub plots

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

0	None
MN	Manganese sprays

- NOTES:** (1) Until 1978 test P was applied cumulatively, rates varied with crop, K was also applied cumulatively, to P1 and P3 plots. Since 1981 K has been applied basally (none in 1986 and 1987).  
 (2) On Sawyers I (R) manganese was applied at 0.15 kg Mn, as manganese chelate, in 260 l on 20 June, 1988, repeated in 200 l on 19 July.  
 (3) On Stackyard C (W) manganese was applied at 0.16 kg Mn in 220 l on 15 June and at 0.15 kg Mn with sulphur at 0.12 kg S in 220 l on 15 July.

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

**Basal applications:**

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

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

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

**Cultivations, etc.:-**

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

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

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

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

**GRAIN (AT 90% DRY MATTER) TONNES/HECTARE**

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

P	0	P1	P2	P3	Mean
<b>CHALK</b>					
15	2.53	2.57	2.78	2.89	2.69
24.5	2.57	2.90	2.76	2.84	2.77
52.5	2.62	2.81	2.62	2.59	2.66
Mean	2.57	2.76	2.72	2.77	2.70
<b>MANGNESE</b>	0	MN	Mean		
<b>CHALK</b>					
15	2.73	2.65	2.69		
24.5	2.78	2.76	2.77		
52.5	2.65	2.66	2.66		
Mean	2.72	2.69	2.70		

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

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

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

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

CHALK	P	MANGNESE	CHALK P
0.136	0.157	0.047	0.272
CHALK MANGNESE	P	CHALK MANGNESE	CHALK MANGNESE
0.148	0.171	0.295	
Except when comparing means with the same level(s) of			
CHALK	0.082		
P		0.094	
CHALK.P			0.163

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

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

GRAIN MEAN DM% 59.8

SUB PLOT AREA HARVESTED 0.00177



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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

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

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

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

CHALK	MANGNESE	
	P	MN
0	0	0.74
	P1	0.97
	P2	1.62
	P3	1.73
9	0	2.34
	P1	2.96
	P2	2.81
	P3	2.99
25.5	0	2.82
	P1	2.85
	P2	2.64
	P3	2.93
45.5	0	2.11
	P1	2.59
	P2	2.39
	P3	2.59

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	CHALK	P	MANGNESE	CHALK P
	0.154	0.154	0.057	0.308
	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE	
	0.174	0.174	0.348	
Except when comparing means with the same level(s) of	CHALK			
	0.114			
P		0.114		
CHALK.P			0.229	

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

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

GRAIN MEAN DM% 83.7

SUB PLOT AREA HARVESTED 0.00185

88/W/CS/34

### NEMATICIDES IN CROP SEQUENCE

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

**Sponsor:** A.G. Whitehead.

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

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

**Design:** 4 series of 3 blocks of 10 plots.

**Whole plot dimensions:** 4.27 x 9.14.

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

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

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

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

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

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

FMC65201  
FMC67825  
OXAMYL

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

2.8  
5.6  
11.2

plus one untreated plot

**RATE**

0.0

88/W/CS/34

Treatments to s. barley (Series IV):

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

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

**Standard applications:**

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

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

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

**Seed:** Potatoes: Pentland Crown.

W. wheat: Avalon, sown at 190 kg.

S. barley: Klaxon, sown at 150 kg.

**Cultivations, etc.:-**

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

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



88/W/CS/34

**Cultivations, etc.:-**

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

**W.WHEAT SERIES I**

**GRAIN TONNES/HECTARE**

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

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

RATE 0.0 3.41

Grand mean 3.87

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

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

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.518	13.4
GRAIN MEAN DM%	85.0		
PLOT AREA HARVESTED	0.00251		



88/W/CS/34

S. BARLEY SERIES IV

GRAIN TONNES/HECTARE

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

NEMACIDE[86]

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

Mean 4.78

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

NEMACIDE[86]

0.382

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.468	9.8
GRAIN MEAN DM%	86.8		
PLOT AREA HARVESTED	0.00251		

88/R/CS/140

### CHEMICAL REFERENCE PLOTS

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

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

The 15th year, s. barley.

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

**Design:** Single replicate of 32 plots.

**Whole plot dimensions:** 4.06 x 4.57.

**Treatments,** applied cumulatively except as stated:

All combinations of:-

1. **WEEDKLLR** Weedkiller in autumn:  

NONE	None
GLYPHOS	Glyphosate at 1.4 kg to barley stubble each autumn from 1979 to 1984, at 0.72 kg in 1985, at 0.54 kg in 1986 and at 1.3 kg in 1987
  
2. **FUNGICIDE[1]** Fungicide in autumn:  

NONE	None
TRIADIM	Triadimefon at 0.25 kg in autumn 1981, 1982, 1984, 1985, 1986 and 1987, 0.28 kg in autumn 1983
  
3. **FUNGICIDE[2]** Fungicide in spring:  

NONE	None
BENOMYL	Benomyl at 4 kg to seedbed
  
4. **INSCTCDE** Insecticide:  

NONE	None
CHLORFEN	Chlorfenvinphos at 2 kg to the seedbed
  
5. **NEMACIDE** Nematicide:  

NONE	None
ALDICARB	Aldicarb at 6 kg to the seedbed

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

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

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

88/R/CS/140

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

**GRAIN TONNES/HECTARE**

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

<b>FUNGCIDE [1]</b>	NONE	TRIADIM	Mean
<b>WEEDKLLR</b>			
NONE	4.31	4.17	4.24
GLYPHOS	4.29	4.38	4.34
Mean	4.30	4.28	4.29
<b>FUNGCIDE [2]</b>	NONE	BENOMYL	Mean
<b>WEEDKLLR</b>			
NONE	4.25	4.24	4.24
GLYPHOS	4.31	4.36	4.34
Mean	4.28	4.30	4.29
<b>FUNGCIDE [2]</b>	NONE	BENOMYL	Mean
<b>FUNGCIDE [1]</b>			
NONE	4.24	4.37	4.30
TRIADIM	4.32	4.24	4.28
Mean	4.28	4.30	4.29
<b>INSCTCDE</b>	NONE	CHLORFEN	Mean
<b>WEEDKLLR</b>			
NONE	4.25	4.24	4.24
GLYPHOS	4.29	4.38	4.34
Mean	4.27	4.31	4.29
<b>INSCTCDE</b>	NONE	CHLORFEN	Mean
<b>FUNGCIDE [1]</b>			
NONE	4.24	4.37	4.30
TRIADIM	4.30	4.25	4.28
Mean	4.27	4.31	4.29
<b>INSCTCDE</b>	NONE	CHLORFEN	Mean
<b>FUNGCIDE [2]</b>			
NONE	4.24	4.32	4.28
BENOMYL	4.30	4.30	4.30
Mean	4.27	4.31	4.29
<b>NEMACIDE</b>	NONE	ALDICARB	Mean
<b>WEEDKLLR</b>			
NONE	4.05	4.44	4.24
GLYPHOS	4.21	4.47	4.34
Mean	4.13	4.45	4.29

88/R/CS/140

GRAIN TONNES/HECTARE

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

<b>NEMACIDE</b>	NONE	ALDICARB	Mean
<b>FUNGCIDE [1]</b>			
NONE	4.08	4.53	4.30
TRIADIM	4.18	4.38	4.28
Mean	4.13	4.45	4.29
<b>NEMACIDE</b>	NONE	ALDICARB	Mean
<b>FUNGCIDE [2]</b>			
NONE	4.16	4.40	4.28
BENOMYL	4.10	4.50	4.30
Mean	4.13	4.45	4.29
<b>NEMACIDE</b>	NONE	ALDICARB	Mean
<b>INSCTCDE</b>			
NONE	4.05	4.50	4.27
CHLORFEN	4.21	4.41	4.31
Mean	4.13	4.45	4.29
<b>WEEDKLLR</b>	<b>FUNGCIDE [2]</b>	NONE	BENOMYL
NONE	NONE	4.30	4.33
	TRIADIM	4.20	4.15
GLYPHOS	NONE	4.19	4.40
	TRIADIM	4.43	4.33
<b>WEEDKLLR</b>	<b>INSCTCDE</b>	NONE	CHLORFEN
NONE	NONE	4.24	4.38
	TRIADIM	4.26	4.09
GLYPHOS	NONE	4.24	4.35
	TRIADIM	4.34	4.41
<b>WEEDKLLR</b>	<b>INSCTCDE</b>	NONE	CHLORFEN
NONE	NONE	4.26	4.24
	BENOMYL	4.24	4.23
GLYPHOS	NONE	4.22	4.39
	BENOMYL	4.36	4.37
<b>FUNGCIDE [1]</b>	<b>INSCTCDE</b>	NONE	CHLORFEN
NONE	NONE	4.13	4.36
	BENOMYL	4.36	4.37
TRIADIM	NONE	4.36	4.27
	BENOMYL	4.24	4.23

88/R/CS/140

GRAIN TONNES/HECTARE

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

	<b>NEMACIDE</b>	NONE	ALDICARB
<b>WEEDKLLR</b>	<b>FUNGCIDE [1]</b>		
NONE	NONE	4.05	4.58
	TRIADIM	4.06	4.29
GLYPHOS	NONE	4.12	4.47
	TRIADIM	4.30	4.46
	<b>NEMACIDE</b>	NONE	ALDICARB
<b>WEEDKLLR</b>	<b>FUNGCIDE [2]</b>		
NONE	NONE	4.05	4.46
	BENOMYL	4.06	4.41
GLYPHOS	NONE	4.27	4.35
	BENOMYL	4.15	4.58
	<b>NEMACIDE</b>	NONE	ALDICARB
<b>FUNGCIDE [1]</b>	<b>FUNGCIDE [2]</b>		
NONE	NONE	4.03	4.46
	BENOMYL	4.14	4.59
TRIADIM	NONE	4.28	4.35
	BENOMYL	4.07	4.40
	<b>NEMACIDE</b>	NONE	ALDICARB
<b>WEEDKLLR</b>	<b>INSCTCDE</b>		
NONE	NONE	3.99	4.52
	CHLORFEN	4.12	4.36
GLYPHOS	NONE	4.11	4.47
	CHLORFEN	4.30	4.46
	<b>NEMACIDE</b>	NONE	ALDICARB
<b>FUNGCIDE [1]</b>	<b>INSCTCDE</b>		
NONE	NONE	3.94	4.54
	CHLORFEN	4.22	4.51
TRIADIM	NONE	4.16	4.45
	CHLORFEN	4.20	4.31
	<b>NEMACIDE</b>	NONE	ALDICARB
<b>FUNGCIDE [2]</b>	<b>INSCTCDE</b>		
NONE	NONE	4.02	4.47
	CHLORFEN	4.30	4.34
BENOMYL	NONE	4.08	4.52
	CHLORFEN	4.12	4.48



88/R/CS/140

GRAIN TONNES/HECTARE

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

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

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

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

GRAIN MEAN DM% 85.2

PLOT AREA HARVESTED 0.00075

88/R/CS/212

**SEASONAL EFFECTS OF TAKE-ALL**

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

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

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

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

**Design:** 3 randomised blocks of 8 plots.

**Whole plot dimensions:** 5.33 x 10.7.

**Treatments:**

PREVCROP	Previous crops before w. wheat 1988:									
	78	79	80	81	82	83	84	85	86	87
W8 W W	W	W	W	W	W	W	W	W	W	W
W1 W BE	BE	W	W	BE	W	W	BE	W	W	BE
BE BE W	W	BE	W	W	BE	W	W	BE	BE	W
W2 BE W	W	W	BE	W	W	BE	W	W	BE	W
W8 BE W	W	W	W	W	W	W	W	W	BE	W
W1 W W	BE	W	W	BE	W	W	BE	W	W	W
W2 W W	W	W	BE	W	W	BE	W	W	W	W

BE = s. beans, W = w. wheat

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

**Standard applications:**

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

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

**Cultivations, etc.:-**

Both crops: Ploughed: 24 Sept, 1987. Rotary harrowed: 5 Oct.

W. wheat: Seed sown: 5 Oct, 1987. Chlortoluron applied: 6 Nov. N applied: 14 Apr, 1988. Fluroxypyr and isoproturon applied: 26 Apr. Combine harvested: 23 Aug.

S. beans: Heavy spring-tine cultivated, rotary harrowed, seed sown: 11 Mar, 1988.

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

88/R/CS/212

GRAIN TONNES/HECTARE

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

PREVCROP

W8 W W	6.21
W1 W BE	6.61
BE BE W	7.43
W2 BE W	7.07
W8 BE W	7.07
W1 W W	6.79
W2 W W	6.82

Mean 6.86

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

PREVCROP

0.438

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

Stratum	d.f.	s.e.	cv%
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BLOCK.WP	12	0.537	7.8
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GRAIN MEAN DM% 82.5

PLOT AREA HARVESTED 0.00291

88/W/CS/245

**MINIMUM CULTIVATION AND DEEP PK**

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

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

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

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

**Column plot dimensions:** 4.27 x 57.6.

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

**Treatments:** All combinations of:-

**Series:**

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

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

Column plots: All combinations (duplicated) of:

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

---	None, mouldboard ploughed
--S	None, subsoiled
PKS	PK to subsoil
3. **YEAR** Years of applying PK SUB:  

1980	In autumn 1979
1980/3/6	In autumn 1979, autumn 1982 and autumn 1985
4. **DRILL** Drills and associated cultivations:  

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

88/W/CS/245

Row plots:

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

S. rape

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

S. wheat

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

S. barley

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

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

**EXTRA**

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

- NOTES:** (1) Rates of extra P and K were 500 kg P<sub>2</sub>O<sub>5</sub>, as superphosphate, 250 kg K<sub>2</sub>O as muriate of potash.
- (2) Subsoiling was done with the Wye double-digger which turns a furrow with a conventional plough share, to a depth of 23 cm, and at the same time rotary cultivates the bottom of the adjacent furrow to a further depth of 15 cm. When applying P and K this was distributed ahead of the rotary cultivator.
- (3) The topsoil PK dressing was equally divided before and after ploughing.
- (4) Standard pathogen control in 1988 was conventional seed dressing. Enhanced pathogen control had in addition, on Series I only, deltamethrin at 0.075 kg in 220 l: 5 May, 1988, azinphos-methyl at 0.28 kg and demeton-S-methyl sulphone at 0.084 kg in 340 l applied: 13 June, vinclozalin at 0.50 kg in 220 l applied: 2 Aug, triazophos at 0.42 kg in 220 l applied: 2 Aug and, on Series II and III, propiconazole at 0.12 kg and tridemorph at 0.25 kg in 220 l, applied: 7 June and 12 July.
- (5) All plots with the combination YEAR 1980/3/6; DRILL DIRECT were mouldboard ploughed and conventionally drilled in error in 1987.



88/W/CS/245

**Standard applications:**

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

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

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

**Cultivations, etc.:-**

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

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

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

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

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

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

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

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

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

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

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

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

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

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

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

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

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

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

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

\* Within the same level of N PATH only

DRILL

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

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

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

GRAIN MEAN DM% 83.6

SUB PLOT AREA HARVESTED 0.00341



88/W/CS/245 SPRING WHEAT SERIES II

GRAIN TONNES/HECTARE

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

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

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

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

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

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

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



88/W/CS/245 SPRING WHEAT SERIES II

GRAIN TONNES/HECTARE

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

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

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

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

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

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

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

88/W/CS/245 SPRING WHEAT SERIES II

GRAIN TONNES/HECTARE

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

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

\* Within the same level of N PATH only

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

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

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

GRAIN MEAN DM% 82.6

SUB PLOT AREA HARVESTED 0.00341

88/W/CS/245 SPRING BARLEY SERIES III

GRAIN TONNES/HECTARE

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

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

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

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

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

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

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

88/W/CS/245 SPRING BARLEY SERIES III

GRAIN TONNES/HECTARE

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

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

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

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

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

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

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

88/W/CS/245 SPRING BARLEY SERIES III

GRAIN TONNES/HECTARE

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

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

\* Within the same level of N PATH only

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

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

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

GRAIN MEAN DM% 82.3

SUB PLOT AREA HARVESTED 0.00341



88/W/CS/273

**INTENSIVE POTATOES**

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

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

The seventh year, s. barley, potatoes.

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

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

**Whole plot dimensions:** 9.00 x 24.7.

**Treatments:** All combinations of:-

Whole plots

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

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

Sub plots, two replicates of:-

2. **SD TREAT** Seed treatment:

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

3. **NEMACIDE** Nematicide:

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

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

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

20 June	12.5
24 June	12.5
5 Aug	12.5
16 Aug	12.5

Total 50

88/W/CS/273

**Standard applications:**

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

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

**Cultivations, etc.:-**

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

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

**TOTAL TUBERS TONNES/HECTARE**

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

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

88/W/CS/273

TOTAL TUBERS TONNES/HECTARE

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

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

Mean 34.4 46.4 40.4

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

Mean 34.4 46.4 40.4

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

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

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

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

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

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

88/W/CS/273

PERCENTAGE WARE 4.44 CM (1.75 INCH) RIDDLE

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

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

Mean 66.5 66.4 66.5

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

Mean 63.2 69.8 66.5

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

Mean 63.2 69.8 66.5

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

SUB PLOT AREA HARVESTED 0.00075



88/R/CS/302

**EYESPOT RESISTANCE TO MBC**

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

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

The fourth year, w. wheat.

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

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

**Whole plot dimensions:** 12.0 x 24.0.

**Treatments:** All combinations of:-

Whole plots

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

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

Sub plots

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

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

**NOTES:** (1) Fungicide treatments were applied in 200 l on 10 Dec, 1987 and 11 Apr, 1988.

(2) The eyespot inoculum was colonised on oat seed and this was broadcast in October, 1984.

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

**Seed:** Avalon, sown at 180 kg.



88/R/CS/302

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

**NOTE:** Eyespot and sharp eyespot were assessed in July.

**GRAIN TONNES/HECTARE**

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

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

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

EYE INOC	FUNGICIDE	EYE INOC
0.179	0.359	min.rep
0.155	0.311	max-min

**EYE INOC**

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

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

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

GRAIN MEAN DM% 85.1

SUB PLOT AREA HARVESTED 0.00134

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

LONG-TERM STRAW INCORPORATION

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

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

**Associate sponsor:** D.S. Powlson.

The fourth year, w. wheat.

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

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

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

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

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

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

**Basal applications:**

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

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

**Basal applications:**

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

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

**Cultivations, etc.:-**

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

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

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

GRAIN TONNES/HECTARE

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

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

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

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

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

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	37	0.362	5.0
GRAIN MEAN DM%	80.6		
PLOT AREA HARVESTED	0.00621		



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

GRAIN TONNES/HECTARE

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

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

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

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

**STRAW**

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

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.657	15.8
GRAIN MEAN DM%	83.4		
PLOT AREA HARVESTED	0.00884		



88/R/CS/311

### EFFECTS OF SHALLOW STRAW INCORPORATION

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

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

The fourth year, w. wheat.

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

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

**Whole plot dimensions:** 9.0 x 57.0.

**Treatments:** Combinations of:-

Whole plots

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

BURNT	Burnt and then disced on 21 Aug, 1987
BALED	Baled and removed on 20 Aug
CHOPPED	Chopped on 21 Aug

2. **CULTTIME** Time of cultivation, to 10 cm depth:

EARLY	Cultivated by rotary grubber on 1 Sept, 1987
LATER	Cultivated by rotary grubber on 16 Sept

Sub plots

3. **AUT N** Autumn N as 'Nitram' applied just before cultivation:

0	None
50	50 kg N on 29 Aug, 1987 (CULTTIME EARLY), 16 Sept (CULTTIME LATER)

4. **FUNGCIDE** Fungicides:

0	None
FULL	Full programme:- Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l on 21 Apr, 1988 Propiconazole at 0.125 kg in 260 l on 25 May Propiconazole at 0.125 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 260 l on 20 June

5. **INSCTCDE** Insecticides:

0	None
FON+PIR	Fonofos at 1.4 kg in 200 l on 21 Jan, 1988 and pirimicarb at 0.14 kg in 260 l on 20 June, 1988

88/R/CS/311

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

0 None  
METHCARB Methiocarb at 0.22 kg in autumn 1986

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

**Seed:** Mission, sown at 180 kg.

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

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

**GRAIN TONNES/HECTARE**

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

CULTTIME	EARLY	LATER	Mean
<b>STRAW</b>			
BURNT	7.03	7.15	7.09
BALED	6.42	6.55	6.49
CHOPPED	5.79	6.44	6.12
Mean	6.41	6.71	6.56
<b>AUT N</b>	0	50	Mean
<b>STRAW</b>			
BURNT	7.11	7.07	7.09
BALED	6.31	6.66	6.49
CHOPPED	5.88	6.36	6.12
Mean	6.43	6.69	6.56
<b>AUT N</b>	0	50	Mean
<b>CULTTIME</b>			
EARLY	6.26	6.57	6.41
LATER	6.61	6.82	6.71
Mean	6.43	6.69	6.56
<b>MOLLCIDE</b>	0	METHCARB	Mean
<b>STRAW</b>			
BURNT	7.12	7.06	7.09
BALED	6.58	6.39	6.49
CHOPPED	5.97	6.26	6.12
Mean	6.56	6.57	6.56

88/R/CS/311

GRAIN TONNES/HECTARE

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

<b>MOLLCIDE</b>	0	METHCARB	Mean
<b>CULTTIME</b>			
EARLY	6.34	6.49	6.41
LATER	6.77	6.65	6.71
Mean	6.56	6.57	6.56
<b>MOLLCIDE</b>	0	METHCARB	Mean
<b>AUT N</b>			
0	6.46	6.41	6.43
50	6.65	6.74	6.69
Mean	6.56	6.57	6.56
<b>FUNGCIDE</b>	0	FULL	Mean
<b>STRAW</b>			
BURNT	6.32	7.86	7.09
BALED	5.94	7.04	6.49
CHOPPED	5.46	6.77	6.12
Mean	5.91	7.22	6.56
<b>FUNGCIDE</b>	0	FULL	Mean
<b>CULTTIME</b>			
EARLY	5.72	7.11	6.41
LATER	6.10	7.33	6.71
Mean	5.91	7.22	6.56
<b>FUNGCIDE</b>	0	FULL	Mean
<b>AUT N</b>			
0	5.77	7.10	6.43
50	6.05	7.34	6.69
Mean	5.91	7.22	6.56
<b>FUNGCIDE</b>	0	FULL	Mean
<b>MOLLCIDE</b>			
0	5.84	7.28	6.56
METHCARB	5.98	7.16	6.57
Mean	5.91	7.22	6.56
<b>INSCTCDE</b>	0	FON+PIR	Mean
<b>STRAW</b>			
BURNT	6.84	7.34	7.09
BALED	6.30	6.67	6.49
CHOPPED	5.84	6.40	6.12
Mean	6.32	6.80	6.56

88/R/CS/311

GRAIN TONNES/HECTARE

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

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

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

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

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

88/R/CS/311

GRAIN TONNES/HECTARE

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

AUT N	FUNGCIDE	INSCTCDE	MOLLCIDE
0.110	0.110	0.110	0.110
STRAW*	CULTTIME*	STRAW*	CULTTIME*
AUT N	AUT N	FUNGCIDE	FUNGCIDE
0.191	0.156	0.191	0.156
AUT N	STRAW*	CULTTIME*	AUT N
FUNGCIDE	INSCTCDE	INSCTCDE	INSCTCDE
0.156	0.191	0.156	0.156
FUNGCIDE	STRAW*	CULTTIME*	AUT N
INSCTCDE	MOLLCIDE	MOLLCIDE	MOLLCIDE
0.156	0.191	0.156	0.156
FUNGCIDE	INSCTCDE		
MOLLCIDE	MOLLCIDE		
0.156	0.156		

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

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

Stratum	d.f.	s.e.	cv%
WP.SP	20	0.383	5.8

GRAIN MEAN DM% 78.7

SUB PLOT AREA HARVESTED 0.00276



88/R/CS/312

### STRAW DECOMPOSITION

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

**Sponsor:** S.H.T. Harper.

The fourth year, w. wheat.

For previous years see 85-87/R/CS/312.

**Design:** 4 randomised blocks of 4 plots.

**Whole plot area:** 4.5 x 12.0.

**Treatments:** All combinations of treatments applied to chopped straw in the field, cumulative to applications in the previous years:

1. **TREATMNT[1]** Treatment one:  

NONE	None
BASID 1	Basidiomycete 1, cumulative to this treatment in 1987 and to whey at 15 kg in 1985 and 1986
  
2. **TREATMNT[2]** Treatment two:  

NONE	None
BASID 2	Basidiomycete 2, cumulative to this treatment in 1987 and to a fungal accelerator in 1985 and 1986

- NOTES:**
- (1) Basidiomycetes 1 and 2 were naturally occurring fungi found in soil at Rothamsted and Woburn respectively.
  - (2) The basidiomycete fungus was colonised on wheat seed and this was spread on the surface at 1 seed per square cm on 18 Sept, 1987.
  - (3) Straw was chopped by a trailed straw chopper and incorporated to a depth of about 10 cm by a rotary grubber.

**Basal applications:** Manures: 'Nitram' at 120 kg followed by 580 kg. Weedkillers: Glyphosate at 0.27 kg in 200 l followed by 1.1 kg in 200 l. Tri-allate at 2.2 kg. Isoproturon at 2.1 kg in 200 l. Fluroxypyr at 0.20 kg in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l. Propiconazole at 0.12 kg in 260 l. Carbendazim at 0.25 kg and maneb at 1.6 kg with propiconazole at 0.12 kg in 260 l. Insecticides: Fonofos at 1.4 kg in 200 l. Pirimicarb at 0.14 kg in 260 l. Molluscicide: Methiocarb at 0.22 kg.

**Seed:** Mission, sown at 180 kg.

88/R/CS/312

**Cultivations, etc.:-** Straw chopped: 21 Aug, 1987. Cultivated with rotary grubber: 16 Sept. First glyphosate applied: 30 Sept. Methiocarb applied, spring-tine cultivated, seed sown: 26 Oct. Triallate applied: 9 Dec. Fonofos applied: 21 Jan, 1988. First N applied: 24 Feb. Isoproturon applied: 17 Mar. Prochloraz and carbendazim applied: 21 Apr. Second N applied: 22 Apr. Fluroxypyr applied: 6 May. Propiconazole applied: 25 May. Propiconazole with carbendazim and maneb applied, pirimicarb applied separately: 20 June. Second glyphosate applied: 9 Aug. Combine harvested: 25 Aug.

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

**GRAIN TONNES/HECTARE**

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

TREATMNT [2]	NONE	BASID 2	Mean
TREATMNT [1]			
NONE	7.83	7.95	7.89
BASID 1	7.45	7.68	7.57
Mean	7.64	7.81	7.73

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

TREATMNT [1]	TREATMNT [2]	TREATMNT [1]	TREATMNT [2]
0.264	0.264	0.374	

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.529	6.8
GRAIN MEAN DM%	78.7		
PLOT AREA HARVESTED	0.00276		

88/R/CS/323

### CEREAL SEQUENCES AND TAKE-ALL

**Object:** To study the effects on take-all (*Gaeumannomyces graminis*) and yield of including triticale in cereal sequences - West Barnfield II.

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

The first year, w. barley, w. oats, w. triticale, w. wheat, s. barley.

**Design:** 3 randomised blocks of 26 plots.

**Whole plot dimensions:** 3.0 x 10.0.

**Treatments:**

CROPS	Crops:
W BARLEY	W. barley (6 plots per block)
W OATS	W. oats (3 plots per block)
W TRITIC	W. triticale (7 plots per block)
W WHEAT	W. wheat (9 plots per block)
S BARLEY	S. barley (1 plot per block)

**Standard applications:** Manures: (0:18:36) at 280 kg. 'Nitram' at 90 kg to all w. cereals followed by 490 kg (w. wheat), 430 kg (w. barley), 350 kg (w. oats and w. triticale). 'Nitram' at 350 kg to s. barley. Weedkillers: Methabenzthiazuron at 2.4 kg in 200 l (not to s. barley). Fluroxypyr at 0.20 kg in 200 l (not to s. barley). Fluroxypyr at 0.15 kg applied with the prochloraz and carbendazim in 200 l. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg in 200 l.

**SEED:** Winter barley: Magie, sown at 150 kg.  
Winter oats: Peniarth, sown at 190 kg.  
Winter triticale: Cumulus, sown at 180 kg.  
Winter wheat: Mercia, sown at 180 kg.  
Spring barley: Klaxon, sown at 160 kg.

**Cultivations, etc.:-**

All crops: PK applied: 24 Sept, 1987. Ploughed: 25 Sept. Rotary harrowed: 30 Sept. Fluroxypyr with prochloraz and carbendazim applied: 6 May, 1988. Propiconazole applied: 25 May.  
All winter crops: Rotary harrowed, seed sown: 1 Oct, 1987.  
Methabenzthiazuron applied: 3 Oct. First N applied: 1 Mar, 1988.  
Fluroxypyr alone applied: 17 Mar. Second N applied: 15 Apr.  
Combine harvested: 4 Aug (w. barley), 23 Aug (w. wheat), 26 Aug (w. oats and triticale).  
S. barley: N applied, rotary harrowed, seed sown: 7 Mar, 1988.  
Combine harvested: 16 Aug.  
Previous crops: W. beans 1986, s. oilseed rape, 1987.

**NOTES:** (1) Plant samples were taken at the end of June to assess take-all.  
(2) Because of a harvesting error the yield of one plot of S BARLEY was lost. An estimated value was used in the analysis.

88/R/CS/323

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

GRAIN TONNES/HECTARE

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

CROPS	
W BARLEY	9.24
W OATS	5.77
W TRITIC	9.92
W WHEAT	9.61
S BARLEY	6.01
Mean	8.11

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

W OATS	0.184			
W TRITIC	0.145	0.180		
W WHEAT	0.137	0.173	0.131	
S BARLEY	0.281	0.300	0.278	0.274
	W BARLEY	W OATS	W TRITIC	W WHEAT

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

BLOCK.WP                      70                      0.451                      5.0

GRAIN MEAN DM%    81.9

PLOT AREA HARVESTED    0.00275



88/R/CS/324

### COMPARISON OF COMBINABLE CROPS

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

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

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

For previous year see 87/R/CS/324.

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

**Whole plot dimensions:** 2.5 x 8.0.

**Treatments:** All combinations of:-

Whole plots

1. PREVCROP	Crops in 1987:
W OATS	W. oats
W RAPE	W. oilseed rape
W PEAS	W. peas, <i>Pisum sativum</i>
W WHEAT	W. wheat
S BEANS	S. field beans, <i>Vicia faba</i>
S LUPINS	S. lupins, <i>Lupinus albus</i>
S PEAS	S. peas, <i>Pisum sativum</i>
SNFLOWER	Sunflower
FALLOW B	Fallow (after w. field beans that failed)
FALLOW	Fallow

Sub plots

2. SPRING N	Nitrogen fertilizer applied on 14 Apr, 1988:
0	None
N	Applied, amount depending on quantity in crop and soil in spring

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

After PREVCROP	W PEAS	190
	W RAPE, S PEAS	200
	FALLOW B	210
	S BEANS	220
	W WHEAT, FALLOW	240
	W OATS	250

(2) W. wheat after PREVCROP S LUPINS and SNFLOWER failed and was resown to s. wheat given 125 kg N to SPRING N N.

88/R/CS/324

**Standard applications:**

After all treatments except after lupins and sunflowers (w. wheat only): Weedkillers: Paraquat at 0.60 kg ion in 220 l. Terbutryne at 2.8 kg in 220 l. Mecoprop at 1.8 kg (after s. beans only) in 220 l. Mecoprop at 3.0 kg with isoproturon at 2.1 kg and (after oats only) diclofop-methyl at 1.1 kg in 220 l. Cyanazine at 0.46 kg, clopyralid at 0.078 kg with mecoprop at 1.8 kg in 220 l. Flamprop-M-isopropyl at 0.70 kg (after oats only) in 220 l. Fungicides: Prochloraz at 0.27 kg and carbendazim at 0.10 kg applied with the cyanazine, clopyralid and mecoprop. Propiconazole at 0.12 kg applied with the flamprop-M-isopropyl (after oats only). Fenpropimorph at 0.75 kg and chlorothalonil at 1.0 kg in 220 l. Carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l. Pirimicarb at 0.14 kg applied with the fenpropimorph and chlorothalonil.

After s. lupins and sunflowers (s. wheat only): Weedkillers: Terbutryne at 2.8 kg in 220 l (after sunflowers only). Mecoprop at 3.0 kg with isoproturon at 2.1 kg in 220 l. Bentazone at 0.80 kg, dichlorprop at 1.1 kg and MCPA at 0.64 kg in 220 l. Fungicides: Fenpropimorph at 0.75 kg and chlorothalonil at 1.0 kg in 220 l. Carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l to sunflowers only. Pirimicarb at 1.4 kg applied with the fenpropimorph and chlorothalonil.

**Seed:** W. wheat: Mercia, sown at 200 kg.  
S. wheat: Alexandria, sown at 180 kg.

**Cultivations, etc.:-**

After w. oats, w. rape, w. peas, w. wheat, s. beans, s. peas and fallow (w. wheat only): Paraquat applied, rotary harrowed twice, w. wheat sown: 24 Sept, 1987. Terbutryne applied: 25 Sept. Mecoprop applied (after beans only): 15 Dec. Deltamethrin applied: 21 Jan, 1988. Mecoprop, isoproturon and (after oats only) diclofop-methyl applied: 30 Mar. Cyanazine, clopyralid, mecoprop, prochloraz and carbendazim applied: 28 Apr. Flamprop-M-isopropyl and propiconazole applied (after oats only): 5 May. Fenpropimorph, chlorothalonil and pirimicarb applied: 25 May. Carbendazim and maneb applied: 20 June. Combine harvested: 25 Aug.

After s. lupins and sunflowers (s. wheat only): Rotary harrowed, w. wheat sown: 29 Oct, 1987 (after sunflowers only). Terbutryne applied: 30 Oct (after sunflowers only). Spring-tine cultivated: 18 Nov (after lupins only). Rotary harrowed, w. wheat sown: 30 Nov (after lupins only). Deltamethrin applied: 21 Jan, 1988 (after sunflowers only). Mecoprop and isoproturon applied: 30 Apr. Rotary harrowed, resown with s. wheat: 8 Apr. Bentazone, dichlorprop and MCPA applied: 20 May. Fenpropimorph, chlorothalonil and pirimicarb applied: 25 May. Carbendazim and maneb applied: 20 June. Combine harvested: 12 Sept.

88/R/CS/324

GRAIN TONNES/HECTARE

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

SPRING N	0	N	Mean
PREVCROP			
W OATS	1.06	8.00	4.53
W RAPE	3.07	9.51	6.29
W PEAS	3.21	9.32	6.26
W WHEAT	1.10	7.59	4.34
S BEANS	3.69	9.52	6.60
S LUPINS	3.06	4.53	3.80
S PEAS	3.58	9.01	6.29
SNFLOWER	1.09	5.00	3.04
FALLOW B	3.74	9.20	6.47
FALLOW	3.03	9.12	6.07
Mean	2.66	8.08	5.37

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

	PREVCROP	SPRING N	PREVCROP SPRING N
	0.313	0.104	0.390
Except when comparing means with the same level(s) of PREVCROP			0.328

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	18	0.384	7.1
BLOCK.WP.SP	20	0.401	7.5

GRAIN MEAN DM% 79.6

SUB PLOT AREA HARVESTED 0.00058



88/R/CS/326 and 88/W/CS/326

AMOUNTS OF STRAW

**Object:** To study the effects of a range of amounts of straw incorporated into the soil on w.wheat - Rothamsted (R) Great Knott III, Woburn (W) Far Field I.

**Sponsors:** D.G. Christian, J.F. Jenkyn, E.T.G. Bacon, R.D. Prew.

The second year, w. wheat.

For previous year see 87/R&W/CS/326.

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

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

**Treatments:**

**STRAW** Amounts of straw incorporated into seedbed (t ha 85% DM), cumulative to dressings in 1987:

		R	W
NONE	None	-	-
NORMAL	Normal	6.8	4.6
2 NORMAL	Twice normal	13.6	9.2
4 NORMAL	Four times normal	27.2	18.4

**NOTES:** (1) Straw was chopped by trailed straw chopper and spread on 21 Aug, 1987 (R), 21 Sept (W). Straw treatments were applied on 21 Aug (R), 10 Sept (W).

(2) At Rothamsted straw was incorporated by 'I.E.R. Mixaplough' on 4 Sept. At Woburn it was heavy-tine cultivated in to 10 cm twice on 3 Oct, power harrowed with crumbler attached on 29 Oct.

**Basal applications:**

Great Knott III (R): Manures: 'Nitram' at 116 kg followed by 580 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Tri-allate at 2.2 kg. Isoproturon at 2.1 kg in 200 l. Fluroxypyr at 0.20 kg in 200 l applied with the prochloraz and carbendazim. Fungicides: Prochloraz at 0.40 kg and carbendazim at 0.15 kg. Propiconazole at 0.12 kg and tridemorph at 0.25 kg in 200 l. Carbendazim at 0.25 kg, maneb at 1.6 kg with propiconazole at 0.12 kg in 200 l.

Far Field I (W): Manures: 'Nitram' at 116 kg followed by 580 kg. Weedkillers: Glyphosate at 1.1 kg in 200 l, followed by 0.27 kg in 200 l, followed by 1.1 kg in 200 l. Isoproturon at 2.1 kg with bromoxynil at 0.20 kg, ioxynil at 0.20 kg and mecoprop at 1.6 kg in 220 l. Fungicides: Propiconazole at 0.12 kg with tridemorph at 0.25 kg in 220 l.

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

88/R/CS/326 and 88/W/CS/326

**Cultivations, etc.:-**

Great Knott III (R): Paraquat applied: 29 Sept, 1987. Spring-tine cultivated: 23 Oct. Seed sown, harrowed: 24 Oct. Tri-allate applied: 8 Dec. N applied: 24 Feb, 1988 and 22 Apr. Isoproturon applied: 17 Mar. Fluroxypyr, prochloraz and carbendazim applied: 6 May. Propiconazole and tridemorph applied: 3 June. Carbendazim, maneb and propiconazole applied: 23 June. Combine harvested: 25 Aug.

Far Field I (W): Glyphosate applied: 25 Sept, 1987. Heavy spring-tine cultivated twice to 10 cm: 3 Oct. Glyphosate applied: 22 Oct. Power harrowed with crumbler attached: 29 Oct. Spring-tine cultivated: 7 Dec. Spike harrowed with crumbler attached, seed sown: 9 Dec. N applied: 8 Mar, 1988 and 3 May. Isoproturon, bromoxynil, ioxynil and mecoprop applied: 26 Apr. Fungicides applied: 22 June. Glyphosate applied: 16 Aug. Combine harvested: 25 Aug.

- NOTES:** (1) Establishment counts and dry weights were determined (R only). Shoot numbers and dry weight at growth stage 30, dry weights and fertile ear numbers after anthesis and harvest index were measured at both sites.  
 (2) Foliar diseases and foot and root rots were assessed in summer.

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

**GRAIN TONNES/HECTARE**

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

<b>STRAW</b>	
NONE	6.76
NORMAL	6.89
2 NORMAL	6.95
4 NORMAL	6.93
Mean	6.88

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

<b>STRAW</b>
0.182

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	9	0.257	3.7
GRAIN MEAN DM%	79.8		
PLOT AREA HARVESTED	0.00310		



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

GRAIN TONNES/HECTARE

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

STRAW	
NONE	5.58
NORMAL	5.27
2 NORMAL	5.15
4 NORMAL	5.39
Mean	5.34

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

STRAW
0.342

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	6	0.419	7.8
GRAIN MEAN DM%	83.3		
PLOT AREA HARVESTED	0.00442		

88/R/CS/327

### CONTROL OF STEM NEMATODE

**Object:** To study the effects of rates of carbofuran and row spacings on the incidence of stem nematode (*Ditylenchus dipsaci*) and yield of four varieties of lucerne - Long Hoos IV 3.

**Sponsor:** A.G. Whitehead.

The first year, lucerne.

**Design:** 2 randomised blocks of 20 plots.

**Whole plot dimensions:** 1.22 x 8.84.

**Treatments:** All combinations of:-

1. **VARIETY**                      Varieties:  
  
    EUROPE  
    EUVA  
    VELA  
    VERTUS
2. **CARBRATE**                    Rates of carbofuran (kg):  
  
    0.0  
    1.5
3. **ROWSPACE**                   Spacings between rows (cm):  
  
    15                              15 (6 inches)  
    30                              30 (12 inches)

plus four extra treatments:

- CA3 R015**                      Varieties given 3 kg carbofuran, on 15 cm row spacing:  
  
    EUROPE  
    EUVA  
    VELA  
    VERTUS

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

**Basal applications:** Manures: Chalk at 2.9 t. Muriate of potash at 520 kg.  
Weedkillers: Paraquat at 0.60 kg ion in 220 l. 2,4-DB at 2.1 kg in 220 l. Carbetamide at 2.1 kg in 220 l.

**Seed:** Varieties, inoculated with Rhizobium, sown at 11 kg on 30 cm rows, 22 kg on 15 cm rows.

**Cultivations, etc.:-** K applied: 29 Sept, 1987. Chalk applied: 2 Oct.  
Paraquat applied: 31 Mar, 1988. Inoculum applied as infected lucerne, spring-tine cultivated: 6 Apr. Rotary harrowed, seed sown: 7 Apr. Rolled: 8 Apr. 2, 4-DB applied: 15 June. Cut: 1 Aug and 1 Nov. Carbetamide applied: 19 Oct.

88/R/CS/327

NOTE: Plant samples were taken before the first cut to assess stem nematode damage.

1ST CUT (1/8/88) DRY MATTER TONNES/HECTARE

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

<b>CARBRATE</b>	0.0	1.5	Mean		
<b>VARIETY</b>					
EUROPE	3.59	3.87	3.73		
EUVA	3.45	4.27	3.86		
VELA	3.24	3.72	3.48		
VERTUS	2.85	3.46	3.16		
Mean	3.28	3.83	3.56		
<b>ROWSPACE</b>	15	30	Mean		
<b>VARIETY</b>					
EUROPE	4.34	3.11	3.73		
EUVA	4.25	3.46	3.86		
VELA	3.84	3.13	3.48		
VERTUS	3.81	2.51	3.16		
Mean	4.06	3.05	3.56		
<b>ROWSPACE</b>	15	30	Mean		
<b>CARBRATE</b>					
0.0	3.66	2.91	3.28		
1.5	4.47	3.19	3.83		
Mean	4.06	3.05	3.56		
<b>VARIETY</b>	<b>ROWSPACE</b>	15	30		
EUROPE	<b>CARBRATE</b>				
	0.0	4.03	3.15		
	1.5	4.66	3.07		
EUVA	0.0	3.88	3.01		
	1.5	4.62	3.91		
VELA	0.0	3.35	3.14		
	1.5	4.34	3.11		
VERTUS	0.0	3.36	2.35		
	1.5	4.26	2.67		
<b>CA3 RO15</b>	EUROPE	EUVA	VELA	VERTUS	Mean
	3.82	4.34	4.63	3.01	3.95
<b>GRAND MEAN</b>	3.64				

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

<b>CA3 RO15</b>	<b>VARIETY</b>	<b>CARBRATE</b>	<b>ROWSPACE</b>
0.566	0.283	0.200	0.200
<b>VARIETY</b>	<b>VARIETY</b>	<b>CARBRATE</b>	<b>VARIETY</b>
<b>CARBRATE</b>	<b>ROWSPACE</b>	<b>ROWSPACE</b>	<b>CARBRATE</b>
			<b>ROWSPACE</b>
0.400	0.400	0.283	0.566

88/R/CS/327

1ST CUT (1/8/88) DRY MATTER TONNES/HECTARE

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.566	15.6
IST CUT MEAN DM%	16.7		

2ND CUT (1/11/88) DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
<b>VARIETY</b>			
EUROPE	2.07	2.19	2.13
EUVA	1.84	2.13	1.98
VELA	1.72	2.22	1.97
VERTUS	1.97	2.08	2.02
Mean	1.90	2.15	2.03

ROWSPACE	15	30	Mean
<b>VARIETY</b>			
EUROPE	2.12	2.14	2.13
EUVA	2.04	1.92	1.98
VELA	1.93	2.02	1.97
VERTUS	2.13	1.91	2.02
Mean	2.06	2.00	2.03

ROWSPACE	15	30	Mean
<b>CARBRATE</b>			
0.0	1.97	1.83	1.90
1.5	2.14	2.17	2.15
Mean	2.06	2.00	2.03

VARIETY	ROWSPACE		Mean
	0.0	1.5	
EUROPE	2.17	1.97	
	2.08	2.30	
EUVA	1.87	1.81	
	2.22	2.03	
VELA	1.72	1.72	
	2.14	2.31	
VERTUS	2.12	1.81	
	2.13	2.02	

CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	2.32	2.03	2.18	2.19	2.18

GRAND MEAN 2.06

88/R/CS/327

2ND CUT (1/11/88) DRY MATTER TONNES/HECTARE

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

CA3 RO15	VARIETY	CARBRATE	ROWSPACE
0.222	0.111	0.078	0.078
VARIETY	VARIETY	CARBRATE	VARIETY
CARBRATE	ROWSPACE	ROWSPACE	CARBRATE
			ROWSPACE
0.157	0.157	0.111	0.222

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.222	10.8
2ND CUT MEAN DM%	26.0		

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

CARBRATE	0.0	1.5	Mean
VARIETY			
EUROPE	5.66	6.05	5.86
EUVA	5.29	6.39	5.84
VELA	4.97	5.95	5.46
VERTUS	4.82	5.54	5.18
Mean	5.18	5.98	5.58
ROWSPACE	15	30	Mean
VARIETY			
EUROPE	6.47	5.25	5.86
EUVA	6.30	5.39	5.84
VELA	5.77	5.14	5.46
VERTUS	5.94	4.42	5.18
Mean	6.12	5.05	5.58
ROWSPACE	15	30	Mean
CARBRATE			
0.0	5.63	4.74	5.18
1.5	6.61	5.36	5.98
Mean	6.12	5.05	5.58



88/R/CS/327

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

VARIETY	ROSPACE	15	30		
	CARBRATE				
EUROPE	0.0	6.20	5.12		
	1.5	6.74	5.37		
EUVA	0.0	5.75	4.82		
	1.5	6.84	5.95		
VELA	0.0	5.07	4.87		
	1.5	6.47	5.42		
VERTUS	0.0	5.49	4.16		
	1.5	6.39	4.69		
CA3 RO15	EUROPE	EUVA	VELA	VERTUS	Mean
	6.15	6.36	6.82	5.20	6.13
GRAND MEAN	5.69				

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

CA3 RO15	VARIETY	CARBRATE	ROSPACE
0.638	0.319	0.225	0.225
VARIETY	VARIETY	CARBRATE	VARIETY
CARBRATE	ROSPACE	ROSPACE	CARBRATE
			ROSPACE
0.451	0.451	0.319	0.638

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	19	0.638	11.2

TOTAL OF 2 CUTS MEAN DM% 21.3

PLOT AREA HARVESTED 0.00045

88/W/CS/328

DEEP-WORKED SOIL AND PCN

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

**Sponsor:** A.G. Whitehead.

The second year, potatoes.

For previous year see 87/W/CS/328.

**Design:** 3 randomised blocks of 8 plots.

**Whole plot dimensions:** 3.0 x 8.0.

**Treatments:** All combinations of:-

1. **SOIL TRT**            Soil treatment:  
  
    NONE                None  
    SUBSOIL            Subsoiled, with 25 cm wide wings on tines 38 cm deep and 66 cm apart, applied twice with tines on the second pass between those of the first pass, on 14 Apr, 1988
  
2. **NEMACIDE**        Nematicides:  
  
    NONE                None  
    OXAMYL            Oxamyl at 5.6 kg worked into seedbed on 14 Apr
  
3. **VARIETY**           Varieties:  
  
    CARA                Cara  
    DESIREE            Desiree

**Basal applications:** Manures: (10:10:15+4.5 Mg) at 2400 kg. Weedkiller: Metribuzin at 0.70 kg in 220 l. Fungicides: Mancozeb at 1.4 kg on five occasions in 220 l, applied with the pirimicarb on the first, second and fifth occasions. Fentin hydroxide at 0.28 kg in 220 l. Insecticide: Pirimicarb at 0.14 kg. Desiccant: Diquat at 0.80 kg ion in 400 l.

**Cultivations, etc.:-** Ploughed: 22 Feb, 1988. Heavy spring-tine cultivated: 5 Apr. NPK Mg applied: 7 Apr. Rotary cultivated, potatoes planted: 14 Apr. Rotary ridged, weedkiller applied: 13 May. Mancozeb applied: 15 July, 1 Aug. Mancozeb with pirimicarb applied: 14 June, 5 July, 15 Aug. Fentin hydroxide applied: 30 Aug. Desiccant applied: 6 Sept. Haulm mechanically destroyed: 16 Sept. Potatoes lifted: 12 Oct.

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

88/W/CS/328

TOTAL TUBERS TONNES/HECTARE

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

<b>NEMACIDE</b>	NONE	OXAMYL	Mean	
<b>SOIL TRT</b>				
NONE	24.8	36.3	30.6	
SUBSOIL	21.0	39.6	30.3	
Mean	22.9	38.0	30.4	
<b>VARIETY</b>	CARA	DESIREE	Mean	
<b>SOIL TRT</b>				
NONE	37.6	23.6	30.6	
SUBSOIL	36.2	24.3	30.3	
Mean	36.9	23.9	30.4	
<b>VARIETY</b>	CARA	DESIREE	Mean	
<b>NEMACIDE</b>				
NONE	30.4	15.4	22.9	
OXAMYL	43.4	32.5	38.0	
Mean	36.9	23.9	30.4	
<b>SOIL TRT</b>	<b>NEMACIDE</b>	<b>NONE</b>	<b>OXAMYL</b>	
	<b>VARIETY</b>	<b>CARA</b>	<b>DESIREE</b>	<b>CARA</b> <b>DESIREE</b>
NONE		35.1	14.5	40.1 32.6
SUBSOIL		25.7	16.3	46.8 32.3

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

<b>SOIL TRT</b>	<b>NEMACIDE</b>	<b>VARIETY</b>	<b>SOIL TRT</b>
			<b>NEMACIDE</b>
1.49	1.49	1.49	2.11
<b>SOIL TRT</b>	<b>NEMACIDE</b>	<b>SOIL TRT</b>	
<b>VARIETY</b>	<b>VARIETY</b>	<b>NEMACIDE</b>	<b>VARIETY</b>
2.11	2.11	2.98	

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	14	3.65	12.0

88/W/CS/328

PERCENTAGE WARE 4CM (1.57 INCH) RIDDLE

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

<b>NEMACIDE</b>	NONE	OXAMYL	Mean
<b>SOIL TRT</b>			
NONE	87.1	91.4	89.3
SUBSOIL	85.8	93.3	89.6
Mean	86.5	92.4	89.4

<b>VARIETY</b>	CARA	DESIREE	Mean
<b>SOIL TRT</b>			
NONE	94.2	84.3	89.3
SUBSOIL	94.2	84.9	89.6
Mean	94.2	84.6	89.4

<b>VARIETY</b>	CARA	DESIREE	Mean
<b>NEMACIDE</b>			
NONE	94.7	78.2	86.5
OXAMYL	93.7	91.1	92.4
Mean	94.2	84.6	89.4

	<b>NEMACIDE</b>	NONE		OXAMYL	
<b>SOIL TRT</b>	<b>VARIETY</b>	CARA	DESIREE	CARA	DESIREE
NONE		95.8	78.5	92.7	90.2
SUBSOIL		93.7	77.9	94.7	92.0

PLOT AREA HARVESTED 0.00120



88/R/CS/333

### COMPARISON OF COMBINABLE CROPS

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

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

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

**Design:** 3 randomised blocks of 12 plots.

**Whole plot dimensions:** 2.5 x 8.0.

**Treatments:**

CROP	Crops:
W BEANS	W. beans
W OATS	W. oats
W PEAS	W. peas
W RAPE	W. rape
W WHEAT	W. wheat
S BEANS	S. beans
S LUPINS	S. lupins, <i>Lupinus albus</i>
S PEAS	S. peas
SNFLOWER	Sunflowers

**NOTE:** There were three additional treatments from which yields were not taken. A cultivated fallow, an uncultivated fallow with paraquat and grass, cut with produce returned.

**Standard applications:**

- W. beans and w. peas: Weedkillers: Trietazine at 1.2 kg and simazine at 0.17 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the deltamethrin in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg in 220 l, applied on a second occasion, with the pirimicarb, to w. peas only. Insecticides: Deltamethrin at 0.075 kg. Pirimicarb at 0.14 kg.
- W. rape: Manure: N at 200 kg as 'Nitro-Chalk'. Weedkillers: Tebutam at 3.6 kg in 220 l. Clopyralid at 0.07 kg and propyzamide at 0.70 kg in 220 l. Fungicide: Iprodione at 0.50 kg applied with the insecticide in 220 l. Insecticide: Deltamethrin at 0.075 kg.
- W. wheat and w. oats: Manure: N at 230 kg (w. wheat) and 120 kg (w. oats) as 'Nitro-Chalk'. Weedkillers: Terbutryne at 2.8 kg in 220 l to w. wheat only. Cyanazine at 0.46 kg, clopyralid at 0.08 kg with mecoprop at 1.8 kg applied with the prochloraz and carbendazim in 220 l. Fungicides: Prochloraz at 0.27 kg, carbendazim at 0.10 kg. Fenpropimorph at 0.75 kg with chlorothalonil at 1.0 kg applied with the pirimicarb in 220 l. Carbendazim at 0.25 kg and maneb at 1.6 kg in 220 l. Insecticides: Deltamethrin at 0.062 kg in 220 l. Pirimicarb at 0.14 kg.



88/R/CS/333

**Standard applications:**

- S. beans: Weedkillers: Trietazine at 1.2 kg, simazine at 0.17 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the insecticide in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg in 220 l. Insecticide: Deltamethrin at 0.075 kg.
- S. lupins: Weedkillers: Terbutryne at 0.98 kg, terbuthylazine at 0.42 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the deltamethrin in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg applied with the pirimicarb in 220 l. Insecticides: Deltamethrin at 0.075 kg. Pirimicarb at 0.14 kg.
- S. peas: Weedkillers: Terbutryne at 0.98 kg, terbuthylazine at 0.42 kg in 220 l. Fungicides: Benomyl at 0.50 kg applied with the deltamethrin in 220 l. Chlorothalonil at 1.0 kg with benomyl at 0.50 kg in 220 l on five occasions, applied with the pirimicarb on the second. Insecticides: Deltamethrin at 0.075 kg. Pirimicarb at 0.14 kg.
- Sunflowers: Weedkillers: Trifluralin at 1.1 kg in 220 l. Linuron at 0.50 kg.
- Cultivated fallow: None.
- Uncultivated fallow: Weedkiller: Paraquat on four occasions, at 1.0, 0.60, 0.40, 0.60 kg ion respectively in 220 l.

- Seed:**
- W. beans: Bourdon, sown at 220 kg.
  - W. oats: Peniarth, sown at 180 kg.
  - W. peas: Frijaune, sown at 220 kg.
  - w. rape: Ariana, sown at 8 kg.
  - W. wheat: Mercia, sown at 200 kg.
  - S. beans: Minden, sown at 240 kg.
  - S. lupins: Vladimir, sown at 210 kg.
  - S. peas: Progreta, sown at 230 kg.
  - Sunflowers: Asmer, sown at 120,000 seeds per hectare.
  - Grass (R): Manhattan PRG at 27 kg.

**Cultivations, etc.:-**

- W. beans and w. peas: Deep-tine cultivated, w. beans only: 6 Oct, 1987. Ploughed: 27 Oct. Rotary harrowed, seed sown: 29 Oct. Trietazine and simazine applied: 30 Oct. Benomyl and deltamethrin applied: 25 May, 1988. Chlorothalonil and benomyl applied: 30 June, repeated, with pirimicarb, to w. peas only: 18 July. Combine harvested, w. peas: 2 Aug, w. beans: 8 Sept.
- W. rape: Rotary harrowed twice, seed sown: 21 Sept, 1987. Tebutam applied: 25 Sept. Clopyralid and propyzamide applied: 27 Nov. N applied: 19 Feb, 1988. Fungicide and insecticide applied: 25 May. Combine harvested: 22 Aug.
- W. wheat and w. oats: Rotary harrowed twice, and seed sown, w. wheat only: 24 Sept, 1987. Terbutryne applied, w. wheat only: 25 Sept. Deep-tine cultivated, rotary harrowed, seed sown, w. oats only: 6 Oct. Deltamethrin applied: 21 Jan, 1988. N applied: 18 Apr. Cyanazine, clopyralid, mecoprop, prochloraz and carbendazim applied: 28 Apr. Fenpropimorph, chlorothalonil and pirimicarb applied: 25 May. Carbendazim and maneb applied: 20 June. Combine harvested, w. oats: 16 Aug, w. wheat: 2 Sept.
- S. beans: Ploughed: 27 Oct, 1987. Spring-tine cultivated, seed sown: 28 Mar, 1988. Weedkillers applied: 30 Mar. Benomyl and deltamethrin applied: 25 May. Chlorothalonil and benomyl applied: 30 June. Combine harvested: 8 Sept.

88/R/CS/333

**Cultivations, etc.:-**

S. lupins: Ploughed: 27 Oct, 1987. Spring-tine cultivated, seed sown: 28 Mar, 1988. Weedkillers applied: 30 Mar. Benomyl and deltamethrin applied: 25 May. Chlorothalonil, benomyl and pirimicarb applied: 15 July. Hand harvested: 4 Oct.

S. peas: Ploughed: 27 Oct, 1987. Spring-tine cultivated, seed sown: 29 Mar, 1988. Weedkillers applied: 30 Mar. Benomyl and deltamethrin applied: 25 May. Chlorothalonil and benomyl applied: 30 June, 2 Aug, 11 Aug, 23 Aug and with pirimicarb: 18 July. Combine harvested: 5 Sept.

Sunflowers: Ploughed: 27 Oct, 1987. Trifluralin applied, rotary harrowed, seed sown: 8 Apr, 1988. Linuron applied: 11 Apr. Combine harvested: 8 Sept.

Cultivated fallow: Ploughed: 27 Oct, 1987. Rotary cultivated: 26 May, 1988 and 4 Aug.

Uncultivated fallow: Paraquat applied: 15 Dec, 1987, 5 May, 1988, 15 June and 16 Aug.

Grass: Rotary harrowed: 17 Sept, 1987. Rotary harrowed, seed sown: 21 Sept. Topped: 23 May, 1988, 15 June and 4 Aug.

Previous crops: S. barley 1986 and 1987.

**GRAIN TONNES/HECTARE**

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

CROP	
W BEANS	5.92
W OATS	5.23
W PEAS	0.54
W RAPE	2.20
W WHEAT	8.12
S BEANS	4.56
S LUPINS	0.09
S PEAS	2.97
SNFLOWER	0.71
Mean	3.37

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

CROP
0.454

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	16	0.557	16.5
GRAIN MEAN DM%	73.6		
PLOT AREA HARVESTED	0.00125	W RAPE	
	0.00123	W WHEAT, W OATS	
	0.00115	OTHER CROPS	