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Yields of the Field Experiments 1991

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91/W/CS/357 Cover Crops - Forage Rape, Phacelia, Ryegrass, Rye, Mustard, W. Barley, S. Barley

Rothamsted Research

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91/W/CS/357

COVER CROPS

Object: To compare a range of cover crops for their ability to take up N during the autumn, to measure rates of mineralization of N after incorporating them in spring and to measure their effects on the yield of a subsequent spring barley crop - Woburn, Lansome III.

Sponsors: D.G. Christian, D.S. Powlson.

The first year, forage rape, phacelia, ryegrass, rye, mustard, w. and s. barley.

Design: 3 randomised blocks of 15 plots split into 2 sub plots.

Whole plot dimensions: 6.0 x 25.0.

Treatments: All combinations of:-

Whole plots

1. **CROPS** Cover crops, sown 1990, ploughed on 13 Mar, 1991, sown to s. barley: 14 Mar:

FO RA SB	Forage rape
PH TA SB	Phacelia tanacetifolia
RY GR SB	Perennial ryegrass
RYE SB	Rye
WH MU SB	White mustard
WM+RY SB	White mustard + rye

2. **CC SOWDT** Sowing dates of cover crops:

24 AUG	24 August, 1990
24 SEPT	24 September

Sub plots

3. **N** Nitrogen fertilizer on 14 Mar, 1991 (kg N) as 'Nitro-Chalk':

0
50

plus three extra treatments:

1. **EXTRA**

CULT FAL	Cultivated fallow until sown to s. barley on 14 Mar, 1991
TUMBDOWN	Tumbledown fallow, no weed control until sown to s. barley, on 14 Mar, 1991
W BARLEY	W. barley sown 25 September, 1990, taken to maturity

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Sub plots

2. **N EXTRA** Nitrogen fertilizer on 14 Mar, 1991 (kg N) as 'Nitro-Chalk':

O
APPLIED 50 (CULT FAL and TUMBDOWN) or 100 (W BARLEY)

NOTE: The tumbledown fallow was given 50 kg of seed from the previous wheat crop to ensure volunteers.

Basal applications: Manure: Magnesian limestone at 7.5 t.

Standard applications:

CULT FAL plots only: Weedkiller: Paraquat at 0.60 kg ion in 250 l.
W BARLEY plots only: Manures: N treatments applied on two occasions, each at 50 kg. Weedkillers: Diflufenican at 0.10 kg and isoproturon at 1.0 kg applied with insecticide in 220 l. Fungicide: Propiconazole at 0.12 kg in 300 l. Insecticide: Deltamethrin at 5.0 g.
S. barley only: Weedkiller: Metsulfuron-methyl at 6.0 g with fungicide in 200 l. Fungicide: Tridemorph at 0.26 kg.

Seed: Forage rape: Giant, sown at 30 kg.
Phacelia tanacetifolia: sown at 30 kg.
Perennial ryegrass: Contessa, sown at 25 kg.
Rye: Halo, sown at 180 kg.
White mustard: sown at 30 kg.
White mustard + rye: sown at 15 kg and 90 kg respectively.
W. barley: Puffin, sown at 140 kg.
S. barley: Alexis, sown at 160 kg

Cultivations, etc.:-

All plots: Deep-tine cultivated with tines 1.5 m apart and 0.4 m deep: 18 Aug, 1990. Disced: 19 Aug. Magnesian limestone applied, rotary cultivated: 23 Aug.
24 AUG plots only: Rotary harrowed with crumbler attached, seed sown, rotary harrowed, rolled: 24 Aug.
24 SEPT plots only: Rotary harrowed with crumbler attached, and rolled: 24 Aug. Seed sown, rotary harrowed: 24 Sept.
CULT FAL plots only: Disced: 23 Oct. Weedkiller applied: 26 Feb, 1991.
All plots except W BARLEY: Ploughed: 13 Mar. N treatments applied, rotary cultivated, s. barley seed sown: 14 Mar. Weedkiller and fungicide applied: 24 May. Combine harvested: 15 Aug.
W BARLEY plots only: Rotary harrowed with crumbler attached, w. barley seed sown: 25 Sept, 1990. Weedkillers and insecticide applied: 29 Nov. N treatments applied: 14 Mar and 22 Apr, 1991. Fungicide applied: 21 May. Combine harvested: 6 Aug.

NOTE: Because of rabbit damage the yields of three plots were lost, with treatment combinations:-

CROPS	FO RA SB	RYE SB	RY GR SB
CC SOWDT	24 SEPT	24 SEPT	24 AUG
N	0	0	0

Estimated values were used in the analysis.

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GRAIN TONNES/HECTARE

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

SPRING BARLEY

CC SOWDT	24 AUG	24 SEPT	Mean
CROPS			
FO RA SB	4.38	5.78	5.08
PH TA SB	4.05	4.14	4.09
RY GR SB	4.00	4.12	4.06
RYE SB	3.73	4.89	4.31
WH MU SB	4.65	3.89	4.27
WM+RY SB	4.73	5.66	5.20
Mean	4.26	4.75	4.50

	N	0	50	Mean
CROPS				
FO RA SB		4.63	5.53	5.08
PH TA SB		2.85	5.34	4.09
RY GR SB		4.49	3.62	4.06
RYE SB		3.92	4.70	4.31
WH MU SB		3.50	5.04	4.27
WM+RY SB		4.80	5.59	5.20
Mean		4.03	4.97	4.50

	N	0	50	Mean
CC SOWDT				
24 AUG		3.76	4.75	4.26
24 SEPT		4.30	5.19	4.75
Mean		4.03	4.97	4.50

	N	0	50	
CROPS				
CC SOWDT				
FO RA SB		24 AUG	3.76	5.01
		24 SEPT	5.51	6.05
PH TA SB		24 AUG	2.66	5.44
		24 SEPT	3.04	5.23
RY GR SB		24 AUG	5.27	2.72
		24 SEPT	3.72	4.52
RYE SB		24 AUG	2.77	4.69
		24 SEPT	5.07	4.71
WH MU SB		24 AUG	3.95	5.35
		24 SEPT	3.06	4.72
WM+RY SB		24 AUG	4.18	5.28
		24 SEPT	5.42	5.90

	N	0	APPLIED	Mean
N EXTRA				
EXTRA				
CULT FAL		2.85	4.88	3.87
TUMBDOWN		5.06	5.06	5.06
Mean		3.96	4.97	4.46

GRAND MEAN 4.50

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GRAIN TONNES/HECTARE

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

WINTER BARLEY

N EXTRA	O	APPLIED	Mean
	4.58	5.97	5.27

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

CROPS	CC SOWDT	N	CROPS
			CC SOWDT
0.664	0.384	0.350	0.940
CROPS	CC SOWDT	CROPS	N EXTRA
N	N	CC SOWDT	N
0.899	0.519	1.272	0.857

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

CROPS	0.857
CC SOWDT	0.495
CROPS.CC SOWDT	1.212

EXTRA	N EXTRA
	EXTRA
0.940	1.272

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

EXTRA	1.212
-------	-------

NOTE: do not use SED for comparisons involving Winter Barley means

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	26	1.15	25.6
BLOCK.WP.SP	25	1.48	33.0
GRAIN MEAN DM%	83.8		

STRAW TONNES/HECTARE

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

SPRING BARLEY

CC SOWDT	24 AUG	24 SEPT	Mean
CROPS			
FO RA SB	1.94	2.60	2.27
PH TA SB	2.27	1.70	1.99
RY GR SB	1.65	1.70	1.67
RYE SB	1.49	2.04	1.76
WH MU SB	1.97	2.18	2.07
WM+RY SB	1.83	2.37	2.10
Mean	1.86	2.10	1.98

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STRAW TONNES/HECTARE

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

	N	0	50	Mean
CROPS				
FO RA SB		2.09	2.45	2.27
PH TA SB		1.15	2.83	1.99
RY GR SB		1.90	1.45	1.67
RYE SB		1.54	1.99	1.76
WH MU SB		1.68	2.46	2.07
WM+RY SB		1.88	2.32	2.10

Mean 1.71 2.25 1.98

	N	0	50	Mean
CC SOWDT				
24 AUG		1.57	2.15	1.86
24 SEPT		1.84	2.35	2.10

Mean 1.71 2.25 1.98

	N	0	50
CROPS			
FO RA SB	CC SOWDT		
	24 AUG	1.68	2.20
PH TA SB	24 SEPT	2.51	2.69
	24 AUG	1.28	3.26
RY GR SB	24 SEPT	1.01	2.40
	24 AUG	2.34	0.95
RYE SB	24 SEPT	1.46	1.94
	24 AUG	0.91	2.06
WH MU SB	24 SEPT	2.17	1.91
	24 AUG	1.67	2.27
WM+RY SB	24 SEPT	1.69	2.66
	24 AUG	1.52	2.14
	24 SEPT	2.23	2.51

	N	0	APPLIED	Mean
N EXTRA				
EXTRA				
CULT FAL		0.90	2.04	1.47
TUMBDOWN		2.94	2.05	2.50
Mean		1.92	2.05	1.98

GRAND MEAN 1.98

WINTER BARLEY

	N	0	APPLIED	Mean
N EXTRA		2.77	3.17	2.97

STRAW MEAN DM% 89.3

PLOT AREA HARVESTED 0.00252