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# Yields of the Field Experiments 1982

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## 82/W/CS/245 Minimum Cultivation and Deep Pk - W. Oilseed Rape, W. Wheat, W. Barley

### Rothamsted Research

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82/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.

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The third year, w. oilseed rape, w. wheat and w. barley.

For previous year see 80-81/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 WOS | Series I, w. oilseed rape in rotation with two cereals |
| SER2 WW5 | Series II, w. wheat, fifth cereal after a break crop   |
| SER3 WB5 | Series III, w. barley, fifth cereal after a break crop |

Column plots: All combinations (duplicated) of:

2. PK SUB      Extra PK and subsoil treatments (applied autumn 1979 only):

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

3. DRILL      Drills:

DIRECT	Direct drilled (duplicated)
CNVNTIAL	Mouldboard ploughed conventionally drilled

Row plots:

4. N PATH      Nitrogen fertilizer in spring, and pathogen control:

	Rape	w. wheat & barley	Rape	w. wheat & barley	
125 ENHD	75 ENHD	125 kg N	75 kg N	enhanced pathogen control	
200 ENHD	150 ENHD	200 kg N	150 kg N	enhanced pathogen control	
260 ENHD	225 ENHD	260 kg N	225 kg N	enhanced pathogen control	
200 STND	150 STND	200 kg N	150 kg N	standard pathogen control	

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

82/W/CS/245

EXTRA

TPK D PK applied to topsoil and mouldboard ploughed in 1979,  
direct drilled since  
TPK 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 was conventional seed dressings and  
methiocarb pellets at sowing. Enhanced pathogen control had in  
addition prochloraz at 0.4 l in 280 l on 3 Apr to all crops and,  
to w. wheat and w. barley only, propiconazole at 0.12 kg with  
maneb at 1.6 kg plus zineb at 0.18 kg in 280 l on 7 June.

Basal applications:

Series I, w. oilseed rape: Manures: (0:20:20) at 290 kg, N at 56 kg as  
'Nitro-Chalk' to the seedbed. Molluscicide: Methiocarb (as 'Draza'  
pellets at 5.6 kg). Weedkiller: TCA at 10 kg in 280 l. Fungicide:  
Iprodione at 0.98 kg in 280 l (applied as basal in error intended for  
ENHD only). Desiccant: Diquat at 0.42 kg ion in 280 l.

Series II and III, w. wheat and w. barley: Manures: (10:23:23) at  
300 kg, combine drilled. Weedkillers: Paraquat at 0.42 kg ion in  
280 l, chlortoluron at 5.6 l in 280 l. Growth regulators:  
Chlormequat at 1.4 kg in 280 l to series II, w. wheat, mepiquat  
chloride and ethephon (as 'Terpal' at 2.5 l) in 280 l to series III,  
w. barley.

Seed: W. oilseed rape: Jet Neuf, sown at 9.0 kg.  
W. wheat: Flanders with methiocarb pellets, sown at 200 kg.  
W. barley: Igri with methiocarb pellets, sown at 170 kg.

Cultivations, etc.:-

Series I, w. oilseed rape: Barley straw spread and burnt: 5 Aug, 1981.  
Spring-tine cultivated, DIRECT plots: 10 Aug. Ploughed, CNVTIAL  
plots. PK and N applied: 11 Aug. Spike rotary cultivated with  
crumbler attached, two strokes, CNVTIAL plots: 12 Aug. Methiocarb  
applied: 13 Aug. TCA applied: 14 Aug. Seed sown: 19 Aug. N  
treatments applied: 23 Feb, 1982. Iprodione applied: 9 June. Diquat  
applied: 14 July. Combine harvested: 22 July.

Series II, w. wheat: Wheat straw spread and burnt: 25 Aug, 1981.  
Shallow disc cultivated: 27 Aug, 1 Sept. Ploughed, CNVTIAL plots:  
7 Sept. Spike rotary cultivated, with crumbler attached, CNVTIAL  
plots: 8 Sept. Rotary cultivated, CNVTIAL plots: 9 Sept. Paraquat  
applied: 23 Sept. Seed sown: 24 Sept. Chlortoluron applied: 23 Oct.  
Chlormequat applied: 12 Apr, 1982. N treatments applied: 13 Apr.  
Combine harvested: 19 Aug.

82/W/CS/245

Series III, w. barley: Barley straw spread and burnt: 3 Aug, 1981.  
 Spring-tine cultivated: 10 Aug. Shallow disc cultivated: 27 Aug,  
 1 Sept. Ploughed, CNVNTIAL plots: 7 Sept. Spike rotary cultivated  
 with crumbler attached, CNVNTIAL plots: 8 Sept. Rotary cultivated,  
 CNVNTIAL plots: 9 Sept. Paraquat applied: 23 Sept. Seed sown:  
 25-28 Sept. Chlortoluron applied: 23 Oct. 'Terpal' applied: 12 Apr,  
 1982. N treatments applied: 13 Apr. Combine harvested: 27 July.

NOTE: Plant establishment counts were made. Observations on diseases were  
 made during the season.

OILSEED RAPE SERIES I

GRAIN TONNES/HECTARE

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

PK SUB	---	--S	PKS	MEAN
N PATH				
125 ENHD	3.63	3.57	3.53	3.57
200 ENHD	4.00	4.07	4.06	4.04
260 ENHD	4.23	4.11	4.20	4.18
200 STND	3.56	3.35	3.97	3.63
MEAN	3.85	3.77	3.94	3.86

DRILL	DIRECT	CNVNTIAL	MEAN
N PATH			
125 ENHD	3.49	3.73	3.57
200 ENHD	4.04	4.05	4.04
260 ENHD	4.20	4.13	4.18
200 STND	3.57	3.74	4.63
MEAN	3.83	3.91	3.86

DRILL	DIRECT	CNVNTIAL	MEAN
PK SUB			
---	3.89	3.79	3.85
--S	3.67	3.98	3.77
PKS	3.93	3.96	3.94
MEAN	3.83	3.91	3.86

N PATH	125 ENHD	200 ENHD	260 ENHD	200 STND	MEAN
EXTRA					
TPK D	3.68	4.54	4.72	4.68	4.40
TPK C	3.51	4.34	3.94	3.41	3.80
MEAN	3.60	4.44	4.33	4.05	4.10

82/W/CS/245

OILSEED RAPE SERIES I

GRAIN TONNES/HECTARE

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

PK SUB DRILL N PATH	---		--S		PKS	
	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL
125 ENHD	3.56	3.75	3.43	3.83	3.49	3.60
200 ENHD	3.97	4.06	4.01	4.19	4.14	3.90
260 ENHD	4.25	4.19	4.13	4.05	4.21	4.16
200 STND	3.76	3.15	3.09	3.87	3.87	4.19

GRAND MEAN 3.88

\*\*\*\*\* STANDARD ERRORS OF DIFFERENCES OF MEANS \*\*\*\*\*

TABLE	EXTRA	PK SUB	DRILL	N PATH* PK SUB
SED	0.472	0.193	0.167	0.235

  

TABLE	N PATH* DRILL	PK SUB DRILL	N PATH* EXTRA	N PATH* PK SUB DRILL	MIN REP	MAX-MIN	MAX REP
SED	0.235	0.334		0.406			
	0.203	0.289	0.574	0.352			
	0.166	0.236		0.287			

\* 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	DF	SE	CV%
WP1	12	0.334	8.6
WP1.WP2	36	0.267	6.9

GRAIN MEAN DM% 74.6

SUB PLOT AREA HARVESTED 0.00341

82/W/CS/245

WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB	---	--S	PKS	MEAN
N PATH				
75 ENHD	5.83	6.02	6.16	6.00
150 ENHD	7.17	7.04	7.11	7.11
225 ENHD	6.86	7.53	6.94	7.11
150 STND	6.74	6.93	6.96	6.88
MEAN	6.65	6.88	6.79	6.77

DRILL	DIRECT	CNVNTIAL	MEAN
N PATH			
75 ENHD	6.26	5.49	6.00
150 ENHD	7.50	6.31	7.11
225 ENHD	7.63	6.06	7.11
150 STND	7.26	6.12	6.88
MEAN	7.16	5.99	6.77

DRILL	DIRECT	CNVNTIAL	MEAN
PK SUB			
---	6.97	6.00	6.65
--S	7.21	6.22	6.88
PKS	7.31	5.75	6.79
MEAN	7.16	5.99	6.77

N PATH	75 ENHD	150 ENHD	225 ENHD	150 STND	MEAN
EXTRA					
TPK D	6.32	7.59	6.68	7.15	6.94
TPK C	5.36	5.89	6.13	5.99	5.84
MEAN	5.84	6.74	6.41	6.57	6.39

PK SUB	---	--S		PKS		
DRILL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL
N PATH						
75 ENHD	6.05	5.38	6.32	5.42	6.41	5.65
150 ENHD	7.51	6.49	7.30	6.51	7.70	5.93
225 ENHD	7.27	6.02	7.99	6.59	7.62	5.57
150 STND	7.05	6.13	7.21	6.36	7.51	5.87

GRAND MEAN 6.73

82/W/CS/245

WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

\*\*\*\*\* STANDARD ERRORS OF DIFFERENCES OF MEANS \*\*\*\*\*

TABLE	EXTRA	PK SUB	DRILL	N PATH* PK SUB	
SED	0.188	0.077	0.066	0.182	
TABLE	N PATH* DRILL	PK SUB DRILL	N PATH* EXTRA	N PATH* PK SUB DRILL	
SED	0.182	0.133		0.315	MIN REP
	0.157	0.115	0.574	0.272	MAX-MIN
	0.128	0.094		0.222	MAX REP

\*\*\*\*\* STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION \*\*\*\*\*

STRATUM	DF	SE	CV%
WP1	12	0.133	2.0
WP1.WP2	36	0.329	4.9

GRAIN MEAN DM% 83.0

SUB PLOT AREA HARVESTED 0.00341

82/W/CS/245

WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB	---	--S	PKS	MEAN
N PATH				
75 ENHD	5.65	6.29	7.30	6.42
150 ENHD	7.23	7.31	7.37	7.30
225 ENHD	7.60	7.78	7.76	7.71
150 STND	6.95	6.93	7.21	7.03
MEAN	6.86	7.08	7.41	7.12

DRILL	DIRECT	CNVNTIAL	MEAN
N PATH			
75 ENHD	6.58	6.09	6.42
150 ENHD	7.59	6.72	7.30
225 ENHD	7.93	7.28	7.71
150 STND	7.21	6.68	7.03
MEAN	7.33	6.70	7.12

DRILL	DIRECT	CNVNTIAL	MEAN
PK SUB			
---	7.16	6.26	6.86
--S	7.37	6.50	7.08
PKS	7.45	7.33	7.41
MEAN	7.33	6.70	7.12

N PATH	75 ENHD	150 ENHD	225 ENHD	150 STND	MEAN
EXTRA					
TPK D	6.49	7.64	7.93	6.99	7.26
TPK C	6.89	6.67	7.56	6.32	6.86
MEAN	6.69	7.15	7.74	6.66	7.06

PK SUB	---	--S		PKS		
DRILL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL
N PATH						
75 ENHD	6.00	4.95	6.56	5.75	7.16	7.58
150 ENHD	7.69	6.32	7.62	6.68	7.46	7.17
225 ENHD	7.95	6.90	8.11	7.12	7.73	7.82
150 STND	7.00	6.86	7.17	6.45	7.45	6.75

GRAND MEAN 7.11



82/W/CS/245

WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

\*\*\*\*\* STANDARD ERRORS OF DIFFERENCES OF MEANS \*\*\*\*\*

TABLE	EXTRA	PK SUB	DRILL	N PATH* PK SUB	
SED	0.537	0.219	0.190	0.386	
TABLE	N PATH* DRILL	PK SUB DRILL	N PATH* EXTRA	N PATH* PK SUB DRILL	
SED	0.386	0.380		0.669	MIN REP
	0.334	0.329	0.946	0.579	MAX-MIN
	0.273	0.268		0.473	MAX REP

\*\*\*\*\* STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION \*\*\*\*\*

STRATUM	DF	SE	CV%
WP1	12	0.380	5.3
WP1.WP2	36	0.635	8.9

GRAIN MEAN DM% 85.2

SUB PLOT AREA HARVESTED 0.00341