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# Yields of the Field Experiments 1986

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## 86/W/CS/245 Minimum Cultivation and Deep Pk - W. Wheat, W. Barley

### Rothamsted Research

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86/W/CS/245

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 P205, as superphosphate, 250 kg K20 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) N for treatments was applied as 'Nitram' and for basals as 'Nitro-Chalk'.  
(5) Standard pathogen control was conventional seed dressings. Enhanced pathogen control had in addition, (Series I and II, w. wheat) propiconazole at 0.25 kg with fluroxypyr at 0.20 kg in 250 l on 9 June, 1986, (Series III, w. barley) propiconazole at 0.25 kg in 250 l on 9 June.

Standard applications:

Series I and II: W. wheat: Manures: N at 40 kg as 'Nitro-Chalk', (0:18:36) at 280 kg. Weedkillers: Diquat at 0.56 kg ion in 250 l Series I, tine cultivated plots only, paraquat at 0.50 kg ion in 250 l Series II, tine cultivated plots only. Clopyralid at 0.70 kg with bromoxynil octanoate at 0.34 kg and mecoprop at 2.1 kg and isoproturon at 2.0 kg in 250 l. Growth regulator: Chlormequat at 1.6 kg with a wetting agent ('Agral' at 0.04 l) in 250 l. Molluscicide: Methiocarb at 0.22 kg to Series I only.  
Series III: W. barley: Manures: N at 40 kg as 'Nitro-Chalk', (0:18:36) at 280 kg. Weedkillers: Clopyralid at 0.07 kg with bromoxynil octanoate at 0.34 kg and mecoprop at 2.1 kg and isoproturon at 2.0 kg in 250 l. Growth regulator: Mepiquat chloride with 2-chloroethylphosphonic acid (as 'Terpal' at 2.0 l) with a wetting agent ('Citowett' at 0.10 l) in 250 l.

Seed: Series I and II: W. wheat: Avalon, sown at 200 kg.  
Series III: W. barley: Igri, sown at 170 kg.

Cultivations, etc.:-

Series I and II: W. wheat: Discd Series I only, straw burnt Series II only: 6 Sept, 1985. Spring-tine cultivated Series II only: 8 Sept. Ploughed and subsoil treatments applied: 2-9 Oct. Diquat applied to DIRECT plots, Series I, paraquat applied to DIRECT plots, Series II: 10 Oct. Discd: 15 Oct. Rotary harrowed twice CNVENTIAL plots, standard N applied to all plots: 17 Oct. Harrowed both series, seed sown Series II: 18 Oct. Seed sown Series I: 21 Oct. Methiocarb applied Series I: 3 Mar, 1986. N treatments applied: 28 Apr. Weedkillers applied: 29 Apr. Growth regulator applied: 23 May. Combine harvested, Series II: 21 Aug. Series I: 1 Sept.

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Series III: W. barley: Straw burnt: 6 Sept, 1985. Spring-tine cultivated: 8 Sept. Ploughed and subsoil treatments applied: 2-9 Oct. Paraquat applied to DIRECT plots: 10 Oct. Discd: 15 Oct. Rotary harrowed twice CNVTIAL plots, standard N applied to all plots: 17 Oct. Harrowed, seed sown: 18 Oct. N treatments applied: 28 Apr, 1986. Weedkillers applied: 29 Apr. Growth regulator applied: 23 May. Combine harvested: 13 Aug.

NOTE: On Series I three column plots were severely attacked by slugs (total of 12 plots) those with treatment combinations,

PK SUB	---	PKS	---
YEAR	1980/3/6	1980	1980/3/6
DRILL	DIRECT	DIRECT	DIRECT

Estimated values were used in the analysis.



86/W/CS/245 W. WHEAT SERIES I

GRAIN TONNES/HECTARE

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

PK SUB	---	--S	PKS	MEAN
N PATH				
75 ENHD	6.83	6.74	7.65	7.07
150 ENHD	7.94	8.24	7.30	7.83
225 ENHD	7.87	7.79	8.03	7.90
150 STND	6.74	6.93	7.60	7.09
MEAN	7.35	7.42	7.65	7.47
YEAR	1980	1980/3/6	MEAN	
N PATH				
75 ENHD	6.88	7.27	7.07	
150 ENHD	7.85	7.81	7.83	
225 ENHD	7.55	8.24	7.90	
150 STND	6.86	7.31	7.09	
MEAN	7.29	7.66	7.47	
YEAR	1980	1980/3/6	MEAN	
PK SUB				
---	7.58	7.11	7.35	
--S	7.32	7.53	7.42	
PKS	6.96	8.33	7.65	
MEAN	7.29	7.66	7.47	
DRILL	CNVNTIAL	DIRECT	MEAN	
N PATH				
75 ENHD	7.22	7.00	7.07	
150 ENHD	7.85	7.82	7.83	
225 ENHD	7.87	7.91	7.90	
150 STND	7.05	7.10	7.09	
MEAN	7.50	7.46	7.47	
DRILL	CNVNTIAL	DIRECT	MEAN	
PK SUB				
---	6.98	7.53	7.35	
--S	7.48	7.39	7.42	
PKS	8.02	7.46	7.65	
MEAN	7.50	7.46	7.47	

86/W/CS/245 W. WHEAT SERIES I

GRAIN TONNES/HECTARE

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

DRILL YEAR	CNVNTIAL	DIRECT	MEAN
1980	7.22	7.32	7.29
1980/3/6	7.77	7.60	7.66
MEAN	7.50	7.46	7.47

PK SUB YEAR	--- 1980 1980/3/6		--S 1980 1980/3/6		PKS 1980 1980/3/6	
N PATH						
75 ENHD	7.09	6.57	6.40	7.07	7.14	8.16
150 ENHD	8.52	7.36	8.43	8.06	6.59	8.01
225 ENHD	7.74	8.00	7.81	7.76	7.10	8.97
150 STND	6.94	6.53	6.62	7.23	7.02	8.18

PK SUB DRILL	--- CNVNTIAL		--S DIRECT CNVNTIAL		PKS DIRECT CNVNTIAL		DIRECT
N PATH							
75 ENHD		6.35	7.08	6.73	6.74	8.57	7.19
150 ENHD		8.04	7.89	8.03	8.35	7.47	7.22
225 ENHD		7.32	8.15	7.88	7.74	8.41	7.84
150 STND		6.24	6.99	7.29	6.74	7.63	7.58

YEAR DRILL	1980 CNVNTIAL		1980/3/6 DIRECT CNVNTIAL		DIRECT
N PATH					
75 ENHD		6.89	6.88	7.55	7.13
150 ENHD		7.74	7.90	7.95	7.74
225 ENHD		7.56	7.55	8.18	8.27
150 STND		6.71	6.94	7.40	7.27

PK SUB DRILL	YEAR 1980 CNVNTIAL		1980/3/6 DIRECT CNVNTIAL		DIRECT
---		7.17	7.78	6.79	7.27
--S		6.30	7.83	8.67	6.96
PKS		8.20	6.35	7.85	8.57

YEAR DRILL	1980 CNVNTIAL		1980/3/6 DIRECT CNVNTIAL		DIRECT
N PATH PK SUB					
75 ENHD ---		6.61	7.33	6.08	6.82
75 ENHD --S		5.28	6.96	8.18	6.52
75 ENHD PKS		8.76	6.33	8.37	8.05
150 ENHD ---		8.54	8.52	7.54	7.27
150 ENHD --S		6.81	9.24	9.25	7.46
150 ENHD PKS		7.88	5.95	7.06	8.49
225 ENHD ---		7.07	8.08	7.56	8.21
225 ENHD --S		7.14	8.15	8.62	7.34
225 ENHD PKS		8.47	6.42	8.36	9.27
150 STND ---		6.48	7.18	6.00	6.79
150 STND --S		5.97	6.95	8.61	6.54
150 STND PKS		7.67	6.69	7.60	8.48

86/W/CS/245 W. WHEAT SERIES I

GRAIN TONNES/HECTARE

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

N PATH EXTRA	75 ENHD	150 ENHD	225 ENHD	150 STND	MEAN
TPK 80 D	7.44	7.91	8.15	8.97	8.12
TPK 80 C	5.55	8.65	7.29	6.55	7.01
MEAN	6.49	8.28	7.72	7.76	7.56

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

TABLE	EXTRA	PK SUB	YEAR	DRILL	
SED	1.022	0.417	0.341	0.361	
TABLE	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL	
SED	0.484	0.395	0.590	0.419	
TABLE	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
SED	0.723 0.626 0.511	0.590 0.511 0.417	1.186	0.685	MIN REP MAX-MIN MAX REP
TABLE	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
SED	0.839 0.726 0.593	0.684 0.593 0.484	1.022 0.885 0.723	1.186 1.027 0.839	MIN REP MAX-MIN 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	DF	SE	CV%
WP1	4	0.723	9.7
WP1.WP2	12	0.492	6.6

GRAIN MEAN DM% 82.2

SUB PLOT AREA HARVESTED 0.00341

86/W/CS/245 W. WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB	---	--S	PKS	MEAN
N PATH				
75 ENHD	5.88	5.99	6.35	6.07
150 ENHD	6.39	6.08	6.54	6.34
225 ENHD	6.68	6.99	7.46	7.04
150 STND	5.85	5.56	5.99	5.80
MEAN	6.20	6.16	6.58	6.31
YEAR	1980	1980/3/6	MEAN	
N PATH				
75 ENHD	6.12	6.03	6.07	
150 ENHD	6.41	6.26	6.34	
225 ENHD	7.07	7.01	7.04	
150 STND	6.34	5.26	5.80	
MEAN	6.48	6.14	6.31	
YEAR	1980	1980/3/6	MEAN	
PK SUB				
---	6.41	5.98	6.20	
--S	6.18	6.14	6.16	
PKS	6.86	6.31	6.58	
MEAN	6.48	6.14	6.31	
DRILL	CNVNTIAL	DIRECT	MEAN	
N PATH				
75 ENHD	6.13	6.05	6.07	
150 ENHD	6.12	6.45	6.34	
225 ENHD	7.09	7.02	7.04	
150 STND	5.56	5.92	5.80	
MEAN	6.22	6.36	6.31	
DRILL	CNVNTIAL	DIRECT	MEAN	
PK SUB				
---	6.20	6.20	6.20	
--S	5.80	6.34	6.16	
PKS	6.68	6.53	6.58	
MEAN	6.22	6.36	6.31	
DRILL	CNVNTIAL	DIRECT	MEAN	
YEAR				
1980	5.97	6.74	6.48	
1980/3/6	6.47	5.98	6.14	
MEAN	6.22	6.36	6.31	



86/W/CS/245 W. 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	5.85	5.91	5.92	6.07	6.58	6.11
150 ENHD	6.68	6.09	6.13	6.04	6.41	6.66
225 ENHD	6.65	6.71	6.54	7.44	8.02	6.90
150 STND	6.47	5.23	6.12	5.01	6.43	5.55

	PK SUB	---		--S		PKS	
N PATH	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
75 ENHD		5.98	5.83	5.90	6.04	6.51	6.26
150 ENHD		6.35	6.40	5.78	6.23	6.21	6.70
225 ENHD		6.79	6.63	6.66	7.16	7.84	7.27
150 STND		5.67	5.94	4.86	5.92	6.15	5.91

	YEAR	1980		1980/3/6	
N PATH	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
75 ENHD		5.89	6.23	6.37	5.86
150 ENHD		5.80	6.71	6.43	6.18
225 ENHD		6.62	7.30	7.57	6.74
150 STND		5.59	6.71	5.53	5.13

PK SUB	YEAR	1980		1980/3/6	
	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
---		5.74	6.75	6.65	5.65
--S		5.14	6.70	6.46	5.98
PKS		7.04	6.77	6.32	6.30

	YEAR	1980		1980/3/6		
N PATH	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	
75 ENHD	PK SUB		5.62	5.97	6.33	5.70
	---		5.29	6.23	6.51	5.85
	--S		6.76	6.48	6.26	6.04
150 ENHD	PKS		6.14	6.95	6.56	5.85
	---		5.33	6.52	6.23	5.94
	--S		5.93	6.66	6.50	6.74
225 ENHD	PKS		5.94	7.01	7.63	6.25
	---		5.11	7.26	8.20	7.05
	--S		8.80	7.63	6.88	6.91
150 STND	PKS		5.25	7.08	6.09	4.80
	---		4.84	6.76	4.88	5.08
	--S		6.69	6.30	5.62	5.52

N PATH	75 ENHD	150 ENHD	225 ENHD	150 STND	MEAN
EXTRA					
TPK 80 D	6.19	6.20	6.53	5.57	6.12
TPK 80 C	5.73	4.75	6.92	4.76	5.54
MEAN	5.96	5.47	6.73	5.17	5.83

86/W/CS/245 W. WHEAT SERIES II

GRAIN TONNES/HECTARE

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

TABLE	EXTRA	PK SUB	YEAR	DRILL	
SED	0.898	0.366	0.299	0.318	
TABLE	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL	
SED	0.489	0.400	0.518	0.423	
TABLE	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
SED	0.635	0.518			MIN REP
	0.550	0.488	1.199	0.692	MAX-MIN
	0.449	0.366			MAX REP
TABLE	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
SED	0.848	0.692	0.898	1.199	MIN REP
	0.734	0.599	0.777	1.038	MAX-MIN
	0.599	0.489	0.635	0.848	MAX REP

\* WITHIN THE SAME LEVEL OF N PATH ONLY

DRILL  
 MIN-REP CNVNIAL  
 MAX-REP DIRECT  
 MAX-MIN DIRECT V CNVNIAL

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

STRATUM	DF	SE	CV%
WP1	6	0.635	10.1
WP1.WP2	18	0.649	10.4

GRAIN MEAN DM% 80.6

SUB PLOT AREA HARVESTED 0.00341

86/W/CS/245 W. BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB	---	--S	PKS	MEAN
N PATH				
75 ENHD	5.58	5.89	6.17	5.88
150 ENHD	6.75	6.90	6.77	6.81
225 ENHD	6.72	7.05	6.97	6.91
150 STND	6.00	6.68	6.33	6.33
MEAN	6.26	6.63	6.56	6.48
YEAR	1980	1980/3/6	MEAN	
N PATH				
75 ENHD	5.88	5.89	5.88	
150 ENHD	7.13	6.48	6.81	
225 ENHD	7.19	6.64	6.91	
150 STND	6.54	6.13	6.33	
MEAN	6.68	6.28	6.48	
YEAR	1980	1980/3/6	MEAN	
PK SUB				
---	6.67	5.86	6.26	
--S	6.75	6.50	6.63	
PKS	6.63	6.49	6.56	
MEAN	6.68	6.28	6.48	
DRILL	CNVNTIAL	DIRECT	MEAN	
N PATH				
75 ENHD	5.75	5.95	5.88	
150 ENHD	6.07	7.17	6.81	
225 ENHD	6.19	7.28	6.91	
150 STND	5.75	6.63	6.33	
MEAN	5.94	6.76	6.48	
DRILL	CNVNTIAL	DIRECT	MEAN	
PK SUB				
---	5.67	6.56	6.26	
--S	6.16	6.86	6.63	
PKS	5.99	6.85	6.56	
MEAN	5.94	6.76	6.48	
DRILL	CNVNTIAL	DIRECT	MEAN	
YEAR				
1980	5.99	7.03	6.68	
1980/3/6	5.89	6.48	6.28	
MEAN	5.94	6.76	6.48	

86/W/CS/245 W. BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB YEAR N PATH	---		--S		PKS	
	1980	1980/3/6	1980	1980/3/6	1980	1980/3/6
75 ENHD	5.70	5.47	5.89	5.90	6.04	6.30
150 ENHD	7.45	6.04	7.01	6.79	6.93	6.62
225 ENHD	7.14	6.31	7.19	6.92	7.24	6.70
150 STND	6.37	5.63	6.93	6.42	6.31	6.34

N PATH	PK SUB ---		--S		PKS		DIRECT
	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	
75 ENHD		5.47	5.64	5.76	5.96	6.02	6.25
150 ENHD		5.80	7.22	6.31	7.19	6.09	7.12
225 ENHD		5.76	7.21	6.54	7.30	6.25	7.32
150 STND		5.65	6.18	6.02	7.00	5.58	6.70

N PATH	YEAR 1980		1980/3/6		DIRECT
	DRILL	CNVNTIAL	DIRECT	CNVNTIAL	
75 ENHD		5.44	6.10	6.06	5.80
150 ENHD		6.32	7.54	5.82	6.81
225 ENHD		6.49	7.54	5.88	7.02
150 STND		5.71	6.95	5.79	6.30

PK SUB	YEAR 1980		1980/3/6	
	DRILL	CNVNTIAL	DIRECT	CNVNTIAL
---		5.89	7.05	5.45
--S		6.16	7.05	6.16
PKS		5.92	6.99	6.05

N PATH	PK SUB	YEAR 1980		1980/3/6	
		DRILL	CNVNTIAL	DIRECT	CNVNTIAL
75 ENHD	---		5.40	5.85	5.53
	--S		5.39	6.14	6.12
	PKS		5.51	6.30	6.52
150 ENHD	---		6.32	8.01	5.29
	--S		6.34	7.34	6.28
	PKS		6.29	7.26	5.89
225 ENHD	---		5.93	7.75	5.59
	--S		7.10	7.23	5.99
	PKS		6.45	7.63	6.06
150 STND	---		5.91	6.61	5.40
	--S		5.81	7.50	6.23
	PKS		5.42	6.75	5.74

N PATH EXTRA	75 ENHD	150 ENHD	225 ENHD	150 STND	MEAN
TPK 80 D	6.54	7.78	8.34	6.52	7.29
TPK 80 C	5.38	6.06	6.72	6.56	6.18
MEAN	5.96	6.92	7.53	6.54	6.74



86/W/CS/245 W. BARLEY SERIES III

GRAIN TONNES/HECTARE

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

TABLE	EXTRA	PK SUB	YEAR	DRILL	
SED	0.584	0.239	0.195	0.207	
TABLE	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL	
SED	0.399	0.326	0.337	0.345	
TABLE	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
SED	0.413	0.338			MIN REP
	0.358	0.292	0.978	0.565	MAX-MIN
	0.292	0.239			MAX REP
TABLE	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
SED	0.692	0.564	0.584	0.978	MIN REP
	0.599	0.489	0.506	0.847	MAX-MIN
	0.489	0.399	0.413	0.692	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	DF	SE	CV%
WP1	6	0.413	6.3
WP1.WP2	18	0.641	9.8

GRAIN MEAN DM% 82.6

SUB PLOT AREA HARVESTED 0.00341