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Yields of the Field Experiments 2014

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W/RN/12 Organic Manuring

Rothamsted Research

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14/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 49th year, S Barley and mustard

For previous years see 'Details' 1973 and Yield Books for 74-13/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)

Experimental Diary

Date		Application	Rate	Units
10-Sep-13	s	Broadcast mustard cv. Asta undressed - Plots 4, 10,19 and 32	10	kg/ha
10-Sep-13	a	Power harrowed to cover mustard. Plots 4,10,19 and 32	-	-
10-Sep-13	a	Rolled plots 4, 10,19 and 32	-	-
27-Sep-13	p	Sprayed Samurai - Grass and Mustard plots NOT sprayed	4.0	l/ha
27-Sep-13	p	Sprayed Firebrand - Grass and Mustard plots NOT sprayed	1.0	l/ha
05-Mar-14	p	Sprayed Gallup 360. Prep for spring crop. Grass plots not sprayed.	1.0	l/ha
18-Mar-14	f	Applied FYM Plots 8, 14, 18, 28.	10	t/ha
18-Mar-14	f	Applied FYM Plots 5, 11, 23, 26.	25	t/ha
18-Mar-14	a	Applied straw Plots 3, 15, 17 and 31	7.5	t/ha
18-Mar-14	a	Applied compost Plots 7, 12, 21 and 27.	40	t/ha
20-Mar-14	a	Ploughed	-	-
01-Apr-14	s	Drilled Barley var. Tipple	350	seeds/m^2
15-Apr-14	f	Applied TSP - Applied to all plots apart from 5,11,23 and 26	97.5	kg/ha
15-Apr-14	f	Applied SOP - Applied to all plots apart from 5,11,23 and 26	200	kg/ha
30-Apr-14	p	Sprayed Hallmark with Zeon Technology in 200l/ha water volume	40	ml/ha
13-May-14	f	Applied Nitro Chalk applied by hand at rates given above.	-	-
21-May-14	p	Sprayed Refine Max in 150 l/ha water volume	75	g/ha

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21-May-14	p	Sprayed Kingdom in 150 l/ha water volume	1.25	l/ha
21-May-14	p	Sprayed Bravo 500 in 150 l/ha water volume	1.0	l/ha
21-May-14	p	Sprayed Hatchet Xtra in 150 l/ha water volume	0.75	l/ha
13-Jun-14	p	Sprayed Fezan - barley only	0.6	l/ha
14-Jun-14	p	Sprayed Hallmark - barley only	40	ml/ha
26-Jun-14	a	Cut grass plots for yield	-	-
30-Jun-14	a	Mowed grass plots	-	-
01-Jul-14	a	Turned hay	-	-
02-Jul-14	a	Turned hay	-	-
03-Jul-14	a	Baled and Removed hay	-	-
24-Aug-14	a	Combined plots for yield	-	-
06-Sep-14	a	Baled and Removed	-	-
11-Sep-14	p	Sprayed Firebrand in 200 l/ha water volume. Problem with "Auto control" on sprayer, switched to manual.	1.0	l/ha
11-Sep-14	p	Sprayed Samurai in 200 l/ha water volume. Problem with "Auto control" on sprayer, switched to manual.	4.0	l/ha
03-Dec-14	a	Cut grass plots for yield	-	-
10-Dec-14	a	Topped grass plots	-	-

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SPRING BARLEY

GRAIN TONNES/HECTARE (100%DM)

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

Nitrogen Treatment	0kg	35kg	70kg	105kg	140kg	175kg	Mean
F(Fd)	2.14	4.53	5.93	6.64	7.36	7.36	5.66
F(Ln,Lc6)	2.63	5.18	6.99	7.39	7.54	8.10	6.31
St(St)	2.47	4.66	6.52	6.94	7.97	7.71	6.04
CC(Gm,Lc8)	1.77	4.08	5.07	6.06	6.28	6.49	4.96
Co(Pt,Lc8)	4.29	6.44	8.13	8.42	7.98	7.74	7.17
Dg10(Fs)	2.82	5.23	6.58	7.65	7.51	7.77	6.26
Dg25(Dg)	4.38	6.36	7.14	7.24	6.70	7.07	6.48
MEAN	2.93	5.21	6.62	7.19	7.33	7.46	6.13

Standard errors of differences of means

Table	Treatment	Nitrogen	Treatment Nitrogen
rep.	24	28	4
s.e.d.	0.254	0.119	0.383
d.f.	18	105	73.11
Except when comparing means with the same level(s) of Treatment			0.314
d.f.			105

Grain Mean %DM 86.5

Plot area harvested (ha)
0.001766 0.001566

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

Cut dry matter t/ha (26-Jun-14 & 03-Dec-14)

Note: See previous Yield Books (2004-12) for cutting dates

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