ROTHAMSTED RESEARCH

Yields of the Field Experiments 1985

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85/W/CS/245 Minimum Cultivation and Deep P K - W. Oilseed Rape, W. Wheat, W. Barley

Rothamsted Research

Rothamsted Research (1986) *85/W/CS/245 Minimum Cultivation and Deep P K - W. Oilseed Rape, W. Wheat, W. Barley ;* Yields Of The Field Experiments 1985, pp 128 - 138 **- DOI: https://doi.org/10.23637/ERADOC-1-19**

85/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. oilseed rape, w. wheat and w. barley either sown conventionally or direct drilled - Woburn Warren Field I and II.

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

For previous years see 80-84/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 WW8	Series II, w. wheat, eighth cereal after a break crop
SER3 WB8	Series III, w. barley, eighth 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
1983	In autumn 1979 and in autumn 1982

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)

Row plots:

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

Rape	Cereals	Rape	Cereals	
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
275 ENHD	225 ENHD	275 kg N	225 kg N	enhanced pathogen control
200 STND	150 STND	200 kg N	150 kg N	standard pathogen control

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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 and basals to cereals and for basals to w. oilseed rape was applied as 'Nitro-Chalk' (26% N). N for treatments to w. oilseed rape was applied as 'Nitro-Chalk' (27.5% N).
(5) Standard pathogen control was conventional seed dressings. Enhanced pathogen control had in addition, (Series I, w. oilseed rape) prochloraz at 0.27 kg with carbendazim at 0.10 kg in 250 l on 10 Apr, 1985. (Series II, w. wheat) cypermethrin at 0.025 kg applied with the basal isoproturon on 2 Nov, 1984. Prochloraz at 0.40 kg in 250 l on 29 May, 1985. Propiconazole on two occasions, on the first occasion at 0.25 kg on 17 June, on the second occasion at 0.12 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 250 l on 3 July. (Series III, w. barley) cypermethrin at 0.025 kg with the basal isoproturon on 2 Nov, 1984. Prochloraz at 0.40 kg with propiconazole at 0.25 kg in 250 l on 29 May, 1985.

Standard applications:
Series I: W. oilseed rape: Manures: (0:20:20) at 290 kg. N at 60 kg as 'Nitro-Chalk'. Weedkiller: Propyzamide at 0.82 kg in 300 l. Desiccant: Diquat at 0.60 kg ion in 250 l.
Series II: W. wheat, Series III: W. barley: Manures: (5:14:30) at 340 kg combine drilled. N at 25 kg as 'Nitro-Chalk'. Weedkillers: Paraquat at 0.30 kg ion in 250 l, isoproturon at 2.0 kg in 250 l, mecoprop at 2.0 kg with bromoxynil at 0.25 kg and ioxynil at 0.25 kg in 250 l. Growth regulator: Mepiquat chloride with 2-chloroethylphosphonic acid (as 'Terpal' at 1.5 l) with a wetting agent ('Citowett' at 0.04 l) in 250 l to w. barley only.

Seed: W. oilseed rape: Jet Neuf, sown at 9 kg.
W. wheat: Avalon, sown at 200 kg.
W. barley: Igri, sown at 170 kg.

Cultivations, etc.:-
All series: Straw burnt: 20 Aug, 1984. Disced: 21 Aug. Ploughed CNVNTIAL plots: 30 Aug.
Series I: W. oilseed rape: PK and N applied: 3 Sept, 1984. Disc CNVNTIAL plots, harrow, seed sown: 7 Sept. Weedkiller applied: 27 Jan, 1985. N treatments applied: 11 Mar. Desiccant applied:

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31 July. Combine harvested: 15 Aug.
Series II: W. wheat, Series III: W. barley: N applied: 13 Sept, 1984. Disced CNVNTIAL plots: 19 Sept. Paraquat applied: 24 Sept. Heavy spring-tine cultivated: 26 Sept. Disced, harrowed, seed sown: 27 Sept. Isoproturon applied: 2 Nov. Treatment N applied: 10 Apr, 1985. Weedkillers applied: 19 Apr. Growth regulator applied to w. barley only: 16 May. Combine harvested, w. barley: 13 Aug, w. wheat: 6 Sept.

WINTER OILSEED RAPE SERIES I

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

PK SUB / N PATH	---	--S	PKS	MEAN
125 ENHD	2.18	2.80	2.81	2.60
200 ENHD	2.39	3.32	3.17	2.96
275 ENHD	2.48	3.34	3.22	3.01
200 STND	2.12	2.74	2.82	2.56
MEAN	2.29	3.05	3.01	2.78

YEAR / N PATH	1980	1983	MEAN
125 ENHD	2.41	2.79	2.60
200 ENHD	2.95	2.97	2.96
275 ENHD	3.02	3.01	3.01
200 STND	2.34	2.79	2.56
MEAN	2.68	2.89	2.78

YEAR / PK SUB	1980	1983	MEAN
---	2.21	2.38	2.29
--S	3.06	3.04	3.05
PKS	2.77	3.24	3.01
MEAN	2.68	2.89	2.78

DRILL / N PATH	CNVNTIAL	DIRECT	MEAN
125 ENHD	1.84	2.98	2.60
200 ENHD	1.99	3.44	2.96
275 ENHD	1.88	3.58	3.01
200 STND	1.63	3.03	2.56
MEAN	1.84	3.26	2.78

DRILL / PK SUB	CNVNTIAL	DIRECT	MEAN
---	0.69	3.09	2.29
--S	2.45	3.35	3.05
PKS	2.36	3.33	3.01
MEAN	1.84	3.26	2.78

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85/W/CS/245 WINTER OILSEED RAPE SERIES I

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

DRILL	CNVNTIAL	DIRECT	MEAN
YEAR			
1980	1.68	3.18	2.68
1983	1.99	3.34	2.89
MEAN	1.84	3.26	2.78

PK SUB	---		--S		PKS	
YEAR	1980	1983	1980	1983	1980	1983
N PATH						
125 ENHD	2.17	2.20	2.61	2.99	2.45	3.18
200 ENHD	2.40	2.37	3.46	3.19	3.00	3.34
275 ENHD	2.41	2.55	3.48	3.20	3.16	3.28
200 STND	1.84	2.41	2.69	2.78	2.47	3.17

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
125 ENHD	0.87	2.84	2.21	3.09	2.43	3.01
200 ENHD	0.84	3.16	2.69	3.64	2.45	3.53
275 ENHD	0.77	3.34	2.45	3.79	2.44	3.61
200 STND	0.29	3.04	2.47	2.87	2.13	3.17

YEAR	1980		1983	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
125 ENHD	1.63	2.80	2.05	3.16
200 ENHD	2.01	3.43	1.98	3.46
275 ENHD	1.90	3.58	1.87	3.58
200 STND	1.20	2.91	2.06	3.15

YEAR	1980		1983	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	1.14	2.74	0.24	3.45
--S	2.37	3.41	2.54	3.29
PKS	1.53	3.39	3.19	3.27

YEAR		1980		1983	
DRILL		CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH	PK SUB				
125 ENHD	---	1.50	2.50	0.24	3.18
	--S	1.83	3.00	2.59	3.19
	PKS	1.54	2.91	3.32	3.10
200 ENHD	---	1.37	2.92	0.31	3.40
	--S	2.68	3.85	2.70	3.43
	PKS	1.97	3.52	2.93	3.55
275 ENHD	---	1.37	2.93	0.16	3.75
	--S	2.50	3.98	2.40	3.60
	PKS	1.82	3.83	3.05	3.39
200 STND	---	0.32	2.61	0.26	3.48
	--S	2.47	2.81	2.46	2.94
	PKS	0.80	3.31	3.46	3.03

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85/W/CS/245 WINTER OILSEED RAPE SERIES I

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N PATH EXTRA	125 ENHD	200 ENHD	275 ENHD	200 STND	MEAN
TPK 80 D	3.06	3.16	3.58	3.23	3.26
TPK 80 C	1.87	2.05	1.53	1.48	1.73
MEAN	2.47	2.61	2.55	2.36	2.50

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

TABLE	EXTRA	PK SUB	YEAR	DRILL	
SED	0.442	0.181	0.147	0.156	
TABLE	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL	
SED	0.206	0.168	0.255	0.179	MAX-MIN
TABLE	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
SED	0.313	0.256			MIN REP
	0.271	0.222	0.505	0.292	MAX-MIN
	0.221	0.181			MAX REP
TABLE	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
SED	0.357	0.291	0.442	0.505	MIN REP
	0.309	0.252	0.383	0.437	MAX-MIN
	0.253	0.206	0.313	0.357	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	0.313	11.4
WP1.WP2	18	0.199	7.2

GRAIN MEAN DM% 86.1

SUB PLOT AREA HARVESTED 0.00341

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85/W/CS/245 WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB N PATH	---	--S	PKS	MEAN
75 ENHD	6.67	6.59	6.92	6.73
150 ENHD	8.25	7.97	8.08	8.10
225 ENHD	8.97	8.97	9.01	8.98
150 STND	7.49	7.35	7.33	7.39
MEAN	7.85	7.72	7.84	7.80

YEAR N PATH	1980	1983	MEAN
75 ENHD	6.91	6.54	6.73
150 ENHD	8.44	7.76	8.10
225 ENHD	9.27	8.69	8.98
150 STND	7.67	7.11	7.39
MEAN	8.07	7.53	7.80

YEAR PK SUB	1980	1983	MEAN
---	8.06	7.63	7.85
--S	8.06	7.38	7.72
PKS	8.10	7.57	7.84
MEAN	8.07	7.53	7.80

DRILL N PATH	CNVNTIAL	DIRECT	MEAN
75 ENHD	6.14	7.02	6.73
150 ENHD	7.29	8.50	8.10
225 ENHD	8.09	9.43	8.98
150 STND	6.53	7.82	7.39
MEAN	7.01	8.19	7.80

DRILL PK SUB	CNVNTIAL	DIRECT	MEAN
---	6.99	8.27	7.85
--S	6.97	8.09	7.72
PKS	7.07	8.22	7.84
MEAN	7.01	8.19	7.80

DRILL YEAR	CNVNTIAL	DIRECT	MEAN
1980	7.31	8.45	8.07
1983	6.71	7.93	7.53
MEAN	7.01	8.19	7.80

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85/W/CS/245 WINTER WHEAT SERIES II

GRAIN TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1983	1980	1983	1980	1983
N PATH						
75 ENHD	6.85	6.48	6.72	6.46	7.15	6.69
150 ENHD	8.58	7.92	8.34	7.60	8.40	7.76
225 ENHD	9.07	8.87	9.39	8.54	9.36	8.66
150 STND	7.75	7.23	7.77	6.92	7.48	7.17

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
75 ENHD	6.04	6.98	5.92	6.93	6.45	7.16
150 ENHD	7.34	8.71	7.17	8.36	7.37	8.44
225 ENHD	8.08	9.42	8.39	9.25	7.79	9.62
150 STND	6.52	7.98	6.40	7.82	6.67	7.66

YEAR	1980		1983	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	6.38	7.18	5.89	6.87
150 ENHD	7.47	8.93	7.11	8.08
225 ENHD	8.53	9.65	7.65	9.22
150 STND	6.87	8.07	6.19	7.57

YEAR	1980		1983	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	7.26	8.47	6.72	8.08
--S	7.25	8.46	6.69	7.72
PKS	7.43	8.44	6.71	8.00

YEAR	1980		1983	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH PK SUB				
75 ENHD ---	6.26	7.15	5.82	6.81
--S	5.89	7.14	5.96	6.71
PKS	7.00	7.23	5.90	7.09
150 ENHD ---	7.44	9.15	7.24	8.27
--S	7.48	8.77	6.87	7.96
PKS	7.50	8.86	7.24	8.02
225 ENHD ---	8.50	9.35	7.65	9.49
--S	8.77	9.69	8.01	8.81
PKS	8.30	9.90	7.28	9.35
150 STND ---	6.83	8.21	6.20	7.75
--S	6.88	8.22	5.93	7.41
PKS	6.91	7.77	6.43	7.55

N PATH	75 ENHD	150 ENHD	225 ENHD	150 STND	MEAN
EXTRA					
TPK 80 D	7.39	9.12	9.32	7.95	8.44
TPK 80 C	6.59	7.77	8.37	6.81	7.39
MEAN	6.99	8.45	8.85	7.38	7.92

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GRAIN TONNES/HECTARE

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

TABLE	EXTRA	PK SUB	YEAR	DRILL	
SED	0.438	0.179	0.146	0.155	

TABLE	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL
SED	0.253	0.206	0.253	0.219

TABLE	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
SED	0.309	0.253			MIN REP
	0.268	0.219	0.619	0.357	MAX-MIN
	0.219	0.179			MAX REP

TABLE	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
SED	0.438	0.358	0.438	0.619	MIN REP
	0.379	0.310	0.379	0.536	MAX-MIN
	0.309	0.253	0.309	0.438	MAX REP

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

STRATUM	DF	SE	CV%
WP1	6	0.309	4.0
WP1.WP2	18	0.357	4.6

GRAIN MEAN DM% 80.1

SUB PLOT AREA HARVESTED 0.00341

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85/W/CS/245 WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB N PATH	---	--S	PKS	MEAN
75 ENHD	6.96	6.98	6.94	6.96
150 ENHD	8.07	8.44	8.14	8.22
225 ENHD	8.51	8.78	8.36	8.55
150 STND	7.76	8.01	7.62	7.80
MEAN	7.83	8.05	7.77	7.88

YEAR N PATH	1980	1983	MEAN
75 ENHD	7.00	6.92	6.96
150 ENHD	8.55	7.89	8.22
225 ENHD	8.73	8.37	8.55
150 STND	8.00	7.59	7.80
MEAN	8.07	7.69	7.88

YEAR PK SUB	1980	1983	MEAN
---	8.05	7.60	7.83
--S	8.18	7.93	8.05
PKS	7.99	7.54	7.77
MEAN	8.07	7.69	7.88

DRILL N PATH	CNVNTIAL	DIRECT	MEAN
75 ENHD	6.82	7.03	6.96
150 ENHD	7.96	8.35	8.22
225 ENHD	8.17	8.74	8.55
150 STND	7.20	8.10	7.80
MEAN	7.53	8.05	7.88

DRILL PK SUB	CNVNTIAL	DIRECT	MEAN
---	7.42	8.03	7.83
--S	7.80	8.18	8.05
PKS	7.39	7.95	7.77
MEAN	7.53	8.05	7.88

DRILL YEAR	CNVNTIAL	DIRECT	MEAN
1980	7.63	8.29	8.07
1983	7.44	7.82	7.69
MEAN	7.53	8.05	7.88

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85/W/CS/245 WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

PK SUB	---		--S		PKS	
YEAR	1980	1983	1980	1983	1980	1983
N PATH						
75 ENHD	7.02	6.90	6.91	7.06	7.06	6.81
150 ENHD	8.50	7.64	8.72	8.17	8.44	7.85
225 ENHD	8.57	8.45	8.98	8.58	8.65	8.07
150 STND	8.11	7.42	8.10	7.91	7.81	7.43

PK SUB	---		--S		PKS	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH						
75 ENHD	6.98	6.95	6.82	7.06	6.65	7.08
150 ENHD	7.71	8.25	8.30	8.52	7.86	8.29
225 ENHD	7.77	8.88	8.62	8.85	8.10	8.49
150 STND	7.20	8.05	7.44	8.29	6.96	7.95

YEAR	1980		1983	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH				
75 ENHD	6.83	7.08	6.80	6.98
150 ENHD	8.19	8.73	7.72	7.97
225 ENHD	8.13	9.03	8.21	8.45
150 STND	7.38	8.32	7.02	7.87

YEAR	1980		1983	
DRILL	CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
PK SUB				
---	7.34	8.40	7.49	7.66
--S	8.12	8.21	7.48	8.15
PKS	7.43	8.27	7.35	7.64

YEAR		1980		1983	
DRILL		CNVNTIAL	DIRECT	CNVNTIAL	DIRECT
N PATH	PK SUB				
75 ENHD	---	6.82	7.12	7.14	6.77
	--S	7.11	6.81	6.54	7.32
	PKS	6.57	7.31	6.73	6.85
150 ENHD	---	7.77	8.86	7.65	7.64
	--S	8.77	8.69	7.83	8.34
	PKS	8.03	8.64	7.69	7.93
225 ENHD	---	7.49	9.11	8.05	8.65
	--S	8.88	9.03	8.37	8.68
	PKS	8.01	8.96	8.19	8.01
150 STND	---	7.30	8.51	7.10	7.58
	--S	7.70	8.29	7.18	8.28
	PKS	7.13	8.15	6.79	7.75

N PATH	75 ENHD	150 ENHD	225 ENHD	150 STND	MEAN
EXTRA					
TPK 80 D	6.74	8.62	9.23	8.24	8.21
TPK 80 C	6.76	8.19	8.81	7.39	7.79
MEAN	6.75	8.40	9.02	7.81	8.00

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85/W/CS/245 WINTER BARLEY SERIES III

GRAIN TONNES/HECTARE

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

TABLE	EXTRA	PK SUB	YEAR	DRILL	
SED	0.404	0.165	0.135	0.143	

TABLE	N PATH* PK SUB	N PATH* YEAR	PK SUB YEAR	N PATH* DRILL
SED	0.251	0.205	0.234	0.218

TABLE	PK SUB DRILL	YEAR DRILL	N PATH* EXTRA	N PATH* PK SUB YEAR	
SED	0.286	0.233			MIN REP
	0.248	0.202	0.616	0.355	MAX-MIN
	0.202	0.165			MAX REP

TABLE	N PATH* PK SUB DRILL	N PATH* YEAR DRILL	PK SUB YEAR DRILL	N PATH* PK SUB YEAR DRILL	
SED	0.435	0.355	0.404	0.616	MIN REP
	0.377	0.307	0.350	0.533	MAX-MIN
	0.308	0.251	0.286	0.435	MAX REP

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

STRATUM	DF	SE	CV%
WP1	6	0.286	3.6
WP1.WP2	18	0.379	4.8

GRAIN MEAN DM% 82.3

SUB PLOT AREA HARVESTED 0.00341

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