ROTHAMSTED RESEARCH

Yields of the Field Experiments 2012

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W/RN12 Organic Manuring

Rothamsted Research

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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 47th year, forage maize

For previous years see 'Details' 1973 and Yield Books for 74-12/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)

Experimental Diary

Date		Application	Rate	Units
01-Sep-11	a	Combined Plots	-	
30-Sep-11	s	Spread mustard by hand, as per plan	-	
30-Sep-11	a	Shallow power harrow to incorporate mustard seeds as per plan	-	
24-Nov-11	a	Cut and weighed grass plots for yield (yield cut 2 in 2011).	-	
30-Nov-11	a	Cut and removed grass - grass plot only	-	
01-Dec-11	a	Topped grass a second time to tidy up	-	
29-Mar-12	f	Spread Fert TSP with Kuhn, as per plan	97.5	kg/ha
29-Mar-12	f	Spread Fert SOP with Kuhn, as per plan	200	kg/ha
29-Mar-12	f	Applied basal fertilisers as plans, TSP @97.5kg/ha except plots 5,11,23,26. Sulphate of Potash applied @200kg/ha except plots 5,11,23,26. TH	-	kg/ha
19-Apr-12	a	Spread FYM, straw, compost by hand	-	kg/ha
20-Apr-12	a	Spread FYM, straw, compost by hand to finish	-	kg/ha
20-Apr-12	a	chopped straw with orsi	-	
18-May-12	a	Ploughed soil to the south	-	
23-May-12	a	Powerharrowed maize areas	-	
24-May-12	f	Applied N treatments, as per plan	-	kg/ha
25-May-12	s	Drilled Maize, Hudson Maize trt Mesurol, rolled plots after drilling	10.1	seeds/m^2
26-Jun-12	p	Spray Samson Extra herbicide + Callisto in 200l of water on maize areas only	Sa 0.75 Ca 1.0	l/ha
12-Jul-12	f	Applied Nitro-chalk as per plan	See above	
17-Jul-12	a	Cut and weighed grass plots for yield - cut 1	-	
17-Jul-12	a	Cut paths	-	
24-Jul-12	a	Grass areas topped	-	

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25-Jul-12	a	Turned hay	-
28-Jul-12	a	Rowed up hay	-
28-Jul-12	a	Baled and Removed	-
15-Aug-12	a	Cut paths	-
02-Oct-12	a	Cut Maize for yields	-
03-Oct-12	a	Cut Maize for yields	-
10-Oct-12	a	Mowed, Baled and removed maize	-
05-Nov-12	a	Cut and weighed grass plots for yield cut 2	-
05-Nov-12	a	Applied FYM as per plan	see plan

NOTE: Whole crop samples taken for chemical analyses

FORAGE MAIZE

WHOLE CROP TONNES/HECTARE (100%DM)

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

Nitrogen / **Treatment**	0kg	50kg	100kg	150kg	200kg	250kg	Mean
F(Fd)	1.96	3.31	2.95	3.30	3.65	3.25	3.07
F(Ln,Lc6)	3.26	5.40	5.20	5.38	6.73	6.55	5.42
St(St)	3.03	4.12	6.53	5.73	6.71	5.55	5.28
CC(Gm,Lc8)	3.18	4.35	5.25	5.81	6.09	6.46	5.19
Co(Pt,Lc8)	5.22	5.79	8.26	9.17	7.43	8.45	7.39
Dg10(Fs)	3.60	5.59	6.94	5.69	7.31	6.28	5.90
Dg25(Dg)	5.75	6.65	7.47	8.80	6.80	7.28	7.13
Mean	3.71	5.03	6.09	6.27	6.39	6.26	5.62

Standard errors of differences of means

Table	**Treatment**	**Nitrogen**	**Treatment Nitrogen**
s.e.d.	1.311	0.449	1.702
Except when comparing means with the same level(s) of Treatment			1.188

Grain Mean %DM 24.3

Plot area harvested (ha) 0.000560

NOTE: Due to wet weather and severe weed infestation maize yields were much smaller than would normally be expected.

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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

Cut dry matter t/ha (17/7/12 & 5/11/12)

Note: See previous Yield Books (2004-11) for cutting dates

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