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ROTHAMSTED RESEARCH

Yields of the Field Experiments

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W/RN/12 Organic Manuring

Rothamsted Research

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16/W/RN/12

ORGANIC MANURING

Object: To study, from crop yields and soil analyses, the effects of a range of types of organic matter – Woburn, Stackyard B.

Sponsors: A. J. Macdonald

The 51st year, Winter Wheat

For previous years see 'Details' 1973 and Yield Books for 74-15/W/RN/12.

Design: 4 blocks of 8 plots

Whole plot dimensions: 8.0 x 29.5 (8.0 x 26.5 on Block III).

Treatments: From 1966 to 1971 the experiment had a preliminary period designed to build up organic matter from different sources. An arable rotation was started on two blocks on 1972 and the remaining two blocks in 1973. After a period of testing the residues, a further period of accumulation was started; on two blocks (which included ley sown in 1979) in 1981 and on the other two (which included ley sown in 1980) in 1982. A second test phase began when leys on the first pair of blocks were ploughed for the 1st test crop in 1987 and on the second pair for the 1st test crop in 1988. From 1988 two blocks, and 1989 the other two, to 1994, plots were split into 6 sub-plots to test five levels of nitrogen and nil. From 1995 to 1997 residual effects of that nitrogen were measured. In 1998 to 2000 yields were taken from whole plots only. In 2001 plots were split into half-plots to test two rates of N.
For 2003 the experiment was modified to test further inputs of organic matter. An arable rotation (w. rye, s. barley, w. beans, w. wheat, forage maize) was started on seven plots within each block; the eighth was sown to a grass/clover ley.

Whole plots

1. **Treatment** (Not necessarily applied each year):

1966-1971/2	1979/82-1986/7	Since 2003
Fd	Fd	F
Ln	Lc6	F
St	St	St
Gm	Lc8	CC
Pt	Lc8	Co
Fs	Fs	Dg10
Dg	Dg	Dg25
Lc	Lc6	Lc

F: no organic amendment. St: chopped straw at 7.5t/ha. CC: cover crop prior to spring sown crops. Co: compost at 40t/ha. Dg10: FYM at 10t/ha. Dg25: FYM at 25t/ha. Dg: FYM at 50t/ha. Fd: fertilizers equivalent to FYM. Fs: fertilizers equivalent to straw (+P). Lc/Lc6/Lc8: grass/clover leys. Ln: grass ley + N. Gm: green manure. Pt: peat.

Since 2003, all treatments, except Dg25, have also received PKS fertilizers:
20 kg P/ha, 83 kg K/ha, 36 kg S/ha

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In addition, in 2003 F and CC treatments received 120 kg N/ha, St received 90 kg N/ha. Dg10 received 60 kg N/ha. No N was applied to Dg25, Co or Lc treatments.

Nitrogen
In 2008 all plots, except Lc (permanent grass/clover), split into 6 to test rates of N. For crops receiving nitrogen rates rotate as follows:
N0 > N1 > N2 > N3 > N4 > N5 > N0 etc.

For 2009 s. barley crop nitrogen rates (kg N/ha) were:
0, 35, 70, 105, 140, 175 as nitro-chalk (27% N).

No N was applied to the beans in 2010

For 2011 W. wheat nitrogen rates (kg N/ha) were:
0, 50, 100, 150, 200, 250 as nitro-chalk (27% N).

For 2012 Forage Maize nitrogen rates were 0, 50, 100, 150, 200, 250 & 250 kg N/ha as Nitro-chalk (27% N)

For 2013 Winter rye nitrogen rates were 0,30,60,90,120,150 kg N/ha as Nitro-chalk (27% N)

For 2014 S Barley nitrogen rates were 0, 35, 70,105,140,175 kg N/ha as Nitro-chalk (27% N)

For 2015 Winter beans – No Nitrogen Applied

Experimental Diary

Date		Application	Rate	Units
29/10/2015	f	Applied FYM; Plots 5,11,23,26	25.00	t/ha
29/10/2015	f	Applied FYM; Plots 8,14,18,28	10.00	t/ha
30/10/2015	f	Applied compost; Plots 7 and 21	40.00	t/ha
02/11/2015	f	Applied compost; Plots 12 and 27	40.00	t/ha
02/11/2015	f	Applied straw; Plots 3,15,17,31	7.50	t/ha
09/11/2015	f	Topped straw plots; Plots 3,15,17,31.	-	-
10/11/2015	a	Ploughed; Thrown west	-	-
12/11/2015	a	Power harrowed	-	-
16/11/2015	s	Drilled Gallant, tr Redigo Pro; 4m tine drill	400.00	seeds/m^2
29/02/2016	f	Applied SOP; all plots except plots 5,11,23 and 26 (Dg25)	200.00	kg/ha
04/03/2016	f	Applied TSP Fertilizer; all plots including grass except plots 5,11,23 and 26 (Dg25)	97.50	kg/ha
31/03/2016	p	Sprayed Atlantis (in 150 lt/ha water volume); wheat only	0.40	kg/ha
31/03/2016	p	Sprayed Compitox Plus (in 150 lt/ha water volume); wheat only	1.00	lt/ha
31/03/2016	p	Sprayed Biopower (in 150 lt/ha water volume); wheat only	1.00	lt/ha
11/04/2016	f	Applied Nitro-chalk (27% N); 1st nitrogen treatment; by hand to wheat only	185.00	kg/ha
27/04/2016	f	Applied Nitro-chalk (27% N); 2nd nitrogen treatment; by hand to wheat only	185.00	kg/ha

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27/04/2016	f	Applied Nitro-chalk (27% N); 2nd nitrogen treatment; by hand to wheat only	370.00	kg/ha
27/04/2016	f	Applied Nitro-chalk (27% N); 2nd nitrogen treatment; by hand to wheat only	556.00	kg/ha
27/04/2016	f	Applied Nitro-chalk (27% N); 2nd nitrogen treatment; by hand to wheat only	741.00	kg/ha
30/04/2016	p	Sprayed Sprinter (in 150 lt/ha water volume); wheat only	2.00	lt/ha
30/04/2016	p	Sprayed Simba (in 150 lt/ha water volume); wheat only	20.00	g/ha
30/04/2016	p	Sprayed Cortez (in 150 lt/ha water volume); wheat only	0.75	lt/ha
30/04/2016	p	Sprayed Bravo 500 (in 150 lt/ha water volume); wheat only	1.00	lt/ha
23/05/2016	p	Sprayed Sprinter (in 150 lt/ha water volume); wheat only	2.00	lt/ha
23/05/2016	p	Sprayed Vortex (in 150 lt/ha water volume); wheat only	1.50	lt/ha
23/05/2016	p	Sprayed Hunter (in 150 lt/ha water volume); wheat only	1.50	lt/ha
26/05/2016	a	Cut paths		
09/06/2016	p	Sprayed Cello (in 150 lt/ha water volume); wheat only	0.60	lt/ha
09/06/2016	p	Sprayed Cyflamid (in 150 lt/ha water volume); wheat only	0.15	lt/ha
09/06/2016	p	Sprayed Hallmark (in 150 lt/ha water volume); wheat only	50.00	ml/ha
11/07/2016	a	Cut paths	-	-
12/07/2016	a	Cut paths	-	-
13/07/2016	a	Cut grass plots for yield	-	-
14/07/2016	a	Mowed all grass plots	-	-
14/07/2016	a	Turned grass	-	-
18/07/2016	a	Turned hay	-	-
18/07/2016	a	Rowed up and baled hay; Grass plots only	-	-
13/08/2016	a	Combined plots for yield; All wheat plots	-	-
15/08/2016	a	Combined; Commercial combine swathed rest of the plots	-	-
19/08/2016	a	Removed all bales	-	-
08/09/2016	a	Baled Straw	-	-
12/09/2016	a	Removed bales	-	-
10/11/2016	a	Cut grass plots for yield (2nd Cut)	-	-

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16/W/RN/12

WINTER WHEAT

GRAIN TONNES/HECTARE (85%DM)

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

Nitrogen	0	50	100	150	200	250	Mean
Treatment							
F(Fd)	0.91	3.69	6.13	6.83	7.93	7.91	5.57
F(Ln,Lc6)	2.38	3.64	5.95	7.13	7.31	6.94	5.56
St(St)	1.17	3.85	5.63	6.98	6.92	7.70	5.37
CC(Gm,Lc8)	0.84	3.92	5.65	6.76	7.52	7.72	5.40
Co(Pt,Lc8)	1.92	3.67	7.19	7.09	6.82	7.23	5.65
Dg10(Fs)	1.15	4.31	6.28	7.37	8.5	8.39	6.00
Dg25(Dg)	2.33	4.93	7.4	8.16	7.83	9.15	6.63
Mean	1.53	4	6.32	7.19	7.55	7.86	5.74

Standard errors of differences of means

Table	Treatment	Nitrogen	Treatment Nitrogen
rep.	24	28	4
s.e.d.	0.518	0.246	0.788
d.f.	18	105	74.46

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

Treatment	0.651
d.f.	105

Grain Mean Dm (%) 86.8

Plot area harvested (ha)
0.001566 0.001766

GRASS/CLOVER

DRY MATTER TONNES/HECTARE

***** Table of means *****

Year	1st Cut	2nd Cut	Total
2003	-	-	-
2004	1.82	-	1.82
2005	1.86	0.13	1.99
2006	4.07	-	4.07
2007	3.12	1.36	4.48
2008	5.72	1.65	7.37
2009	4.77	-	4.77
2010	4.41	-	4.41
2011	1.46	0.39	1.85
2012	4.11	0.64	4.75
2013	4.65	0.60	5.24
2014	4.09	0.91	5.01
2015	*	0.36	-
2016	3.97	0.56	4.53

Cut dry matter t/ha (13-Jul-2016 & 10-Nov-2016)

*Note: Herbage and grain samples were taken for chemical analysis.

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