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Results of the Classical and Other Long-term Experiments - 2017

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17/W/RN/12 Organic Manuring (Stackyard B, Woburn Farm)

Rothamsted Research

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17/W/RN/12 ORGANIC MANURING (Stackyard B, Woburn Farm)

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 52nd year, Forage Maize.

For previous years see 'Details' 1973 and Yield Books for 74-16/W/RN/12.

Design: 4 blocks of 8 plots

Whole plot dimensions: 8.0 m x 29.5 m (8.0 m x 26.5 m 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 (winter rye, spring barley, winter beans, winter 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

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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

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 spring 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 Winter wheat rates were 0, 50, 100, 150, 200 & 250 kg N/ha as nitro-chalk (27% N).

For 2012 Forage maize 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

For 2016 Winter wheat rates were 0, 50, 100, 150, 200 & 250 kg N/ha as Nitro-Chalk (27% N)

For 2017 Forage maize rates were 0, 50, 100, 150, 200 & 250 kg N/ha as Nitro-Chalk (27% N)

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Experimental Diary

Date		Application	Rate	Units
09/09/2016	s	Hand broadcast mustard Zlata - plots 4, 10, 19 and 32 only. Cover Crop plots (CC).	10.00	kg/ha
09/09/2016	a	Power harrowed - Cover crop plots lightly.	-	-
13/04/2017	p	Sprayed Firebrand - Sprayed off stubble only.	1.00	lt/ha
13/04/2017	p	Sprayed Samurai - Sprayed off stubble only.	4.00	lt/ha
20/04/2017	f	Applied Chalk - all plots	5.00	t/ha
21/04/2017	f	Applied SOP (50% K2O, 45% SO3) - all plots apart from 5, 11, 23, 26.	200.00	kg/ha
21/04/2017	f	Applied MOP - all plots a part from 5,11,23,26.	97.50	kg/ha
24/04/2017	f	Applied compost - plots 7, 12, 21, 27	40.00	t/ha
25/04/2017	f	Applied straw - plots 3, 15, 17, 31	7.50	t/ha
25/04/2017	f	Applied FYM - plots 5, 11, 23, 26	25.00	t/ha
25/04/2017	f	Applied FYM - plots 8, 14, 18, 28	10.00	t/ha
26/04/2017	a	Topped straw plots	-	-
27/04/2017	a	Ploughed - thrown south east	-	-
03/05/2017	a	Power harrowed	-	-
04/05/2017	a	Rolled prior to drilling	-	-
04/05/2017	s	Drilled maize Severus tr. Mesurial	10.10	s/m^2
25/05/2017	f	Applied Nitro-chalk (27% N) by hand - N1 to N5 treatments	185.00	kg/ha
19/06/2017	a	Cut paths	-	-
22/06/2017	f	Applied Nitro-chalk (27% N) by hand. To plots 0025, 0033, 0044, 0054, 0064, 0076, 0085, 0091, 0102, 0111, 0123, 0142, 0154, 0162, 0176, 0181, 0192, 0201, 0211, 0223, 0236, 0252, 0262, 0273, 0283, 0305, 0312, 0323 - Maize plots only	185.00	kg/ha

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22/06/2017	f	Applied Nitro-chalk (27% N) by hand. To plots 0023, 0034, 0042, 0051, 0061, 0074, 0086, 0094, 0103, 0114, 0125, 0141, 0152, 0165, 0172, 0183, 0191, 0204, 0216, 0221, 0234, 0254, 0264, 0275, 0281, 0306, 0316, 0321 - Maize plots only	370.00	kg/ha
22/06/2017	f	Applied Nitro-chalk (27% N) by hand. To plots 0026, 0031, 0041, 0052, 0066, 0075, 0081, 0096, 0101, 0115, 0122, 0145, 0151, 0161, 0174, 0184, 0196, 0203, 0213, 0224, 0233, 0251, 0261, 0276, 0285, 0301, 0314, 0322 - Maize plots only	556.00	kg/ha
22/06/2017	f	Applied Nitro-chalk (27% N) by hand. To plots 0024, 0032, 0045, 0053, 0065, 0073, 0084, 0093, 0106, 0116, 0126, 0146, 0155, 0163, 0171, 0185, 0193, 0202, 0215, 0226, 0235, 0256, 0266, 0272, 0282, 0304, 0311, 0325 - Maize plots only	741.00	kg/ha
26/06/2017	p	Sprayed Callisto in 200 lt/ha water volume - maize plots only	1.50	lt/ha
26/06/2017	p	Sprayed Samson Extra in 200 lt/ha water volume	0.75	lt/ha
27/06/2017	a	Cut grass plots for yield (1st Cut)	-	-
06/07/2017	a	Mowed all remaining grass on plots	-	-
10/07/2017	a	Baled and removed all remaining grass	-	-
11/08/2017	a	Topped Surrounds and paths	-	-
20/09/2017	a	Started Harvesting Maize for Yield	-	-
21/09/2017	a	Finished Harvesting Maize for Yield	-	-
29/09/2017	a	Topped Trial Site	-	-
17/11/2017	a	Cut grass plots for yield (2nd Cut)	-	-

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Yields

FORAGE MAIZE

GRAIN TONNES/HECTARE (100% DM)

Tables of means

Nitrogen Treatment	0	50	100	150	200	250	Mean
F(Fd)	3.40	6.04	7.05	8.85	10.37	10.06	7.63
F(Ln, Lc6)	5.31	8.27	9.57	11.87	10.62	13.05	9.78
St(St)	5.75	6.79	8.88	9.26	10.84	12.14	8.94
CC(Gm, Lc8)	5.19	5.59	8.93	8.61	7.51	11.64	7.91
Co(Pt, Lc8)	7.96	11.38	13.86	11.60	13.13	13.91	11.97
Dg10(Fs)	6.32	8.14	11.70	11.57	12.78	12.86	10.56
Dg25(Dg)	9.75	13.24	16.00	13.45	13.94	14.79	13.53
Mean	6.24	8.49	10.85	10.74	11.31	12.64	10.05

Standard errors of differences of means

Table	Treatment	Nitrogen	Treatment Nitrogen
s.e.d.	1.559	0.499	1.971
Except when comparing means with the same level(s) of Treatment	1.321		
d.f.	105		
Grain Mean DM (%)	28.8		
Plot area harvested (ha) 0.00063			

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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
2013	4.65	0.60	5.24
2014	4.09	0.91	5.01
2015	*	0.36	-
2016	3.97	0.56	4.54
2017	2.17	1.48	3.65

Cut dry matter t/ha (27 JUN 2017 & 17 NOV 2017)

Note: Whole maize crop and herbage samples were taken for chemical analyses and archiving.

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